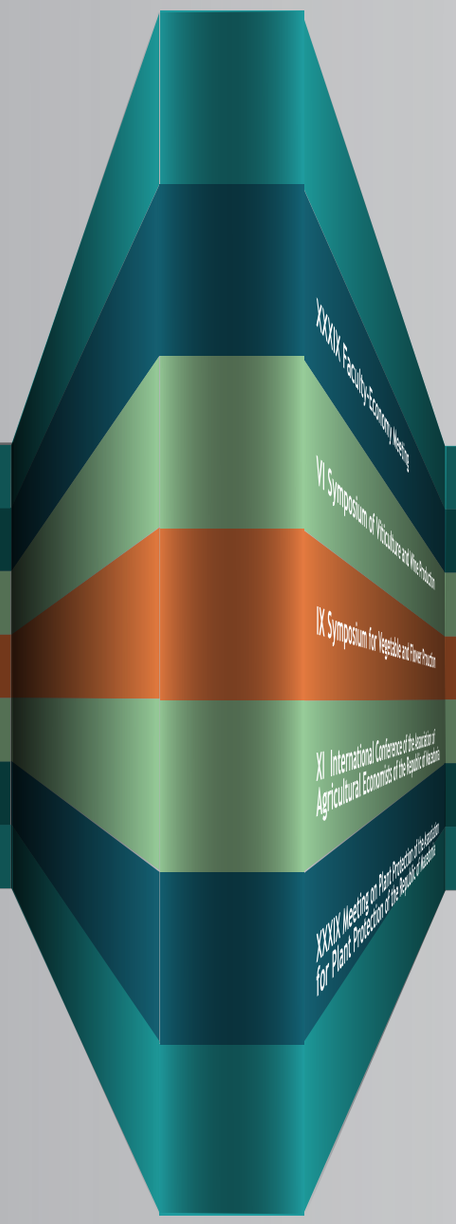
BOOK OF ABSTRACTS



70 YEARS

1947
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3rd INTERNATIONAL SYMPOSIUM FOR
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18-20 October 2017,

Ohrid, Republic of Macedonia

Ss. Cyril and Methodius
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BOOK OF ABSTRACTS

The Abstracts are arranged by the chronological order of acceptance, only technically edited according to the Guidelines for Abstracts, without additional editing of the main text. The results and writing style are presented in the original form provided by the authors.

3rd INTERNATIONAL SYMPOSIUM FOR AGRICULTURE AND FOOD

ISAF 2017

Organized by
Faculty of Agricultural Sciences and Food-Skopje
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Republic of Macedonia

18-20 October 2017 Ohrid, Republic of Macedonia

EVENTS COVERED BY ISAF 2017

XXXIX FACULTY-ECONOMY MEETİNG
VI SYMPOSİUM OF VİTİCULTURE AND WİNE PRODUCTİON
IX SYMPOSİUM FOR VEGETABLE AND FLOWER PRODUCTİON
XI INTERNATİONAL CONFERENCE OF THE ASSOCİATİON OF AGRİCULTURAL ECONOMİSTS OF THE REPUBLİC OF MACEDONİA
XXXIX MEETİNG ON PLANT PROTECTİON OF THE ASSOCİATİON FOR PLANT PROTECTİON OF THE REPUBLİC OF MACEDONİA

For the occasion of its 70 years anniversary, the Faculty of Agricultural Sciences and Food – Skopje organizes a 3rd International Symposium for Agriculture and Food (ISAF 2017), offering possibility for presenting novel and fundamental advances in the field of sustainable agriculture and food production. ISAF 2017 will bring together and foster the communication among leading researchers, engineers and practitioners with an aim to share their scientific ideas and experience with all actors in the agricultural sector. The 3rd International Symposium for Agriculture and Food (ISAF 2017) is intended to gather scientists and engineers in the area of agriculture and food production with imperative to improve and strengthen the cooperation between Universities, Institutes, Agribusiness and related companies.

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NEW CONCEPTS IN TECHNOLOGICAL DEVELOPMENT OF AGRICULTURE

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Abstract
The agriculture in the Republic of Macedonia is in the constant development crisis originating from its agricultural policy. There are several structures such as: very small individual holdings (farms) that use about 80% of the agricultural land; several cooperatives; and agricultural companies that use about 20% of the best quality agricultural land in the country.The industrial labor organization in the several big agricultural companies disrupts the natural cycle of the plant and animal production, increases the input, decreases the production capacity of the land and creates environmental issues. The reproduction and milk production as phases of the farming process are especially expensive and require individual treatment of animals. The trend of development of village structures for production which can encompass the principles of agricultural production is negative. The small land property structure, which is worsening each year, causes de-professionalization, especially in the hilly and mountain regions. A change of strategy for technological development in agriculture is proposed for benefit of village agricultural holdings according to the west European examples based on cooperative investment and ownership.
Keywords: agricultural corporations, environmental issues, agricultural structure, production potential, production phases.

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STRUCTURAL CHARACTERISTICS OF FARMS IN THE REPUBLIC OF MACEDONIA

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Abstract
Agricultural households are the basic productive and socio-cultural communities in the villages. The general, as well as the specific characteristics contribute to the overall level of productivity. This kind of characteristics, such as size of the farm, surface, irrigation and water availability, are the main indicators and potentials for development. The limited size of the farms is considered one of the major factors hindering the transition from the households based on subsistence in agricultural economy to commercially-oriented production systems. Irrigation and water availability have major influence on the long lasting incomes and sustainability of resources. Besides these agricultural features, socio-demographic characteristics of farmers such as level of education, knowledge of agricultural practices, accession to agricultural funds, poverty level, age and gender structure in the households, can also affect on the performance of the farms. The purpose of this paper is to present the current condition in terms of number of farms, size of the land at their disposal, possibilities for irrigation, livestock, labor characteristics, and also to provide insight in the functioning of the farms in the Republic of Macedonia. The paper should also provide a way to use the advantages or to correct the current structures in order to effectively provide growth, thus empowering small farmers to make significant changes, so the ultimate goal is achieved – reduce of rural poverty. Methodologically, the paper is based on the data from the Statistical Office of the Republic of Macedonia, and the analysis is made with a combination of quantitative and qualitative approach, where the main indicators are number of farms, their size, number of employees, irrigation surface and number of livestock.
Keywords: farm, household, structure, characteristics.

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ENTREPRENEURSHIP IN THE PUBLIC UTILITY COMPANY - CITY MARKETS

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Abstract

The aim of this paper is to highlight the important aspects that determine entrepreneurship and its importance to the economic development, it is their effects on the development of City Markets Co.This study was conducted using various methods such as analytical methods, interview and direct observation. In addition, hypothetical-deductive method, statistical methods and descriptive methods were also used. Data were obtained from different sources - the internal and electronic documentation of Public Utility Company (PUC) - City Markets, professional literature and the internet.The Public Utility Company City - Markets follows the rhythm of technological development intensively and adapts to the changing needs of consumers. These changes were primarily influenced by the appearance of supermarkets and megamarkets, the expansion of cashless payment system, credit cards and sprecific changes in habits, desires and tastes of customers.The Law on Public Utilities will open the possibility for cooperation with the private sector and various subcontractors, which will greatly contribute to the development strategy for the future development of market activity.

Keywords: technological innovation, organizational structure, strategy, urban markets.

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ANALYSIS OF VEGETABLES PRODUCTION IN REPUBLIC OF SERBIA

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Abstract
In this paper are analyzed vegetables production characteristics in Republic of Serbia and Vojvodina region, in the period 2000-14 year. Production characteristics are harvested area under the vegetables, and share of it in total area. Source of data is official publications of Republic institution of statistics of Republic of Serbia. Data were analyzed by method of descriptive statistic.Analysis show that total average area under the vegetables was 131.003 ha in Serbia, and 34.462 ha in Vojvodina. Maximal area was 138.924 ha in Serbia, and 37.390 ha in Vojvodina in first year of analysis, and minimal area was 121.260 ha in Serbia (2013), and 30.676 ha (2014) in Vojvodina. Average year change rate was -1.47% with coefficient of variation of 4.72% in Serbia, and change rate -2.18% and coefficient of variation of 6.96% in Vojvodina.Negative tendencies in area under the vegetables are compensated by increasing of average yields, so total production of vegetables in Serba and Vojvodina region show positive tendency.
Keywords: descriptive analysis, vegetable production characteristics.

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PROPOSAL OF A NEW SPATIAL INTERPOLATION TECHNIQUE BASED ON THE HARMONIC ANALYSIS

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Abstract

In most application, it is difficult to measure a variable at every point in a given area. On the other hand, making measurements at multiple locations require significant economic cost. Thus, it is crucial to optimize the number of measurement stations In most agrometeorological, meteorological and hydrological studies, it is important to know the areal distribution of a variable in question. In most cases, we may not have the observation values at a specific point in the study area. This kind of problem can be solved by applying some spatial interpolation techniques. In this study, a practical spatial interpolation technique is introduced into the current literature. This technique is based on the harmonic analysis. In this application, we used the monthly precipitation totals of 50 meteorological stations separated over Inner Anatolian Region of Turkey. By using this precipitation data, Fourier coefficients A1, A2, B1, and B2 were calculated and mapped on the study area. By using these coefficients the amplitudes C1, C2 and the phase angles 1, 2 were also calculated and mapped. Besides to these calculations, variation of the average monthly precipitation totals over region also considered in study. Bu utilizing these spatial variations of abovementioned parameters, it is possible to estimate the variation of monthly precipitation totals of an ungauged location. In other words, the proposed method enables us to make spatial or areal interpolation of a given variable at every point in the study area. The results of the study showed that the proposed method is capable of making accurate estimation. The proposed method can be used in the estimation of any variable such as temperature, humidity, river flows, evaporation, soil water content at an ungauged location.

Keywords: spatial interpolation, harmonic analysis, precipitation, ungauged location, Turkey.

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SUPPLY CHAIN OF INDONESIAN BEEF MARKET

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Abstract

Indonesian beef market is very interested, with 250 million inhabitants, a year around 670 million Kg be consumed, which are 440 million Kg supplied by local production and 230 million Kg be imported. The beef price in Indonesian market about double than that in Australia as 9.1 USD to 4.2. The highness of price and a wide margin are interested for research team is now going on. The research question are how do supply chain look like, how do distribution of the wide margin from importers to retailers, is corruption still exist due to the import licensed, and who really enjoy the profit?

Keywords: Indonesia, import license, corruption.

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INFLUENCE OF CLIMATIC CONDITIONS ON YIELD AND PROFITABILITY OF QUINCE BRANDY

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Abstract
The aim of this study was to show how climatic conditions could affect the yield and profitability of quince brandy production.The study was conducted using various methods such as content analysis, analytical methods, interview and direct observation. In addition, hypothetical-deductive method, statistical methods and descriptive methods were also used. Data were obtained from different sources i.e. the internal documentation of agricultural holding where the quince, as a raw material for production of brandy was produced, professional literature and the internet.The analysis was done for the period 2013 - 2016.The study showed that climatic conditions can affect the yield and profitability of quince brandy production, and the production of quince brandy in analysed years was profitable.
Keywords: climate conditions, yield, profitability, quince brandy.

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ORGANISATIONAL AND ECONOMIC CONDITIONS FOR IMPROVING BIODIVERSITY AND HUNTING IN THE JABLANICA DISTRICT

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Abstract
Hunting development in the Jablanica District was not approached in an organised fashion, with the purpose of establishing a profitable activity. Hunting development as a whole aimed at entertaining people. As a result, the environment was not treated with sufficient care and one needs to bear in mind that the environment is a natural framework within which all living beings live and interact. The environment is an ecosphere comprising the biosphere, i.e. the world of nature and natural resources, and the techno-sphere, i.e. the world of human inventions and produced material goods.Putting the notion of hunting in the framework of material welfare constituted a major injustice, and instead of turning this area into a leading hunting destination for tourists, we had to satisfy ourselves with sporadic hunting tourists who were ready to pay for hunting services. However, even that was not done properly. Hills and mountains characterised by untouched wild life, which offered certain advantages for hunting development, have not even been considered.It is crucial to persuade people who decide to visit our hunting destination that foreign currency effects in the course of one hunting trip could be higher than total income of an entire hotel in the course of a tourist season. Accordingly, with regards to hunting strategy development, facts and business indices are more important than ideas.In order to change the current circumstances it is necessary to have hunting development programmes available at any time. These programmes, however, should also promote hunting as an activity which surpasses sport, i.e. an activity which can be highly profitable and which can provide employment for numerous young people and highly educated professionals.
Keywords: hunting, biodiversity, tourism, profitable activity.

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DEVELOPMENT OF TOBACCO ECONOMY IN THE REPUBLIC OF MACEDONIA

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Abstract
Tobacco production is an important part of the Macedonian tradition, the Macedonian agriculture and economy in general. The aim of this work was to provide a clear picture of tobacco production and processing in Macedonia for a past period of twenty five years; for that purpose there were mainly used published statistical data by the State Statistical Office of the Republic of Macedonia, Analysis of the Ministry of Agriculture, Forestry and Water Economy. During data processing, many methods common for such research were used, mainly the comparative-analytical method. The production of tobacco takes place on an area of above 16.000 hectares, where farmers mostly use relatively poor, low productivity class soil. Today, the whole process of tobacco production includes more than 30.000 households and large number of family members. Tobacco industry in Macedonia has great importance for the overall economy of the state. The tobacco industry is also important as primary production, although less than 50 % of the available capacities are not utilized. The production of cigarettes since independence of the country has a major reduction because of declining demand, which previously consisted of consumers from the ex-Yugoslavia. Today, part of the tobacco industry is transformed into private enterprises. The industry employs about 3.500 workers per year, has a relatively high share in the creation of domestic GDP and exports tobacco and cigarettes whose value exceeds the value of imported tobacco and cigarettes for domestic factories and direct customers with over 130 million US dollars annually. Tobacco is the most widely cultivated cash crop and, it seems that in Macedonia, tobacco will remain to be an interesting and profitable crop for many generations further.
Keywords: tobacco production, industry, cigarettes.

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STRUCTURAL PROBLEMS OF SERBIAN AGRO EXPORTS – EXAMPLE ON CORN EXPORTS AND PORK IMPORTS

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Abstract
The most visible changes in the structure of Serbian foreign trade have occurred during the transitional reforms in the nineties of the last century. They have reflected in deterioration of export structure, to the detriment of livestock products (reducing the share of livestock products), and in favor of raw materials, primarily grain. Thus, on the one hand extensification of agricultural export was carried out, reflected in increased participation of grains, raw and unprocessed products, while on the other hand there was increase in imports of meat, milk and other animal products, whose production is based on the production of cereals, or corn. Taking into account the production and technological connections, increased imports of finished livestock products could be substituted by domestic production, based on the consumption of maize as the export of raw materials for fodder. From an economic standpoint, the import of finished products (meat and meat products) is the opportunity cost of export of raw unprocessed product (maize). The opportunity cost of corn exports represents the increase value of the import of meat and meat products, which is the result of unrequited domestic production and export of meat on the basis of exported corn as the basic raw material for animal feed, i.e. pigs. For the purposes of calculating the opportunity cost, the analysis of production, consumption, exports, imports and prices of raw materials and finished products of corn and pork in Serbia has been done for the period 2000-2015. The aim of the study was to analyze the opportunity cost of increased exports of unprocessed primary agricultural products, based on the examples of increased exports of corn as raw material and imports of pork as product of higher stage of finalization.
Keywords: agrarian production, agrarian export, opportunity cost, export of corn, import of meat.

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THE ROLE OF ALTERNATIVE FOOD SYSTEMS IN LOCAL ECONOMIC DEVELOPMENT

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Abstract

Local food systems are potential alternatives for small-scale farmers and for consumers committed to support sustainable food consumption. Besides providing healthy food and supporting the sustainable operation of local food producers, the activities of grassroots consumer-producer groups invigorate the local economy. In our study we demonstrate the potential role of alternative food systems in local economic development and community development through as European and Hungarian good examples. Due to the concerns about the long-term sustainability of globalized retail, and to the stronger presence of the health-conscious food consumer behaviour, the European Union's rural development policy places great emphasis on this type of food system chains, to develop the quality and the production of local food products of small farmers and to promote their access on the direct market. The demand for establishing and developing short food supply chain networks has increased in Hungary as well. The Hungarian small farmers are typically made up of individuals and micro-enterprises, and the majority of them do not have the appropriate level of expertise, legal knowledge, advocacy and the application capacity to fully utilise the opportunities of short supply chains. For them the alternative local food systems can be an ideal solution.

Keywords: small-scale food systems, local economy, good practices, document analysis.

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ECONOMIC AND SOCIAL EFFECTS OF AGRICULTURAL IRRIGATIONS IN TURKEY

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Abstract

In this study, we examined the Asartepe dam in Ankara province. We evaluated the economic and social effects of agricultural irrigation and selected main variables are determined as a agricultural usage of water, agricultural production, social-cultural design, migration, economical conditions and etc.A significant portion of the material used in the survey, which was composed of any farming in the area of agriculture to data obtained by the enterprise survey. Survey by interviewing enterprises questionnaire forms have been filled out by going into enterprise.Data for 2016 production period year of agricultural enterprises are collected by questionnaire. In addition to the primary data obtained well as research findings that are previously made on the subject, which has benefited from the secondary data records and published by various organizations.Studies and surveys identified and then a set of selected enterprises are to be implemented by the Simple Random Sampling method (SRS). The information in the questionnaire data entry is made in the MS Office environment. The primary data analysis using SPSS Statistical package programme and Eviews Econometrics package program entered into the computer program and evaluated in the process of statistical tables are prepared.

Keywords: economic and social effects, agricultural establishments, agricultural irrigation, Turkey.

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SUPPLY CHAINS AS NETWORK -THE CASE OF ORGANIC PRODUCTION IN MACEDONIA

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Abstract

The absence of relations between the primary producers and markets has been identified as one of the primary problems in the supply chain for producing organic products in Macedonia Nevertheless, the organization and network structure of the supply chains are often responsible for the economic performance, competitiveness and information diffusion between the trading firms and their partners-farmers producing organic products. In this regard, analyzing supply chains through social network analysis lens helps to identify the actors and the important factors that contribute in the information diffusion across the supply chains. The aim of this paper is to identify and map the information diffusion channels of the largest distributors of organic products in Macedonia, by mapping the structure of their social networks. The Social Network Analysis include networks on: horizontal level - farmer's decision to involve in organic farming, or transfer the conventional production into organic and vertical level – information provided by the distribution and trading partners in the organic value chain. The results show that information and resources are often embedded in the farmers' personal network, however farmers producing organic products are a closed group with very few relations among themselves, indicating to a low level of trust in sharing or receiving information. Most of the identified relations among the actors in the analyzed network are based either on commercial (distributors) or friendship (other farmers) basis. The identified absence of relations among farmers on horizontal level can seriously impede the transfer of information innovation and decrease the motivation for entering, maintaining and introducing innovations in the organic production, thus further examination and improvement of the information channels is necessary.

Keywords: information, Macedonia, organic, social network analysis, supply chains.

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INDICATORS OF RURAL POVERTY IN MACEDONIA – MULTIDIMENSIONAL POVERTY ANALYSIS

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Abstract
Rural poverty presents an escalating problem for post-communist countries struggling with a long-lasting transition towards market economy. As a country deriving from such economic background, Republic of Macedonia is facing typical problems with poverty and is classified as one of the poorest countries in Europe. The rural population in the country is especially affected and faced with poverty, reflected through different obstacles such as: limited access to institutions, infrastructure, finances, and other aspects which not only impede these populations living conditions but also obstruct the development and growth of the rural areas. In order to provide detailed description of the rural poverty situation as well as to identify the vulnerable and depraved group in the rural areas in the Republic of Macedonia, this paper represents an initial record of the poverty conditions in the rural areas. The poverty features are presented through a multi-dimensional poverty analytical tool and the indicators and dimensions of poverty on micro and macro (country) level in order to describe the socio-economic, environmental, political and institutional context. The comprehensive multi-dimensional analysis of the poverty dimensions in the Republic of Macedonia gives an overview of the rural poverty situation and highlights several groups suffering from multiple deprivations such as rural woman and agriculture households, which are part of an extremely vulnerable group with the highest risk of going under the poverty base lines.
Keywords: agriculture, deprived, multi-dimensional, rural poverty, vulnerable.

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CHALENGES IN FINANCING OF AGRICULTURE IN SERBIA

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Abstract
The aim of this paper is to determine the challenges and propose the solutions for improvement in the agriculture financing in Serbia.Agriculture in Serbia has great economic and social importance, but its development is not adequate to its role, and the potential resources in agriculture are underutilized. The reasons for this are numerous, but one of the most important is the lack of high-quality sources of funding.Agriculture financing is accompanied by the numerous problems, whose resolution is essential for the development of this activity. The authors' conclusion is that the financing of agriculture in Serbia, because of its underdevelopment, should be supported by the government. With aim to develop this segment, in the paper is proposed the establishment of national development financial institution whose primary goal should be the financing of agriculture under the favorable conditions. As potential model of financing the agriculture in Serbia, in addition to effective utilization of EU pre-accession funds, the authors' proposal is a development of micro-credit institutions, securities and security derivatives markets.
Keywords: specialized agricultural bank, microcredit institutions, securities, security derivatives, EU funds.

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COST OF PRODUCTION OF CHICKEN MEAT

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Abstract

Implemented the cost budget feasibility of chicken meat production in feedlot size of 600m2 with 6 cycles in a year and a time of 42 days for each of them. Flock size is 10,000 pieces. The aim is to determine the economic efficiency of production of poultry meat in a partial indicator of economy (cost). As a starting point with the cost of accepted norms are experiential - experimental studies, because there is really a problem of precision calculations, because of the uneven price components of the mixture of food, the price of meat produced on the market, production costs and so on. Another problem in calculating the profitability of feed conversion into meat, which is related to the genotype of the starting material and can directly affect the ultimate feasibility of production budget of chicken meat.It has been concluded that due to the large fluctuations in the price of inputs and outputs, cost-effectiveness exists if there is a large number of units per shift with repeated production of 6 times per year - in industrial production. The results are presented in tables, charts and logical conclusions.

Keywords: efficiency, cost, budget, production results.

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RECENT DEVELOPMENTS IN TOBACCO PRODUCTION IN BALKAN COUNTRIES

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Abstract
Tobacco is a plant that originated in America. Both usage and cultivation of it had been dispersed by Venetian and Spanish merchants short after its arrival to Europe. Thus it is known that only around a century after the discovery of America, the cultivation of tobacco had begun in Balkan countries. Even though an exact date can't be given for the start of its cultivation its conjectured that it started in Skopje, Yannica and Kardzhali. The tobacco that has been grown in these regions had grown unique features by the effects of cultivation conditions and operations. This tobacco which has a high aromatic character has been desired all over the World.In this study, the last 20 years tobacco production of Macedonia, Greece and Bulgaria - the greatest Tobacco producer countries among the Balkan countries- will be examined. The effects of restrictions and amendments on tobacco production in this region during EU harmonization process will be examined. In this context, yearly change of tobacco production quantity, the number of producers and production area will be presented, using basic statistical methods. In addition, the production quanty of the tobacco industry and the latest developments in the tobacco products sector will be examined.
Keywords: oriental tobacco, balkan countries, European Union.

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THE EFFECTS OF CONTRACTED PRODUCTION MODEL ON TURKISH TOBACCO PRODUCTION

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Abstract
Regie Company was purchased by Turkish Republic Government in 1925 and the tobacco production in Turkey was nationalized. However, the monopoly situation of TEKEL, which had been the national tobacco monopoly and controlled the Turkish tobacco market alone for a long time, ended with the transition of Turkey to the free market economy. On the other hand, with the amendment made in the legislation in 2002, the production model of tobacco purchase prices declared by the state was changed from the production model to the contracted production model and the producers started to produce by signing contracts with the companies in the market conditions shaped by the supply and demand balance.In this study, the effects of the contracted production model, which started to be implemented in Turkey in 2002, on Turkish Tobacco Production will be discussed. In this context, changes in the amount of production and the number of producers and production area in the period from 2002 to the present day will be compared with the previous 15 years of 2002 and various statistical analyzes will be carried out.
Keywords: regie company, TEKEL, oriental tobacco, turkish tobacco, contracted production model.

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DATA QUALITY IN AGRICULTURAL ECONOMICS RESEARCH IN THE REPUBLIC OF MACEDONIA

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Abstract

The transition process in the South-East European countries opened new research topics and encouraged use of new methodologies in agricultural economic studies. The process of transformation of the agri-food sector towards market economy principles required introduction of complex micro and macroeconomic models to evaluate the alternative solutions to the ongoing challenges. The models' relevance and their usefulness depend on the availability and quality of input data. Data unavailability and big differences among databases makes them unreliable and require adjustments to make the data suitable for use (Macours & Swinnen, 1997; Csaki & Jambor, 2009). As an EU candidate country since 2005, Republic of Macedonia conducts institutional and systemic harmonization, including the national statistics. The aim of this paper is to analyse the role of data and their quality in the agricultural economics research in Macedonia, through a review of the available literature and experiences of the stakeholders (experts'/users survey) in the last decade. The analysis merges the attribute-based approach (Wang et al., 1995), defining data quality as multi-dimensional and hierarchical concept; and the data evolution life cycle (Liu and Chi, 2002) describing their path from observation until application. The paper underlines the role of data availability and their quality for the needs of evidence-based policy decision making; and the need for more active involvement of the agricultural economics science and practice in the creation, harmonization, quality assurance and sharing of data necessary for research.

Keywords: attribute-based approach, data evolution life cycle.

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WHOLE-FARM REVENUE INSURANCE AS A NEW MODEL OF CROP INSURANCE

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Abstract
Agricultural production represents a specific area of business to which a strong impact have natural, climatic, market, financial and institutional factors. These are all perils that do not depend on the will of manager and his work, and it is necessary to predict them and to insure against them. Crop insurance is the most effective instrument of risk management in the open field crop production. The aim of this paper is to present a new model of crop insurance which began to apply in 2015 in the United States. Every farm by its implementation, provides farm's expected total revenue that may be affected by the operation of both natural and climate risks, and market risks too, which are manifested through fluctuations in market prices. In this way all farm crops are insured against any risks with just one policy. The analyzed case farm had a loss of income due to drought, and thus qualifies for compensation in the amount of 2,500 €. The insurance policy costs are estimated at 330 €.
Keywords: crop insurance, revenue, farm, whole-farm policy.

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ASSESSING TECHNICAL EFFICIENCY OF MACEDONIAN VEGETABLE FARMS

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Abstract

Measuring the economic performance of a farm is an important indicator when assessing the impact of agricultural policy measures. Efficiency studies enable assessment of farm performance whereas the highly efficient farms are considered to have higher potential for operating in the changing economic and technological environment. Improved farm efficiency indicates achieving higher outputs and/or better input utilization. The aim of this paper is to assess the technical efficiency of vegetable farms in the Republic of Macedonia. Data Envelopment Analysis (DEA) is used to estimate the farms technical efficiency, as a non-parametric approach estimating the relative efficiency of the decision making units producing multiple outputs and using multiple inputs (Coelli, 2005). The analysis is based on data from the Farm Monitoring System including 75 vegetable farms in the Republic of Macedonia in the 2011 survey. Apart from the baseline scenario (technical efficiency estimated upon farm outputs and major inputs such as seeds, fertilizers, plant protection, machinery costs, other direct costs and farm area), additional scenarios were assessed whereas the available agricultural policy support in 2011 and 2016 was taken into account (direct subsidies per area, per output and additional subsidies for young farmers and farms in less favored areas). The results suggest that the average technical efficiency of vegetable farms is 0.62 when considering constant returns to scale, i.e. 0.71 and 0.75 when considering variable returns to scale (in output and input oriented perspective, respectively). One-third of the farms in the sample are considered to be fully technically efficient. The technical efficiency expectedly increases in the subsidies scenarios, overall by 2 to 3 percent points. Such analyses, based on farm level data, are valuable when estimating the effects of the implementation of agricultural policy measures as well as when creating new policy interventions.

Keywords: technical efficiency, vegetable farms, Macedonia.

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LABOUR NEEDS IN ORGANIC FARMING IN MACEDONIA: FOCUS ON CROP ENTERPRISE CASES

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Abstract

Job creation is one of the positive impacts of agriculture in rural areas, as this sector is usually dominant absorber of rural labour force. Organic crop farming, a potentially expanding agricultural system in Macedonia, is characterized with prevalence of family labour. This paper analyses the economic performance of selected organic crop farm enterprises, focusing on labour requirements, costing and productivity. Additionally, an opinion survey reflects on the farmers' perception of organic production and the corresponding labour needs. The analysis is carried out on a pilot sample of 12 organic crop enterprises. The results suggest that the average Annual Working Unit (AWU) is around 1.07 per hectare, with large variations depending on the crop specifics and production intensity. The labour productivity in physical terms is most labour intensive in tomato greenhouse production (5.2 AWU/ha), followed by aronia (3.1 AWU/ha) and peppers (2.0 AWU/ha). The production of grapes and beans is less labour intensive (0.2 AWU/ha), and least labour is needed in sunflower production (0.04 AWU/ha). Labour takes an important share in total costs (at least with 40%, with the highest share present in fruit production), although to a large extent as an opportunity cost, since work is mostly performed by family labour. External labour is generally engaged as seasonal workforce, rarely as permanent labour. Most farmers face problems in finding additional labour, but consider that labour costs in organic production are not significantly higher compared to conventional production. The gross margins of almost all crop enterprises are positive, being highest in the cases of strawberry and tomato production. Organic farming in Macedonia is mostly developed at primary production level, yet there is potential for additional diversification or expansion of the existing farm businesses, that will in due course increase the (in)direct labour requirements in the chain.

Keywords: organic production, labour needs, economic performance, Macedonia.

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WHAT IS MORE PROFITABLE - VRANEC OR MERLOT WINE PRODUCTION IN MACEDONIA?

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Abstract

Wine production is one of the most important sub-sectors in Macedonian agriculture, wine being one of the most significant export commodities. The gross output of the wine sub-sector amounted 43.9 mil. EUR in 2014. In this paper, we investigate the profitability of the most popular grape varieties used for wine production, Vranec and Merlot, comparatively in two wineries. The wine production income and costs data refer to the production year 2015/2016. Standard economic performance measures and indicators are used for the analysis (contribution and profitability margin, cost of production at direct and total costs, labour productivity, etc.). The results revealed that all production lines are profitable, with a profitability margin over 30%. The cost of production ranges from 1.15 EUR/l to 1.80 EUR/l for Merlot wine and from 1.30 EUR/l to 1.63 EUR/l for Vranec wine. Labour productivity indicator is highest in the Merlot wine production, indicating an efficient use of the labour production factor. The grape-to-wine conversion ratio ranges from 1.67 to 2.00. The economic indicators provide grounds for past performance analysis and at the same time can serve as a basis for future managerial decision making. Also, such analysis can be beneficial for sub-sector strategy planning purposes.

Keywords: wine costs, comparative analysis, economic performance, Macedonian wine.

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FOOD CONSUMPTION OF WOMEN IN HUNGARY

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Abstract
In our research we are looking for the difference in food consumption between men and women in Hungary. Our publication is based on secondary and primary databases. The stereotype is well known: women take more care about the quality and quantity of the food they / their family is eating. Is it really true? Hungary is a very traditional country as we know we have a several food Hungaricums. Is it relevant when they buy food they prefer the Hungaricums? Although women roles changed a lot in the past decades its still their task to provide the families with food. In our hypothesis is that women are more reliable and their consumption is more conscious than men. We examine the women's shopping habits with an online survey made by us. We would like to have a deeper understanding of men and women food consumption habits in Hungary.
Keywords: hungaricums, food consumption habits, traditional eating habits, quality foods, survey.

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THE INFLUENCE OF TRANSACTION COSTS ON FARMERS' CHOICE OF A BANK – AN EVIDENCE FOR A MARKET-BASED FINANCE MECHANISM

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Abstract

The issue of agricultural finance is constantly on top of the national and international agendas. It is especially vital for post-communist countries, such as the Republic of Macedonia. Macedonian agriculture is an important segment of its economy, but it is still characterized by a low competitiveness mostly due to the inefficient capital market. Therefore, new governance structures in agriculture finance are required. The past years have demonstrated that Macedonian banks, which are major suppliers of finance to the agricultural sector, are not able to sufficiently meet the financial needs along the whole agriculture value chain. The existing mechanisms for agricultural finance in the country are not adequate, and market-based finance approaches are necessary. The first step to achieving this necessity,is to provide a baseline diagnosis of the current Macedonian agricultural capital market that examines conditions and solutions for various categories of farmers. Thus, the aim of this study is to identify the conditions for behavioral changes by Macedonian farmers regarding their choice of bank. This study focuses on a sample of apple producers from the Resen region, and provides ground for further related researches. The transaction cost approach is used to provide explanations.The results suggest an understanding of the factors that shape the financial behavior of farmers. This study sets ground for future policy making for agriculture and rural finance, and additionally, it may be used as a guideline for related researches in the context of other post-communist economies.

Keywords: agricultural finance, institutional economics, apple production, behavioral approach, Republic of Macedonia.

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EFFECTIVENESS OF BUSINESS MODELS IN FARMING: THE CASE OF APPLE PRODUCTION IN THE REPUBLIC OF MACEDONIA

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Abstract

Macedonian farmers are facing constant liquidity constraints since they lose their competitive edge on the constantly changing markets. Designing innovative business models may help them to achieve sustainable advantage and to develop a financially viable farm. Business models are the key concepts helping stakeholders to understand and clearly articulate the business configuration in creating, delivering and capturing value. The changing nature of markets and the high level of production risk in agriculture increases the need for effective farm business models. We consider that determination of the existing business models and testing their effectiveness is the first step in the creation of viable business models in agriculture. Thus, the aim of this study is to detect types of related farm business models and to compare their effectiveness. The focus is on the existing business models in apple production in the Resen region. This region requires the most immediate attention, because, the spring of the 2017, the apple producers were faced with a natural uncertainty that destroyed the whole production of apples in the region. This imposes a need for alteration of current business model designs. For this reason, the following objectives underline the research: 1) Determination of the existing business models; 2) Assessment of factors that influence the existing business models, and 3) Comparative valuation of effectiveness of the existing business models. In this regards, we use the Business Model Canvas by Osterwald et al. (2014) as a contemporary guideline. The effectiveness among different business models is examined with hypothesis tests. The results suggest an understanding of the effectiveness of the existing business models in apple production in the Resen region, and set ground for developing new business models in apple production. Additionally, the developed method may be used as a guideline for studying of other business model designs in agriculture.

Keywords: business design, decision behavior, Resen region, statistics.

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DRONE USE IN AGRICULTURE

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Abstract

When the world population has approached eight billion, the worldwide focus shifted to supply food for it in a sustainable way. A new grip on precision agriculture has been led. This was identified as a farm management. This emerging concept is established to observe, measure, respond the crops and their inter and intra-field variability and versatility. To gain yield in a maximum level from the limited sources of a farm, this notion can be an efficient way for farmers to reach this aim. Meantime, the outcomes in terms of crop yields, plant health and other data have to be observed constantly while having a real-time feedback. They also require an analysis to be done objectively and equitably. Drones are considerably convenient to the farmers for helping to optimize the use of inputs such as fertilizers, seed and water. They are helpful for them to react quickly and on time to threats like weeds, pests and fungi. The farmers can also save time in treatment validation of the crop scouting, can improve the variable rate prescriptions in real time and can do an estimation about the yield to be given from a field in harvest seasons. Our environment and our food can be cleaned more and more from chemical load. The reduction of water use can be figured out more and better. Despite being a young technology, drone usage in agriculture is expected to increase significantly. Encouraging the farmers to use the drone with the aid of the government support and agricultural extension efforts, will help them to warm towards this technology and to become adherent to future technologies. In this paper, secondary data was used to show drone usage and benefits in agriculture and how it effects environment positively.

Keywords: drone, environment, agriculture, sustainability, extension.

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THE USE OF BOOKKEEPING IN THE FADN SYSTEM DATA COLLECTION IN THE REPUBLIC OF SERBIA

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Abstract
Establishment of the Serbian Farm Accountancy Data Network - FADN system based on the use of bookkeeping with the additional information necessary to meet the specific needs of the system from the methodological point of view. FADN system data collection are covered by commercial farms, which according to existing legal regulations in the Republic of Serbia are obliged to use of bookkeeping in two cases. The first case is if the farm has an entrepreneurial status, which has a binding character through the submission of tax returns to the competent tax authority. The second case is if the registered farm payer of value added tax. This paper analyzes the use of bookkeeping in the FADN system data collection in the Republic of Serbia through the appropriate methodological model. The main objective of this paper is to highlight the importance of bookkeeping records on commercial farms in the Republic of Serbia, which contributes to the rationalization and efficiency of data collection for the FADN system.
Keywords: bookkeeping, commercial farm, FADN system, a methodological model, rationalization and efficiency of data collection.

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COMPETITIVENESS AND ADAPTABILITY TO THE EUROPEAN MARKET OF THE STOCK BREEDING BRANCH IN PELAGONIA REGION

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Abstract

Agriculture and livestock breeding are branches, which determine the economic structure of Pelagonia region. In the last years the stock breeding in the region has marked progress, and the product quality has been improved and stabilized in quantitative aspect. There are milk and meat processing companies, situated in Pelagonia region, which work for the European market. The aim of this paper is to investigate the competitiveness and adaptability to the European market of the stock-breeding branch in Pelagonia region. In order to achieve this goal, the following tasks have to be solved: to analyze the condition of the stock-breeding branch in Pelagonia region; to examine the trends in the development of the stock-breeding branch; to analyze the possibilities for sale of the animal products on the European market. The following methods are applied in order to achieve this goal and to solve the tasks such as analysis and synthesis, a systematic approach, a structural approach and statistical methods.

Keywords: competitiveness, stock breeding, market, quality.

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ECONOMIC EFFECTS OF ORGANIC LIVESTOCK FARMING – A CASE OF BREEDING BUSHA IN SERBIA

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Abstract

Organic livestock farming refers to environmentally friendly production, production of animals in good health, meeting high animal welfare standards, as well as producing of high quality livestock products. Many farmers convert their agricultural production to organic or "low input" farming as a strategy for their economic survival, by ensuring better marketing of their products and gaining higher profits. The aim of this paper is to analyse the economic effects of an organic livestock farm, by providing an overview of the profitability of the farm, comparatively for the period 2015-2016. The analysed case farm is situated in the region of Stara Planina in Serbia, with a total number of 261 heads in 2015 and 332 heads in 2016. The economic performance of the farm is determined by calculating the standard profitability indicators. For that purpose, analytical budgets for both years are calculated. The results show that the busha production in both years is profitable, with a profitability rate of 4% in 2015 and significantly higher profitability rate of 37% in 2016. The cost effectiveness ratio of 1.04 in 2015 and 1.59 in 2016 also confirms the profitable working of farm, revealing that the farm achieves higher revenues compared to the total costs. These results provide an overview of the profitability of a single case farm, and can be used for initiating deeper researches on the organic livestock production and its effects on the economic performance of the organic farms.

Keywords: organic production, livestock, profitability, Serbia.

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CONSUMER FOOD WASTE BEHAVIOR

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Abstract

Around 88 million tons of food is wasted in the EU each year. This calls attention to the food waste as fast growing global problem addressing its economic, environmental and ethical meaning. In the food supply chain, consumer ethics behavior is out of great importance in avoiding food waste and loses. Therefore, we aim to determinate the level of food waste among Macedonian consumers and to determinate a possibility for food waste minimization. An online questionnaire was sent to a number of consumers on the Macedonian market. On the basis of previous studies, scales were developed in order to measure different factors in consumer food waste behavior. Using SPSS software, exploratory factorial analysis (EFA) and confirmatory factorial analysis (CFA) will be applied on the data to identify the number of latent factors for the scales, as well as to test the validity of the resulting latent factors. Furthermore, structural equation modeling will also be conducted. The expected results will preview the level of the food waste among consumers in different households thus setting grounds for recommendations for food waste minimization. It should also provide insights aimed at changing consumers' food waste behavior. The results could be further used for policy recommendations and activities that would encourage avoiding food-waste related habits in consumer's everyday behavior.

Keywords: food waste, consumer behavior, food waste minimization.

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CONSUMERS AT DIFFERENT WINE EVENTS - RESEARCH BASED CONSUMER SEGMENTATION

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Abstract
Different wine events target different audience with different behavior profiles. This paper suggests research based consumer segmentation on different wine events in Macedonia. The topic of consumer segmentation on the wine market in Macedonia is less empirically explored. Only two consumers' profiles were selected by the national strategy, but were not empirically supported. This paper aims to explore the consumer segments existing different wine events in Macedonia. Using a targeted sample of 776 respondents in total visiting different types of wine-events in the period between 2013 and 2016, we conducted cluster analysis in order to create and compare the consumer segments. We further divided the sample having into consideration the type of event the respondent visited and provide additional information on the different segments' characteristics. The findings of this paper would complement the theoretical segmentation and have practical application. Having the right segments and targeting the right audience can be crucial for wineries that focus on this market. Furthermore, providing academic and research based feedback to the wineries, would help them position better on the market and enhance personalize their approaches.
Keywords: consumer segments, segmented wine events, cluster analysis.

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MEASURING PERCEPTION AND CONSUMPTION LEVEL OF AGRICULTURAL ENGINEERING STUDENTS FOR MEDICINAL AND AROMATIC PLANTS: A CASE STUDY FOR CUKUROVA UNIVERSITY

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Abstract

Medicinal & Aromatic Plants (MAPs) are botanical raw materials, also known as herbal drugs, that are primarily used for therapeutic, aromatic and/or culinary purposes as components of cosmetics, medicinal products, health foods and other natural health products.Turkey has an important role for trading MAPs. Considering climate, plant variety and agricultural potential of Turkey there is no wonder that Turkey has an important role in international trade. Medicinal and Aromatic Plants which are subject of the international trade are collecting from their habitats. In Turkey, MAPs are generally cultivated in Aegean, Marmara, East Black Sea and Southeast Anatolia Regions. Collected plants are vary such as daphne, sage, thyme, rosemary, rosehip and linden.Both widely used in many areas and their high economic value MAPs are very important subjects as they are taught in the Agrciultural Engineering Faculties of universities in Turkey. and it is aimed to instruct young agricultural engineering candidates.In this context the present study aimed to measure agricultural engineering students knowledge and consuming habits for MAPs who are coming from different regions of Turkey. In the study primary and secondary data were used. Secondary data were collected from the past studies and organization reports. Primary data were obtained from the face to face interviews which would present the originality of the study.

Keywords: medicinal and aromatic plants, perception level, consuming habits.

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PRODUCTION, MARKET STRUCTURE AND AGRICULTURAL POLICIES ON MEDICINAL AND AROMATIC PLANTS IN THE WORLD AND TURKEY

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Abstract

Medicinal and aromatic plants (MAPs) have been recognized as an important resource for health care and perfumery since antiquity. At present, there is a vast scope for enterprise development in this natural resource. The wealth of knowledge on the use of MAPs and different stages of MAPs sector, including collection, cultivation, processing, marketing, value addition and manufacturing, each stage on its own forms a base for an exclusive enterprise. Realizing the scope of MAPs worldwide, many national andinternational organizations, including the United Nations Develop-ment Programme (UNDP), the World Health Organization (WHO) ,the World Wide Fund for Nature (WWF), have come forward to support the MAPs sector. The World Bank has launched projects to supportthe farming and conservation of MAPs.According to the study "Flora of Turkey and The East Aegean Islands", it can be said that Turkey has a very rich flora among Europe with 12.000 plant taxons and 1251 types of plants that belonging 174 families. In 2015, Turkey's Department of Agriculture started to give subsidies to Medicinal and aromatic plants, aiming to spread the agriculture practice of MAPs. Opium poppy, cummin, anise, thyme and rose (essantial oil) are the most cultivated MAPs in Turkey.This study aimed to present Medicinal and Aromatic Plants economic situtation and market dynamics in Turkey as the sector rapidly growing. In the study secondary data which gathered from the government organization reports such as Department of Agriculture of Turkey, TurkStat, Exporter Associations, Com Trade and Ministry of Economy were used. In addition past international and national academic studies would be considered.

Keywords: medicinal and aromatic plants, marketing, agricultural policies.

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NATURAL DISASTERS AND DAMAGE ASSESSMENT IN AGRICULTURE - FLOOD DAMAGES IN ANNUAL AND PERENNIAL CROPS IN SKOPJE REGION

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Abstract

Agricultural production is greatly reliant on the weather conditions, and is often negatively affected by disasters related to this weather and climate circumstances. Natural disasters influence the development of the agricultural production and the influence in most instances has a negative connotation, contributing to the already existing vulnerability and risks for the agricultural producers. In August 2016, Macedonia and especially the Skopje region was stroke by floods which caused vast damage to agricultural production in this region. This natural disaster is expected to have a prolonged impact. Therefore, the research in this paper is based on data obtained from actual data that were collected immediately after the flood. The analysis include the reported damages in crop production, their structure, surfaces, etc. The damage estimations are based on standard valuation methods published in the Official gazette of the Republic of Macedonia. The data set contains information that assess the damage and give determine grounds for compensation of farmers who were most affected. There is an urgent need to mitigate the effects of natural disasters in the agricultural sector, as well as highlight the need of c permanent insurance practices in the sector.

Keywords*:* crop production, damage estimation, insurance, flood, Macedonia.

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STATUS AND PROSPECTS OF GROWTH AND DEVELOPMENT OF AGRICULTURE IN REPUBLIC OF SERBIA

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Abstract
Agriculture is an economic field with the greatest potential in Serbia, in terms of high-quality soil and climate suitable for agricultural production. Unfortunately, agricultural potential in Serbia is almost completely unused. Instead of having the main role in economic recovery of the country, establishing stability and achieving economic growth, agriculture is being neglected and, thus, in a bad condition. The aim of this paper is to identify the development prospects of in order to improve the present condition of agriculture in Serbia, it is necessary to create a long-term strategy of its growth and development, based on improvement of knowledge and skills, better operational organization and introduction of technical-technological innovations. There is a number of different strategies of growth and development, each of which has certain advantages and disadvantages, but all of which are based on development of knowledge, as the most significant resource, and introduction of technical-technological innovations, without which agricultural growth and development will not be possible.
Keywords*:* agriculture, strategies of growth and development, education, technical-technological innovations, R. Serbia.

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YOUNG SCHOOL CONSUMER ATTITUDES TOWARDS FRESH SNACK VEGETABLES AND HEALTHY VENDING

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Abstract

The mini vegetables also called "snack" began to be cultivated in Spain as an alternative of diversification and a development strategy for horticultural sector value chain. Although they still occupy a small market share, these vegetables could generate potential market niches to obtain greater added value to the products and to increase its profitability. This work analyzes the market possibilities of these new snacks varieties, trying to adapt the offer not only to the conventional and usual channels of the vegetable large distribution and point sales, but also to address other new marketing channels as well as new formats, range and product packaging. In this framework, to search for niche market potential and to socialize more the consumption of these mini fresh vegetables, this research analyzes the attitudes and opinions of young school consumers towards the consumption and willingness to purchase of three type of vegetables snacks (mini pepper, mini cucumber and cherry tomato) through vending machines "healthy vending". For that a survey has been performed during 2015 to 324 young scholar consumers in the provinces of Granada and Almeria (Andalusia, South of Spain), adopting a non-probabilistic for convenience type of sampling due to the selected target population of the research. The sample size is suitable to perform an exploratory and descriptive analysis of the results. The empirical findings shown that the marketing of such snack vegetables through the vending system could be a very practical and innovative way to encourage its consumption in fresh and contribute to a healthy and balanced diet in society in, general and young consumers, in particular.

Keywords: fresh vegetables, healthy vending, consumer preferences.

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DECISION MAKING FACTORS ON FAMILY FARMS

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Abstract

Family farming is the most common farming model in Europe. However, family farms vary in terms of their size and available resources, as well as the economic, agro-environmental and social contexts they operate in. The decision-making process on small family farms is significantly different from commercial agricultural holdings. There are many internal and external factors influencing the decision-making process in general, so often this process is based on boundary rationality. The aim of this research is to identify the factors that influence the decision-making process of family farms in two countries with different working environments: Macedonian farms, which are typically very small (up to 1 ha), and Irish farms, which are larger (10-20 ha). The research is based on an observation of the agricultural infrastructure in the Republic of Macedonia and the Republic of Ireland; a survey of family farms in both countries; and informal conversations with the farmers. The implementation of the survey took place in July 2017, with 30 questionnaires in total (15 in each country). The results showed differences in the general external factors, whereas the specific external factors are more similar in both countries. In terms of the internal factors, differences are most often present in the perception farmers have for farming as a occupation that they pass on to future generations; in Ireland, farmers are considered as respected part of the society with potential for growth, unlike the Macedonian counterparts which are not appropriately valued. Improved decision making process on family farms would enhance their contribution to the socio-economic and environmental sustainability of rural areas.

Keywords: general external factors**,** internal factors, Ireland, Macedonia, specific external factors.

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PRODUCTION AND ECONOMIC INDICATORS OF RICE IN THE REPUBLIC OF MACEDONIA

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Abstract

The production of rice on a world level (on an area of 161.2 million hectares) is about 741.5 million tons (2014). Of this, 28% is produced in China. In the world, the average yield is 4.6 t/ha. According to FAO data (2014), about 8% of rice production in the world is subject to international trade. According to the statistics of the State Statistical Office of the Republic of Macedonia, our country produces rice on 5,830 hectares (1955-2016) or almost 1.4% of the arable area. In that respect, the maximum area under rice was in 1987 (9,675 ha), and the minimum (1,255 ha) in 1995. The total production at an average yield of 4,536 kg/ha is 25,952 tons. The average yield in this relatively long period (61 years) varies from year to year, but it is important that it is in general increasing. Concerning the domestic consumption of rice, agricultural households use the highest quantity (8.9 kg/member) and non-agricultural households the lowest quantity (6.5 kg/member). The Republic of Macedonia has a positive trade balance in the period from 1997 to 2016, continuously (except in 2003). The quantity of exports, on average (1997-2016), is 3,790,471 kg, and the import is 368,617 kg. As a result, the net foreign exchange inflow from the international trade with rice is 2.6 mil. EUR.

Keywords: rice, area, production, consumption, export, import.

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ARE FARM-ANIMAL WELFARE STANDARDS IN COMMERCIAL EGG PRODUCTION SYSTEMS FINANCIALLY VIABLE? A CASE STUDY FOR THE REPUBLIC OF MACEDONIA

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Abstract

Animal welfare in commercial poultry production receives more legislative attention in the European Union (EU) than in the developing part of Europe, such it is the Republic of Macedonia. After 2012, laying hens in the EU are kept in enriched cages with a minimum space allowance of 750 cm2 per hen. These legal adjustments will be inevitable with the consolidation of the Macedonian market to the EU's if the country joins the union. The existing Macedonian poultry farms for egg production will have to adapt their capital investment and technical know-how to the European standards on protection and welfare of farm-animals. This entails a completely new investment whose financial viability is still not revealed. Thus, the aim of this paper is to examine the financial viability of such an investment. A case study approach is used to generate in-depth analysis of the planned investment. For this reason, an investment plan is prepared for installation of a new equipment for commercial egg production according to EU standards on welfare of layers. Developing a business plan includes a synthesis of different approaches, including a set of investment appraisal techniques and financial decision-making methods. The results revealed that poultry farms for egg production will remain financially viable even after reducing the bird density according to the new EU's directive for welfare of laying hens. These results, in addition, may serve as an example when planning future investments in the context of this issue, especially for preparing investment plans for loan purposes.

Keywords: investment appraisal, poultry farming, developing country, EU harmonization.

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OPTIMAL STRUCTURE OF PIGS ON THE FARM WITH MINIMUM PRODUCTION COSTS

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Abstract
The study deals with situational analysis and the basic problems development on pig meat production in Serbia, as well as an economical analysis of fattening pigs at farm production conditions. The research included small private farm "Gracanica" farm, in central Kosovo and Metohija, as well as a cooperative farm in December the first "Žitorađa" T Serbia. During the period in 2016, have been monitored the volume and application production technology of fattening pigs on both farms, and analyzed the resulting economic results. During the observing period, it was found that at private farm, their breeding pigs were 60 head, for the cooperative farm, their breeding pigs were 35,442 heads. The produced fattened pig in private farm costs 82 Euro's, the pork meat carcasses 1.10 Euro's/kg, and for thev farm, cost of fattened pigs is 132 Euro's, while, the pork meat carcasses 1.84 Euro's/kg. The average weight of carcass sides is uniform in both at 79kg, whereas the share of pork sides varied from 80% to private farms and 78% cooperative farm.
Keywords: development, pigs, pork carcass, price, economy justification.

Section 2.
AGRICULTURAL MACHINERY

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CUTTING TEST OF ÖKÜZGÖZÜ (*VITIS VINIFERA* L. CV.) GRAPE CANES

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Abstract

The aim of this study were determine to cutting properties of Öküzgözü (*Vitis vinifera* L.) local grape variety in different phenological stages. The tests samples were obtained from an organic commercial vineyard in Diyarbakır province, which is located in the southeastern part of Turkey. The cutting tests canes were carried out during the different phenological stages of the veraison (30 August), 15 days after veraison (15 September) and harvesting time (30 September) in 2016. Lloyd LRX plus materials testing machine were used for cutting tests.The phenological stages has been significant effect on the measured cutting properties of grape canes ($P < 0.05$). Cutting force, cutting strength, upper bio-yield force and cutting energy gradually decreased with phenological stages. All of average maximum values were obtained at veraison stage. At this stage, while the maximum cutting force, cutting strength, bio-yield and cutting energy values were obtained as 774.55 N, 13.16 MPa, 631.60 N and 5.94 J, minimum values were observed 568.42N, 9.63 MPa, 513.13 N and 3.33 J, respectively. The cutting energy was obtained closely related to cane diameter. As the diameter increased, require energy linearly increased for cutting of cane. While the maximum cutting force and energy were obtained at an internode 5 (IN5) diameter 995.49 N and 7.34 J, respectively. However, while the maximum cutting strength was obtained at IN1 diameter as 11.63 MPa, the minimum cutting force, upper bio-yield and cutting energy were obtained at IN1 diameter as 385.52 N, 355.87 N and 1.77 J, respectively.

Keywords: grape, Öküzgözü, cane, cutting force, cutting energy.

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DETERMINATION OF CANE CUTTING PARAMETERS OF SOME GRAPE VARIETIES

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Abstract

Grape is an important product for the economy of Turkey and it will continue to acting an important role in grape production in the world because of its large number of grape varieties, favorable ecological conditions and large amount of production areas. However, pruning and harvesting of grape berries are mainly performed by manually and labor intensive. So, production cost is very high and labor efficiency is low in Vineyard. Whereas, pruning and harvesting are the most critical operations in the management of the vineyard. The cutting information about cane of grape varieties are very important for the suitable design of harvest machine and efficient use of energy and comparative performance of cutting elements applied in harvester and pruning machine design can be judge by their cutting energy requirements. This study has been carried out to determine cutting properties for different local grape varieties, namely, Genç Mehmet, Boğzakere ve Öküzgözü. Cutting tests were carried out with grapevine canes of one year and two year old. The canes were obtained from a commercial vineyard in Diyarbakır province, which is located in the southeastern part of Turkey. Lloyd LRX plus materials testing machine were used for cutting tests. There were found significant different between grape varieties about cutting properties. The cutting force and cutting energy increased with increase diameter of canes and years.

Keywords: grape, Genç Mehmet, Öküzgözü, Boğazkere, cane, cutting force, cutting energy.

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RESULTS FROM THE EXPLORATION RESEARCH AND QUALITY OF WORK IN SEMI AUTHOMATHIC TRANSPLANTING OF INDUSTRIAL TOMATO

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Abstract

In each production technology in planting of industrial tomatoes, farmers tend basically is to broadcasting material planned number of plants per hectare. There are a number of factors affecting plant and to accept the planned number of plants, but always great importance has machines that enable planting. Constantly we make new constructions propagandized technical solutions that are characterized by high precision, productivity, allowing planting for a shorter time and in optimal weather conditions.The need for mechanic workflows due as a result of the increasing shortage of labor, but also by poor execution of business processes as a result of insufficient education and advocacy workers.In this paper we will be presenting the results of the examination of the exploitation characteristics of machine for semi automatic transplanting the tomato industry, the production conditions and quality testing of the machine operation.

Keywords: machine transplanting, seedlings, speed of movement, exploitation, productivity.

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STUDE FOR ANALIZATION OF THE DIFERENT AGRICULTURAL (TRACTOR) MACHINES FOR THE COOPERATIVES IN MAACEDONIA

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Abstract

Studying the modern trends of agricultural production both in Macedonia and wider and Comon Agricultural Policy in the Republic of Macedonia, we concluded that there is a tendency to introduce of Agricultural (tractor) machines cooperatives since certain changes that have occurred in agricultural policy, but also in the changes in the trends for procurement, exploitation, maintenance and accessing agricultural machines. This trend comes as a result of the small number of hours of exploitation that occur in private agricultural sector, insufficient utilization of agricultural machinery that gives expensive working hour of a working process per hectare. In the world, there are different models for the formation and operation of cooperatives and Machine (tractors) cooperatives and that's why we in Macedonia have to engaged our efforts in this area, to study which is the appropriate model for the establishment and proper functioning of the machine-tractor-cooperative.

Keywords: machine, tractor, cooperative, exploitation.

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RESULTS AND ANALYSIS OF IMPLEMENTATION AND APPLICATION OF MODERN AGRICULTURAL MACHINERY ON IMPROVED AGRICULTURAL PRODUCTION

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Abstract
Improvement of the agricultural production in all areas and activities, depend mainly on the introduction and application of a new technique that gives a basic precondition to realize new production technology. That tendency of agricultural production growth is the realization by separate crop varieties of modern and economical agricultural production, which are looking to get higher and cheaper product and to reduce the production costs. These tendencies of the agricultural producers impose modern factories to produce consistently new agricultural machines. The analysis which was carried out in Macedonia and Bulgaria can be seen that the last two decades in that part where has been constant agricultural progress, based on various funds and new concept in agricultural policy, took high influence to recovery machine-tractor parks and renew of agricultural machinery leading to positive results in agricultural production.
Keywords: agricultural machinery, factories, production technology, economical agricultural production.

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TECHNICAL EXPLOITATOPN CHARACTERISTICS OF MACHINES LINES FOR PALET PRODUCTION

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Abstract
The energy always not only in the agricultural production but also in other sectors was of high importance. The last two decades there was high interest and efforts how to use alternative energy for different purposes and in different forms, fallow wed with a large number of institutes and factories who were investing great efforts and knowledge for making different machines and constants modernization of utilization of alternative energy, and urilizing waste materials and any lower substances in agricultural production. Worldwide there are different types of machines for the production of pellets with different capacity and different technical characteristics and rising high interest of their usage. This was the imperative to sign this paper and present some of these machines, and to present that in Macedonia only about 1% of different biomass is used to produce pellets but the interest from year to year has increase because of the annually pellets import from abroad in large quantities. In R.Makedonija we estimate thet the volume of unused biomass is about 800,000 cubic meters of trees, part of Forestry, part of the wine-fruit growing production, and also from other agricultural activities. Certainly this unused volume will strongly contribute to the domestic production of alternative energy for both industrial and household usage.
Keywords: agricultural production, machines, alternative energy.

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OPTIMIZATION OF THE NUMBER OF HARVESTING AND TRANSPORT COMPLEXES IN WHEAT FARMING

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Abstract

The efficient operation of the harvesting transport complex (grain harvester - transport aggregate) depends on the organization of the transport service and the identification of the necessary means of transport is a probable task. An economically viable ratio counts combines, service vehicles for which minimizes the target function:

$$S = C_{\Pi}.\lambda.t_{оч} + C_a.n \Rightarrow \min$$

Overview of pre-selection - transport complex as a mass service system.When machines are operating in a group, service requests are continually being carried out on a grain harrow filled grain hopper and after unloading the hopper, the combine is restarted and is a potential source of new orders.Thus, the "harvester-car" system is considered a mass service system in which a service request per unit time arises on average.We assume that the stream of queries is a simple (Poisson) stream that is ordinarily, stationary, and without consequences.The query flow intensity is λ , and the bandwidth of the service channel is μ . Then the average number of grain combinations waiting to be served by transport means m_s :

$$m_s = \left(\frac{\psi^{n+1}}{n!n\left(1-\frac{\psi}{n}\right)^2} \right) \times \left(\sum_{k=0}^{n} \frac{\psi^k}{k!} + \frac{\psi^{n+1}}{n!(n-\psi)} \right)^{-1}.$$

Where $\Psi=\lambda\ t_{обс}$, and $t_{обс}$ is the average wait time for service start requests.The mathematical model for optimizing the number of vehicles for servicing a group of grain harvesting combines is:

$$S = C_1 m_s + C_2 n_z \Rightarrow \min$$

C_1 is the value of the layover time of the combine harvesters, C_2 - the value of the vehicle's layover, n_z- the average number vehicles, waiting to be loaded from the combine harvester.The proposed model is certified with real data for agricultural cooperative in Yambol and the results show that for 5 CLAAS combine harvesters, is optimally served by three cars working in a group.

Keywords: combine harvesters, serving cars, requests, mass service system, mathematical model, optimization.

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MECHANISED TECHNOLOGY FOR GROWING AND HARVESTING CORN

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Abstract
Improvement of applied modern mechanized technologies for growing and harvesting of corn, introduction of hybrids with a low and strong stem, suitable for thicker sowing, irrigation, etc. Lead to an increase in average grain yield per hectare.The best precursors for corn are bean cultures, peas, alfalfa etc. Keeping this crop rotation turns out to be appropriate for successful weed control. Permanent cultivation of corn is also perceived, but it should not last for more than three consecutive years on the same area. In addition, corn is also eligible for cultivation in the case of reduced soil cultivation, incl. And through direct sowing. Obviously, with these extensive opportunities for crop rotation, account should be taken of the period of natural soil compaction and of the type of soil. Production and protection is carried out by two technologies: harvesting of cobs and harvesting of grain.The main advantages of the first technology are the following: harvesting can be done at higher grain humidity (about 30%) when the stems are still green and can be ensiled; No additional energy costs are required to dry the grain; Timely release of sowing areas for subsequent crops.When grain maize is harvested, the development of the maturity phase and the decrease of grain moisture should be observed, as the maturity increases considerably in the harvest losses. With the prolongation of the maize harvest, the biological losses are particularly high mainly due to fallen cobs, which reach up to 25%.With the maturity phase of corn growing, the productivity of combine harvesters' increases, but taking into account the increase in losses, the optimal harvesting time for corn should be done on an economic basis.
Keywords: mechanized technologies, corn, harvesting, soil treatment, technological operations, economic justification.

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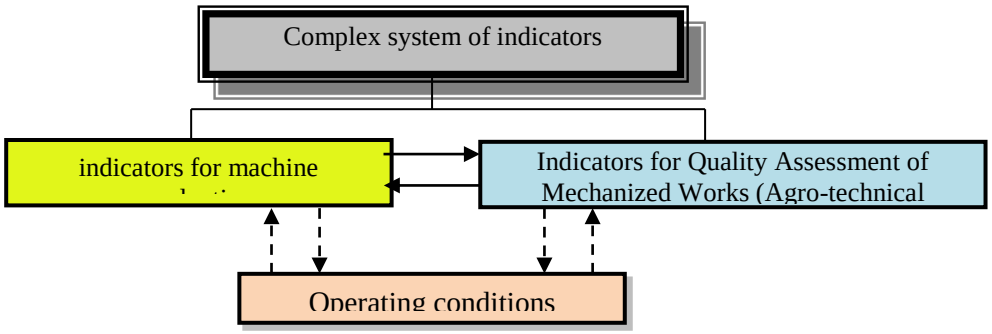
CLASSIFICATION OF INDICATORS FOR INTEGRATED ASSESSMENT OF MACHINERY IN AGRICULTURE

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Abstract
The efficiency of the machines depends on the completeness of the scope of the indicators and the factors with which they are linked.In choosing the best solutions, it is necessary to evaluate the system metrics, and the optimal option machine or set of machines to be chosen using optimization criteria.Some of the indicators are interrelated to such an extent that they can be attributed to several groups, which is not an obstacle to the decision to implement the machines.



The indicators for the quality assessment of mechanized works should be divided into common types for all mechanized works and for separate groups of technological processes: soil treatment, sowing and planting, plant care, harvesting of crops.The system of indicators for the evaluation of agricultural machinery is expressed and evaluated with a large number of properties, indicators and characteristics of quality and reliability.In general, quality has four groups of properties: feasibility, social, bio-ecological and reliability

Keywords: agricultural machinery, indicators, quality, optimization criteria, technological processes.

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METHODOLOGICAL APPROACH FOR THE DETERMINATION OF LIQUIDATION VALUE OF AGRICULTURAL MACHINERY

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Abstract
The structure of production in agriculture is changing with the change of priorities, both at EU and national level. On the one hand, this is due to interconnection in individual sub-branches, on the other, to the replacement of traditional technologies with new ones. In both cases, this requires the maintenance of more equipment than is necessary for production and the corresponding increase in the cost of production and the reduction of the profit from production. Significant lagging of the machine-tractor fleet renewal processes and increased loading of the used equipment imply intensive physical wear and obsolescence. Depending on the reasons for write-off, when determining the liquidation value of the machinery, account shall be taken of special features and the possibilities for further use of individual elements (parts, assemblies and aggregates). Several approaches are used to determine the liquidation value: - the whole machine is considered scrap. The approach is applicable to working machines and attachments to self-propelled agricultural machinery; - the whole machine is classified as scrap but is dismantled and divided according to the type of scrap (ferrous and non-ferrous metals). The approach is applicable to retractors and attachments to self-propelled agricultural machinery as well as stationary machinery for primary production processing; - the machine is rated as scrap of ferrous and non-ferrous metals and second-hand spare parts. The approach is only applicable to physically worn machines. In addition to that, an improved methodology for assessing the liquidation value of different groups of agricultural machinery for moral and physical extinction with and without residual resource elements is suggested.
Keywords: agricultural machinery, spare parts, liquidation value, scrap, methodology, expenses.

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MAIN SOIL TILLAGE TYPES AND ITS EFFECT ON THE AGRONOMIC RESPONSE OF COMMON BEAN (*PHASEOLUS VULGARIS* L.)

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Abstract

This study was carried out at the trial field of DAI from 2014 to 2016. Common beans yield obtained under different main soil tillage systems in 4-field crop rotation, is strongly influenced by the regional soil and the climatic conditions.

The influence of seven main soil tillage systems (MSTS) on the yield and the physical properties of dry bean seeds were investigated. Four of these MSTS were applied independently and annually in crop rotation: 1. CP-conventional plowing; 2. D–disking; 3. C–cutting; 4. NT-nil tillage. The other three MSTS systems included: 5. Plowing (for spring crops) – Direct sowing (of wheat); 6. Cutting-Disking and 7. Plowing-Disking. A significant differentiation in the productivity of dry bean was found depending on the tested MSTS systems. Lowest mean yields were obtained at the annual use of systems 2 (D) and 4 (NT) – 1110.4 kg/ha and 1137.2 kg/ha respectively. Among the annually applied systems, constant plowing (1st MSTS) and cutting (3rd MSTS) were the most favorable for expression of the crop's production potential. The systems involving annual alternation of tillage types with and without turning of the plow layer exceeded with 499.5 kg/ha (37.81%) the same systems, which were applied independently. The alternation of plowing for root crops with direct sowing of wheat and plowing for root crops with disking of wheat were most efficient from an agronomic point of view. In comparison to annual plowing, the increase of productivity were with 473.0 (32.96%) and with 510.1 kg/ha (35.54%) respectively. The values of the physical properties of seeds were also highly differentiated according to MSTS. The mean value of the correlation coefficient between the yield and the test weight (0.644**) was higher than the correlation coefficient of the yield with 1000 kernel weight (-0.526**).

Keywords: tillage, beans, yield, 1000 kernels.

Section 3.
ANIMAL BIOTECHNOLOGY

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ANALYSIS OF ANNUAL HEALTH RECORDS IN ONE DAIRY FARM

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Abstract
Modern technologies of dairy cows breeding is followed by a number of health problems. Perhaps no one single factor has the ability to affect the performance of animal populations as severely as diseases. The objective of this study was to obtain information about dairy cow's health challenges for intensive dairy farm and about the guidelines which should be improved. A one year retrospective study was performed for prevalence determination of the most common health disorders in one dairy farm. The survey included a total of 203 black-white dairy cows in lactation. Cows with health disorders were detected by clinical observation. The data for each cow were obtained from the reproductive board. The annual prevalence of health disorders was 50.25%. The most prevalent health disorder in dairy herd was mastitis (84.31%), than following arthritis (5.88), laminitis (2.94%), apces (2.94%), indigestion (1.96%), pneumonia (0.98%) and diarrhea (0.98%). The highest prevalence was registered in winter season (88.89%) and the lowest in summer season of the year (38.16%). The older cows had the highest risk to suffer from such health disorder. During the survey, only cows that suffer from mastitis manifested repeated cases of disease during lactation. Regardless parities, the first case of health disorder in dairy herd occurred on the average 96.64±8.532 days in lactation. The average period needed for treatment of diseased cows was 3.69±0.121 days. The method of GLM, univariate procedure, was used to analyze risk factors which are responsible for occurring of health disorders in dairy farm. Among the risk factors that were found to affect the health of dairy cows, season of year had have significant influence at level $p<0.001$, while total milk yield estimated for 305 days in lactation influenced at level $p<0.01$.
Keywords: dairy cows, health dissorders, risk factors .

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EVALUATION OF ETHOLOGICAL AND PRODUCTION TRAITS IN VARIOUS GENOTYPES OF MACEDONIAN HONEY BEE SUBSPECIES

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Abstract

The honey bee colonony is a complex society which have a wide range of behaviors. The most important are swarming, colony defense and hygienic behavior. These ethological traits have an impact on the honey yields and are of significant interests of the honey bee breeders. Therefore the ethological characteristics are recognized in selection and breeding programs. According to the breeding programs selection is directed to reduction of swarming and colony defense behavior and increased expression of hygienic behavior.The aim of this research was to evaluate these characteristics in 100 honey bee colonies from four genotypes (A, B, C and D) of the autochthonous honey bee colonies (Apis mellifera macedonica) in one of the registered repro centres for honey bee queen rearing, located in Ohrid region, during 2016.The research included: scoring of defensive and swarming behavior of honey bee colonies- gradation 1 to 4 according to Ruttner method, 1972; scoring of the hygienic behavior of honey bees using Pin test method described by Gramacho and Gonçalves (2009a) as well as scoring of the honey yield by weighing of extracted honey in kg per honey bee colony.The results did not show statistically significant differences concerning defensive behavior, swarming behavior and honey yield between colonies from the four genotypes.The results have shown statistical significant differences in the average cleaning success (hygienic behavior) after 24 hours, between A and B (p=0.0480) genotypes, which gives opportunity for choosing queens for selection purposes.

Keywords: *Apis mellifera macedonica*, swarming behavior, defensive behavior, hygienic behaviorur, honey yield.

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EFFECTS OF ALOE VERA JUICE SUPPLEMENTS ON HYPERGLYCEMIA AND LIPID PROFILE IN DIABETIC WISTAR RATS MODEL

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Abstract

The objective of the study was to investigate whether Aloe vera juice as the supplement with glibenclamide can reduce blood glucose level and improve blood lipid profile in hyperlipidemic-diabetes rats model. The histology of pancreatic organ was also evaluated in the present study. Diabetes in rats was induced in adult male Wistar rats by the administration of streptozotocin (60 mg/kg, ip) and nicotinamide (230 mg/kg, ip). The rats were randomized into four groups: (I) normal rats;(II) Diabetic control rats (received CMC-Na 1 % vehicle only); (III) Diabetic rats received glibenclamide 0,18 mg/200g orally once daily; (IV) diabetic rats group received glibenclamide (0,18 mg/200g body weight) as well as Aloe vera juice supplementation (3,6 mL/200 g body weight) orally once daily for 28th days. The blood glucose level, triglycerides, and total cholesterol were determined by using spectrophotometer at the end of 28 days. The rats were anesthetized using chloroform inhalation and the peritoneum stripped open and the pancreas removed and prepared for histological observation using hematoxylin and eosin staining technique. The blood glucose, triglycerides, and total cholesterol level in Aloe vera juice supplemented and glibenclamide treated diabetic rats significantly lower than glibenclamide only treated rats. The histology of pancreas in diabetic rats which were given the supplementation of Aloe vera juice has the lower destruction of pancreatic islet cells compared than other diabetic rats.Aloe vera juice as supplement therapy has synergy effect with glibenclamide to reduce blood glucose level and lipid profile level in hyperlipidemia-diabetes rats.

Keywords: *Aloe vera*, diabetes mellitus, hyperlipidemia, *in vivo* study, phytomedicine.

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IN VITRO EVALUATION OF THE EFFECTS OF ESSENTIAL OILS ON *ASCOSPHAERA APIS*, THE CAUSATIVE AGENT OF CHALKBROOD DISEASE

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Abstract

Honeybee diseases cause considerable expenses to beekeepers for cost of maintaining apiary's inspection, colonies damaged or destroyed and drugs fed to prevent bee's infections. One of them is *Ascosphaera apis*, a fungal pathogen causing Chalkbrood disease in honey bee larvae. Chalkbrood is most frequent during damp conditions. Infected larvae turn chalky white color, become hard, and then turn black. It can be regarded as "the most widespread infectious disease" and this has led to economic loss in apiculture. We aim to find an alternative approach by using essential oils from medicinal plants in combating and controlling the disease. Therefore, current article compiled the effects of ten essential oils (citral, geraniol, citronelol, cinamaldehid, thymol, eucalyptus oil, lemongrass oil, fennel oil, clove oil and cedar oil) on *Ascosphaera apis* in the laboratory with an agar diffusion method and the method of serial dilutions in microdilution plate. A. apis strains were isolated from the dead honey bee larvae and the fungal strains were identified using a light microscopy. Various concentrations (0.08% - 10%) of the essential oils were experimented for determination of minimal fungistatic and also fungicide concentration. After incubation, the zones of inhibition were determined with a magnifying lens. The minimal inhibitory concentration was in range of 0.3125% - 1.25% for tested essential oils (MIC- values), and the minimal fungicide concentration was in range of 1.25% - 5%. All tested substances shows in vitro fungistatic and fungicide potential and can be considered as potential alternative active agents for prevention and control of Chalkbrood disease without the use of antibiotics.

Keywords: fungus, pathogen, fungicide inhibitory concentration, agar diffusion test, method of serial dilutions, honeybees.

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SHEEP BODY WEIGHT INFLUENCE ON REPRODUCTIVE PARAMETERS WHILE UNDER THE INCREASED DOSAGE OF GONADOTROPIC HORMONE DURING INDUCTION AND SYNCHRONIZATION OF ESTRUS IN ANESTRUS SEASON

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Abstract

Aim of this paper is to determine if there are differences in sexual reaction of mature Il d'france sheep depending on body weight of ewes that were treated with increased dosage of gonadotropic hormone by 250IU compared to usual dosage of 500IU that is given during induction and estrus synchronization during anestrus season. Total number of 99 ewes were treated, divided in to three weight groups depending on their body mass. First group were sheep whose body weight was within 40-50 kg limit, second group was between 50-60 kg and third group was sheep that had higher body weight than 60 kg (control group). All animals of all groups recieved intra vaginall sponges containing 30mg of fluorgestone acetate which remained within for 12 days. At the day of sponge removal each sheep received one dosage 750IU of gonadotropic hormone. Two days later "offhand" mating was done. Obtained results show that from first group 49,06%; II 50,00% and III 65,50% of treated ewes had kids. Average fertility of sheep per treatment I, II and III was 134,61% for I group, which was close to lower expected fertility limit for this breed, however fertility of second group was 157,89% and third group 160,00% was within limits of expected fertility for this breed when it is kept in optimal conditions. Conclusion was that sheep of II and III group reacted better on applied treatment and therefore achieved satisfying fertility.

Keywords: mature sheep, body weight, fluorogeston acetate, gonadotropic hormone of pregnant mares, sheep fertility.

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EFFICIENCY OF INSTALLED COOLING SYSTEMS IN DAIRY BARNS DURING HOT SEASON

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Abstract

Hot season of the year has profound effects on the production, health, profitability, and welfare of dairy cows. The objective of this study was to evaluate the efficacy of cooling systems in controlling the microclimate condition inside the two dairy barns. There was set out to compare the ambient conditions inside the barn with environmental weather data obtained from local meteorological station. The experiment was carried out at the height of summer (from 15th of June to 31st of August) in two familiar dairy farms. Within the barns air temperature, relative humidity and their ratio expressed as temperature humidity index (THI) were measured hourly during the trial period using data loggers. The Pearson's coefficient of correlation demonstrates that climate condition inside the barns and the official local meteorological station significantly correlate. The air temperature and THI were significantly higher in the Farm 1 (1.53±0.2390C higher, $t=6.420$; $p<0.001$, and 2.05±0.344 units higher, $t=5.973$; $p<0.001$, respectively) and in the Farm 2 (1.65±0.2520C higher, $t=6.549$; $p<0.001$, and 2.12±0.357 units higher, $t=5.927$; $p<0.001$, respectively) compare with the environmental weather data. The method of GLM, multivariate procedure, showed that there was statistical significant differences in the minimal values for daily microclimate parameters inside the barns before and after installation of cooling equipment. However, the interaction between the farm and cooling system, months and days of hot summer season showed statistical significant influence on the microclimate conditions inside the cow barns with exception for the maximal values for air temperature and THI. In conclusion, due to farm specific and unpredictable variability in climate conditions inside the cow barns and their correlation with environmental weather data, the installed cooling systems could provide better climate zone in the barns for increased milk production but couldn't completely satisfy capacity of cooling during the day time with highest air temperature.

Keywords: climate condition, dairy cow, temperature-humidity index.

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COMPARATIVE STUDY OF SHEEP MILK, WHEY AND TRADITIONAL KASHKAVAL FROM GALICHNIK AND LAZAROPOLE

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Abstract

Traditional cheeses are a reflection of the local rural environment, culture and nature expressed by experience of masters through many decades. In recent years, it is noticed increased consumption of traditional sheep dairy products, especially cheese produced by traditional technology.The purpose of this study was to examine the quality of raw sheep's milk and whey during the production of traditional sheep cheese from two locations, Galichnik and Lazaropole. Samples were taken in four iterations. The physico-chemical composition on the 100th day of ripening of cheese is presented also.The mean fat content was 8.45±1.157% in milk from Galichnik and8.69±0.846% in milk from Lazaropole, while the protein was6.34±0.837% and 6.15±0.242%, respectively. Titratable acidity in Galichnik milk was 10,33^{0}SH and the milk from Lazaropole has 10,50^{0}SH. The Total bacteria count (TBC) and the Somatic cell count (SCC) in both locations showed wide range due to nonstandard sanitary procedures applied in primary production. The results of the chemical composition of whey showed that it has a variable composition, particular in the content of fat (Cv= 9,02% Galichnik and 21.98% Lazaropole) due to the traditional procedure for making cheese.The moisture content of the cheese on 100th day of ripening was 36.64±0.550% in cheese from Galichnik and 32,63±4.980% in Lazaropole cheese. The mean value for fat content was 27.88±0.850% and 30.00±1.950% for cheese from Galichnik and Lazaropole, respectively. According to the classification of cheese in terms of moisture content on a fat-free basis, after 100 days of ripening, the kashkaval cheese from Galichnik had fallen in the group of hard cheeses, while the kashkaval cheese from Lazaropole belong to the group of extra-hard cheeses. Regarding the fat in dry matter, both cheese variants were on the border between medium fat and full fat cheeses.

Keywords: quality of milk, physico-chemical composition, traditional cheese.

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DYNAMIC OF PHYSICO-CHEMICAL PARAMETARS DURING RIPENING OF PECORINO CHEESE MADE FROM GOAT MILK

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Abstract

In this study, technological process and dynamic of the main characteristics of Pecroino cheese from goat cheese are presented. Analyses were performed on 5th, 10th, 20th , 40th and 90th day of ripening. Pecorino on 90th day of the ripening contained 39.8±0.57% dry matter, 60.20±0,57% fat, 26.48±0.44% proteins (1,44±0.056% Soluble N, 0,94±0.068% Peptides N, 0,54±0.064 Amino Acid N), 4.60±0.20% salt, 1.76±0.09 lactic acid and pH 5.36 ±0.20%.The most dominant Free Amino Acid (FAA) in cheese was proline (Pro) with 159.61±0,55 mg $100g^{-1}$, then leucine (Leu) 143.71± 0,44 mg $100g^{-1}$, phenylalanine (Phe) 137.21± 0.54 mg $100g^{-1}$ and isoleucine (Ile) 131,22 ±0,32 mg $100g^{-1}$. Regarding the Free Fatty Acid, capric acid (C10:0) was most dominant (1.3241 mg $100g^{-1}$) and caprylic acid (C8:0) with 1.1210 mg $100g^{-1}$. Compared with other hard cheeses from cow or sheep milk, higher concentration of FAA and FFA in goat pecorino cheese was noticed. Intensive lypolitic and proteolytic process in this cheese is due to the specific content and enzymatic activity of the goat milk specially because of the higher content of capric acid and other short-chain fatty acids (SCFA).

Keywords: quality, Free Amino Acid, Free Fatty Acid.

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EGG QUALITY IN DIFFERENT GENOTYPES OF CHICKENS

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Abstract

Egg quality parameters (egg weight, egg shell strength, yolk color and albumen quality-Hough units) in several pure breed of layers, kept on the indoor floor farming system, were compared. The layers were at same age, grouped according the breed and kept under same condition, same feeding regimes and farming method. Robotmation's Co. Ltd., Tokyo, Japan computerized equipment that performs unbiased analyzes was used in the Laboratory for testing marketing egg quality at the Institute for animal biotechnology of the Faculty of agricultural science and food. Egg shell Gauge was used for measuring eggshell strength and automatic machine Egg Multi Tester EMT 5200 was used for measuring of the Egg weight (size) and internal egg quality (Hough units and yolk color). Analysis of variance revealed no significant differences between observed trait other than egg size (weight), among the analyzed 272 eggs from different genotypes (Australorp – 16; Brown Leghorn – 53; New Hampshire – 60; Rhode Island Red – 23; Sussex – 32; Autochthonous breed – 88;). Average egg mass were (61.20g; 54.51g; 58.29g; 57.43g; 61.54g; 56.92g;) for each of the breeds respectively and significant differences of LSD test of this trait were observed between Australorp (61.20g) Brown Leghorn (54.51g) and Indigenous genotype (56.92g). Sussex also expressed significantly higher egg mass (61.54g) compared to all other breeds except Australorp. Eggshell strength varies between minimum 3312.42g/cm2 in Brown Leghorn and maximum 3616.31 g/cm2 in Sussex with no significant differences in individual LSD test comparison. Significant LSD test differences in egg yolk color were noticed only between Brown Leghorn (11.31) in comparison with New Hampshire (11.99) and Sussex breeds (12.08 units of La Roche Leader). The only significant individual comparison LSD differences in Hough units were observed between Brown Leghorn (58.43), New Hampshire (58.28) and Indigenous genotype (62.85).

Keywords: egg quality, breeds, layers.

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FINANCIAL EFFECTS FROM INTRODUCTION OF EUROPEAN EGG MARKETING STANDARDS ON THE LAYER FARMS IN R. MACEDONIA

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Abstract
Comparative analyze of production records in three flocks of ISA commercial layers (Flock 1-18125, Flock 2–17587, Flock 3-16818 housed layers and financial effects that comes from introduction of the new EU method for grading the eggs according the size (mass, weight) in 4 classes instead of Macedonian method of grading in 7 weight classes. Flocks did not differ much according the hen housed number of egg laid (299.88, 297.99 и 297.96) but differs according the average hen-day number of egg laid (313.14, 327.83 и 333.71) for Flock 1, 2 и 3 respectively. Highest quantity of feed on hen housed (44.89kg) are spent in Flock 1, and lowest (42.87kg) in Flock 2, while presenting the data on average hen-day number, highest amount of feed spent Flock 3 (48.01kg) and lowest Flock 1 (46.88kg). Application of European model for egg grading resulted in increased income on the level of 15-35 denars per housed or average hen-day layer that significantly improve the financial effects of the activity or more precisely profitability of the layer farms. Expressed per unit of production it could be stated that egg grading based on the egg size (weight) in to 4 classes according the mass or weight results in increased income per unit of production of 0.1 denar that is significant increase of the profitability of the farms if we know that each layer produces around 300 eggs during one production cycle of one year.
Keywords: layers, eggs, grading, profitability.

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EVALUATION OF PRODUCTIVE AND REPRODUCTIVE PARAMETERS IN HOLSTEIN-FRISIAN BULLS IN R. MACEDONIA

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Abstract
Comparative analysis of the production results were realized (milk yield or kg milk produced in lactation of 305 days and kg produced milk in lactation of 305 days corrected on third lactation, on percentage content of milk fat and milk protein in standard lactation of 305 days corrected on third lactation), and reproductive results (age at first calving, length of calving period and length of open period, in days) at 214 cows of Holstein-Friesian breed of different ages i.e. in different parity of lactations aiming Relative Corrected Values (RCV) of the bulls – fathers of the dauthers analyzed for these traits to be evaluated. Highest value for kg of milk was estimated in daughters of the bull Furgative (4 daughters), than Amarone (12 daughters) and Norentine (10 daughters). The lowest value for milk yield expressed daughters of the bull Lothan (13 daughters), for the traits total milk yield of whole lactation, as well as for the total milk yield in kg and corrected on 3rd lactation. The highest value for the trait milk fat (MM) expressed daughters of the bull Pos (21 daughter -3.63% MM) and Alegro (10 daughters - 3.61% MM), and the lowest value daughters of Furgative (4 daughters - 19.3% MM). Highest values for milk protein content (%) (MP), were monitored in daughters of Tenor Matie (20 daughters - 3.25% MP), Oportunis (12 daughters - 3.23% MP) and Alegro (10 daughters - 3.22% MP). In reproductive traits, the highest value for the trait age at first calving, was noticed in daughters of bull Norentin (9 daughters), and smallest value in Lothan daughters.The highest value for the trait length of open period show daughters of Pos, and the smallest daughters of Lemer. For the trait duration of calving period of cows the highest value were estimated in daughters of Pos, and the lowest of Furgative.
Keywords: bulls, productive, reproductive, parameters, A/I.
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STUDY OF GONADOSOMATIC INDEX OF *SALMO OHRIDANUS* STEINDACHNER FROM OHRID LAKE

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Abstract
With the aim to investigate the gonadosomatic index of Ohrid belvica (*Salmo ohridanus*, Steindachner, 1892), investigations were conducted on individuals captured in vegetative and reproductive development period of belvica, on three localities of Ohrid Lake: Kalista, Kaneo and Elesec, on depth from 45 to 70 m. Samples for researching have average body mass from 90 to 100 g and average total body length from 217 to 225 mm. The gonadosomatic index is the ratio of fish gonads weight to body weight. It was found that this ratio varies from 0.12 to 6.77 for the three localities during the two developmental stages, or that is an average of 0.14 to 5.86. High gonadosomatic indexes were recorded in the reproductive development period, which suggested the spawning period.
Keywords: *Salmo ohridanus*, gonadosomatic index.

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THE EFFECT OF SAWDUST AS A ROUGHAGE SOURCE IN THE FEED MIXTURES FOR FATTENING STEERS III. INTERNAL ORGAN'S MASS

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Abstract

The influence of sawdust as a roughage source was evaluated in the feeding trial of 42 holstain fattening steers, divided onto two groups with 21 animals each. The experimental animals were included into the experiment on the age of 130-140 days and average body weight of 150-160 kg. The duration of the experiment was 267 days, and it was divided on two periods. The preparation period last 15 days and the duration of the experimental period was 252 days. The experimental period was also divided onto two subperiods, first with duration of 84 days (body live weight of 250-260 kg), and the second with 168 days (up to 450 kg body live weight). After sloughtering of the animals, the internal organs of all animals were measured on technical scale. The substitution of 7% compaund feed, based on corn soybean meal and sunflower meal, with 7% of sawdust, influenced on significantly hevier legs (+7,8%), skin (+12,03%), heart (+8,13%), spleen (+12,12%) and pleura-peritoneum (+11,34%), and the significantly easier rumen (-17,43%) in relation with the control group (confidence interval 95%).

Keywords: sawdust, corn, soybean, sunflower, fattening steers, internal organ's mass.

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GENETIC EROSION OF GENETIC RESOURCES OF CATTLE IN THE REPUBLIC OF MACEDONIA

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Abstract
Busha cattle and domestic water buffalo are autohtonous breeds in cattle species in the Republic of Macedonia. Those breeds are part of the National Biodiversity Program for conservation of the indigenous breeds of animals in the Republic of Macedonia. Because of the economic, cultural and scientific reasons it is very important to protect biological diversity of autochthonous breeds like busha cattle and domestic buffalo. The aim of the research was to archive the total number of autohtonous cattle and farmers, as well as their effective size of controlled population under their phenothypic characterization and conservation. It is obviusely that in last several years the total number of autohtonous cattle rapidely declined, which is alarm for the state policy to react fast and effective to conserve them by ex-sity and in-vivo conservation methods.
Keywords: busha, domestic water buffalo, domestic breeds, cattle, conservation.

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HOW TO INCREASE ACCURACY OF BREEDING VALUES IN SMALL DAIRY POPULATIONS — A SIMULATION STUDY

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Abstract
Genetically linked small and large dairy cattle populations were simulated to test impact of different sources of information on the accuracy of predicting breeding values for young animals in a small population. For all animals phenotypes and genotypes were simulated. First, a large dairy cattle population (PL) with >20 generations was simulated (n=402000). Then a small subpopulation (PS) with 3 generations was formed as a related population (n=6000). Predicted breeding values (EBV or GEBV) for young animals in the small population were calculated using BLUP and single-step genomic BLUP (ssGBLUP) in 6 different cases: C1) 3166 phenotypes, 22,855 pedigree animals of PS; C2) C1 plus EBV for 4475 PL sires as external information; C3) C1 plus genotypes for 1000 to 6000 animals from PS; C4) C3 plus GEBV for 4475 PL sires as external information; C5) C1 extended with genotypes for 4475 PL sires; C6) C1 extended with genotypes for 2000, 3000, and 6000 animals in PS and genotypes for 4475 PL sires. The ability to predict true breeding value was assessed in the youngest genotyped animals in the small population. In C1 EBVs' accuracy was 0.31. Adding external EBV for PL sires did not considerably increase accuracy (0.33). By adding genomic information for only PS animals (C3), accuracy went from 0.31 when only 1000 animals were genotyped to 0.42 when all animals were genotyped. External GEBVs for PL sires related to PS did not improve the accuracy, but reduced variation. When only genotypes for PL were used in evaluation, accuracies were very similar to C1 estimations. Accuracy of 0.42 was also achieved in C6, when genomic information for PS and PL were included. As more animals from PS were genotyped the accuracy increased. In a small population the highest accuracy of evaluation may be obtained by using genomic information.
Keywords: dairy cattle, genomic breeding value, prediction accuracy, small population.

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PHENOTYPIC PARAMETERS OF SOME TRAITS IN HONEY BEE POPULATION OF *APIS MELLIFERA MACEDONICA*

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Abstract
Phenotypic parameters for the traits defensive behaviour (DB, score from 1 for aggressive to 4 for gentle), calmness (CB, score from 1 for unsteady to 4 calm and static on the comb) and honey production (HP, kg) were estimated for honey bee colonies (n=88) from the native population of *Apis mellifera macedonica* on 8 locations in Macedonia. The performance testing was conducted at least 3 times from September 2015 to October 2016. The queens in the test colonies belonged to unrelated sister groups (n=3). Each sister group (A, B, C) was reared and mated in locations near Sveti Nikole, Bogdanci and Strumica, respectively. The assessment of the colonies was standardized according to the international SMARTBEES performance testing protocol and harmonized to the requirements of BEEBREED data base. After the initial treatment against Varroa no further treatment was applied during the testing. The average value and number of total observations were DB 3.25 (n=329), CB 3.41 (n=329), and HP 5.93 (n=88) showing that the tested colonies were gentle and calm, but with low honey production. We found statistically significant phenotypic correlation between DB and CB (0.417, $p<0.01$) and DB and HP (0.227, $p<0.05$) as well as between CB and HP (0.279, $p<0.01$). The correlations between the traits found in our study are comparable with previous findings in the population of A. m. carnica in Germany and Austria. In the paper we further discuss the implications of our findings for breeding practice as well as for practical beekeeping.
Keywords: *A. m. macedonica*, performance testing, correlations, breeding.

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AGRICULTURE AND ZOONOTIC DISEASES

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Abstract
Zoonoses or zoonotic disease "under natural conditions, vertebral in animals, found in the saprophytic or pathogenic, microorganisms, fungi and parasites with different transmission routes of Zoonoses can be defined as diseases that occur with the passing of people in the world, to be seen frequently, the workforce can cause economic losses although sometimes by large outbreaks caused the death of many people due to public health still continues to be a problem. More than 250 known zoonotic in the world. The reasons for the increase of the disease increased along with the increase in the protein needs of the world's population in order to suply plays an important role in increasing livestock production. The rising numbers of people dealing with livestock, zoonotic the number of cases has increased. In addition, depending on the change in the increase of environmental pollution and ecology: transition to irrigated agriculture mosquitoes, rats, and mollusks (vectors of zoonotic diseases) to increase the forest into housing, factory, roads, bridges, etc. to be done, wild life, the relations of domestic life increased, dams, ponds, artificial waterways to be made for them to be contaminated, the forests are burning, destruction, ecological factors such as changes in the location of any zoonoses is a common cause of. As the assembly prepared in this study, the zoonotic diseases that can infect humans during herbal and organic agricultural practices, information about the measures to be taken and ways to protect them is given and recommendations are given.
Keywords: agriculture, plant production, animal production, zoonotic diseases, human health.

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ULTRASTRUCTURE OF THE FEMALE REPRODUCTIVE SYSTEM IN *ODONTOTARSUS PURPUREOLINEATUS* (ROSSI 1790) (HETEROPTERA: SCUTELLERIDAE)

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Abstract
The present study describes the ultrastructure of the female reproductive system in *O. purpureolineatus* which is an economically important species as detail using light microscope (LM), scanning (SEM) and transmission electron microscopes (TEM).Adult females of *O. purpureolin*eatus were collected from Kızılcahamam, Ankara, Turkey in July 2016. Samples for LM preparations were fixed in Formaldehyde. Thereafter, the tissues were washed, dehydrated and embedded in paraffin. Paraffin sections were cut into 6 μm thick slides and stained with Mallory's triple stain. The sections were photographed. Samples for SEM preparations were mounted with double-sided tape on SEM stubs, coated with gold and examined with a JEOL SEM. Samples for TEM preparations were then fixed 5% glutaraldehyde, postfixed in 1% OsO4, routinely processed, and embedded in Araldite. Ultrathin sections were stained with uranyl acetate and lead citrate. They were examined and photographed in JEOL 1400 TEM.In LM and SEM examinations, we observed that in *O. purpureolineatus*, the female reproductive system consists of a pair of ovaries join to form lateral oviducts which inturn leads into a common oviduct and opens out by female genital chamber. Each ovary is composed of six telotrophic ovarioles, with for different regions: the thread-like terminal filament, the germarium which has a chamber housing anteriorly the nurse cells, the vitellarium composed of oocytes in different developmental stages, the pedicel in which the mature eggs are lodged before passing into the lateral oviduct. Pair of accessory glands and a spermatheca are placed near of the common oviducts. In LM and TEM examinations, we observed that the germarium contains trophocytes, arrested oocytes and small prefollicular cells. The trophocytes possess large nuclei with accumulations of chromatin. The vitellarium has 3-4 oocytes at consecutive stages of oogenesis: previtellogenesis, vitellogenesis and choriogenesis
Keywords: germarium, vitellarium, light microscope, SEM, TEM.

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SURFACE MORPHOLOGY OF EGGS AND ECOLOGY OF *ARCTIA VILLICA*- CREAM-SPOT TIGER (LINNAEUS,1758)

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Abstract
In this study, surface morphology of eggs and ecology of *Arctia villica* (Linnaeus, 1758) were studied both by light and scanning electron microscopy (SEM). This species is polyphagous and feeds on herbs and lower parts of shrubs. Therefore, it is an economic species. Cream-spot Tiğer *Arctia villica* is distrubited from Spain to the Middle East and Turkey. In Turkey, its produces one generation per year. It has four life stages: egg, larva, pupa and adult. The caterpillars are fully-grown in April. Adults of *Arctia villica* were collected from Antalya, Korkuteli, Ayanlar village (24 May 2016). Fresh eggs were obtained from a colony maintained in breeding cages under laboratory conditions. Approximately 30 eggs were examined and measured with an Olympus SZX12 light microscope. For SEM, eggs were cleaned with a brush and air-dried before being mounted with double-sided tape on SEM stubs. They were then coated with gold in a Polaron SC 502 Sputter Coater, and examined with a Jeol JSM 6060 SEM operated at 15 kV.The spherical eggs are about 0.95 mm long and 0.97 mm wide. Newly deposited eggs are goldenyellow and darken after the onset of embryonic development. Using light microscopy and low-power SEM, the egg surface appears smooth, but at high magnifications, the micropylar region is surrounded by a rosette of 8–9 petal-shaped primary cells. The cells are polygonal and vary in size. In *Arctia villica* there are four or six micropylar canals in the central micropylar pit at the anterior pole of the egg. They permit the passage of the sperm through the eggshell for fertilization. The remaining part of the egg appear smooth and without remarkable features besides the aeropyles. Aeropyles are shown in the corner of polygons in *Arctia villica*.
Keywords: *Arctia villica*, egg chorion, SEM.

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EFFECT OF A CATTLE BREED ON BULL SPERM QUALITY AFTER CRYOPRESERVATION

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Abstract
Cryopreservation allows for long-term storage of semen; however, it leads to damage of sperm that may result in decrease of sperm fertility. The objective of this study was to study the influence of breed on semen stability to cryopreservation. 61,000 ejaculates have been investigated from 300 bulls of Angler, Hereford, Black-and-White, Simmental, Red-Pied and Red-Steppe breeds reared and kept in the West Siberian region of the Russian Federation. The frequency of semen culling for all breeds in according to post-thaw semen characteristics was 3.3±0.07 %. The sires of Red-Steppe breed were characterized the lowest percentage of rejected ejaculates (1.7±0.14%). At the same time, the frequency of rejected ejaculates was several times higher in sires of Angler (6.0±0.6%) and Hereford (4.6±0.8%) breeds. The differences between breeds in the stability of the male gametes to the cryopreservation reflect genetically determined semen peculiarities. This research was supported by Russian Science Foundation (project № 15-16-30003).
Keywords: semen, cryopreservation, cattle, breed, sperm fertility.

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PHENOTYPIC VARIABILITY OF FERTILITY AND MILK TRAITS IN OFFSPRING OBTAINED BY INSEMINATION BY SEXED AND CONVENTIONAL SEMEN OF HOLSTEIN BREED BULLS

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Abstract
The objective of this paper was to compare heifers reproductive traits and characteristics of their calves after artificial insemination performed by conventional (non-sexed) and sexed sperm on 6 commercial farms in Serbia. Conception rate was 55% and 44% for conventional and sexed semen, an average gestation length being 274.6 and 274.9 days, respectively. Average body mass at birth was 37.47 and 36.75 kg for non-sexed and sexed semen, respectively. The rate of stillbirths and twinning was 6.19 and 3.78% for conventional and 7.54 and 1.13% for sexed semen, respectively. The use of conventional semen exerted no statistically significant ($P>0.05$) effect on female:male calves relationship (51.96 : 48.04) while artificial insemination by sexed semen highly significantly ($P<0.01$) changed calf sex-ratio (85.10 : 14.90). First-calf heifers originating from sires whose sperm was obtained in conventional way produced 7880 kg milk with 269 kg milk fat and 242 kg protein in standard lactation, while first-calf heifers originating from sires whose sperm was sex-sorted produced 8184 kg milk with 251 kg milk fat and 242.3 kg protein. Type of insemination (conventional and sexed semen) did not significantly affect the studied milk yield traits ($P>0.05$).
Keywords: sexed semen, conventional semen, heifers, fertility traits, milk traits.

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MONOGENEAN PARASITES FROM THE GENUS *DACTYLOGYRUS* (DIESING, 1850) IN COMMON CARP (*CYPRINUS CARPIO* L., 1758) FROM CYPRINID FISH FARM IN PELAGONIA REGION (BITOLA, MACEDONIA)

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Abstract
The aim of this study was to determine the presence of monogenean parasites in common carp (*Cyprinus carpio* L. 1758) from a cyprinid fish farm located in Pelagonia region (Bitola, Macedonia). Total of 157 specimens of common carp (*Cyprinus carpio*) from cyprinid aquaculture facility in Pelagonia region (fish farm Bukri) were examined for parasitological investigations. The fish were caught using net or hook by local fishermen. The specimens were immediately transferred to the research laboratory. During the study period, data on parasite species were categorized according to season. Classical epidemiological variables (prevalence and mean intensity) were calculated according to Bush et al. (1997). The parasite specimens were identified using reference keys of Bauer (1985). During the examinations at Laboratory for fish diseases in Hydrobiological Institute in Ohrid (Macedonia), stereomicroscopes „Zeiss"- Stemi DV4 and „MBS 10", as well as light microscope „Reichart" were used. In common carp (*Cyprinus carpio*) from this cyprinid fish farm the presence of two monogenean parasite species from genus *Dactylogyrus* was established: *Dactylogyrus extensus* and *Dactylogyrus minutus*. It is very important to know the composition of parasite fauna in common carp as economically most important fish species in Macedonia cuisine, their seasonal dynamics as well as prevalence and mean intensity of certain parasites in different fish age.
Keywords: monogenea, parasite, common carp, aquaculture.

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CALCULATION IN MILK PRODUCTION ON FAMILY FARMS

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Abstract
Milk production in Serbia is mostly carried out by family farms characterized by small herds of cattle, low milk yield per cow, high costs of feeding and nutrition, and variable milk quality. Both small and specialized farms housing up to 10 lactating cows are often unable to maintain their cost-effectiveness. A study was conducted on two family farms A and B during 2013-2015 to record production data. Total production value, variable costs and contribution margin were calculated. For easy comparison between the farms, results were expressed per lactating animal. The sensitivity analysis of milk yield and farm gate milk prices showed that, at low values, contribution margins were more sensitive to changes in farm gate milk price. Through subsidies and premium payments, family farms maintain the cost-effectiveness of their production. However, small-scale producers are facing the largest threat, given low milk yields per cow and poor milk quality.
Keywords: contribution margin, price of milk, sensitivity analysis.

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INFLUENCE OF GENOTYPE, PARITY, YEAR X SEASON OF INSEMINATION AND BACK FAT OF SOWS BEFORE FARROWING ON THE LITTER SIZE TRAITS IN PIGS

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Abstract
Objective of the investigation was testing of influences of genotype, parity, year x season of insemination and back fat of the sows before farrowing on the litter size traits in pigs. Experiment done in Rača farm near Kragujevac in Serbia, include effects of 3 genotypes (Line), sows with up to 8 parties (Parity), 6 years from 2011 to 2016 (Y_mat) and 3 seasons of mating (S_mat) per year, from total observed 2900 litters in which the back fat measures before farrowing (BF_F) and after weaning (BF_W) was measured (back fat measured at P2 in all individual sows). Collected records were evaluated using standard method univariate analysis of variances under valid models (adjusted R squared variate from 0,200 to 0,987). Analyzed traits of litter size were number of piglets per litter of: total born & mummified (TB_GA), total born (TB), live born (BA) and dead born (BD). Results show clear significant influence of all investigated factors on: TB_GA (from P>0,029 to P>0,000), TB (from P>0,033 to P>0,000) and BA (from P>0,061 to P>0,000). Number of mummified (GA) and dead born (BD) piglets per litter were estimated under lower level of R adjusted squared models (0,200 and 0,262) and some of factors were not significant (not significant for: GA was BF_F and for BD were Line and BF_F, all with P<0,127). Investigation emphasizes the importance of proper breeding, parity structure, feeding management and microclimate on litter size traits. In addition, proper body condition management of sows expressed via fat body reserves (BF_F) can be consider like significant tool for moderation of desired level of the litter size traits in pigs.
Keywords: sows, litter size, back fat, effects.

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INFLUENCE OF GENOTYPE, PARITY, YEAR X SEASON OF INSEMINATION AND BACK FAT OF SOWS BEFORE FARROWING ON THE LITTER WEIGHT AT FARROWING AND WEANING IN PIGS

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Abstract

Objective of the investigation was testing of influences of genotype, parity, year x season of insemination and back fat of the sows before farrowing on the litter weight at farrowing and weaning in pigs. Experiment done in Rača farm near Kragujevac in Serbia, include effects of 3 genotypes (Line), sows with up to 8 parties (Parity), 6 years from 2011 to 2016 (Y_mat) and 3 seasons of mating (S_mat) per year, from total observed 2900 litters in which the back fat measures before farrowing (BF_F) and after weaning (BF_W) was measured (back fat measured at P2 in all individual sows). In addition, for litter weight at farrowing number of the born alive (BA) was included as correction and for litter weight at weaning we include the number of piglets weaned (WP). Finally, in the model of evaluation of litter weight at weaning, the back fat was generate in classes (BF_class2) to overcome the statistical problem of missing observation per individual class. Collected records were evaluated using standard method univariate analysis of variances under highly valid models (adjusted R squared variate from 0,986 to 0,987). Analyzed traits of pigs were litter weight (kg) at farrowing (LW_F) and litter weight at weaning (LW_W). Results show clear high significant influence of all investigated factors over two investigated variables (LW_F and LW_W, P>0,000 respectively). Investigation emphasizes the importance of proper breeding, parity structure, feeding management and microclimate on litter weight traits. In addition, proper body condition management of sows, judged by body fat reserves (BF at P2) can be considering like helpful tool in modern pig husbandry.

Keywords: sows, litter weight, back fat, effects.

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IDENTIFICATION OF GROWTH FACTORS IN WHITE FISH MUSCLES USING REVERSE TRANCRIPTION PCR

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Abstract

Muscle growth is the predominant economic characteristic in fishery. There are polymorphisms and upregulation of some genes that are involved in the development of fish muscles. One question is whether the polymorphic genes are directly related to hypertrophy or hyperplasia in white fish muscles which are the main part of muscle mass. The aim of this study was to identify such genes in large and small samples of koi carp using reverse transcription of isolated mRNA from white muscles and amplification of cDNA with in house designed forward primers for such genes and oligodT as reverse primer sequence. Based on the previous data we were discovering the activity of ten genes that are involved in muscle growth as follow: cystathionine-beta-synthase, myogenin, □-homocystein-methyl-transferase, myoD1, methionine-synthase, methionine-tetra hidrofolate reductase, myf6, myf5, myoD2 and myostatin. As a marker gene for technique accuracy was used leptin. RNA was isolated using TRIzol method according to manufacturer protocol. Reverse transcription was performed using Invitrogen kit, while the PCR reaction was optimized with gradient PCR. In the white muscle samples of the small fish we identified the activity of the following genes: myogenin, myf6, MyoD2 and myostatin, while in the white muscle samples of large fish we discovered the activity of myogenin, myf6, MyoD2 and myf5 genes. It means that there are same active genes in white muscles from small and large samples, except that only in small samples is active myostatine gene, while myf5 gene is active only in white muscles of large fish. The study should continue with estimation of expression level of identified genes.

Keywords: muscle, growth, genes, koi carp.

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INFLUENCE OF SPICE MIXTURE OF OREGANO AND SAVORY ON THE CHARACTERISTICS OF CEVAPI

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Abstract

Shelf life of cevapi, in which chemical additives were substituted with biopreservatives, was examined. Bioprotective culture B-2 SafePro (Lactobacillus sakei) in freeze-dried form and spice mixture Oregano plus, composed of oregano (Origanum viridis) and savory (Satureja montana) were used. Three variants of cevapi were produced: with B-2 SafePro (R\L) (control), with oregano plus (R\O) and with combined use of B-2 SafePro and oregano plus (R\O\L). pH value, grilling weight loss, chemical composition, sensory characteristics, TBARS (Thibarbituric Acid Reactive Substances) and microbiological profile were investigated in all cevapi variants. Continuous pH value decreasing was established in all variants. Cevapi of R\L variant had significantly ($P<0.05$) lower pH than the other two variants. Statistically significant negative correlation between pH value and grilling weight loss of cevapi has been found ($P<0.01$). Consequently, the highest weight loss during grilling has been found in variant R\L. R\O\L products had the most acceptable sensory attributes 3 days after production. In R\L all sensory properties were significantly ($P<0.05$) better seven days after production. Significantly ($P<0.05$) lower TBA-numbers in R\O products indicate that the spice mixture oregano plus has evident antoxidative effect. R\L products had the highest total bacteria count, as a result of the L. sakei colony intensive growth and development. The most expressive anticoliform effect was detected in R\O products. Generally, it can be concluded that the addition of a mixture of oregano and savory results in getting microbiologically safe products with extended shelf life.

Keywords: cevapi, oregano, savory, characteristics.

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INFLUENCE OF "PROGRAM FOR PROTECTION OF BIODIVERSITY IN LIVESTOCK BREEDING" ON OVCHEPOLIAN SHEEP

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Abstract
Ovchepolian sheep is the most common but also the most studied autochthonous sheep population in the R Macedonia. The characterization of: phenotype, productive and reproductive traits, as well as the molecular characterization of the ovchepolian sheep is usually the result of individual research studies, which complement each other. The results of these studies are especially important because they have contributed to the incresed knowledge of Ovchepolian sheep, in defining the breeding goals, but also in defining the direction for conservation and characterization of this sheeppopulation. The activities of the program for protection of biodiversity in livestock breeding in the period 2011-2017 enabled the realization of coordinated activities in the characterization of Ovchepolian sheep through implementation of FAO criteria for phenotypic characterization as well as for *ex situ in vitro* conservation of biological material. An additional unified characterization of the phenotype was undertaken, ie appropriate activities were carried out in the direction of *ex situ in vitro* conservation of biological material, the status of Ovchepolian sheep according to the FAO criteria for endangermendstatus was changed. As a result of these activities positive phenotypic characterization was performed in 6981heads,a biological material was collected (450 doses of whole blood), the collection of *ex situ in vitro* conserved biological material consistis6676 doses of sperm donated by a total of 9 donors and 19 oocytes from 4 donors.The activities enabled an appropriate migration of Ovchepoliansheep from category endangered in category not at risk, according to FAO recommendation. The achievements and the acquired knowledge of the overall activities in the general characterization of Ovchepoliansheep form an appropriate basis for the future directions in characterization of this sheep population. They clearly define the needs and directions that should be included in the future program for the protection of biodiversity in livestock breeding. In addition to the low degree of phenotypic characterization, the future program should focus on intensive *ex situ in vitro* conservation (increased number of donors of biological material) as well as the implementation of molecular markers for additional characterization of Ovchepoliansheep genome.
Keywords: ovchepolian sheep, biodiversity, *ex situ, in vitro*.

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NEW PROGRAM FOR THE PROTECTION OF BIODIVERSITY IN LIVESTOCK BREEDING IN THE REPUBLIC OF MACEDONIA- CONCEPTUAL FRAMEWORK

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Abstract

A very small number of indigenous breeds are involved in livestock production, low level of productivity makes them less attractive to breeders. As a result of these two factors, many autochthonous breeds are lost or are at risk of extinction. In the 20th century there were about 1000 extinct breeds, and since year 2000 over 100 breeds are extinct. The autochthonous breeds and their conservation must be considered as a public good due to their historical, cultural, scientific and economic value. Conservation of animal genetic resources (AnGR) must be planned and systematically realized and all indigenous breeds should be included in the conservation programs. The most important criterion for establishing the conservation priority of breeds is the assessment of breeds risk. However, a number of other factors have their own influence on breed conservation programs. The realization of the activities in characterization and preserving the AnGRin the Republic of Macedonia is coordinated within the framework of a national seven year program that covers common but also separate activities according to the specifics of the breed. Activities in the period 2011-2017 indicate that different breed, even species, stages regarding conservation of AnGR. In cattle, sheep, goats, bees and dogs the current state is satisfactory, except for two autochthonous sheep breeds, where the identification of pure breed heads is difficult. Especially critical is the condition inpoultry and pigs. The main priority of the new national program is conservation and sustainable use of animal genetic resources for food and agriculture (priority 1). According to the status of each breed, the program will provide continuous application of characterization, inventarization, monitoring of trends and related risks considering animal genetic resources. Sustainable use and development of animal genetic resources represent the second priority of the new program. Successful realization should ensure further sustainable development and use of animal genetic resources mainly in traditional production systems in the country, with emphasis on food production and rural development. Further conservation of biological material *ex situ in vitro*, as well as live animals *in situ in vivo* or *ex situ in vivo* are the third priority. The last, fourth, priority is institutional capacity building and raising awareness of policy makers. The realization of defined priorities within this program framework is prerequisite for appropriate conservation of AnGR.

Keywords: indigenous breeds, conservation, biodiversity, program.

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BIOCHEMICAL, HEMATOLOGICAL AND MINERAL PARAMETERS IN PIGS OF TWO BREEDS REARED IN LARGE INDUSTRIAL COMPLEXES OF WESTERN SIBERIA

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Abstract
Pig farming has a long tradition in Russian agriculture. The objectives of the present study were to investigate some indicators of blood biochemistry and hematology, and mineral metabolism in pigs (aged 6 months) of Landrace and Kemerovskaya breeds reared and kept in large industrial complexes named "Chistogorsky" and "Altaimyasoprom" (250 thousand heads in each) and to determine differences between two breeds in biochemical, hematological and mineral parameters. The Kemerovskaya breed belonged to local one but the Landrace breed was introduced from Ireland 3 generations ago. It has been found that serum concentrations of total protein, albumin and uric acid were higher in the Landrace breed then in the Kemerovskaya breed. In contrast, there was increased serum urea concentration in animals of the Kemerovskaya breed in comparison with the Landrace breed. In addition, there were differences between breeds in some hematological indices and mineral metabolism parameters. The higher serum uric acid concentration in Landrace pigs might be a consequence of not yet finished adaptation process to the conditions of Western Siberia. The average population levels of the parameters investigated in two pig breeds could be used as reference intervals to assess animal's interior at other pig farms in Western Siberia.
Keywords: animal biochemistry, animal husbandry, adaptation, population, pig raising plant.

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THE DETERMINATION OF SOME AGRONOMIC AND OIL QUALITY CHARACTERISTICS OF PEANUT BREEDING LINES

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Abstract

This study was conducted as a main crop in University of Çukurova, Faculty of Agriculture Field Crops Department in 2016. The objective of this research was to determine some agronomic and quality characteristics of peanut breeding lines. In this study, 22 peanut lines (F6) belonging to Halisbey (High yield) x Brantley (High oleic) crossing were used as a plant material. The experimental design was a Randomized Complete Block with three replications. Pod number and pod weight per plant, 100 seed weight, shelling percentage, oil content, oleic acid percentage, pod and kernel yield per hectare values of lines were investigated.As a result, the pod number per plant of breeding lines was between 24.9-34.9 pod plant-1, pod weight was 73.3-91.2 g plant-1, 100 seed weight 118.0-148.6 g, shelling percentage was 59.5-66.9% and pod yield was 6064-9232 kg ha-1. The oil content and oleic acid percentage of breeding lines were varied between 41.2-50.95% and 51.97-80.06%, respectively.

Keywords: peanut, breeding lines, agronomic characteristic, oleic acid, pod yield.

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ABSORPTION OF MACRONUTRIENTS IN COMMON WHEAT (*TRITICUM AESTIVUM* L.) IN TERMS OF VEGETATION EXPERIMENT

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Abstract

The aim of the study was to characterize genotypic specificity in absorbing the main macronutrients (nitrogen, phosphorus and potassium) depending on the variety and level of fertilization. The genotype specificity in the uptake of the main nutrients according to the fertilization rate was investigated on 12 *T. aestivum* L. varieties under conditions of a vegetation experiment. Four fertilization rates were tested: N0P0K0 (a), N200P200K200 (b), N400P200K200 (c), and N600P200K200 (d). The response of the varieties to the nutrition conditions provided was studied during several stages of growth and development. The different nutrition regimes used lead to manifestation of the specific abilities of the varieties to take up nutrients. Genotype and mineral fertilization had a higher effect on nutrients uptake than stage of development. During the initial stage of wheat development, the differences established in the uptake of macro elements were greater between the varieties than between the individual fertilization rates. The differences were most evident at maturation. This specificity was well expressed in nitrogen and phosphorus uptake in total biomass and to a lesser extends - in potassium uptake. Varieties Slaveya and Milena had highest amounts of nitrogen uptake in grain.

Keywords: wheat, mineral fertilization, uptake, nutrients.

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THE EFFECT OF HARVESTING TIMES ON OIL AND FATTY ACID COMPOSITION OF PEANUT VARIETIES GROWN IN MAIN CROPPED CONDITION IN CUKUROVA REGION (MEDITERRANEAN AREA) IN TURKEY

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Abstract

This study was conducted at the experimental area of the Department of Field Crops, Faculty of Agriculture, Cukurova University as a main crop in 2015. The objective of this study was to determinate the effect of harvesting dates on oil and fatty acid composition of peanut (*Arachis hypogaea* L.) varieties grown in main cropped condition in Cukurova region. The experimental design was a split plot with three replications. The Halisbey, Sultan, Arioglu-2003, Osmaniye-2005, NC-7, Batem-5025, Flower 22, Flower-32, Flower-36, Brantley and Wilson peanut varieties (Virginia market type) were used as a plant material in this research. The plants were harvested at 149, 156, 163 and 170 days after sowing (DAS).Oil and fatty acids (palmitic acid, stearic acid, oleic acid, linoleic acid, linolenic acid, arachidic acid, behenic acid and lignocerik acid) content of varieties were investigated. As a result, the oil percentage of peanut varieties was increased from 47.8% to 50.3% when the harvesting delayed from 149 DAS to 170 DAS. While the Palmitic and Linoleic acid percentage was decreasing, the stearic and oleic acid percentage was increased when the harvesting delayed from 149 DAS to 170 DAS in peanut varieties. The others fatty acids were not affected by the harvesting time.

Keywords: peanut, main crop, harvesting time, oil content, fatty acid.

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THE IMPACT OF INSERTION ON SOME TECHNOLOGICAL CHARACTERS OF BASMAK TOBACCO VARIETIES IN THE REPUBLIC OF MACEDONIA

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Abstract

Technological characters determine the so-called technological - commercial quality of tobacco and tobacco products during fabrication. Three-year trials were performed with variety YK 7-4/2 (check) and three Basmak varieties - MK-1, MB-2 and MB-3. The trial was designed in randomized blocks with five replications. The aim of investigation was to determine water retention capacity (WRC), density, filling capacity and fractional composition of tobacco by insertions. WRC was determined by the method of D. Boceski, filling capacity (cm^3/g) and density (g/cm^3) were determined using the Borgwaldt densimeter by the method of Shuto (1972) and fractional composition by the method of Dorahova and Dikker. During the three years of investigation, WRC ranged from 16.87% in the lower leaf of variety MB-2 to 23.70% in the middle leaf of MB-3, which proves that the investigated varieties of Basmak tobacco have higher WRC compared to the check. The lowest density by insertions and years and the highest filling capacity was recorded in the middle leaf of MB-2 in 2009 (0.195 g/cm^3). In the three years of investigation, the lowest average density was recorded in lower leaves of the variety MB-3 (0.213 g/cm^3) and the highest in top leaves of the check variety YK 7-4/2 (0.303 g/cm^3). The filling capacity was the highest (5.13 cm^3/g) in middle leaves of the variety MB-2 and the lowest (2.91 cm^3/g) in under top leaves of the variety MB-3 in 2009. In average, the lowest positive fraction was measured in lower leaves of the variety MB-2 (78.99%) and the highest in middle leaves of the variety MB-3 (93.23%), while the negative fraction ranges from 10.16% in MB-3 to 21.11% in the check variety JK 7-4/2. The data obtained show that the characteristics of the investigated Basmak varieties are typical for the oriental tobacco.

Keywords: density, filling capacity, water retention capacity, faction.

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CHARACTERISTICS OF THE NEWLY CREATED GENOTYPE OF VIRGINIA TOBACCO - LINE V-79/09 CMS F1 IN THE REGION OF PRILEP DURING 2012-2016

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Abstract

V-79/09 CMS F1 is a hybrid male sterile line created in the Scientific Tobacco Institute - Prilep in 2009 by intervarietal hybridization. It was included in comparative trials in the period 2012/2016, performed at the Experimental field of the Tobacco Institute, along with introduced varieties as a check. Through the whole period of investigation, line V-79/09 CMS F1 showed better biomorphological and productional properties compared to the check varieties. Due to its characteristics, it surpassed all other varieties and lines included in the investigation. Thus, the line starts to flower 71.8 days, 50% flowering occurs in 76.6 days and end of flowering in 81.8 days from the date of planting. The average length and width of the 5th leaf are 52.1 cm and 36.8 cm, of the 10th leaf 69.3 cm and 39.9 cm, and of the 15th leaf 64.7 cm and 35.1 cm, respectively. Height of the stalk with inflorescence averages 213 cm and the number of leaves is 34.0. The yield was 3450 kg/ha, but it should be mentioned that throughout investigation, the line V-79/09 CMS F1 showed statistically significant differences compared to the check varieties. All these characteristics make this line interesting for tobacco industry.

Keywords: tobacco, Virginia, flowering, morphology, yield.

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UTILISING PADDY BY-PRODUCTS

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Abstract

When paddy cultivation area in Turkey is analysed in terms of production and productivity values, it can be stated that 35 thousand tons production and 6.04 tons productivity were gained in 50 thousand ha cultivation area in 2000 while in 2013 90 thousand production and 8.13 ton ha productivity were gained in 110 thousand ha cultivation area. Generally, the grain of paddy are commonly considered as white rice in the world. However, the straws remaining from the harvesting of pieces of broken rice, bran, photocell, raw piece and glumes generated during processing of paddy into rice are by products of paddy. Rice flour, rice starch, rice wine and beer are produced from broken rice. Raw piece and photocell remaining which are other by products of paddy are used as additive in forages. Paddy husk are used as construction material, in wall construction and manufacture of fire-resistant brick, animal breeding and as base material in poultry husbandry, in production of compost, electricity, as absorbing material in watery solutions in order to separate ions, as potential filter in order to separate arsenic in water and in order to absorb oil on hard surfaces. The ash of paddy husk is used for the production of glass, cement, ceramic and other products. Finally, rice bran is used as forage and the oil generated from the bran is used in sectors of food, cosmetology and pharmacy.

Keywords: paddy, straw, husk, broken, bran.

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CHARACTERISTICS OF TOBACCO SEED IN SOME ORIENTAL TOBACCO VARIETIES DEPENDING ON PLANTING DENSITY

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Abstract

Planting density is important factor for obtaining the intended yield of tobacco seed with satisfactory quality. The aim of this study was to determine the yield and quality of seed material derived from tobacco planted with different planting densities. The trial was set up at the Experimental field of Tobacco Institute-Prilep and analyses were made in the accredited laboratory for testing the quality of seed from agricultural crops. Investigations included two varieties of oriental tobacco Prilep: P-66-9/7 and NS-72 in various planting densities (50 x 15 cm, 45 x15 cm and 40 x 15 cm. The plot was prepared using standard farming practices and and transplanting was done manually, in 5 replications. Morphological measurements were made on 10 plants in each variant of the two tobacco varieties tested. The following morphological characters were measured: height and width of the stalk, height and width of the inflorescence and thickness and width of the seed capsule, along with inflorescence mass, number of capsules in the inflorescence and number of seeds in the capsule of each stalk. After harvest and processing, certain measurements and laboratory tests were performed to determine the quality characteristics of the seeds, such as: germability of seed in % and absolute mass in grams. It can be stated that seeds obtained from stalks grown in larger vegetative space are almost always better in yield and quality. Thus, the average amount of seed in variety P-66-9/7 was 13,68g and in NA-72 it was 15,51g. In the stalks grown in smaller vegetative space, the average amount of seed ranged from 3,36 g in P-66-9/7 to 6,76 g in NS-72. In few cases the results may vary, but the general conclusion remains that the seeds obtained from plants that grow in larger vegetative space have better quantitative and qualitative characteristics.

Keywords: tobacco, tobacco seed, P-66-9/7, NS-72.

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PEG INDUCED DROUGHT STRESS ON GERMINATION AND SEEDLING PERFORMANCE OF BREAD WHEAT GENOTYPES

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Abstract

This study was carried out to determine the response to drought stress of some bread wheat genotypes during germination and seedling growth. Two bread wheat cultivars (Karatopak and Sagittoria) and three breeding advanced lines (numbered 1, 8 and 20) of Mediterranean region of Turkey were used as seed material. Three different doses (Control, -0.6 MPa and -1.2 MPa) of Polyethylene Glycol (PEG-6000) were used to generate drought stress in germination and seedling growth of bread wheat. Germination experiment was carried out in petri dishes settled in a germination incubator with 4 replications in factorial arrangement of CRD. Seedling emergence experiment was carried out in the plastic containers filled with a mixture of sand and peat settled in growth cabinet with 3 replications in factorial arrangement of CRD. Results of the germination experiments showed that genotype, PEG and genotype x PEG interactions was significant for examined traits except germination rate. In the seedling growth experiment genotype, PEG and genotype x PEG interaction were significant except for mean emergence time. Generally increased doses of PEG caused remarkable decrease all examined traits but increase in mean germination time and mean emergence time. As the PEG doses increased genotypes responded differently as regard to examined traits in germination and seedling emergence of bread wheat genotypes. Bread wheat genotypes were grouped in terms of tolerance to drought stress induced by PEG in germination and seedling emergence. It can be concluded that PEG-6000 was useful agent to create drought stress in germination and seedling growth of bread wheat but more doses and osmotic pressure levels lower than -1.2 MPa could be applicable for better drought stress tolerance genotypes screening.

Keywords: bread wheat, polyethylene glycol, germination, emergence.

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EFFECTS OF DIFFERENT PRETREATMENT METHODS ON FIBER CONTENT OF SWEET SOGHUM BAGASSE FOR BIOETHANOL PRODUCTION

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Abstract
Pretreatment is one of the key processes in lignocellulosic bioethanol production, which is needed to improve accessibility of enzyme to cellulose. This study was conducted to investigate the effects of different pretreatment methods on fiber content of sweet sorghum bagasse. 9 pretreatment methods were used in the study, these are; 1 % H_2SO_4, 1.5 % H_2SO_4, 2 % H_2SO_4, 1 % H_2SO_4 + 0.5 M NAOH, 1.5 % H_2SO_4 + 0.5 M NAOH, 2 % H_2SO_4 + 0.5 M NAOH, 1 % NAOH, 1.5 % NAOH and 2 % NAOH. According to results, while 2 % H_2SO_4 + 0.5 M NAOH gave the highest cellulose (91.51 %) and lowest lignin (1.7 %) contents, the lowest cellulose (65.11 %), hemicellulose (0.4 %), and highest lignin contents (23.42 %) were provided by 1.5 % H_2SO_4 among pretreatments. Cellulose, hemicellulose and lignin contents of sweet sorghum bagasse after alkali pretreatments (1 % NAOH, 1.5 % NAOH and 2 % NAOH) ranged from 76.72 to 79.88, 11.75 to 14.62, and 2.05 to 4.11 %, respectively. The most suitable cell wall composition for enzymatic saccharification derived from dilute acid pretreatments combined with alkali (1 % H_2SO_4 + 0.5 M NAOH, 1.5 % H_2SO_4 + 0.5 M NAOH and 2 % H_2SO_4 + 0.5 M NAOH) due to the fact that they provided the highest cellulose (90.68 – 91.51 %), lowest lignin (1.7 – 3.41 %) and desirable hemicellulose (1.10 – 1.82 %) contents, enzymatic hydrolysis must be done to learn which method enables to the highest fermentable sugar production.
Keywords: sweet sorghum, pretreatment, bioethanol, lignocellulosic, fiber.

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CHARACTERISTICS OF THE FERTILITY OF WINTER BARLEY IN AGRO-ECOLOGICAL CONDITIONS OF THE NIŠAVA DISTRICT

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Abstract
A proper selection of varieties for the appropriate agro-ecological area can significantly influence the achievement of high and stable grain yield. The paper studies the fertility characteristics of three varieties of livestock feed winter barley: KG Zlatnik, Nonius and Amorosa. The experiments were conducted in the seasons of 2013/2014 and 2014/2015 in the area of the city of Niš. The experiment included the following parameters: spike length, number of grains per spike, number of plants per m2, number of sheaths per m2, number of spikes per m2, general tillering, productive tillering, grain weight per spike, number of grains per spike, 1000 grain weight, hectolitre weight and grain yield per hectare. Bearing in mind the analysed parameters, significant differences have been established among the examined varieties. On the basis of the statistical analysis of the examined characteristics one can assert that the variety KG Zlatnik gave the best results regarding most of examined fertility characteristics.
Keywords: livestock feed winter barley, agro-ecological conditions, fertility traits, variety.

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EFFECT OF BIOMASS AT DIFFERENT GROWTH STAGE ON GRAIN YIELD AND QUALITY IN BREAD WHEAT (*TRITICUM AESTIVUM* L.) GENOTYPES

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Abstract

The aim of this research was to determine the effects of location, genotypes and the interaction of location x genotypes on biomass, canopy temperature, yield and some of the quality traits of the bread wheat genotypes under field conditions. Thus, it was established with 25 genotypes in randomized completely blocks design with 4 replications at 3 locations in Trakya Region, Turkey, in 2013-2014 growing season. Grain yield, biomass, canopy temperature, plant height, 1000-kernel weight, test weight, and relationship among these characters were investigated. For determining biomass of the genotypes, data was taken at three plant growth stages; tillering, shooting and heading. Combined analysis of variance across three locations revealed highly significant variation among wheat genotypes for grain yield, biomass of stem elongation, heading stage and canopy temperature. The mean yield of the genotypes was 723.0 kg/da, and the highest yields were obtained from Entry 22 with 826.3 kg/da. The highest biomass was scaled in Entry-9 during three-plant growth stages. Additionally, a positive correlation was observed between grain yield and biomass in tillering, shooting, and heading growth stages of the genotypes. These results indicated that higher biomass at early plant growth stage was more significant for yield potential. There was detected slightly negative relationship between canopy temperature and biomass, and grain yield. It could be that the canopy temperatures of genotypes were measured lower during the increasing of biomass in plant development. During tillering stage, higher biomass promoted to plant height and positively affected protein ratio and values of gluten and sedimentation. In shooting phase of genotypes, biomass positively affected and increased in 1000-kernel weight, protein ratio, gluten value and sedimentation value, as well. But increasing in biomass during heading stage, negatively affected and decreased in canopy temperature, 1000-kernel weight, test weight, protein ratio, gluten index and sedimentation value.

Keywords: bread wheat, genotypes, yield, biomass, quality parameters.

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DIFFERING IN AGRONOMIC AND QUALITY CHARACTERS IN SOME BACKCROSS–DERIVED LINES IN BREAD WHEAT (*TRITICUM AESTIVUM* L.) GENOTYPES

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Abstract

The backcrossing method remains an efficient tool for transferring genes into established crop varieties. In this study; we were focused on evaluating the selected some backcross lines for yield, grain-quality traits and some agronomic traits under field condition. The experiment was conducted using 15 genotypes in randomized completely blocks design with four replications in Trakya ARI experimental field, during 2009-2010 and 2010-2011 growing years. Grain yield, days of heading and maturing, plant height and some quality parameters and relationship among these parameters were investigated. According to results, there was statistically difference among genotypes in terms of yield and other investigated characters, except for 1000-kernel weight, test weight. Grain yields decreased in Pehlivan, Aldane, Tekirdağ and Dropia backcross lines. It was determined that TKW increased in the backcross derived lines of the Gelibolu, Dropia and Prostor, gluten value increased in Pehlivan and Tekirdağ cultivars. Backcross line for gluten index of the Pehlivan, Aldane, Gelibolu, Prostor and Dropia cultivars highly increased compared with other components. Sedimentation values of the backcross lines of cultivars decreased in Prostor and increased in Pehlivan, Gelibolu and Dropia. The strongly negative correlations were measured between grain yield and days of maturing (r=-0.689**), plant height (r=-0.655**), and lodging resistant (r=-0.743**). Also, grain yield was negatively correlated with protein ratio (r=-0.608*), gluten value (r=-0.541*), and days of heading (r=-0.607*). The negative correlations were found between grain yield and 1000-kernel weight, test weight, hardness, sedimentation, and winter-kill, as well. The strong positive correlations were measured between protein ratio and gluten, hardness, sedimentation, days of heading and maturing, plant height, and lodging resistant. Grain hardness in genotypes increased with the extension of maturation period of the genotypes. Plant height in genotypes strongly correlated with grain yield, protein ratio, gluten value, gluten index, days of heading and maturing.

Keywords: bread wheat, backcross lines, genotypes, agronomic characters.

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FIELD STUDIES OF NITROGEN APPLICATION ON YIELD OF İSTANBUL THYME

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Abstract
Turkey has 70 percent of world origanum production. But most of the production is still consisted of gathering from nature. Cultured production is needed in oregano not only for saving natural gene sources but also getting high yield and quality. Fertilization is one of the most important factors in cultural production. Especially nitrogenous fertilizers change the quality and quantity of the producted plant. For this purpose the effects of five levels of nitrogen application (0, 40, 80, 120, and 160 kg ha−1) on biomass yield, İstanbul Thyme (*Origanum vulgare* ssp. *hirtum*) during second cultivation period following field establishment were examined. First year (establishment year) of thymes were not have sicnificant datas. Field study was established in Yalova and South Marmara climatic conditions in 2014. Thymes planted 45 x 30 cm (row space X intra-row space) and irrigate with drip irrigation system. The yield of second year was affected by nitrogen levels depending on increasing biomass. Yield of thyme increased up to 28418 kg ha-1.
Keywords: tyhme, oregano, nitrogen, yield.

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IMPORTANCE OF *CRAMBE* SP. IN MEDICAL AND COSMETIC INDUSTRIES

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Abstract

Crambe sp. are an annual and perennial plants with shrub form and belonging to Brassiceae family. Sterols in seed oil uses at margarine as additive for reduce to blood cholesterol. Likewise; similiar to *Simmondsia chinensis* oil and whale seminal oil, it uses at production of liquid wax. İnstead of materials, which ones proven carcinogenic effect, Erukamid, obtained with transform of erucic acid, uses at personal care products (such as perfume, lotion and dye for cosmetics), dyes (for polissage), medical equipments have importance for healty generation. Nitryl and isothiocyanate in the Crambe leaves have potential uses against to cancer. It is a natural alternative to harmful mineal oils and silicon with omega-9 content. Otherwise Crambe oil protect stem cell, decelerate skin aging and fight with free radicals by stimulate to collogen production.

Keywords: *Crambe* sp., seed oil, cosmetic, medicinal use.

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QUANTITATIVE TRAITS OF SOME MAIZE HYBRIDS DEPENDING OF FAO MATURITY GROUP

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Abstract

The yield as the base for determination of the proper hybrid in relation to the vegetation period strongly depends of the traits that determine it. In this research, using standard producing technology during two years, have been evaluated the quantitative traits of five maize hybrids, with different maturity group: OS2893 (FAO200), OS378 (FAO300), DRAVA404 (FAO400), OSSK515 (FAO500) and OSSK617 (FAO600).The length of the cob varied and depends of the genotype. The shortest average cob length was determined at the hybrid OS378 (17.7 cm), while the largest at OSSK617 (22.7 cm). The hybrids of earlier maturity groups have shown lower average values for cob diameter compared with later hybrids. In this study, the hybrids with the smallest average length of kernel, were OS2893 and OS378 (0.87 cm), and the hybrid with the highest average length was OSSK617 (1.04 cm). All hybrids showed one cob per plant. The number of rows per cob is a genotype characteristic, but it also depends on the growing conditions. In tested hybrids, the number of rows was ranged from 14 to 16.4. According to the received data, the lowest average kernel weight per cob for both years was obtained in the OS2893 hybrid (177.5 g) and the highest in OSSK617 (320 g).

Keywords: traits of maize cob, kernel weight, vegetation period.

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INVESTIGATION OF WHEAT DEVELOPMENT AFTER BIOCHAR SOIL APPLICATION

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Abstract

Pyrolysis of biomass produces three different energy products in different quantities: solid, liquid and gaseous. The pyrolysis is a thermal decomposition in the absence of an oxidizing agent. The solid product of the pyrolysis process is charcoal that has application in metallurgical industry, household electronics and as a soil improver. To establish the influence of BC on the soil properties were conducted field experiments with wheat on leached meadow-cinnamon soil. In the field experiments two variants were realized: first is control variant, second with added 6 kg BC over an area of 300m^2 (20kg/dka) and 20 kg / 100m2 (2000 kg/ha). The biometrical measurements, such as a weight and height of the plants during different stages of the vegetation are shown improved (between 8 and 10% heavier and higher). In all variants with applied BC plants are visibly darker green color.

Keywords: yield, water regime, photosynthetic activity.

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EFFECTS OF DIFFERENT PLANTING SYSTEMS ON SOME PRODUCTIVE AND QUALITY TRAITS OF RICE

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Abstract
The traditional planting system of rice in the Republic of Macedonia is wet direct seeding (hand broadcasting of seeds into pre-standing water in the fields). In this paper, the effects of different planting methods of rice (wet seeding as well as dry seeding by using seed drills) on productivity and quality of rice are presented. Field trials were set up at the Experimental Station of the Institute of Agriculture – Skopje, locality Mishjak, Kocani region, with two varieties (San Andrea and Onice) included. The following planting systems were explored: 1. wet direct seeding, with seeding rate of 250 kg seeds per ha (control); 2.dry seeding, 150 kg seeds per ha; 3. dry seeding, 200 kg seeds per ha. During the harvesting, the number of tillers per m2, biological yield, paddy rice yield, head rice yield and white rice yield were analyzed. The highest number of tillers per m2 (San Andrea 383.00 and Onice 731.33) and the highest average paddy yield (San Andrea 11,780.00 kg ha-1 and Onice 10,113.33 kg ha-1) were achieved in the control. The highest biological yield in Onice (21,493.33 kg ha-1) was found in the control, while in San Andrea (20,650.00 kg ha-1) in the treatment dry seeding, 150 kg seeds per ha. For the head rice yield, the highest percentage was determined in the control (San Andrea, 54.57%) and in the treatment dry seeding, 150 kg seeds per ha (Onice, 66.72 %). Both varieties (San Andrea with 6,428.35 kg ha-1 and Onice with 6,143.83 kg ha-1) reached the highest white rice yield in the control. In general, in the treatment dry seeding with 200 kg seeds per ha, the higher values of number of tillers per m2, paddy yield and white rice yield were assessed, compared to the treatment dry seeding with 150 kg seeds per ha, in both varieties.
Keywords: variety, seeding rate, tillers, yield, paddy rice, head rice yield.

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INFLUENCE OF HARVESTING METHODS ON YIELD AND QUALITY OF RICE IN THE REPUBLIC OF MACEDONIA

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Abstract
In this study, the influence of two different paddy harvesting methods (manual harvesting and combine harvesting) on paddy yield, head rice yield and white rice yield was investigated. Field trials were set up in three different locations in the rice producing regions Kocani, Cesinovo-Oblesevo and Stip under the standard production technology, adopted in the entire Macedonian rice production. Two Italian introduced varieties (San Andrea and Onice) were included in the trials. Samples were taken from the treatments with different methods of harvesting (manual and combine harvesting) from which the paddy rice yield data were collected directly. In order to determine the head rice yield, laboratory milling of paddy grains was performed on a paddy quality testing machine (three average samples of 100 g per treatment, duration of milling 1,40 min.). On the base of the data for paddy rice yield and head rice yield, the white rice yield was estimated. According to the results obtained, the highest paddy rice yield (11,925.67 kg ha-1) as well as the highest white rice yield (6,710.57 kg ha-1) were achieved in the treatment with manual harvesting in Kocani region (San Andrea variety). The highest head rice yield (65.80 %) was determined in the treatment with manual harvesting in Stip region (Onice variety) , while the lowest head rice yield (43.90 %) was in the treatment with combine harvesting of the variety Onice in Kocani region. In general, the method of manual harvesting resulted in higher values of paddy yield, head rice yield and white rice yield compared to the method of mechanized, combine harvesting in all the examined treatments (two varieties, three locations).
Keywords: varieties, paddy rice, white rice, head rice yield.

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RAPESEED (*BRASSICA NAPUS* L.) – BIOLOGICAL REQUIREMENTS, GROWING CONDITIONS AND NEED FOR IRRIGATION

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Abstract
Rapeseed is one of the most important energy and food crops. The European agricultural producers are highly interested in it due to the obligations under the EU Directive for replacing the fossil fuels with biofuels as much as 20% by 2020, which has drawn the purchase prices considerably up. Rapeseed is widely used for production of cooking oil and rich in protein feed too. As regards to the environment, it contributes for restoration of degraded and contaminated lands owing to its capability for improving soil structure and leaving the area free of weeds. Rapeseed is one of the best pre-crops of winter wheat and contributes for some 20-30% increase of its yield.The paper contains an overview of different aspects of rapeseed growing: its biological requirements and the abiotic stressing factors in the Balkan geographic region; its sensibility to water and the impact of the water deficit on the yield and yield structural components; its yearly and monthly evapotranspiration and crop coefficients at different empirical evapotranspiration calculation methods; world data on its yields and the agricultural practices such as proper irrigation scheduling for its yield increase. The conclusions show that the soil and the climatic conditions on the Balkans are suitable for rapeseed growing and irrigation can contribute for obtaining sustainable yields from this crop.
Keywords: rapeseed, abiotic stressing factors, irrigation scheduling, yield & yield components.

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IMPACT OF THE FERTILIZATION ON THE MAJOR TECHNOLOGICAL PROPERTIES IN SOME ORIENTAL VARIETIES OF PRILEP TOBACCO

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Abstract

The researches were done in the Scientific Tobacco Institute - Prilep. The experiment was made in three repetitions with four fertilization method in randomized blocks. Four oriental tobacco types were tested: Prilep P-23, Prilep P-66-9/7, Prilep NS-72 and Prilep P-79-94. The subject of tests was the influence of fertilization on important technological properties: representation of midrib in the leaves, the thickness of the tobacco leaves, materiality and length and width of the tobacco leaves. The results obtained from the accredited Laboratory for control of the authenticity and the quality of tobacco raw - L04, in Scientific Tobacco Institute - Prilep showed that fertilization to a certain dose has positive influence on the technological properties of the tested varieties of tobacco.

Keywords: fertilization, technological properties, type Prilep, tobacco varieties.

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ASSESSMENT OF EFFECTS OF DIFFERENT IRRIGATION WATER REGIME ON WHEAT YIELD AND WATER USE EFFICIENCY

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Abstract

This study was carried on to determine the effect of different irrigation regime on winter wheat crop and water-use efficiency (WUE). For this purposes the experiment was conducted with 4 different irrigation treatment which was I1; Rainfed, I2; Full irrigation (irrigate when calculated soil water depletion is 60 mm) I3; Limited irrigation (2 irrigation maximum) one at tillering and another at grain filling, I4; No irrigation after establishment until heading, after which irrigation when soil water depletion is 60 mm below field capacity at Saraykoy Research Station in Murted Basin. The experimental design was completely randomized block design with four replications. Soil moisture was measured with neutron probe. At the end of the research study conducted during the wheat growth period for the years 2009-2010 and 2010-2011, in average wheat yield was found to be 3.35 t ha-1, 4.54 t ha-1, 4.22 t ha-1and 4.31 t ha-1respectively according to the plots (I1, I2, I3, I4). The highest yield was obtained from the full-irrigation plot while the lowest yield was obtained from the no-irrigation plot. No statistically significant difference was found between the plots subjected to the irrigation treatments while a difference of $P < 0.05$ was obtained between the no-irrigation and full-irrigation plots. Average harvest index values were found to be respectively 29, 31%, 32% 31% and 32% again according to the plots. A significant negative correlation was found between grain yield, total harvested biomass and the WUE. The results presented in this work suggest that the amount of soil water content affects grain yield and water use efficiency. It might be recommended that irrigation concentrated in the after heading period increase WUE in Central Anatolia Region of Turkey. Crop water stress index is a useful tool for detecting crop water stress.

Keywords: wheat, water use efficiency, irrigation.

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STATUS AND MEASURE FOR IMPROVE PASTURE CONDITIONS IN THE EASTERN PLANNING REGION OF MACEDONIA

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Abstract
The Eastern Planning Region occupies an area of 3548,7 km2 or 14.2% of the territory of the Republic of Macedonia. The region has 188.387 ha agricultural land. By that, the lawns covers 119.504 ha, of which 110.640 ha under pastures and 8.864 ha under meadows, representing a significant source in the production of animal feed, especially in the mountainous areas of the region. On the other hand, on livestock unit comes 2,23 ha pasture area which shows that in this region livestock is poorly developed. As a consequence of this situation which from year to year deteriorates, pastures as a natural resource for providing feed degrade, reducing the quality of grass production and their economic value. In the absence of human factor as a corrector of the specific environmental conditions, hay production is relatively small, ranging from 300-600 kg/ha. Considering the current situation, it is necessary to take certain agro-technical measures, such as introduction of methods of systematic grazing, overseeding, fertilization, weeds protection, etc., but also introduced a system of organizational measures, as well a certain investments for larger agro and hydro technical operations how this status will be improved and agriculture but particularly livestock production become an important branch in economic development of this part of the country.
Keywords: pastures, yield, protection, overseeding, fertilization.

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THE IMPACT OF USING COMBINATIONS OF N, S AND B IN OILSEED RAPE - *BRASSICA NAPUS* L. ON QUANTITATIVE PROPERTIES OF SEED

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Abstract

As a result of the use of the following elements - nitrogen (N), sulphur (S) and boron (B) - quantitative properties of two genotypes of oilseed rape - *Brassica napus* L., Zorica (variety) and Rohan (hybrid) were determined. The main purpose of the study was determination of the production mode, set in both genotypes of oilseed rape versus managing various nutrients. Experiment was set in the Skopje region, on total experimental area of 650m^2. For this purpose, the following combinations of fertilizers were used: N_1 with 110 kg/ha nitrogen, N_2 with 150 kg/ha nitrogen, S_1 with 30 kg/ha sulphur, S_2 with 70 kg/ha sulphur, B_1 with 1.0 kg/ha boron, and B_2 with 2.0 kg/ha boron (at spring time, foliar application) versus standard variant: N:P:K in the ratio 10:20:30 (N 50kg/ha, 90 kg/ha P_2O_5 and 180 kg/ha K_2O) used in autumn. During the experiment the following parameters were monitored: height of plants (cm), number of branches per plant, number of pods per plant, length of pod (cm), number of seeds in the pod, and seed yield (t/ha). From the combinations of nutrients and variations that have been set in terms of genotypes, the results of yield showed statistical significance at level of 0.05 from variants N_2PK, $N_2PK+S_2+B_2$ in variety Zorica and $N_1PK+S_1+B_1$ in the hybrid Rohan.

Keywords: N, S, B, quantitative properties, oilseed rape.

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THE EFFECT OF COVER CROPS ON THE CONTENT OF PROTEIN IN GRAIN OF SWEET MAIZE

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Abstract

The study was conducted in the experimental field of the Maize Research Institute Zemun Polje, Serbia, during 2013/14-2014/15. The experiment was established as a block design with four replications. As winter cover crops-CC (factor A) the following plants were grown: CV–common vetch (*Vicia sativa* L.), FP-field pea (*Pisum sativum* L.), WO-winter oats, (*Avena sativa* L.), FK-fodder kale (*Brassica oleracea* (L.) convar. *acephala*), two mixture variants of legume crops with oats (CV+WO and FP+WO) and two control treatments: a variant in which the surface was covered with dead organic mulch (DOM) and traditional variant: after ploughing in the fall plot stayed uncovered during the winter (TV). Green biomass of the cover crops was incorporated in the soil, immediately after, half of the elementary plot was infested with bio-fertilizer (BF) - Uniker (mobilizer of nutrients) in an amount of 10 l ha-1 (factor B), which contains the strains of cellulolytic and proteolytic bacteria to support the mineralization of entered crop residues. The seeds of sweet maize 'ZPSC 421su (FAO 400) were sown at the arrangement of 70 cm between rows and 22 cm between plants in the row (65,000 plants per ha). Preceding crop in both years was winter wheat. The kernel protein content was measured on infrared analyser. The data were processed by ANOVA.The investigated factors (CC and BF) showed significant effect on protein content in sweet maize kernel in both years. As it was expected, the greatest impact on protein content was exhibited in leguminous species grown alone, or in mixtures with oats, particularly in the dry, 2015. Small grains intercropped with legumes obtained higher values of protein content than small grain grown as monocrops.

Keywords: sweet maize, cover crops, content of protein, microbiological fertilizer.

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ENERGY CROPS AS ALTERNATIVE AGRICULTURE CROPS FOR BIOMASS PRODUCTION IN MACEDONIA AND BULGARIA

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Abstract

Energy crops can be classified into those providing solid fuels for direct combustion, thermal processing and electricity generation, and liquid fuels, notably bioethanol and bioediesel. Solid fuel crops include energy coppice, Miscanthus and whole-crop cereals. Bioethanol is derived from the fermentation of sugar, starch or, potentially, cellulosic crops. Biodiesel refers commonly to transesterified vegetable oil, derived from oilseed rape or sunflower. Currently energy crops in Europe comprise mainly traditional food crops as rape seed and sugar or starch crops. In future supply scenarios lignocellulosic energy crops are expected to play a larger role. According recent investigations the potential from traditional food crops will increase with 7.3 EJyr−1 from 2010 to 2030, whereas the potential from lignocellulosic crops will increase with 15.3 EJyr−1.In this review the focus is on few agricultural energy crops, which means crops that are grown exclusively or primarily for the purpose of producing biomass for energy purposes in an agricultural rather than a forestry context. These crops are for the most part unsuitable for consumption by human or animals. Conventional food crops are excluded on the basis of their indirect land use change impact and competition for existing agricultural land. A large number of crop species are currently used worldwide for energy carrier production. However, cultivation of most of these crops is restricted to certain regions, e.g. by requirements for a certain climate zone. Having in mind the similar agro ecological conditions in Macedonia and Bulgaria, but also needs of the crops for successful growth and development, species as Miscanthus, Sweet sorghum and Switch grass are introduced as a potentially used energetic plant species for this part of the Balkan region.

Keywords: energy crops, micanthus, sweet sorghum, sweet grass.

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COMPARISON OF SUNN PEST DAMAGE AND GENOTYPIC DIFFERENCES BY SDS-PAGE ANALYSIS IN BREAD WHEAT VARIETIES

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Abstract

Research in 2010 and 2011 under the ecological conditions of the region of Thrace, Hayrabolu, Malkara, Central, Şarköy and the Palace was carried out in five different locations. In addition, 23 different varieties of bread wheat, Tekirdag Agricultural Faculty of the field trial, over one of the fields in the form of the sun's rays pass closed greenhouse with a white cloth, and the other in the same area using the same varieties were grown in open-top Jogging normal field.The sunn pest damage rates in wheat varieties grown in the open area was found range of 6.0. to 0.10 %. The sunn pest damage rates in bread wheat varieties grown in closing area was changed between ranged from 10.37 to 23.17 with a significant increase. Sunn pest damage in two years, respectively, compared to the average of the highest 15, 10, 1, 11 and 16 cultivars were obtained, while the lowest values are 4, 13, 8 and 3 have been varieties.For bread wheat varieties to reveal differences in genotypic varieties according to the results of SDS-PAGE analysis of protein bands ranged from 17 to 21 units, the band in terms of density and molecular weight bands were significant differences among the varieties. Omega protein bands mainly in the varieties distracted, gamma and beta regions, the number of bands was lower, while in Alpha band was observed.

Keywords: sunn pest, SDS PAGE, open and closed area, bread wheat, damage rate.

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DETERMINATION OF THE HIGH TEMPERATURE STRESS TOLERANCES OF BREAD WHEAT GENOTYPES

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Abstract

Thirty bread wheat genotypes (including 15 advanced lines selected from CIMMYT Heat Tolerance Nursery and 15 early, mid-early or late ripening cultivars) were used as material during the 2014-2015 cropping season.The experimental layout was a randomized complete block design with 3 replications. The sowing rate was 500 seeds square meter. Sowing was done in plots of 6 rows (1.2 m x 5 m, spaced 20 cm apart) in Namık Kemal University, Faculty of Agriculture, Field Crops Department experimental area.Two sowing times were performed. First sowing was made in November suggested usual (normal) and second one was made in January as delayed sown in order to push growing stages of plants into periods in which heat stress is expected will be effected. Sowing times were allotted to main-plots while genotypes were allotted to sub-plots. All agricultural and cultural practices were same for all the experimental units.When the bread wheat varieties and lines used in the experiment are evaluated in terms of tolerance to high temperature, it was shown that Dropia and Nota varieties and CIMMYT-HTN 2014/15-2, CIMMYT-HTN 2014/15-6, CIMMYT-HTN 2014/15-10 lines were better tolerance to high temperature. However, it was noticed that these genotypes were not included in the first groups in terms of grain yield. It is possible to utilize these genotypes as a genitor in cross-breeding programs for breeding studies for tolerance to high temperatures.

Keywords: heat tolerance, bread wheat, advanced lines, heat sensitive.

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EFFECT OF DIFFERENT SOWING METHODS ON FORAGE YIELD OF WOOLY POD VETCH (*VICIA DASYCARPA* TEN.) AND BARLEY (*HORDEUM VULGARE* L.) MIXTURES

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Abstract
This research was carried out in Ankara condition to determine the effect of different sowing methods on forage yield in Wooly pod Vetch (*Vicia dasycarpa* Ten.) and Barley (*Hordeum vulgare* L.) mixtures. The study was designed split plot experimental design with 3 replicates. 25 % barley + 75 % wooly pod vetch, 50 % barley + 50 % wooly pod vetch and 75 % barley + 25 % wooly pod vetch mixture ratio were applied in sole sowing with four sowing methods including same row, different row, upright row and spreading sowing. In the study, natural plant height, main stalk length, botanical composition, green hay yield, dry hay yield, dry matter yield, raw protein ratio and yield were determined. At the end of the study, the highest green hay yield was obtained from simple barley (3113.00 kg/da). Among the mixture ratios, the highest green and dry hay yield were observed in 50 % barley + 50 % wooly pod vetch and 75 % barley + 25 % wooly pod vetch as 2851.30 and 712.33 kg/da, respectively.
Keywords: wooly pod vetch, barley, mixture ratio, sowing methods, green hay yield.

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THE EFFECT OF SOWING DATE AND VARIETY ON YIELD AND OIL CONTENT OF WINTER OILSEED RAPE

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Abstract

Autumn-sown varieties of oilseed rape produce both higher yields and oil content, but hardiness and overwintering present a big constraint in continental cold climates. Winter survival depends directly on plant development stage at the end of the autumn vegetation period and induced during the cold acclimatization period. Sowing date is main factor which had a strong impact on plant development in autumn, resulting in increased leaf number, root neck diameter, plant and root mass, and main root length.Objective of this paper was to research influence of sowing date on yield and oil content of four oilseed rape varieties in condition of Vojvodina. Four years data from field trials which conducted at Institute of field and vegetable crop Novi Sad were used. In a split-plot design three planting dates with (20.VIII, 01.IX and 10.IX) were the main plot and four varieties (Jet Neuf, Banacanka, Samuraj and Falcon) as the sub-plot.According to F-test significant effect ($p<0.01$) on yield had year and variety and on oil content beside year and variety also interactions year*variety and year*sowing date. Significant effect ($p<0.05$) on yield had only interaction sowing date*variety, while all other interaction had no significant effect on both traits. Partitioning in total sum of squares for year and variety were 74.6% and 5.0% for yield and 67.3% and 17.8% for oil content, respectively. Significantly the lowest yield was in 2002/03 1158 kgha-1 because of low winter survival and the highest (2796 kgha-1) in 2005/06. Variety Samuraj had the lowest yield of 1900 kgha-1 mainly because of low winter survival in 2002/3 and 2003/4. Maximum yield all varieties reach when sowing at 1.IX, except Jet Neuf (10.IX). The oil content range was 43.3% and 49.8% for year and 44.5 and 48.0% for varieties.

Keywords: oilseed rape, planting date, cultivars, yield and quality.

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EFFECT OF HUMIC ACID SEED TREATMENT TO SOME YIELD AND YIELD CHARACTERISTIC OF CORN PLANT (*ZEA MAYS* L. *INDENTATA*)

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Abstract
This study was aimed to determination of seed treated humic acid effects to yield and some yield characteristics of corn plant (*Zea mays L. indendata*) as grown second crop conditions. Study was set up according to randomized complete blocks experimental design with 3 replicates under Harran Plain conditions in 2012, Sanliurfa, Turkey. Motril hybrid corn variety was used as a plant material. Humic acid seed treatments were 0 (control), %2.5, %5, %7.5, %10, and %12 humic acid concentrations. Humic acid concentrations were applied to corn seed before sowing. Some yield and yield characteristic of corn plant such as tassel flowering duration, plant height, leaf number per plant, grain weight of ear, thousand kernel weights and grain yield were evaluated in the study. As a result of research; statistical significant differences were seen among humic acid seed treatments at tassel flowering duration and leaf number per plant ($P \leq 0.05$). Also, humic acid seed treatments were significant at grain weight of ear, thousand kernel weights and grain yield ($P \leq 0.01$). Tassel flowering duration decreased with humic acid seed treatment whereas leaf number per plant, grain weight of ear, thousand kernel weights and grain yield values increased with humic acid seed treatment. The highest values were found in % 7.5 humic acid seed treatment.
Keywords: corn, humic acid, seed treatment, Harran Plain.

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DETERMINATION OF YIELD AND YIELD CHARACTERISTICS OF SOME EARLIER RED LENTIL LINES (*LENS CULINARIS* MEDIC) IN F7 AND F8 LEVEL

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Abstract

Lentil is one of the most important crops in arid regions all over the world. Because lentil seeds contain high protein, vitamin and essential elements for human healthy. Lentil is produced in a wide area in Southeastern Anatolia Region of Turkey. This study was aimed to developing of high yieldly red lentil varieties to arid conditions of Southeastern Anatolia region of Turkey and similar regions in the world. Study was conducted in 2011-2012 and 2012-2013 growing seasons under Sanlıurfa conditions. Experiment was established to randomize complete block design with 4 replicates. In the study, 6 earlier red lentil lines in F7 and F8 level and 2 standard varieties were used as a material. Statistically differences were found among the tested lines and standard varieties. Flowering period, plant height, first pod height, thousand kernel weight and grain yield were significant at 0.01 levels. According to average of years; the highest grain yield obtained from line 2 (160.14 kg/da), whereas the lowest grain yield was found at Line 5 standard variety (124.04 kg/da). Some better lines than others were selected in considering to flowering period, plant height, first pod height, thousand kernel weight and grain yield values.

Keywords: red lentil, earlier red lentil lines, arid regions, grain yield.

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PREFERENCE PROPER MANAGEMENT ACTIVITIES BASED ON BEST PRACTICES TOBACCO AGRICULTURE

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Abstract

Today, more and more demanding of professionals and researchers in the fields of biotechnology, natural and social sciences through a multidisciplinary approach to contribute to policy and strategy to improve the development of agriculture, especially to highlight the objectives, benefits, limitations and problems related to the development of tobacco production. In the context of such research is derived management concept of good agriculture practices (GAP), which aims to enable economically feasible and viable quality production of agricultural products which includes tobacco. Tobacco production in the country is around 30.000-35.000 tons for which the amount of special importance is the application of the concept of good agriculture practices.This concept in recent years have developed as a result of rapid change and globalization in agricultural production. Recommendations and information offered GAP relating to the environment, economic and social security of production.Use of widely accepted principles of GAP, general indicators and the practical application and help national policy in the development of strategies to ensure that all producers, consumers, traders etc., participate and the benefits of its application. This paper attempts to show part of the principles of management concept of good agriculture practices (GAP) in tobacco production.

Keywords: management concept, organizational behavior, tobacco production, farming strategy, good agriculture practices.

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VARIABILITY OF THE MORE IMPORTANT QUANTITATIVE TRAITS IN SOME BURLEY TOBACCO VARIETIES

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Abstract

The characteristics that determine the type of tobacco or variety in one type, known as qualitative and quantitative. Quantitative (metric) characteristics are regularly conditioned by the impact of a number of genes with additive effect, and are largely dependent on environmental factors. The investigations were carried out in 2015 in the Scientific Tobacco Institute - Prilep, on a field experiment in four repetitions with the following varieties: Poseydon (control), BD-1, B-1246 and a newly created perspective line DP-1710. The aim of this research is to show the variation of the more important quantitative traits: plant height with inflorescence, number of leaves per stalk and length and width of the largest and smallest leaf from the middle belt of the stalk in Burley tobaccos. The results are statistically processed through parameters: mean value ($\bar{x}$), error of the mean value ($S\bar{x}$), standard deviation (S), coefficient of variability (CV) and width of variability (VW). These investigations found that the tobacco varieties are very stable and that variation is very small because the coefficient of variability showed a value less than 10%. However, the newly created line DP-1710 has the smallest variation in properties traits, among other things it is the highest ($\bar{x}$ = 188 cm) and it has the largest leaves ($\bar{x}$ = 63,5 cm) which is a positive characteristic for big leaf tobacco of this type.

Keywords: big leaf tobacco, Poseydon, BD-1, B-1246, DP-1710.

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EFFECT OF DIFFERENT SOWING DATES AT SOME COTTON CULTIVARS ON FIBER COLOR AT DOUBLE CROP GROWING CONDITIONS

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Abstract

Cotton fiber color is determined by the effect of fiber reflectance (Rd) and fiber yellowness (+ b) which are important standards for determining cotton price. This research was conducted to determine the effect of different different sowing dates at some widely grown cotton varieties on fiber color components in 2015 and 2016 under the Harran Plain at double crop conditions. The experiment was conducted on the experimental area of Agricultural Faculty of Harran University at Eyyubiye Campus. Seed of cotton cultivars were sown according the sowing dates with the randomize complete split plot experimental design with the three replications. Sowing dates (First June, 10th June and 20th June) were kept in main plot and varieties (Stoneville 468, BA 119, DP 499 ve PG 2018) in sub plot by using plot size 2.8 m x 10 m and row spacing and intrarow spacing were 70 cm and 15- 20 cm, respectively. Four cotton varieties (Stoneville 468, BA 119, DP 499 ve PG 2018) were used as plant material which is certified in Harran Plain. At the result of the research, the fiber color of Şanlıurfa province, where all varieties are in bright and white class according to HVI color scale but, white color is changing from standard 2 to standard 3 and standard 4 grade. Also, whiteness of color is dulling by the delaying of sowing time. For that purpose, cotton which is harvested early or late time can not be confused and it should be stored in different warehouse.

Keywords: cotton, sowing date, cultivars, color grade.

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EFFECTS OF DEFICIT IRRIGATIONS ON QUALITY OF SILAGE MAIZE

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Abstract
This study was conducted to determine the effects of different deficit irrigations on silage quality of main crop silage maize under semi-arid climate conditions. Field experiments were conducted in 2014-2015 growing seasons.Irrigation treatments were arranged as to supply 100% (I100), 70% (I70), 35% (I35) of consumed water within 0-90 cm efficient root zone in every 7 days. Crop water consumption of the control treatment (I100) was measured as 684.5 mm in the first year and 755.4 mm in the second year. Silage yield of the control treatment was measured as 10690 kg/da in the first year and 10243 kg/da in the second year. The silage yield obtained from 30% water deficit (I70) treatment was placed in the same statistical group (A) with the control (I100) treatment. The water deficits greater than 30% resulted in significant decreases in silage quality of maize. Irrigation water had significant positive correlations with silage yield and silage quality parameters (pH, ADF and NDF) ($p<0.01$).
Keywords: deficit irrigation, silage, quality, ADF, NDF, pH.

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THE EFFECTS OF USING DIFFERENT SYSTEMS OF PRODUCTION OF TOBACCO SEEDLINGS

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Abstract

Tobacco is an economically important crop in Macedonia. To improve tobacco production is necessary good agricultural practice, which also involves the implementation of new technologies for production of tobacco seedlings. The Floating Trays System (FTS) is an advanced plant growing technology, which is particularly important when it comes to the resistance of tobacco plants and adaptation to a new environment (unavoidable physiological stress after transplantation). It represents an environmentally acceptable technology that allows respectively management chemicals and decreasing the risks of pollution on the humans and environmental management, as well as the establishment of sustainable development at the global level. FTS also provides a high yield and high quality of tobacco. Allows maximum use of dissolved nutrients, so plants form a strong root system and have a rapid development after transplantation. Further development of strong stems enables the formation of an adequate number of leaves even in unfavorable climatic conditions for tobacco, and synthesizes and accumulates more dry weights per sheet. The experiment was set in a randomized block system in four repetitions on two oriental tobacco cultivars (prilep NS 72 and yaka YV 125/3), each in three variants: variant 1-control (conventional system of production); variant 2-N and variant 3-P (the soilless system using Floating Trays). Among the systems evaluated, the soilless system is technically the most successful and innovative which represents a technological progress for producing uniform seedlings for their quick formation in the field and to establish more homogeneous plantations. The results obtained in this trial showed significant differences among the tested variants.

Keywords: tobacco seedlings quality, floating system versus conventional.

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BARLEY EXHIBITS PROMISING YIELD UNDER ALTERNATIVE WATER RESOURCES IN KUWAIT

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Abstract

Kuwait, being a desert country, faces severe challenges in its agricultural sector such as drought, heat stress, and soil salinities, in addition to the scarcity of irrigation water. Almost 96% of its required food is imported. Agricultural productivity can be achieved only by using drought and salt-tolerant high yielding crop varieties by implementing suitable agronomic practices. Therefore, there is an urgent need to adopt a sustainable and economically viable crop production system for salt and drought tolerant varieties of crop of interest. Barley (*Hordeum vulgare* L.), a Triticeae crop, is a foundation of human and animal nutrition and is of high economic importance. The limited sources of freshwater for irrigation lead to the use of alternative water resources such as brackish water in crop production systems. The response of 12 barley lines to brackish water irrigation was evaluated to investigate the effect of water quality on the plant growth. Gustoe, Golden promise, Kuwait 5, Kuwait 2, and California Marriot were the most tolerant cultivars, while Kuwait 4, Kuwait 6, ari-e.156, Kuwait 3, Kuwait 1, Maythrope, and Bonus were the most susceptible cultivars to saline stress. Proximate analysis showed that the dry matter content of the air dry straws varied from 91.26% to 93.35%. The crude fat contents were within the acceptable range (1.13% to 1.93%), and high concentrations of ash and crude protein were found in straw in all cultivars. Analysis of barley grain showed that ash content ranged from 2.44±0.35 to 4.29±0.05%. Further studies are required to investigate the stability of promising lines and mutant barley cultivars under Kuwait's conditions.

Keywords: barley, irrigation, dry matter content, ash, crude protein.

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EVALUATION OF COLD TOLERANCE AT GERMINATION STAGE IN RICE

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Abstract

Cold weather stress at the germination stage is important in temperate rice growing countries where temperatures below 15°C inhibit and reduce germination rate and plant establishment in early sowings dates before mid-may. The aim of this study was to evaluate of cold stress on rice genotypes (*Oryza sativa* L.) by laboratory trials. Rice cold tolerance at the germination stage has been studied under controlled temperature degree and duration. Totally 237 genotypes were used as materials at germination stage in rice. Cold tolerance was evaluated by two methods which firstly it is coleoptiles length differences (CLD) based-method and secondly it is cold severity-duration (CSD) based-method at germination under laboratory conditions. Results were showed second method is more usefull for cold tolerance classified at germination stage. The percentage of all genotypes that were found as tolerant, moderately tolerant, susceptible and highly susceptible were 20%, 53%, 22% and 5%, respectively. Cold stress delayed or aborted the germination in some genotypes, especially indica types are more susceptible than japonica types. Genotypes which were determined as cold tolerant in germination stage by means of laboratory tests, can be suggested for using as breeding material.

Keywords: cold tolerance, germination stage, rice, QTL.

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CONTRIBUTION OF ORGANICALLY GROWN SPELT TO THE QUALITY OF GRAIN

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Abstract

Organic agriculture is capable to contribute to the production of healthier food. Organically produced cereals, such as spelt, represent the potential source of quality and healthy components for human food. Spelt wheat is one of the husked hexaploid wheat grown for centuries within a low-input technology. The nutritive value of spelt is high and it contains all the basic components which are necessary for human nutrition. Spelt is high in digestible proteins, vitamins, minerals and antioxidants. Differences may occur due to the growing place and season, cultivation, fertilizers etc. The content of nutritionally important minerals (Fe, Mg, Zn, Ca, Mn) and some antioxidants were analyzed in spelt wheat grown during four different seasons and in semiarid conditions. The spelt wheat was organically grown in the period 2012-2015, at Maize Research Institute Zemun Polje. The crop was sown on the area of 0.33 ha and after harvesting, grain yield was measured from all production area and calculated with 14% of moisture. Then, grains were milled and content of nutrients Mg, Fe, Mn, Ca and Zn, as well as inorganic phosphorus (Pi), phytic phosphorus (Pphy), phenolics, β-carotene and glutathione (GSH), were determined in grains. Obtained data were processed by analysis of variance (ANOVA) and differences with $p<0.05$ were considered as significant.

Among growing seasons, the highest spelt yield was observed in 2012 (4200 kg ha-1). The variations in content of minerals and antioxidants followed variations in sum of precipitation, as well as average air temperature. The content of Mg was significantly higher in 2015, while the Ca content was lower. Concentration of Zn and Mn continuously decreased from 2012 to 2015. The highest content of almost all investigated antioxidants was observed mostly in 2013. GSH and β-carotene content variations were also affected by the meteorological conditions of the growing season.

Keywords: *Triticum aestivum* subsp. *spelt*, organic, minerals, antioxidants.

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THE EVALUATION OF QUALITY PARAMETERS OF ULTRASONICATION AND EAU DE ROSE PROCESSED BLACKBERRY JUICE

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Abstract
Ultrasound processing or sonication is one of the alternative technologies that have shown promise in the food industry and has been identified as a potential technology to meet the FDA requirement of a 5-log reduction in pertinent microorganisms found in many different fruit juices,including orange, guava, apple, peach and apricot reported by different researchers. Eau de rose, another agent was used in this study due to its inhibitory potential as well as a belief of antimicrobial action of wide use as a folk medicine and existence in traditional Turkish foods such as 'ashura(Noah's pudding)' for its nice flavour. Blackberries are important fruits for health benefits based on high folic acid, vitamin K, vitamin C, and manganese; as well as their antioxidant, anti-inflammatory, and anticancer properties. In this study 10 mL of squeezed blackberry juices were ultrasonicated for a period of 1, 5 and 10 minutes at the frequencies of 30, 60, 90 Hertz (Hz). An approximate reduction of 2,94; 2.85 and 1.43 log cycle was obtained for *E.coli*, *Salmonella* spp. and *Listeria monocytogenes* respectively in combination of 90 dB 10 minute treatment following 20 µL eau de rose addition. No negative effect of the treatments on the physical and chemical quality of the blackberry juice was observed due to the results of pH, total sugar, total soluble solid content, viscosity, titratable acidity and color assays. When the sensory analysis was considered, there were no extreme results between the treatment groups of blackberry juice. As a conclusion, ultrasound and eau de rose combination was very effective against those important foodborne pathogens.
Keywords: *Listeria monocytogenes*, *E.coli*, *Salmonella* spp.

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EFFECTS OF PH ON HUE ANGLE AND VISIBLE ABSORPTION MAXIMA OF CYANIDIN

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Abstract

As a major sub-group of flavonoids, anthocyanins are water soluble plant pigments responsible for the blue, purple and red color of many plant tissues. They occur primarily as glycosides of their respective aglycone anthocyanidin. Cyanidin is the most abundant anthocyanidin in fruits and vegetables (50%). In recent years, the interest in the properties and stability of anthocyanin extracts has increased. However, there remain little data in the literature relating to the properties and stability of pure anthocyanins, and especially of the anthocyanidins. The aim of the study was to compare under various pH conditions visible absorbance maxima (λmax-vis) with the corresponding hue angle (hab) values of cyanidin as a color reference. Thus cyanidin aqueous solution was subjected to spectroscopic and colorimetric study to examine influence of pH value on hab and λmax-vis. The cyanidin had reddish nuances at the lowest pH values. By stepwise pH increase the colour of cyanidin is gradually changed toward magenta and lilac tones, and then with further pH increase to more reddish nuances. In alkaline region cyanidin showed yellow green tones, which is gradually changed toward yellow nuances with further pH increases. For the λmax-vis the following tendency was observed: as pH increased, the λmax-vis values of cyanidin showed the bathochromic shift. The cyanidin solution exhibited variations of hab, although their λmax-vis remained stable. By contrast, solutions having shifted spectra share the same basic tonality. Measurement of the hab and the λmax-vis showed that these values were highly pH dependent. Thus we can conclude that the λmax-vis values of these cyanidin solutions at the various pHs correlate poorly with their corresponding hab and caution should be applied when using λmax-vis values for interpretation of colours.

Keywords: cyanidin, hue angle, visible absorbance maximum, spectrophotometry, colorimetry.

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THE EFFECT OF A SILVER POWDER-FERMENTED SUMACH BASED TYPE DISINFECTANT AGAINST CERTAIN IMPORTANT FOODBORNE PATHOGENS

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Abstract

Foodborne pathogens display health problems in a common variety of food and beverages. In this study, a novel disinfectant was aimed to develop from fermented sumach (*Rhus coriaria*) extract, which is a common salad dressing mainly used in Gaziantep and Şanlıurfa provinces of Turkey; fortified with silver powder. The effect of the disinfectant was subjected to trial on nine isolates which had been recruited from the samples of patients from the hospital of Abant Izzet Baysal University, Faculty of Medicine, Bolu, Turkey including *Salmonella* spp., *Listeria monocytogenes*, *Staphylococcus aureus*, *Klebsiella pneumonia* ATCC 12425 and 12528, E.coli ATCC 12601 and 12598, *Staphylococcus epidermidis* ATCC 12544 and *Acinetobacter baumannii* ATCC 12365. For this purpose, the initial population of all bacterial strains was adjusted to 1.5×108 cfu/mL by using 10 mL Mueller-Hinton broth. Subsequently the cultures were transferred onto relevant agars in order to observe the inhibitions by Kirby-Bauer method on filter paper discs at 37º C for 48 hours by adding 5, 10 and 20µL sole fermented sumach and 1, 5 and 10 mg sole silver powder with respect to control in preliminary dose determination experiments. From these assays, it was found that 20µL fermented sumach and 10 mg silver powder was found to be more effective in general. Sumach was found to be the most effective on *Acinetobacter baumannii* ATCC 12365, E.coli ATCC 12598, 12601 and silver powder was on *Staphylococcus epidermidis* ATCC 12544, *Staphylococcus aureus* and *E.coli* ATCC 12598. All assays were repeated in triplicates. In order to monitor the performance of their low dose combinations, 20 µL-10 mg, 50 µL-20 mg and 100 µL-20 mg fermented sumach and silver powder respectively is under trial upon completion to 100 ml sterile distilled water. In order to observe a powerful inhibition these doses are subjected to increase if no inhibition was observed.

Keywords: *Salmonella* spp. *Escherichia coli, Klebsiella pneumonia, Listeria monocytogenes*.

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FORMULATION AND NUTRITIONAL EVALUATION OF TURMERIC SYRUP PRODUCTS PREPARED USING STEVIA POWDER

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Abstract

Turmeric (*Curcuma longa* Linn) is extensively used as a spice and has been extensively in traditional various diseases. *Stevia rebaudiana* leaves has been used by people since some time ago as a substitute of common sugar in many foods and beverages. The objectives of this study were to formulate and to determine their nutritional and total calorie content of turmeric syrup by using mixture of sucrose and stevia powder. Stevia was used as sweetener because of the low calorie content. Three different formulations of syrup were produced by using different proportions of sucrose and stevia. In the present study the locally used turmeric was selected for developing herbal syrup. Phosphor of turmeric syrup was analyzed by spectrophotometer and calcium was analyzed by atomic absorption spectroscopy. The turmeric syrup showed the highest phosphor and calcium were obtained 79.45 mg and 91.50 mg, respectively. Total calorie content of tested turmeric syrup were lower than that of sucrose 17.00-123.87 calorie/serving. Result of this study showed that formulation can easily be used as functional beverage products at home and had good market potential.

Keywords: *Stevia rebaudiana*, *Curcuma longa* Linn, calorie, calcium, phosphor.

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PRODUCTIVE AND NUTRITIVE PROPERTIES OF INTRODUCED QUINOA (*CHENOPODIUM QUINOA* WILL.) GENOTYPES

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Abstract
Application of alternative cereals in nutrition requires introduction of new plant species in agricultural production, such as quinoa, amarantus, etc. Quinoa (*Chenopodium quinoa* Will.) is cultivated for its grain, which has similar nutrition value like cereal grain, but it,s gluten free. In 2009., 2010. and 2011. we performed experiments with introduced genotypes of quinoa. Experiments were conducted on the calcareous chernozem using two varieties (KVL 37 and KVL 52). Sowing was done in April and harvest in August. Analysis of variance in factorial experiment indicated on significant differences for treatments in whole as well as years. Type of interaction - varieties x years, was also significant. During a three year period average grain yield was 1,458 kg/ha. Mean yield value was the highest in the first year (1,594 kg/ha), which represents 234 kg eg. 17% increasement in relation to the second year, and 175 kg or 12% higher value in relation to the third year of the conducted experiment. Average yield of varieties was pretty much uniform, for variety KVL 37 it was 1,422 kg/ha, and 1,494 kg/ha in the KVL 52. Variation of yield level was mostly lower (5,5-11,0%). Average content of carbohydrates was 54,0%. The variety KVL 37 had 8% higher carbohydrate amount in relation to the KVL 52. Mean value of total proteins was 16,4%. In variety KVL 37 grain had 7% higher amount of proteins in relation to the KVL 52 (17,4% vs. 15,3%). Average oil content was 4,6%. Grain of the KVL 52 had 14% higher amount of oil. Both varieties had equal content of cellulose. Also, the amount of mineral salts was the same in these varieties, 3,4%. Results obtained on yields and nutritive properties are in accordance with results gained in countries cultivating this plant.
Keywords: grain yield, chemical composition, gluten, variety.

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THE EFFECT OF ULTRASONICATION ON CERTAIN CHEMICAL, PHYSICAL AND MICROBIOLOGICAL PROPERTIES OF MEDLAR VINEGAR

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Abstract

Medlar (*Crataegus* spp.) is a plant species, generally grown in temperate forest regions of Northern Hemisphere and its vinegar is produced in Bolu, Turkey. Ultrasound is a process of sound waves, the frequency of which is above the threshold for human hearing (>16 kHz) and power ultrasound is recognised as an alternative method to conventional thermal processing in the food industry and reported to reduce pathogenic microorganisms without disrupting the chemical and physical properties. In this study, a frequency of 24kHz ultrasonication was used for 30, 60 and 90 dB for 1 and 10 minutes. Two brands of medlar vinegar(Mihrinaz and Ertaciroğlu) produced in Bolu environs were investigated for their certain chemical, physical and microbiological properties. The pH, total sugar, total soluble solids, color, titratable acidity, DPPH radical scavenging activity and viscosity of the vinegars were determined. Depending on color, A values were increased and L values and B values and titratable acidity was decreased in ultrasonicated groups with respect to control. No change was observed for total soluble solid values. No change of viscosity values were observed in Mihrinaz brand, but an increase in Ertaciroğlu were observed. The pH values were decreased in Mihrinaz brand, where Ertaciroğlu brand showed vice versa properties. The microbiological analysis pointed out that the total mesophilic aerobic counts were decreased up to the ultrasonication treatment with respect to control.

Keywords: *Crataegus* spp, inhibition, color, viscosity.

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THE INFLUENCE OF DIFFERENT COFFEE TYPES ON ENZYMES OF BAKER'S YEAST MONITORED BY BREAD STALING

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Abstract

Baker's yeast (*Saccharomyces cerevisiae*) is an important ingredient which gives rise to bread. In this study the effect of different coffee types on the main enzymes involved in bread staling was investigated. For this purpose *Saccharomyces cerevisiae* was grown in yeast extract broth for 37˚ C and 48 hours including 1, 5 and 10 grams of Kenya, Guatemala, black cumin, carob and coffee from Turkey and a control was used without any coffee. After confluent growth was observed, 10 mL aliquot was subjected to centrifugation at 4000 rpm for 10 minutes and microfiltered by 0,45 µm filters. The activities of amylase, protease, cellulase and invertase was measured. According to the enzyme activities, terebinth berry was said to have the maximal one compared to the others. The effect of the enzymes were monitored on the bread by adding 0.2 and 0.4 mL of the microfiltered solution that was believed to have an enzyme activity into the dough. The initial microbial counts of the bread was enumerated and when the bread was kept at room temperature the microorganisms were found to be uncountable after three days. The most important indicator for the bread staling for the ones kept at refrigeration temperature was hardness measured by texture analyzer and it was found that there was a significant difference between the control and the bread containing 0.4 mL of the microfiltered solution that was believed to have an enzyme activity after ten days.

Keywords: amylase, protease, invertase, cellulase, *Saccharomyces cerevisiae*.

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MACRO- AND MICROELEMENTS IN *SOLANUM MELONGENA* L. PEEL

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Abstract
Solanum melongena L., commonly known as eggplant or aubergine, is an economically important vegetable crop with over 1.7 million ha produced worldwide. As an agronomically important, eggplant is cultivated and consumed worldwide. Eggplant varieties differ in the fruit size, shape, and color, but the cultivars with dark purple skin receive more attention for high nutritional value. Eggplant is a good source of dietary fiber, vitamins (vitamins B1 and B6), minerals (potassium, magnesium) and phytochemicals especially phenolic compounds. Eggplant peel is a good source of anthocyanin, one of the most important flavonoids, which determines eggplant color. Aim of this experiment was to determinate qualitative and quantitative composition of macro- and microelements in *Solanum melongena* L. peel. Samples were prepared by this procedure: 0.5 g of the dried plant material was topped with 5 cm3 of conc. HNO3, and placed to be heated on a hot plate for a period of 1 h until boiling started. Then again, 5 cm3 of conc. HNO3 and 2 cm3 of H2O2 was added and heated for one hour. After cooling, the solution was filtered through a quantitative filter paper in a volumetric flask of 25 cm3, which was complemented by the line with 2M HNO3. For the purpose of qualitative and quantitative determination of macro- and microelements in *Solanum melongena* L. peel, ICP-OES method was used. Qualitative and quantitative composition of macroelements (Ca, Mg, Na, K) and microelements (B, Co, Cr, Cu, Fe, Mn, Ni, Se, Si, Zn, Al, As, Cd, Pb, P, Ba, V) in *Solanum melongena* L. peel was determinated.
Keywords: ICP-OES, qualitative analysis, quantitative analysis.

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THE FREQUENCY OF MEAT CONSUMPTION AND BONE MINERAL DENSITY

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Abstract

The objective was to investigate the impact of the frequency of meat consumption on bone mineral density (BMD) in females. BMD was measured in 210 females by denzitometar. For the manner of nutrition a Questionnaire was used. The females were divided into 4 age groups, and 4 subgroups: those consuming meat on daily bases; 3-5 times/week; 1-2 times/week; and no consumers. Statistical analysis of data by Statistica 7.1 for Windows and SPSS Statistics 17.0, significance by $p < 0.05$. 40-49 years old females, did not have significant differences in BMD no matter of the meat consumption frequency. 50-59 years old females who consumed meat 3-5 times weekly had significantly lower BMD compared to those with 1-2 weekly meat consumption ($p<0.001$) and to no consumers ($p<0.01$), while BMD was not significantly different between 1-2 weekly consumers and no consumers ($p>0.05$). 60-69 years old females on 3-5 times consumption had significantly lower BMD compared to no consumers ($p<0.001$) and 0.33 g/cm2 lower BMD compared to no consumers, which was significant difference ($p<0,001$). However, 1-2 weekly consumers had significantly (0.18 g/cm2) lower BMD compared to no consumers ($p<0.01$). Every day meat consumers > 69 had significantly lower BMD compared to 1-2 weekly consumers ($p<0,001$). Despite this, there was no significant difference in BMD between 1-2 and 3-5 weekly consumers and no consumers ($p>0.05$). The results suggest that frequency of consumption in age of 40-49, does not have negative impact on the BMD of females. 1-2 weekly meat consumption in age of 50-59 does not have negative effects on BMD. However in age of 60-69, even 1-2 weekly meat consumption has certain negative effect. Surprisingly in the age group > 69 everyday meat consumption has negative influence on BMD only, while frequent use or no consumption is a matter of choice.

Keywords: densitometry, questionnaire, age groups, meat consumption subgroups.

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ANTIBACTERIAL ACTIVITIES OF SOME WILD MUSHROOM EXTRACTS AGAINST *PSEUDOMONAS AERUGINOSA*

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Abstract
Mushrooms synthesize a multitude of low-molecular-weight secondary metabolites that have an important role as communication signals, to defend mushroom habitat or to inhibit the growth of competitors. Investigations have shown that some of these metabolites have potent antimicrobial activity and could be beneficial for humans. In this study, antimicrobial potential of the extracts from six wild mushrooms: *Amanita echinocephala*, *Russula medulata*, *Cerena unicolor*, *Hericium erinaceus*, *Ishnoderma benzoinum* and *Laetiporus sulphureus* was evaluated against Gram-negative bacterium *Pseudomonas aeruginosa*. The antimicrobial activities of the methanolic mushroom extracts were investigated by the microdilution method. All the extracts that demonstrated inhibitory activities were further tested for bactericidal activity and minimum bactericidal concentration (MBC) values were determined. Antimicrobial activity was observed in all species included in the study, while the activities depended on the type and concentration of extract. The tested microorganism was more sensitive to the examined extracts from the polypore fungi (*C. unicolor*, *H. erinaceus*, *I. benzoinum* and *L. sulphureus*). The highest antibacterial activity was obtained in the extracts from polypores *I. benzoinum* and *L. sulphureus* (MBC=15.625 mg/mL). This study demonstrated that the analysed wild macrofungi have the potential to accumulate bioactive metabolites that possess antimicrobial activity.
Keywords: microdilution method, minimum bactericidal concentration (MBC).

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THE PROCESSING OF APPLE JUICE BY ULTRASONICATION AND EAU DE ROSE

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Abstract
Ultrasonication is in its most basic definition, refers to pressure waves with a frequency of 20 kHz or more and it is a non-thermal technique. During the sonication process, longitudinal waves are created when a sonic wave meets a liquid medium, thereby creating regions of alternating compression and expansion. These regions of pressure change cause cavitation to occur, and gas bubbles are formed in the medium. Expansion of these bubbles result in rapid condensation shockwaves, forming regions of very high temperature and pressure, reaching up to 5500 °C and 50,000 kPa. The pressure changes resulting from these implosions are the main bactericidal effect in ultrasound. *Escherichia coli* O157:H7, Listeria monocytogenes and Salmonella spp., mostly known as pathogenic strains are responsible to cause foodborne infections due to the consumption of viable pathogen containing fruit juices and other food materials. Since foodborne infections cause severe infections; in this study, sole ultrasonication, sole eau de rose and a combination of ultrasonication and eau de rose were used to inactivate these pathogenic species in apple juices. It was found that in apple juices, the combination of ultrasound at a frequency of 24 kHz for ten minutes at the amplitude of 90% and 20µL eau de rose resulted an effective inhibition to these important foodborne pathogens mentioned, together with the total mesophilic aerobic bacteria and reducing the amount of yeast-mold content with respect to the control, without disrupting chemical and physical properties.
Keywords: *Escherichia coli* O157:H7, *Listeria monocytogenes*, *Salmonella* spp.

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DETERMINATION OF SOME PESTICIDE RESIDUES IN APPLE JUICE BY HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY

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Abstract
A new, simple and reliable reversed-phase high-performance liquid chromatography (RP-HPLC) method for determination of 2,4-D ((2,4-dichlorophenoxy)acetic acid), atrazine, malathion, fenitrothion and parathion residues in apple juices has been developed and validated. Successful separation and quantitative determination of analytes were performed on Purospher STAR RP-8e (30 x 4 mm, 5 µm) analytical column, with mobile phase consisted of acetonitrile/water (45/55, *V/V*), flow rate of 1 mL/min, constant column temperature at 25^0C and UV detection at 220 nm and 270 nm. A solid-phase extraction (SPE) was used for concentration and clean-up of analytes. Specificity, selectivity, linearity, precision, accuracy, limit of detection (LOD) and limit of quantification (LOQ) were tested for the method validation according to European Commission guidelines for pesticide residue analytical methods, and all performance characteristics were found within acceptance criteria. Calibration curves were linear within the range less than 50 % of the maximum residue limit (MRL) values and 20 % above for all investigated pesticides (R^2> 0.95). Under the stipulated conditions, values for relative standard deviations (RSD) of retention times and peak areas were 0.12 % - 0.28 % and 0.08 % - 8.50 %, respectively. The obtained values for recoveries ranged from 93.65 % - 118.62 %, with RSD ≤ 5.64 %. This method was successfully applied for determination of investigated pesticide residues in apple juice samples, which were taken from Macedonian markets. The run time of assay obtained from this chromatography condition was about 4 min.
Keywords: RP-HPLC, SPE, method development, validation.

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RAPID RESOLUTION LIQUID CHROMATOGRAPHY METHOD FOR DETERMINATION OF CHLOROGENIC ACID IN ECHINACEA EXTRACTS

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Abstract

This study presents a development and validation of a new, fast, efficient and cost effective reversed-phase rapid resolution liquid chromatography (RP-RRLC) method for determination of chlorogenic acid in echinacea extracts. The optimum separation with symmetrical peak shape and good index purity of the analyte was achieved on a Poroshell 120 EC-18 (50 mm x 3 mm; 2.7 µm) analytical column, mobile phase consisted of acetonitrile/(water with 1 % phosphoric acid), (10/90, *V/V*) in isocratic elution with flow rate of 1 mL/min and UV diode-array detection (UV-DAD) at 325 nm. The developed method was validated by testing specificity, selectivity, linearity, precision, accuracy, li¬mit of detection (LOD) and limit of quantification (LOQ). The calibration curve of chlorogenic acid followed Beer's law within the range 28.97 ng - 362.19 ng (R^2 = 0.9994). The LOD was 0.29 pg, while LOQ was 0.96 pg. The intra-day precisions was evaluated for the retention time, peak area and peak height and the calculated values for relative standard deviations (RSD) were 0.21 %, 0.11 % and 0.22 %, respectively. The mean recoveries ranged from 98.75 to 104.63 % and RSD was less than 0.23 %. The developed method was successfully applied for identification and quantification of chlorogenic acid in three samples of echinacea extracts, taken from local pharmacies.

Keywords: RP-RRLC, UV-DAD, method development, validation.

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DIFFERENCES IN THE QUALITY PARAMETERS OF HONEY WITH DIFFERENT BOTANICAL ORIGIN

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Abstract
The aim of the research was to determine differences in the quality parameters of various types of honey according their botanical origin. Materials for the work were 177 samples of honey taken directly from beekeepers. According to the botanical origin, honey samples were classified in honeydew honey and nectar honey. For determination of parameters that describe honey quality AOAC Official Methods 2005 were used, as well as methods prescribed by the International Honey Commission, 2009. Statistical analysis of the obtained data encompass descriptive statistics, analysis of variance using one way ANOVA, as well as post hoc analysis. The results of the analysis of electrical conductivity, content of water, reduction sugars, minerals, HMF, acidity and water non soluble substances of all samples are in line with the parameters described in the EU Honey Directive and national legislation for quality of honey. Statistically important difference has been identified between honeydew and nectar honey particularly in the electrical conductivity of (p=0,0000), sucrose content (p= 0,0000), content of water (p=0,0001), minerals (p=0,0000) and HMF (p=0,0001).
Keywords: honey, quality.

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EFFECT OF NITROGEN AND FOLIAR EXOGENOUS APPLICATION ON GRAIN YIELD AND FLAG LEAF PIGMENTS IN SPRING BREAD WHEATS

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Abstract

The aim of the present study was to evaluated the effects of some exogenous (cytokinin, glycine betaine, methanol, proline and silicon) on chlorophyll (Chl) and total carotenoid contents with 4 bread wheat (*Triticum aestivum* L.) cultivar under two nitrogen levels (Low nitrogen level, LN: 60 kg N ha-1 and high nitrogen level, HN: 180 kg N ha-1) under well-watered condition. Experiement was carried out during 2015-2016 growing season at the experimental field area of the Faculty of Agriculture, University of Cukurova, Adana, Turkey. The results showed that relationship between grain yield and Chla/b was only negatively and significantly correlated ($r=-0.751^{**}$) under LN environment, while, under HN conditions, Chla, Chlb, carotenoid and Chla/b were strongly correlated with grain yield, $r=0.422^{*}$, $r=0.635^{**}$, $r=0.444^{*}$ and $r=-0.590^{**}$ respectively. Among the exogenous, proline was sitimulated to relationships between grain yield and Chlb, carotenoids and Chla/b, r=0.795-, $r=0.795^{*}$ and $r=-0.811^{*}$ respectively. Similary, methanol effects were strongly correlated with grain yield and Chlb and Chla/b, $r=0.844^{**}$ and $r=-0.772^{*}$ respectively. As a result, Chlb was the most effective pigment to increases the grain yield to application of methanol or proline.

Keywords: wheat, exogenous, chlorophyll, carotenoid.

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DIFFERENT APPROACHES IN CHYMOSIN PURITY ANALYSIS

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Abstract

Chymosin is a specific proteolytic enzyme found in rennet, and is the key enzyme in cheese production classified in the aspartic endopeptidases group (EC 3.4.23.4). The aim of this study was to determine the purity of different commercially available chymosins and its equivalents using electrophoretic and chromatographic techniques. Chymosins from the company Chr. Hansen, CHY-MAX 200 and CHY-MAX Plus, CHY-MAX PowderExtra NB as well as Maxiren 1800 Granulate from the company DSM, Sirnik from SZR – Travnik, Kraljevo and Planika from Mikroprocessing, Bileka were used as materials for this study. The purity level of the commercially available enzymes was analyzed using electrophoretic (sodium dodecyl sulfate polyacrylamide gel electrophoresis or SDS-PAGE) and chromatographic (Rapid Resolution Liquid Chromatography or RRLC) techniques. Results showed no presence of undeclared protein fractions due to inappropriate purification process in the samples except for CHY-MAX M 200 which had two protein fractions, most likely as a result of a polymorphism. All the CHY-MAX and Maxiren samples have chymosin as the active component (36 kDa), except for Planika and Sirnik which have a natural protease from R. miehei. Chromatographic analysis showed that beside the active component (chymosin), the preservative sodium benzoate was present in varying concentrations in all but one of the commercial enzymes.

Keywords: chymosin, purity, chromatography, electrophoresis.

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HARNESSING OF LACTIC ACID BACTERIA FOR THE REDUCTION OF IMMUNOGENICITIES

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Abstract

In some cases, acute allergic reactions to consumed foods are leading to severe anaphylaxis. In order to alleviate such reactions it was anticipated that the pre-prandial proteolysis and resulting differences in allergen presentation could decrease food immunogenicity and in fine reduce adverse allergenic reactions. Hence, the well-managed transformation of fermented cheeses, milks, matsuns, kefirs, and yogurts using appropriate Lactic Acid Bacteria (LAB) strains could create multiple hypoallergenic products at least for some classes of allergic patients. This expectation stimulated our interest to address these issues driven by consumer health needs, Food Safety concerns and by general social and market demands. Consequently, several proteolytic LAB strains were isolated, identified and characterized. It was observed that proteases of *L. paracasei* I-N-10 hydrolyze predominately β-casein and in some degree αS2-casein. Surprisingly they do not hydrolyze αS1-casein. The isolated strain was able to cleave β-casein in different sites including 2 of the major linear epitopes responsible for its allergenicity. Being sensitive to main antibiotics classes, *L. paracasei* I-N-10 could be considered as safe and could be used as starter culture with a potential role in decreasing β-casein immuno-reactivity. Proteases of *L. helveticus* A75 hydrolyzed both αS1- and β-caseins. The IgE binding ability of hydrolyzed proteins was lower than that of intact proteins, which indicates that hydrolysis of αS1- and β-caseins by proteases of *L. helveticus* A75 decreases their recognition by specific IgE. Half maximal inhibitory concentration values were 2.01 and 2.28 mg/mL for αS1- and β-casein.The most radical decrease of immuno reactivity (over 2800 fold) was observed after the hydrolysis of αS1- caseins by the strain of *Enteroccoccus faecium* AN1 devoided of major virulence factors and of most of antibiotic resistance genes, hence potentially applicable not only in dairy food formulations. As can be seen this rather simple approach can improve acceptability of otherwise allergenic foods.

Keywords: lactic acid bacteria, milk protein allergy.

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CONTAMINATION OF CULTIVATED VEGETABLES BY HEAVY ELEMENTS FROM FLOODED ARABLE SOIL: HUMAN EXPOSURE

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Abstract

The consumption of vegetables is one of the most important pathways for heavy elements to harm human health. Direct deposition of contaminants from the atmosphere onto plant surfaces and accumulation of heavy elements in flooded arable soil could result in elevated heavy element uptake by vegetables. Thus, the present study was carried out to analyse distribution and soil-plant transfer of 9 heavy elements in five edible horticultural crops (potato, carrot, celery, parsnip and onion) in order to evaluate its potential effects on human health. Total content of heavy elements in 26 vegetable samples was analysed by atomic absorption spectrometry with a graphite furnace (AASGF) after microwave digestion of the analysed samples. Average concentrations of Pb and Cd in some vegetable samples were higher than maximum allowable concentrations set by EC and Serbian regulations. On the other hand, As was not detected in any of the analysed samples. Accumulation and translocation of analysed elements were varied from element to element as well as among selected vegetable crops. The results showed that the parsnip had stronger uptake for the most analysed elements (Fe (107 mg/kg) > Mn (6.98 mg/kg)> Cu (1.94 mg/kg)> Zn (0.65 mg/kg)>Ni (0.34 mg/kg)> Pb (0.13 mg/kg) compared with other investigated crops. The bioaccumulation factor (BA) for analysed elements in investigated vegetables was in order of Cd (0.07)=Fe>Cu (0.06)>Pb (0.01)=Ni, indicating that analysed crops are categorized as excluder (BA<1). The total health risk associated with the consumption of vegetables grown in flooded arable soil was assessed using target hazard quotient (THQ) and hazard risk index (HRI). The THQ values estimated for all analysed crops were notably below the safe limit of 1. Similarly, HRI values were assessed far below 1, except for Mn through the consumption of potato, carrot and onion.

Keywords: soil contamination, plant uptake, risk index, transfer factor.

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SIMULTANEUS DETERMINATION OF SOME PESTICIDE RESIDUES IN APPLE SAMPLES USING HPLC-DAD

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Abstract

Apples are one of the most consumed fruit commodities in Macedonia. To ensure good yields, various types of pesticides are used to repel, destroy and prevent upsurge of pests. For that purpose captan, folpet, difenoconazole and chlorpyrifos are among the commonly used pesticides in Macedonian apple production. The maximum residue limit of pesticides must be regulated and monitored prior consumer consumption, therefore multiresidue method was developed for simultaneous determination of captan, folpet, difenoconazole and chlorpyrifos in apple samples. Analysis was carried out on reversed-phase liquid chromatography (RP-HPLC) coupled with UV-Vis diode array detector (DAD). Samples were blended, then analytes were extracted with acetone and purified with liquid-liquid extraction (LLE). Clean up was performed using solid phase extraction (C-18 SPE). The optimal separation conditions were achieved on C-18 reversed-phase column using isocratic elution with acetonitrile and water acidified with 0.1 % acetic acid as mobile phase. The multiple correlation coefficients (R^2) indicated good linearity which is in compliance with European commission regulations. For precision determination, blank sample was spiked at MRL levels for each of the analytes. The repeatability of the retention time, peak area as well as peak height complied with method performance acceptability criteria.

Keywords: apples, multiresidue method, pesticide.

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THE EDIBLE COATING TREATMENTS ON COLOR QUALITY FRESH-CUT LEEK DURING COLD STORAGE

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Abstract

In this study was carried out to determine the effect of plant-based edible coating on color changes of fresh-cut leek during storage. For this aim 0.5, 1.0 and 2.0% solutions of tapioca-starch was prepared and added 0,25% gelatine to each dose. The fresh-cut leek samples were dipped these solutions for 5 minutes, then dried, packaged and stored at 4 C and %85-90 RH for 28 days. The color values (Lab and h), browning rate (%), poliphenol (PPO) activity, total soluble solids (TSS) and weight losses of samples were determined seven days intervals during storage. As results of research, L values of coated samples higher than control group while the h values of control group was high. PPO activity of samples increased in all treatment groups, but did not show evident differences among the treatments. The TSS of samples treated wit 0,5% tapioca-starch edible coating were the lowes, whereas it was the same tihe other doses of edible coatings with the control group. The weight losses of the samples treated with 1.0% were the lowest than the other treatment groups. Browning rate of samples treated with 2.0% edible coating, however, were found to the lowest. Therefore it could be said that, the coating with tapioca-starh of fresh-cut leek were fount to be effective to prevent browning especiall at the higher dose (2.0%).

Keywords: fresh-cut, leek, browning, edible coating.

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THE EFFECT OF TAPIOCA-STARCH EDIBLE COATING ON QUALITY OF FRESH-CUT CAULIFLOWER DURING STORAGE

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Abstract

The purpose of this study is to determine preventing browning of cut surface of fresh-cut cauliflower using edible coating. Three different contrentration of tapioca-starch solution (5, 10 and 20 g/L) was used, and gelatine was added at the stable concentration (2.5 g/L). The fresh-cut cauliflower stalk was dipped these solutions for 5 minutes, then dried, packaged and stored at 4oC and %85-90 RH for 28 days. Poliphenol oxydase (PPO) activity, total soluble solids (TSS), color $L^*a^*b^*$, and ho values, weight loss, and browning rate were determined seven days intervals during storage. According to the results; PPO activity of edible coated samples were found to be higher than control. Also, hue angle values of coated samples were lower than control group. However, weight losses and browning rate of samples treated with 2,0% of tapioca-starch coating were the lowest compared to the other treatments. Also, TSS of fresh-cut cauliflower stalks coated with tapioca-starch at all doses were determined that higher than control group. In conclusion, the edible coating with tapioca-starch was not effect to prevent browning. But this coating increased TSS of samples and decreased weight loss.

Keywords: cauliflower, edible coating, browning, fresh-cut.

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COMBINATION OF ULTRASOUND AND OXALIC ACID TO CONTROL CHILLING INJURY IN CAPIA PEPPER (*CAPSICUM ANNUUM* L. CV YALOVA YAGLIK)

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Abstract

The chilling injury is caused important produce losses in peppers, after harvest. These losses are emerged both quantity and quality. The purpose of this study is to determine the effect of ultrasound (52 dB) and oxalic acid treatments on chilling injury (CI) and color preservation of Capia peppers at 4 oC temperature. The peppers harvested at the green maturation stage divided into four group and the following treatments were done; 1. Control (C, dip to water at 25oC for 15 min), 2. Oxalic acid (OA, dip to the3 μMol oxalic acid solution at 25oC for 15 min), 3. Ultrasound (US, dip to water bath in a 52 dB and at 25oC for 15 min), 4. US+OA (dip to the3 μMol oxalic acid solution in a 52 dB water bath for 15 min). After treatments, the peppers were dried, placed in polystyrene foam dishes as three pepper per dish, and wrapped polyethylene stretch film. Then, the packaged peppers were stored in a cold room at 4±1°C temperatuer and 85-90% RH. The study was carried out in three replicates, and total soluble solids (TSS), color (L^*, a^*, b^*), weight loss, electrolyte leakage, visual quality scores and CI scores were determined during storage (at the beginning, 14th days, 14th+72h, 28th days, 28th+72h). According to the results, CI scores of samples in three treatments (OA, US, US+OA) were lower compared to control group. But, OA treatment was supressed CI symptoms than the other treatments during all storage period. The color preservation of samples in OA, US, US+OA treatments were lower than control. In conclusion, it was concluded that, while the effect of US treatment on prevent CI symptoms is limited, the OA treatment is successful.

Keywords: pepper, ultrasound, oxalic acid, chilling injury.

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THE FUNGAL DISEASES IN KIWIFRUIT STORAGE, AND NON-CHEMICAL METHODS USING TO PREVENT THESE DISEASES

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Abstract

The kiwifruit is originated Southeast Asia whose production and consumption is increased each day. The production quantity was reached 3.447.605 tonnes around the world. It is also important to protect the quality of kiwifruit which has a high vitamin C, in the postharvest period. One of the most important problems of kiwifruit is infections originated by fungus during storage. The most common fungal disease in kiwifruit storage is *Botrytis cinerea*. The first symptom is seen after a few week storage. Because the pathogen can develope and cause to decay in the cold storage conditions, it caused serious economical damage. Although the chemical methods is used to prevent this disease, with the increasing consumer awareness and due to caused the risk both environmental and human health, the tendency towards non-chemical methods of combat has been increased. The aim of this study is to compile the studies on non-chemical struggle methods used in *Botrytis cinerea* struggle. It was found that the most common non-chemical treatments are curing, heat applications, ultraviolet light applications, gamma radiation applications, ozone application and essential oil applications. Because these physical methods are not risk to the human health, it will guide for future research.

Keywords: kiwifruit, storage, infection, anti-fungal, *Botrytis cinerea*.

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FOOD COMPOSITION DATABASE IN MACEDONIA- NEED AND IMPORTANCE

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Abstract

Food Composition Databases (FCDBs) represent fundamental information resources for nutrition science. The information are used for wide spectrum of purposes i.e. for food labelling, product development and innovation, dietary treatment, consumer information and research. Thus, high quality food composition data are fundamental to most issues related to nutrition and health and their importance is increasingly being recognized for agriculture, trade and economics. INFOODS is the International Network of Food Data Systems. It is a worldwide network of food composition experts aiming to improve the quality, availability, reliability and use of food composition data. Twenty-eight European countries has developed the Food Composition Databases (FCDBs). The development of Food composition databases depends on the combination of the expertise of a diversity of specialists with professional background from agronomy, analytical and food chemistry, food technology, dietetics and nutrition to database and quality management and information technology. To support this EuroFIR has developed various training tools for the production and use of food composition data. However, many countries in Balkan region do not have any form of national food composition data or have been using borrowed information. This is a problem because people need essential information on food composition as well as an access to the information in order they can influence their own dietary patterns. Republic of Macedonia needs to move forward and improve the contribution to development of the FCDB and share it with different stakeholders. There is a need to prepare and implement measures like: increasing capacity development in generating and compiling food composition data; strengthen collaboration with other national and international bodies, organizations and projects working on food composition issues; incorporation of food composition into formal education curricula of schools and universities in nutrition, food science, dietetics; and grants to various training and capacity building activities.

Keywords: food data, capacity development.

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FATTY ACID PROFILE AND SENSORY PROPERTIES OF TRADITIONAL SHEEP KASHKAVAL

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Abstract

The purpose of this paper was to present the fatty acid profile of Galichki sheep kashkaval cheese from Bistra mountain and present its sensory characteristics. The tests were carried out in four iterations on the 180th day of the cheese production. The fatty acids were analyzed under the method AOAC 996.07. The organoleptic assessment was conducted under 20 points scale method, by examining four characteristics (flavor, aroma, texture and additional flavor in the mouth and appearance when cut). Based on the results obtained, it was concluded that the biggest percentage of the fatty acids belongs to palmitic acid (C16:0, hexadecanoic acid) with 30,57±4,17 g/100g, then the oleic (C18:1, z-octadec-11-enoic) with 24,89± 1,05 g/100g and myristic acid (C14:0, tetradecanoic acid) with 11,01±0,69 g/100g. Based on the results of the sensory analysis we concluded that the Galichki kaskhaval cheese belongs to the category of very good quality cheese. The flavor was rated as distinct, characteristic for sheep cheese and moderately salty, while the aroma was characterized as pleasant, slightly sourish, with no foreign odors. The cheese texture was evaluated as compact, homogeneous, and the firmness as characteristic for the product. The cheese was top-rated in terms of the appearance when cut. This property depends mostly on the skills of the master in the fast and successful shaping of the curd dough and the proper shaping of the cheese.

Keywords: quality, cheese, traditional production.

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CHANGES OF NUTRITIONAL PROPERTIES OF THREE VARIANTS PEPPERS BY PROCESSING OF PICKLED RED PEPPERS

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Abstract
The pepper (*Capsicum annuum* L.) is an important vegetable crop due the multiple ways it can be used in the processing industry, as well as the presence of nutrients and bioactive matters that are important for health. The pepper fruits for processing is necessary to have a larger useful part, with expressed red color, a higher content of dry matter and to possess inherent sensory characteristics. The quantity and the inter-relationship of chemical components, including water, are responsible for their nutritional value. The aim of this research was to compare the nutritional composition of three varieties of peppers, fresh and processed, as a pasteurized pickled peppers. As a raw material had been used pepper varieties kurtovska kapija, palanechko chudo and horgosh, harvested in their technological maturity. During the technological process was performed bleaching, at T 85-90 ° C, 5 min. In the pasteurized pepper, acetic acid was added to a concentration of 1.5% in terms of finished product, which belongs to the low marinade products. Pasteurization is carried out at T 92 ° C, 30 minutes. The chemical properties were determined by analyzing the following parameters: total dry matter, carbohydrates, proteins, oils, total acids, vitamin C, β-carotene and ash, both in fresh and in pasteurized peppers. Based on the obtained results were determined the quality and nutritional composition. The variety horgosh has been characterized by the highest average content of total dry matter (11,45 %), vitamin C (138,91 mg/100 g), β-carotene (22,72 mg/100 g) and the highest energy value (41,66 kcal). The pasteurized peppers, the variety of palanechko chudo has been characterized with the lowest average value of total dry matter (7,49 %) and total energy value (24,62 kcal); the variety of kurtovska kapija had the lowest content of vitamin C (52,10 mg/100 g) and β-carotene (6,09 mg/100 g).
Keywords: chemical composition, pasteurization, energy value.

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THE QUALITY PROPERTIES COMPARISON OF FRESH AND DRIED APPLE FRUITS - VARIETIES PINOVA AND RED DELICIOUS

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Abstract
In this research were tested the quality and nutritional composition of fresh and dried apple fruits, from the varieties pinova and red delicious. The apples were grown in the region of Bitola in the Republic of Macedonia. The fruits were harvested manually after the visual assessment on terrain and after determination of harvesting time. After analyzing the mechanical and chemical properties of the fresh fruits, we started the preparation of fruits for drying. The treatment of the raw material was done with 0,1 % solution of citric acid and 0,5 % solution of $K_2S_2O_5$, during the time of immersion for five minutes. In order to compare the impact of applied treatments on tested chemical properties, we also applied a variant of untreated fruit (control). Drying was performed in a chamber drier from the type S-100, at a temperature of 65 °C to 70 °C for 6 to 8 hours. From the chemical composition of fresh and dried apple fruits, we examined: the total dry matter, total sugars, total acids, vitamin C, pectin, flavonoids, tannins and mineral matter. The fresh fruits from the pinova variety were characterized by better mechanical properties (weight 137,35 g, height 62,56 mm, width 68,78 mm) compared to the fruits of the red delicious variety. In fruits from this variety there were higher values for: total sugars 14,16 %, 0,34 % total acids, flavonoids 2,66 μg/g, tannins 1,39 μg/g and mineral matters 0,25 %. After the analysis of dried apple fruits, the varieties of pinova and red delicious, the higher content of vitamin C was found in fruits treated with 0,5% solution of $K_2S_2O_5$. The process of drying in a chamber drier enabled preservation of the chemical properties and getting quality final product.
Keywords: apples, drying, quality, pinova, red delicious.

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DETERMINATION OF VITAMINS AS ADDITIVES FOR FORTIFICATION OF REFRESHING SOFT DRINKS

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Abstract

Soft drinks are sweetened, based on water, usually contain a certain amount of fruit juice, fruit pulp or other natural ingredient and they have a balanced acidity. Their nutritional and energy value is derived mainly from the content of sugars, but besides them there are also mineral elements, vitamins, enzymes and amino acids in a minor amounts. Soft drinks are classified as fruit juices and refreashing beverages. Refreshing beverages can be clear or muddy juices. The main ingredient is water, then sugar or artificial sweetener, fruit juice or fruit base or plant based extracts or based on cereals, with addition of carbon dioxide and allowed additives in the prescribed amounts. In recent times there is a trend of fortification the refreshing beverages with certain vitamins or minerals. Ascorbic acid is commonly added in food as an antioxidant and stabilizer. The vitamins from B group are water soluble and played a significant role in human metabolism. In addition, it is important to perceive the amount of the microelements that are necessary to meet our daily needs as nutrients. The research was made on refreshing beverages fortified with vitamins. The analysis were made on 21 different beverages, 13 in 2014, 15 in 2015 and 11 in the 2016. The quantitative determination of the water soluble and fat-soluble vitamins in the refreshing beverages was performed by using by HPLC-DAD method. The vitamin C was determined by iodometric method. In the examined samples usually were present the following water soluble vitamins: B1 (from 0,15 to 0,3 mg/100ml), B3 (from 0,18 to 3,34 mg/100ml), B5 (from 0,8 to 1,13 mg/100ml), B6 (from 0,21 to 0,41 mg/100ml) and vitamin C (from 8,8 to 26,41 mg/100ml), and more rarely were present vitamin B2 (from 0,22 to 0,28 mg/100ml) and liposoluble vitamin E (from 0,7 to 1,6 mg/100ml).

Keywords: refreshing beverages, fortification, vitamins, HPLC-DAD method.

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EFFECTS OF STORAGE CONDITIONS ON FATTY ACID COMPOSITION OF YOGURT

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Abstract

Food packing is very important process in food industry. It prevents or delay undesirable changes to the appearance, flavor, odor and texture of food. Selection of the most appropriate product packaging is based on the knowledge of the food chemistry and microbiology of the product, the environmental conditions that it will encounter from production to consumption and how this affects interactions between the packaging and the food. The aim of this work was to analyze the effects of storage conditions on fatty acid composition of yogurt stored at different conditions. The yogurt samples were grouped into groups according the storage temperature (samples stored at +4°C and at room temperature). Samples for analysis were taken on each 7th day during the period of 28 days. Samples were packed in the same type of packing material – plastic packing. In the analysis of yogurt samples the following parameters were examined: fat content, dry matter content and acidity. Changes of fatty acids composition in samples stored at different temperature (+4°C and room temperature) were analyzed by gas chromatography. Also microbiological safety of yogurt samples was analyzed. The obtained results in this study did not shown significant differences ($p<0.05$) in the fatty acids compositions between yogurt samples stored at + 4°C and samples stored at room temperature. The results of analyzed parameters of yogurt samples have shown that adequate selection of type of packing material significantly contribute to the maintenance of the quality and safety of the yogurt.

Keywords: packaging material, storage temperature, gas chromatography, food quality.

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QUALITY OF EGGS FOR CONSUMPTION FROM DIFFERENT PRODUCERS IN THE MARKETS IN R. MACEDONIA: 2. HOUGH UNITS AND YOLK COLOR

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Abstract
Eggs from 7 different brands offered to the supermarket chains in R. Macedonia were tested for meeting the minimum quality requirements defined by the Law. Egg size (egg weight in g) as well as internal quality traits (Hough Units that unbiased expressed egg "freshness" and Yolk color expressed as Roche leader scale from 1-14) were analyzed on 140 eggs. Each group was randomly represented by 10 M-weight class and 10 L-weight class eggs from each of the 7 brands, purchased directly from the supermarket shelf and analyzed the same day after the purchasing. Egg quality was analyzed in the Laboratory for control of the marketing quality of eggs at the Institute for animal biotechnology on the Faculty of agricultural science and food, using computerized equipment for measuring egg internal quality (Egg Multi Tester EMT 5200, Robotmation Co. Ltd., Tokyo, Japan). Eggs from analyzed brands in general meat the required marketing standards in respect to the analyzed parameters: egg albumen height or freshness (average = 61.56 and 58.75 Hough Units) and yolk color (average = 12.48 and 12.28 units of Roche scale) for L and M weight class, respectively. Only eggs from brand No. 4 does not fulfill the minimum required marketing standards in respect of the Hough Units (42.49 and 40.89 Hough Units) for M and L weight class, respectively. Additionally, eggs from brand No. 5 have average value below (51.95 Hough Units) the minimal required standard for freshness of 55 Hough units defined in the Law for quality of agricultural products and average weight for L class lower (62.04g) than the minimum requirement of 63g for this weight class.
Keywords: brands, eggs for consumption, markets, Hough units, yolk color.

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EVALUATION OF BIOLOGY AND QUALITY OF EMMER WHEAT FOR ETHNOBOTANICAL USE

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Abstract

Emmer wheat is one of the first domesticated crops in Near East. It was widely cultivated in ancient world, but now is a relict crop in mountain regions in Europe and Asia. Concerning the morphological characters, emmer wheat is a suitable genus for condition of low-input farming systems in marginal areas and in the conditions of organic farming. Two varieties of emmer wheat with different glume and awn color named dicoccum red and dicoccum white were analyzed for biological, morphological and productive features. Also, quality characteristics as total nitrogen and protein levels, polymorphism of gliadins and glutenins were evaluated. Results showed that dicoccum red has higher results in plant height, spike length, grain number per spike, spikelet number and grain yield. Dicoccum white has larger mass of 1000 grains, total number of spikes and plants per m2. Analyzed quality features indicated that dicoccum white has higher total nitrogen and protein level. Glu-score of HMW glutenins was higher in dicoccum white, with 2*, 13+16 on Glu-A1 and Glu-B1 locus, respectively. Both varieties have the same allele b on Glu-A1 locus, however Glu-B1 locus has different alleles f (dicoccum white) and a (dicoccum red). Expression of Gli-B1 locus is the same in both varieties. Gamma gliadin 45 is connected with the good pasta quality in tetraploid wheat. Growing of emmer wheat contributes to an extension of agrobiodiversity and traditional farming in geographically, climatically, culturally and environmentally similar regions of south-eastern Europe. Emmer wheat is an excellent source for local farmers to produce good and healthy indigenous food, to increase human health and contribute to sustainable development of a region. In theory, considering use and threatened conservation status, existing plant germplasm and ethnobotany should be closely linked.

Keywords: emmer wheat, dicoccum, ethnobotany, traditional farming.

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ANTIMICROBIAL EVALUATION OF SOME HYDRAZONE DERIVATIVES

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Abstract
Hydrazone derivatives represent one of the most active classes of compounds possessing a broad spectrum of biological activity. The use of the hydrazones is due to their anti-inflammatory, antimicrobial, antidepressant, antitumoral, analgesic, antiplatelet, anticonvulsant, antischistosomiasis and antiviral activity. Due to their physiological activity, they are also used in agriculture as herbicides, insecticides, fungicides and plant growth regulators. Furthermore, hydrazone derivatives possessing an azomethine proton (-NH-N=CH-) constitute a significant class of compounds for new drug development in order to synthesize effective agents against microbial activity. Considering these applications some p-substituted aromatic hydrazones were previously synthesized and characterized. In this study a series of aromatic hydrazones were evaluated for their in vitro growth and inhibitory activity against *Bacillus subtilis*, *Aspergillus niger* and *Candida utilis*, using filter paper disc method. Stock solutions of compounds were prepared in DMSO, as inert medium in three different concentration levels: 1, 5 and 10 mg/mL. A control disc using DMSO without any test compound was included and there was no inhibitory activity in those disks. The diameter of zone inhibition (mm) was measured. Every test was done in triplicate to confirm the findings. The screening results indicate that not all investigated compounds exhibited antimicrobial activities. It can be noted that compounds with N-p-methoxy substitute group showed the greatest inhibitory effect against *Bacillus subtilis* (max zone of inhibition of 14.3 mm) and *Candida utilis* (max zone of inhibition of 16 mm). All investigated hydrazones showed no inhibitory effects against *Aspergillus niger*.
Keywords: hydrazones, antimicrobial activity, *Bacillus subtilis*, *Aspergillus niger*, *Candida utilis*.

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PESTICIDE USAGE LEVEL AND INFORMATION SOURCES IN SOYBEAN PRODUCTION AS A SECONDARY PRODUCT IN ADANA

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Abstract

Soybean is one of the oldest crop that had been cultivated and planted in the history of humanity. It is believed that homeland of soybean is East Asia probably China. Nowadays world's soybean production has reached almost 170-180 million tons. USA has the largest share with 50 percent of the total production, Brazil, Argentina and China follows USA. Soybean production used to be cultivated on Aegean and Mediterranean region of Turkey but last 20 years Cukurova region became the main producer of soybean after the start of secondary product. Soybean is an important raw material source in all around the world. It is used as a raw material of more than 200 industrial products such as ink, paper, textile, glue, paint, oil, food, fuel, feed etc. Soybean is a healthy product and human beings use in different ways. Investigation of pesticide usage level and source of information in soybean production is vital for to protect farmers from unnecesary inputs costs and to provide much more healtier products to consumers. The aim of this research is to determine the current structure of soybean producers in Adana province with determining the levels of chemical input use and the information sources that play a important role in disseminating information in soybean production. The main material of the research will be obtained with face to face interview from soybean producers in Karatas and Yuregir districts, where soybean production is mostly centered, in Adana province.

Keywords: soybean, information sources, dissemination, Adana.

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LEVEL OF OCHRATOXIN A IN FLOURS FOR CONSUMTION IN PRISHTINA REGION

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Abstract

To assess food safety associated with the occurrence of Ochratoxin A (OTA) residues in different kind of flours a survey was carried out, during 2016–2017 in 6 municipalities of Prishtina region (Prishtina, Drenas, Lipjan, Fushë Kosovë, Podujevë, Kastriot). In the study a total of 100 flour samples were collected, which consist of local and imported samples: 50 wheat flour, 10 maize flour and 4 rye flour were analyzed in 2016, while in 2017 the research materials consisted of 27 wheat flour, 5 maize flour and 4 rye flour. The analytical method used in our study to measure occurrence and concentration range of OTA in the samples was investigated by competitive enzyme-linked immunosorbent assay (ELISA) method. From all samples examined, 10(10.0%) were contaminated with OTA. The frequencies of OTA contamination in 2016, 7 out of 64 samples (10.9%) were positive, and in 2017, 3 out of 36 samples examined (8.33%) were positive. In wheat flour, OTA was detected in seven samples (9.09%), in maize flour in two samples (13.33%) and rye flour in one sample (12.5%), respectively. The positive incidence of OTA in wheat samples collected in 2016 and in 2017 ranged from 0.125 to 0.967 µg/kg, 0.97 to 1.25 µg/kg and 0.86 µg/kg, respectively. In terms of regional distribution of positive samples during 2016 and 2017, Prishtina was the municipality with most of positive samples 5 or (50 %) from all positive cases. None of contaminated samples did not exceed the maximum residue levels (MRL) of 3 µg/kg, according to the European Union Regulation and Kosovo Food Codex. Presence of OTA in different kind of flours is considered to be serious problem for human health whereas this toxin (OTA) is recognized as possible carcinogenic to both human and animal health by International Agency for Research on Cancer.

Keywords: ochratoxin A, flour, Elisa, public health, Prishtina region.

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PRACTICAL APPLICATION OF QSAR TECHNIQUE FOR PREDICTION OF BIOLOGICAL ACTIVITY OF SELECTED HYDRAZONES

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Abstract

One important class of organic compounds is hydrazones which find huge application in many scientific areas. They possess a wide spectrum of biological activity and the changes in this activity depend on the substituents present in its molecule. The use of the hydrazones in medicine is due to their anticonvulsant, antidepressant, analgesic, antiinflammatory, antiplatelet, antimicrobial, antitumoral, antischistosomiasis and antiviral activity. On the other hand, hydrazones possessing an azometine proton (-NHN=CH-) constitute an important class of compounds for new drug development. The wide palette of the useful medical properties has attracted considerable scientific interest for their synthesis. Due to their physiological activity, they are used as herbicides, insecticides, and plant growth stimulants. Some aromatic hydrazones are DNA gyrase inhibitors. Furthermore, the hydrazones are also used in industry as plasticizers, polymer stabilizers, antioxidants, polymerization initiators. A series of substituted aromatic hydrazones have been synthesized and evaluated for in vitro antimicrobial activity against: Bacillus subtilis. QSAR study was performed to estimate the quantitative effects of the selected descriptors of derivatives on their antibacterial activity. Topological and physicochemical descriptors were calculated for each molecule and a several two-parametic mathematical models have been selected for further discussion. The statistical significance of each model was measured by a few cross-validation parameters (Q, PRESS/SSY; SPRESS; PSE and Q2). Statistical evaluation of the data used to test the quality of the obtained models, indicated that in statistically significant model both parameters AC (Atom count) and MAPA (Maximal projection area) have opposite input to the modeling of biological activity of the selected hydrazones. Following statistical parameters were obtained for this model: R^2 = 0.9444; Sd = 0.0097; Ftest = 101.9875; R^2adj = 0.9352; Q = 100.1858; PRESS/SSY = 0.0564; SPRESS = 0.0098; PSE = 0.0088 and Q2 = 0.9436.

Keywords: biological activity, substituted hydrazones, QSAR, statistical evaluation.

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DEVELOPMENT OF PROCEDURE FOR PRODUCTION OF LACTOSE-FREE WHEY PRODUCTS

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Abstract

The intestinal lactase deficiency causes the most common type of carbohydrate maldigestion and malabsoprtion. The lactose malabsorption or hypolactasia as a common condition are generated by a low lactase activity. The lactose intolerance appears when the malabsorption causes symptoms. The amount of lactose tolerated by the humans is highly individualized. Due to the small amount of lactose that can be tolerated, the malabsorbers consume lactose-free food products. Whey as a liquid byproduct obtained during the cheese production has a several commercial uses. However, in dairy industry, still is not valorized as a final product. Therefore, the development of the based whey products is great of importance. All over the world, usually, the whey cheese is produced according to traditional protocols in small scales, through denaturation of whey proteins associated with residual fats. In general, the „urda“, the macedonian traditional whey cheese, is sold as a fresh, unripened grainy cheese, which is white, soft, semi-sweet with approximately 21% dry matter content. The aim of this study was to produce the lactose-free whey and urda in the laboratory conditions using the whey obtained at the kashkaval production. The lactose quantity was determined by applying the method of the high performance liquid chromatogrpahy (HPLC). The whey was treated by b-galactosidase enzyme NOLA®Fit 5500 from Ch. Hansen (Denmark) to complete conversion of lactose to glucose and galactose, while the lactose-free urda was produced from enzyme treated whey by thermical threatment. The quantity of lactose in the samples of whey and urda ranged from 6.54 to 6.95 mg/mL and 1.67 to 1.84 mg/mL, respectively. The produced lactose-free whey and urda are recognised as a dairy products with functional properties such as: free of lactose, high level of globular proteins and low fat content, and can be used in the lactose-free diet.

Keywords: lactose intolerance, lactase, HPLC, lactose-free whey and urda.

Section 6.
FRUIT GROWING

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INFLUENCE OF AGROECOLOGICAL FACTORS OF THE REGION OF TROYAN OVER THE YIELD AND QUALITY OF PLUM FRUITS OF 'KATINKA', 'TEGERA', 'ELENA' CULTIVARS

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Abstract

Grey forest soils with heavy sandy clay structure and low nutrient availability are characteristic for the conditions of the region of Troyan. Climate conditions are the following: the average annual temperature is about 10°C and the annual rainfall is about 750 mm. The duration of vegetation period is 245 days. The experiment includes small-sized plum cultivars of 'Tegera' and 'Elena', grafted on Mirobolan seedlings, and planted in 2000; and 'Katinka' grafted on 'Fereley' rootstock, planted in 2005, all are being grown under non-irrigated conditions.The aim is to determine the influence of soil and climate factors in the region of Troyan over the phenology and reproduction of the introduced German plum cultivars of 'Katinka', 'Tegera' and 'Elena'. The flowering, some vegetative and reproductive indicators were observed and chemical analysis of fruits was conducted for characterization of their taste qualities. It is found that in the foothill region of Troyan, plum cultivars find favourable conditions for growth and development, but they require regular agrotechnical measures and increased attention in extreme climate changes. In 2015, which was a favourable year, the plum harvest of 'Katinka' was about 40 kg per tree. Fruits had very small weight (15; 16; 21 g), but the great quantity gave opportunity for high yield. The earlier ripening cultivars of 'Tegera' and 'Katinka' accumulate less dry matter in comparison with the late ripening cultivar of 'Elena'.

Keywords: Troyan region Bg, agro-ecological conditions, plum, cultivars.

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FIELD PERFORMANCE AND FRUIT QUALITY OF PRIMOCANE FRUITING RASPBERRY CULTIVARS GROWN IN SERBIA

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Abstract

The main focus of our study was to investigate differences in ripening time, vegetative and generative potential (number of canes per meter of hedgerow, cane height and diameter, number of fruiting laterals per primocane, yield per primocane and per meter of hedgerow) as well as fruit quality traits (fruit weight, index of fruit shape, number of drupelets per fruit, soluble solids content - SSC, titratable acidity - TA, total and inverted sugars, and sucrose content) in four newly introduced primocane fruiting raspberry cultivars (‘Erika’, ‘Paris’, ‘Versailles’, ‘Satine’) that are internationally competitive to both growers and marketers in the fresh markets. Studies were conducted at a commercial raspberry plantation located near Kraljevo (Serbia), in the period of 2015-2016. Results from this study showed that the average earliest harvest time was observed in ‘Versailles’ (11th August), whereas ‘Paris’ was the most late cultivar (10th September). Significantly higher cane height was registered in cvs. ‘Erika’ and ‘Paris’ (213 and 204 cm, respectively) in comparison to the two other tested cultivars. ‘Erika’ expressed the lowest values of all generative characteristics, while ‘Paris’ yielded much higher per primocane (840 g), followed by ‘Versailles’ (805 g). The latter one is also characterized by the highest average fruit weight (4.93 g) and the lowest level of SSC, total and inverted sugars (10.9%, 8.18% and 6.94%, respectively), whereas ‘Satine’ had significantly higher TA of the fruit (2.18%) compared to the other cultivars. In general, cvs. ‘Versailles’ and ‘Paris’ demonstrated better productivity and outer or inner fruit quality. Further research on the impact of cultural practices is needed in order to provide high yields of raspberry fruit with undiminished amounts of phytochemicals especially with an increasing trend of fresh raspberry consumption.

Keywords: *Rubus idaeus* L., vegetative potential, productivity, physical and chemical fruit traits.

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GROWTH AND PRODUCTIVITY OF APRICOT CULTIVARS IN THE BELGRADE AREA

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Abstract

Growth and productivity characteristics (shoot length, flower bud density, fruit set, fruit weight, yield per tree, trunk cross-sectional area and yield efficiency) were studied in 15 apricot cultivars in the Belgrade area during the period of two years (2013-2014). The cultivar 'Hungarian Best' was used as a control for comparison. The average length of 1-year old shoots ranged from 68.8 to 84.5 cm, and the number of flower buds per 1 cm of shoot length varied from 0.40 to 1.20. Nine cultivars are characterized by higher flower bud density in comparison to the control cultivar. The average fruit set ranged from 2.4 to 36.2%. Compared to control, fruit set was significantly higher in cultivars 'Cegledi Arany' and 'Roxana', while it was lower in the cultivar 'Laycot'. The average fruit weight ranged from 39.3 to 88.9 g. Compared to control, fruit weight was significantly higher in five cultivars: 'Sophia', 'Neptun', 'Roxana', 'Cegledy Arany', and 'Goldrich', and it was lower in two cultivars: 'Ninfa' and 'Tomcot'. The average yield per tree was the lowest in the control cultivar, 'Hungarian Best' (6.6 kg) and the highest in the cultivar 'Sylred' (29.6 kg). In majority of cultivars (ten) the yield was significantly higher than in the control cultivar. The lowest vigor was recorded in the cultivar 'Neptun', and the highest in the cultivar 'Ninfa'. All cultivars had higher cumulative yield efficiency than the control ('Hungarian Best' with 0.13 kg/cm2) and it ranged from 0.18 to 0.49 kg/cm2.

Keywords: *Prunus armeniaca*, fruit set, yield, vigor, fruit weight.

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EFFICIENCY OF FRUITLET THINNING IN 'GOLDEN REINDERS' AND 'RED JONAPRINCE' APPLES BY USE OF METAMITRON

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Abstract

The apples 'Golden Reinders' and 'Red Jonaprince' were used to study the effect of new chemical compound metamitron on fruit thining. This experiment was carried out in commercial three-year-old apple orchard, which is located on mountain Fruška Gora (Serbia). The planting distance of 3.5 m x 0.8 m (3,571 trees per ha) and slender spindle growing system were applied. Brevis® was used for spraying when central fruit in a cluster were 8-16 mm in diameter. Metamitron (M) was used alone or in combination with Naphthalene acetic acid (NAA) and 6-Benzyladenin (BA). In 'Red Jonaprince' the next treatments were used: 1) 200 mg L-1 M (10 -12 mm); 2) 200 mg L-1 M (10 -12 mm)+ 200 mg L-1 M (14-16 mm); 3) 250 mg L-1 M (14-16 mm); 4) 250 mg L-1 +10 mg L-1 NAA (14-16 mm); 5) 250 mg L-1 +75 mg L-1 BA (14-16 mm). The treatments applied in 'Golden Reinders' were as follows: 1) 225 mg L-1 M (8-10 mm); 2) 225 mg L-1 M (8-10 mm)+ 225 mg L-1 M (12-14 mm); 3) 300 mg L-1 M (12-14 mm); 4) 300 mg L-1 +10 mg L-1 NAA (12-14 mm); 5) 300 mg L-1 +75 mg L-1 BA (12-14 mm). All metamitron treatments significantly reduced number of fruit per tree in both studied cultivars. In 'Golden Reinders', fruit weight and percentage of fruit with diameter above 70 mm were higher in all metamitron treatments than in control treatment, but yield was significantly smaller in treatments 1, 3 and 5. Metamitron expressed a positive influence on fruiting bud formation and fruit quality. Naturally June drop was very strong in 'Red Jonaprince', so that metamitron caused overthining and therefore yield was significantly smaller in these treatments. This effect was intensified by mixing metamitron with NAA and BA.

Keywords: Brevis®, chemical thinning, yield, fruit quality.

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CHARACTERISTICS OF FRUITING SHOOTS OF PEACH AND NECTARINE CULTIVARS

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Abstract

Morphological characteristics of fruiting shoots: length, diameter, internode length, length of basal part without flower buds, number of flower buds per shoot and per 1 m of shoot length were studied in 12 peach and 12 nectarine cultivars. The study was conducted in the peach collection orchard at the Experimental farm "Radmilovac" of the Faculty of Agriculture in Belgrade during the two–year period (2016-2017). Control cultivar for peaches was 'Redhaven', and for nectarines 'Stark Redgold'. For all studied traits statistically significant differences between cultivars were found. The average length of shoots varied from 62.4 to 76.8 cm, diameter from 5.9 to 8.0 mm, and internode length from 2.45 to 3.00 cm. No significant differences were found between peach and nectarine cultivars for these characteristics. The length of basal part of a fruiting shoot without flower buds was on average lower in nectarines (3.9 cm) than in peaches (9.1 cm). Peach cultivar 'Tardibelle' is characterized by the longest basal part of a fruiting shoot without flower buds (22.2 cm). Most of the studied peach cultivars are characterized by lower flower bud density compared to control ('Redhaven'). In nectarines, most of the studied cultivars had flower bud density similar to control ('Stark Redgold'). The highest flower bud density (51.5 flower buds per 1 m of shoot length) was found in the cultivar 'Rita Star'. Cultivars with higher flower bud density such as peaches: 'Redhaven', 'Maria Marta', 'Autumn Glo', and nectarines 'Rita Star', 'Maria Carla', 'Orion' require severe pruning in order to obtain better fruit size. On the other hand, cultivars with lower flower bud density e.g. 'Tardibelle', 'Flavorcrest', 'Royal Glory', 'Bolero', 'Maria Lucia' should be pruned slightly in order to obtain higher yield.

Keywords: *Prunus persica*, flower bud density, pruning.

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ROOTSTOCK INFLUENCE ON VIGOUR AND VEGETATIVE GROWTH OF APRICOT (*PRUNUS ARMENIACA* L)

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Abstract

Rootstock has a great influence on variety performance related to nutrition, vegetative growth, fruit quality and resistance to biotic and abiotic factors. For these reasons, selection of the appropriate rootstocks is of a great importance for the successful cultivation of apricots. The aim of this study was to investigate the effect of indigenous rootstocks on the vegetative characteristics of apricot. Compatibility and vegetative growth were examined on two-years-old apricot plants. Plant material included two apricot varieties ('NS Rodna' and 'Big Red') grafted on three rootstock belošljiva (*P. domestica*), crni trn (*P. spinosa*), džanarika (*P. cerasifera*). Crown height (CH) and crown volume (CV) were used as main indicators of vigor and vegetative growth. The 'NS rodna' variety grafted on džanarika distinguished with the plant height values (PH) (206,3 cm) and the highest first branching values (86,1cm), while the first branching of the plants grafted on the belošljiva rootstock was recorded at the height of 62,5cm. The crni trn / 'Big Red' combination proved to be the weakest regarding to the axial and radial growth as well as CV. Both varieties grafted on džanarika rootstock had extremely low values of radial growth, indicating the need for further research on their compatibility. Results presented in this paper show that the crni trn rootstock is the most vigorous, with the CV values (0,09 m3) significantly higher compared to the džanarika (0,03 m3) and belošljiva (0,03 m3).

Keywords: crown volume, crown height, compatibility.

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PERFORMANCE OF MONDIAL GALA APPLE CULTIVAR GRAFTED ON M9 APPLE ROOTSTOCK IN MEDITERRANEN REGION

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Abstract
This research was carried out on 8 years old trees of the Mondial Gala (Malus domestica Borkh) cultivars grafted on the M9 rootstock due to determine its performance in the Mediterranean region with subtropical climatic conditions in Mersin, Turkey. In the study, flowering times, yield and fruit quality parameters were investigated. Mondial Gala planted with planting spaces of 1x3 m. According to the results, first flowering occurred on April 1, full flowering on April 10 and end of flowering on April 17, and also the fruits were harvested in early July. The fruit weight (average 223.2 g), the yield per tree (average 22.6 kg), and yield per trunk cross-sectional area at the end of the eighth year was observed as 0,16 kg/cm2, and values indicated that Mondial Gala summer apple cultivar were found to be promising for early apple growing in the higher part of subtropical ecological condiditon of Turkey.
Keywords: summer apple, phenology, pomology yield, quality.

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ROOTSTOCK INFLUENCE ON VIGOUR AND GENERATIVE POTENTIAL OF YOUNG SWEET CHERRY TREES

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Abstract
The main goal of breeding and testing of rootstocks for sweet cherry is to obtain small and productive trees and to improve precocity. The objective of this study was to examine the influence of six rootstocks on vigour and productive characteristics of young sweet cherry trees. The experimental orchard is situated at the Experimental farm "Radmilovac", of the Faculty of Agriculture (near Belgrade). Three sweet cherry cultivars: 'Kordia', 'Karmen' and 'Regina' were grafted on six rootstocks: *Prunus mahaleb* L. seedlings, 'Colt', 'Ma×Ma 14', 'Gisela 6', 'Gisela 5' and 'Oblačinska' sour cherry. During a two-year period (2015-2016) the following characteristics were studied: scion diameter above the grating union, rootstock diameter under the grafting union, diameter of shoots, length of shoots, height of the tree and the number of spurs per tree. The results showed different influence of rootstocks on the tree vigour, spur formation and precocity. The average diameter of the scion in all tested cultivars was the largest on the Mahaleb rootstock. The largest average number of spurs per tree was recorded on cherry trees grafted on the rootstocks 'Gisela 6' (24.0) and 'Oblačinska' sour cherry (23.4). The lowest average number of spurs was found on trees grafted on the rootstock 'Colt' (6.0).
Keywords: *Prunus avium*, cultivar, shoot, spur, precocity.

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PRODUCTIVITY OF EARLY AND MEDIUM EARLY APRICOT CULTIVARS IN THE BELGRADE AREA

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Abstract

Characteristics of productivity and growth (yield per tree, trunk cross-sectional area, yield efficiency and fruit weight) were studied in 40 apricot cultivars of early and medium early maturity in the Belgrade area during the six-year period (2009 - 2014). The cultivar 'Hungarian Best' was used as a control for comparison. The period of study was divided to initial bearing (age of trees three and four years) and full bearing (age of trees from five to eight years). Significant differences in yield between cultivars and years were found. Average yield in the period of initial bearing ranged from 0.3 to 11.3 kg per tree, and in the period of full bearing from 5.6 to 24.8 kg per tree. Compared with the control cultivar, significantly higher yield was obtained in 17 cultivars. Adverse weather conditions resulted in significant reduction of yield in two out of six years of study. Cumulative yield efficiency varied from 0.17 to 0.87 kg/cm2 and in 19 cultivars it was significantly higher compared with the control cultivar. Fruit weight ranged from 27.7 to 80.1 g. Compared with control, fruit weight was significantly higher in nine cultivars, and significantly lower in 11 cultivars. On the basis of high yield and large fruit size, for growing in the Belgrade area can be recommended cultivars 'Sylred', 'Dunstan' and 'Dacia'.

Keywords: *Prunus armeniaca*, yield, trunk cross-sectional area, yield efficiency, fruit weight.

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EFFECTS OF THE GRAFTING METHOD AND TIME ON THE GRAFTING SUCCESS AND PLANT DEVELOPMENT IN BELEN HAWTHORN GENOTYPE (*CRATAEGUS AZAROLUS* L.)

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Abstract

The study was carried out to determine the optimal grafting method and time for Belen hawthorn genotype (*Crataegus azarolus* L.) on *Crataegus monogyna* L. rootstock in Hatay province, Eastern Mediterranean region of Turkey. T and chip budding and whip grafting methods were conducted on 15 February, 01 March, 15 March, 01 April, 15 April, 01 May and 15 May dates in 2016. The bud sprout percentage, graft shoot development and diameter were also investigated. The results of the study showed that graft success and plant development were affected by graft times and methods. The highest bud sprout percentage (71.91%), shoot development (30.92 cm) and diameter (5.04 mm) were detected in whip grafting. In addition, grafting success was effected by grafting times. The grafting success was found the highest on 01 April and 15 April dates (84.44% and 77.78%, respectively). The results showed that whip grafting method applied within April was very successful for Belen hawthorn genotype in Hatay ecological conditions.

Keywords: hawthorn, budding, grafting, plant development.

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INFLUENCE OF SPRING FROST ON APPLE FLOWER BUDS AT VARIOUS DEVELOPMENTAL STAGE

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Abstract

Spring frost often reduces the yield because of damaged flowers. Spring frost is a dangerous climatic hazard that can be responsible for yield loses to orchard trees. Frost damage is highly dependent on the stage of development of the flower buds. Flowers buds samples were collected from 'Granny Smith', 'Golden Delicious Rainders' and 'Gala Schniga' apple cultivars at different flower buds stages from BBCH 59 (most flowers with petals forming a hollow ball) to BBCH 65 (full bloom on trees), two days after frost that occurred on the morning at 5:00-7:00 of March 31, 2017 when the temperature dropped to –1,5 to –3,3 ^{0}C in the apple orchard of company Pollino Agrar near Fruška gora mountain. Pistils in flower buds samples at a hollow ball stage to full bloom were examined individually and classified as dead or alive based on tissue browning. The highest damage flowers was recorded to cultivar 'Gala Schniga' (75.4%) and the lowest to cultivar 'Golden Delicious Rainders'. Cultivar 'Gala Schniga' had more than 90% of damage king flowers. Our results showed that the spring frost damage of pistils was variable according to stages of flower bud development and genotypes.

Keywords: cultivar, flowering, damage, bbch scale.

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POMOLOGICAL AND CHEMICAL PROPERTIES OF SOME WALNUT GENOTYPES IN CENTRAL ANATOLIA

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Abstract

This study was conducted to determine some pomological and chemical characteristics of Bilecik, Yavuz, Şebin cultivars and Yerli genotype grown in Kırşehir, Turkey. The nut characteristics such as nut weight, kernel weight, nut width, nut hight and nut diameter and some kernel characteristics were investigated. The results indicated that the average fruit weight ranged from 17.33 g (Yavuz) to 12.83 g (Bilecik), the nut width ranged from 37.63 mm (Yavuz) to 31.33 mm (Yerli), the nut height ranged from 52.25 mm (Yavuz) to 41.07 mm (Yerli), and the kernel percentage ranged from 46.07% (Şebin) to 49.43% (Yavuz). The highest oil content was detected in the Yavuz cultivar (63.20%), while the lowest value was obtained from the Bilecik cultivar with 53.90%. Contrary to fat content, the highest protein content was detected in the Bilecik cultivar. As a results, our data showed that the fruit properties of Yavuz and Şebin cultivars were better than the others in Central Anatolian ecological conditions.

Keywords: walnut, cultivars, nut, kernel characteristics, Central Anatolia.

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PHENOTYPING OF STRAWBERRY BREEDED FROM TURKEY BREEDING PROGRAM

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Abstract

The standardized phenotyping protocol for strawberries was agreed upon by the breeding team in Oregon, Michigan, New Hampshire, California and Florida and includes four trait categories: phenolgy and other flower-related traits, plant characteristics, fruit characteristics, and fruit chemistry traits. This study aims to introduce this category to the breeding programs in our country to characterize 15 cultivars of strawberries that are breeded in our country. In this context, 26 properties are evaluated. As a result, our cultivars is globose conic in respect of external fruit properties, apperance is above average, achene colour is dark, achene position is even, external colour is red, gloss is average, skin strength is soft, calyx size is above equal, calyx position is flat. In terms of fruit internal properties, firmness is soft, internal colour is light red, depth of internal color is at 51.8% level and average level, aroma is at high level.

Keywords: strawberry, phenotyping characterization, plant qualities, breeding.

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POTENTIAL OF PROTECTED FRUIT CULTIVATION IN EASTERN MEDITERRANEAN REGION OF TURKEY

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Abstract

The most important early fruit production center is Eastern Mediterranean region of Turkey due the ecological conditions of the Mediterranean coastal line are very suitable. The region is first for protected banana culture (214.526 tons). The fruit species such as strawberry (61.122 tons), table grape (860 tons) apricot (728 tons), plum (110 tons), peach and nectarines (60 tons) are also cultivated in this region are harvested 10-15 days earlier than the other regions of Turkey as well as the important fruit-bearing countries of Europe such as Spain, Italy and France. In this region, fruit ripening under protected fruit cultivation is earlier with subtropical ecological conditions and allows more productive cultivation. In this review, some fruit species that is important for earlier fruit culture are evaluated to current situation and its future in the protected cultivation.

Keywords: protected cultivation, strawberry, apricot, peach-nectarin.

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EVALUATION OF SOME OLIVE CULTIVARS UNDER KUWAIT ENVIRONMENTAL CONDITIONS

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Abstract

Olea europaea, a native plant of Mediterranean region became a cynosure among agronomists worldwide, owing to its health beneficial properties and tolerance to harsh environmental conditions along with its economic importance. The prevailing climatic and environmental conditions constitute one of the major factors affecting the productivity of different olive cultivars. Hence, an adequate knowledge of the best Olive cultivars in arid area is mandatory to efficiently utilize them for greenery development, desertification control, table olive and olive oil production. As a preliminary effort twenty six olive cultivars were subjected to performance evaluation in coastal sites (Salmiya) of Kuwait. Various growth parameters such as plant height, stem girth, number of shoots and length of shoots were examined clearly. It was found that except the cultivar Shauki, all other cultivars under observation survived under Kuwait's environmental conditions. Moreover, all the varieties flowered and produced fruits, which indicates its ability to reproduce under harsh climatic conditions of Kuwait. This study on the suitability of various olive cultivars under Kuwait's harsh climatic conditions outlined the superior performance of certain cultivars such as Picual, Picholine, Pendulino, Coratina, Arbequina and Frantoio in the coastal sites of Kuwait.

Keywords: *Olea europaea*, horticultural practices.

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STUDY ON THE INFLUENCE OF SOME FERTILIZATION TYPES ON THE BIOCHEMICAL COMPOSITION OF PLUM FRUIT OF CULTIVAR TEGERA

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Abstract

The influence of different fertilization types on the biochemical composition of plum fruit of cultivar Tegera were studied in the present investigation. The scientific experiment was carried out in 2016 at the Research Institute of Mountain stockbreeding and Agriculture in Troyan, Bulgaria. Three types of fertilization were applied in experiment: organic, conventional and with poultry manure. Higher values of the indicators sugars, anthocyanins, tannins and pectin were reported as a result of the fertilization in comparison with control. The content of total polyphenols was the highest in the conventional fertilization – 210.00 mg GAE/100, and antioxidant activity was higher in the variants with poultry manure – 926.67 μmolTE/100 g and the conventional fertilization – 597.78 μmolTE/100 g.

Keywords: antioxidant activity, total polyphenols.

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EFFECT OF FERTILIZATION ON BIOCHEMICAL COMPOSITION OF FRUITS OF BLACK CURRANT AND RED CURRANT

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Abstract

The experiment was conducted in 2015 in the collection plantation at the Research Institute of Mountain Stockbreeding and Agriculture in Troyan, Bulgaria. The study included the following blackcurrant varieties: Ometa, Hedda, Silvergitte schwartze, Titania and the red currant variety Rovada. Conventional and organic fertilizations were applied. As conventional fertilizer was used ammonium nitrate (soil application), and as organic fertilizer – Tekamin Brix at two concentrations (0.2% and 0.3% – twice foliar application). The indicators of biochemical composition of fruits and their average weight in the variants with fertilization, compared to control were investigated. The reported results indicate the effects of fertilization on the following indicators: antocyanins, inverted sugar and total sugars. Higher values of total and inverted sugar (7.04% and 6.2%, respectively) applying Tekamin Brix (0.2%). The highest values of antocyanins (156.838 mg) were reported in the variant with Tekamin Brix (0.3%). The average fruit weight was also reported.

Keywords: total sugar, inverted sugar, antocyanins, average weight of the fruit, organic fertilizer.

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THE DYNAMICS OF VEGETATIVE GROWTH IN THE ONLY CORNELIAN CHERRY (*CORNUS MAS* L.) COLLECTION IN SERBIA

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Abstract

The Cornelian cherry is a plant suitable for the organic production, highly tolerant to diseases and pests, which can be used as both food and medicine. This feature is quite important in the light of the current campaign for more intensive consuming of functional foods. Consumers worldwide are increasingly showing interest in natural high quality fruits, what exactly is a Cornelian cherry. Until recently, Cornelian cherries were mostly growing in the natural population. Systematic collection, selection, breeding programs, propagation and cultivation in orchards have been recently established in the Serbia. The main and the only one collection of Cornelian cherry genotypes in region were established 2011/2012 year at the nursery of Faculty of Agriculture in Novi Sad. The collection contains, in addition, officially registered cultivars in region, and twenty promising selections from natural population in Serbia. The collection represents a wealth of biological and economic potential, as well as a rich source of material for further breeding and selection. It is carried out monitoring of all stages of growth and development in order to develop and improve technology for this new fruit variety introduced to the cultivated area. The paper present the dynamics of the vegetative growth promising Cornelian cherry selections from Novi Sad during 2013-2016 (individually for each year and in average for periods) followed by the tree height, the tree trunk diameter, number of formed branches and their length (104 to 281 mm; 10 to 50 mm; 1 to 73; 3 to 115 mm, respectively). Based on the results, all the parameters showed a high statistical significance depended the year. Also, recorded are the expected high differences in the studied parameters in relation to genotype. These results, combined with our other studies are significant for recommending optimal cultivation technology grafted Cornelian cherry in orchards.

Keywords: cornelian cherry, selection, collection orchard, vegetative growth.

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SOME POSSIBILITIES OF VEGETATIVE PROPAGATION OF STRAWBERRY CULTIVARS *IN VITRO*

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Abstract

This work presents the production technology of four strawberry cultivars by micropropagation. Starting materials were taken in May or June from the stolons that were in the air and meristems of 0.5mm were isolated in the laboratory. The isolated strawberry meristems were cultivated in a medium containing macro and micro elements and phytohormones in different concentrations. The highest percentage of initiated culture was recorded by the cultivar Senga Sengana (81.48%) and the lowest by the cultivar Marmolada (48.00%). Optimal hormone balance for initiating culture strawberries was 1.0 mg / l BAP (Benzylaminopurine), 0,1 mg / l IBA (indole-3 -butyric acid) and 0.1 mg / l GA3 (gibberellic acid). After 50 days of cultivation in the culture, the formed shoots were transferred to medium for multiplication. The multiplication of isolated buds was achieved on the medium with phytohormones BAP and IBA. The highest multiplication index was recorded by the cultivar Senga Sengana (8.77) and the lowest by the cultivar Marmolada (5.42). When planlets reached a height of 10-12mm they were transferred to the rooting medium. The optimal concentration of phytohormones IBA for rooting of the strawberry cultivars was about 5 mg / l. Number of roots ranged from 5.09 for the cultivar Idea to 6.11 for the cultivar Senga Sengana. After two months the plants with developed roots were transplanted into peat briquettes. Adjustment by external conditions was conducted in greenhouses under a mist system. The reception was submitted well by the planted strawberries (90%). The results presented in this paper indicate that micropropagation can speed up the process of getting healthy and HIGH quality planting material of strawberries. The procedure for obtaining strawberries by micropropagation can be accelerated by proper selection of the combination and concentrations of phytohormones.

Keywords: micropropagation, multiplication, phytohormones, adjustment, greenhouses.

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THE INFLUENCE OF SOME PHYTOHORMONES ON THE ROOTING OF FIG CUTTINGS

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Abstract

The fig is a subtropical fruit species. In the Republic of Macedonia it is grown mainly, in the form of individual plants. Lately there is interest for establishing orchards from this fruit species. The purpose of this research was to determine the influence of some phytohormones on the rooting of hardwood cuttings from fig. The research was conducted with cuttings from 3 domestic populations of figs, "Bela smokva", "Crna smokva" and "Petrovka". The research was performed on an experimental field, property of the Faculty of Agricultural Sciences and Food in Skopje. In the research, two phytohormones were used, indolebuteryc acid 0,1% and 1-Naphthaleneacetic acid 0,1%. In the end of the vegetation period the following parameters were evaluated: percentage of rooting, diameter and length of the shoots, the total mass of the roots, the length and nubmer of roots with a diameter above 3mm. On the basis of our research we determined that all of the cuttings had a satisfactory, high, percentage of rooting (86.2%). In the population of "Petrovka" the treatments did not show any statistical significant differences on the evaluated characteristics, regarding the control treatment. With the cuttings from "Bela smokva" treated with NAA, statistical significant difference was found in the parameter mass of the roots (12.2g), while regarding the nubmer and length of roots, this treatment, had statistical significant difference just with the control but not with the IBA treatment. With "Crna smokva" the cuttings treated with IBA had the highest values with statistical significant difference with the number (4,5), the mass (24,3 g) and the length of the roots (179,3 cm).

Keywords: *Ficus carica*, IBA, NAA, propagation.

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OBSERVING THE CHANGES IN BIOCHEMICAL COMPOSITION OF FRESH AND DRIED CHOKEBERRY (*ARONIA MELANOCARPA*) WITH CONVENTIONAL AND ORGANIC FERTILIZING

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Abstract

Chokeberry belongs to the group of fruit species, whose fruits are distinguished by a rich biochemical composition and high antioxidant capacity and has potential positive influence on the health. The experiment was set up in 2016 in the Research Institute of Mountain Stockbreeding and Agriculture – Troyan. Six variants of fertilizing were applied in the experiment with using conventional and organic fertilizers – for soil and leaf. The following indicators of the biochemical composition were determined for fresh and dried fruits: dry matter weight, refractometric determination of dry matter, total sugars, inverted sugar, sucrose, organic acids, ascorbic acid, anthocyanins, tannins and pectin. Antioxidant activity and total polyphenols of fruits in different fertilization variants were determined. The highest antioxidant activity had fruits with conventional leaf fertilizing – 933,33 µmolTE/100g and organic soil application – 750,00 µmolTE/100g. The dried fruits with organic soil and leaf fertilizing had the highest values of antioxidant activity, which were within the range from 916,67 - 1025,00 µmolTE/100g.

Keywords: antioxidant activity, total polyphenols.

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INVESTIGATION OF MORPHOLOGICAL CHARACTERISTICS OF EUROPEAN CHESTNUT (*CASTANEA SATIVA* MILL.) GENOTYPES IN R. MACEDONIA

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Abstract
European chestnut (*Castanea sativa* Mill) genotypes from the Strumica and Skopje regions in R. Macedonia during 2014-2015 are investigated. A large level of polymorphism between the investigated characteristics of Chestnut genotypes it is noted. Some of the types are characterized with twice as big nut mass as most of other investigated genotypes. Differences in the nut shape and asymmetry among the investigated genotypes are registered. It is found many types that are included in the group with large nuts. The Strumica genotypes are larger than the other collected genotypes. According to CIELab color system the nut skin of genotypes from Strumica region is characterized with unusually dark almost black coloration, while the most attractive are the nuts from the Type 8 from the Skopje region. The investigated genotypes show differences in the nut anatomy, most notably in the Type 23 which is characterized with significantly higher value for lobedness degree, specifically seed coat and hilum presence. Polymorphism is registered in the leaf dimension and form.
Keywords: *Castanea sativa* Mill, CIELab, genotype, nut, leaf, polymorphism.

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SWEET CHERRY PRODUCTION IN THE USA: FROM SCIENCE TO PRACTICE

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Abstract

Cherry production in the US geographically is mainly located in the Northwest (Washington state, California, Oregon) and partly in the Midwest (Michigan). Cherries as a highly valuable food and high profitability product has expanded dramatically in the past 20 years and has gained importance in the production structure of fruit species in the US. Increasing use of new dwarfing rootstock selections, comparative trials over the whole country, improvement in crop protection strategies to reduce rain-induced cracking and diseases, training systems for labor efficiency and high-quality fruit combined with precision management are the main characteristics of a modern and science-based approach to cherry production. Research on the most appropriate training system for particular conditions based on physiological knowledge is presented through on-going trials located in respective research institution as well as in cooperation with local farmers. New results based on research are very often available to the farmer through various ways of interaction (one-day training workshops combining theoretical and practical aspects, different types of written instructions and results in scientific journals and industry magazines, orchard tours, personal communication with farmers, etc.). Modern communication methods, e.g., social media and information technologies, are being utilized increasingly by farmers, and the advantages are becoming a very important part of knowledge transfer. Different materials are easily available to farmers through extension-service websites, specialized webinars, YouTube video material on specific production techniques, and an increasing number of very modern and useful applications for tablet computers and smartphones. The transfer path from science to practice nowadays is more efficient than ever.

Keywords: production, transfer of knowledge.

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BIOLOGICAL PROPERTIES AND YIELD OF HAZELNUT (*CORYLUS AVELLANA* L.) IN THE INITIAL YEARS AFTER PLANTING

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Abstract

In 2014 and 2015 i.e. during the 4th and 5th growing season, respectively, major biological indicators of tree vigour (trunk diameter, crown height, crown width), the onset and progress of flowering and leafing, yield per tree and yield per unit area were evaluated in hazelnut cultivars 'Tonda Gentile delle Lange', 'Tonda di Giffoni', 'Rimski', 'Istarski' and 'Enis'. Results showed that tree vigour was lowest in 'Istarski' (TCSA = 24.36 cm2; crown height = 116.6 cm at the end of the 5th growing season) and highest in 'Tonda Gentile delle Lange' (TCSA = 34.94 cm2; crown height = 205.8 cm at the end of the 5th growing season). As regards the onset of flowering, the earliest opening of both male and female flowers was recorded in 'Tonda Gentile delle Lange' and 'Tonda di Giffoni', and the latest in 'Istarski' and 'Rimski'. A similar pattern was observed in the onset of leafing. 'Tonda Gentile delle Lange' and 'Tonda di Giffoni' started leafing at the end of March (on 25 March on average), whereas the average date of onset of leafing in the other three cultivars was at the end of the first ten-day period in April. The yield of in-shell nuts in the 4th year after planting was very low, ranging from 290 g per tree ('Tonda Gentile delle Lange') to 470 g ('Istarski'). In the 5th year, the yield was somewhat higher, ranging between 810 g per tree ('Enis) and 1,080 g ('Tonda di Giffoni' and 'Tonda Gentile delle Lange').

Keywords: hazelnut, phenological properties, vigour, yield.

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PHYSICAL AND CHEMICAL PROPERTIES OF SOIL IN FRUIT GROWING AREA TOPOLA (SERBIA)

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Abstract

The aim of the investigation was to assess the level of soil fertility and repair measures in order to enhance the productivity of fruit production in a traditional fruit growing area. (Municipality of Topola, Serbia). The following tests were performed: mechanical composition, physical and chemical properties of soil, total adsorbed base cation, capacity of adsorbed base cation, degree of base saturation, different types of soil acidity, contents of carbon, humus, total nitrogen, easily accessible forms of P2O5 and K2O. Results obtained have shown that soils from all studied sites are of "heavy" mechanical texture with 75,40-84,90% of physical clay. High capacity of cation adsorption, low to medium hydrolytic acidity and high to almost complete saturation of adsorbed bases, has been measured. In compliance with previous analyses, it has been assessed that soils are neutral and of low acid chemical reaction, with low carbon and medium humus content and total nitrogen. Easily accessible content of P2O5 and K2O varies depending on the food quantity on individual parcels with low to medium accessibility to parcels with no fruit plantations. Based on the parameters analysed, the tested soils demand repair of mechanical properties, which will facilitate greater nutrient uptake.

Keywords: soil fertility, mechanical composition, nutrients, P2O5, K2O.

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THE ROLE OF MICROBIAL INOCULANTS AS COMPONENTS OF SUSTAINABLE AGROECOSYSTEMS

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Abstract

There has been a tendency for intensification of fruit tree cultivation, mainly in order to obtain the highest yield and fruit quality, as well. However, intensive development of fruit tree cultivation, usually based on increasing utilization of synthetic nitrogen fertilizers, significantly contributes to a series of undesirable effects and results in excessive environmental pollution. One such possibility for overcome these problems is the use of microbial inoculants. In this respect we conducted comparative study of the effect of bio- (application of microbial inoculants) and synthetic fertilizers applications on morphometric (fruit weight, length, breadth and thickness) and chemical properties (SSC, TAC, TPC) of 'Stanley' plum cultivar. The analysis of the results points to the fact that application of microbial inoculants in the stated plum cultivar growing technology had a positive effect on plant growth and fruit quality. Therefore, it can be considered as an appropriate practise to ensure safe fruit production and satisfy basic postulates of sustainable agriculture.

Keywords: plum, synthetic fertilizers, biofertilizers, fruit quality traits.

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PHYTOCHEMICAL DIVERSITY IN WALNUTS GROWN IN ANATOLIA

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Abstract

Walnut fruits are used as nutrition purposes for a long time in Anatolia where seed propagated walnuts naturally found as solitary or dense populations. In this study, some important physico-chemical and antioxidant characteristics of fruits from ten promising walnut (*J. regia* L.) selections propagated from seeds and found in Erzincan province in northeastern part of Turkey. The standard Turkish walnut cultivar 'Sebin' is included analysis to make comparison with seed propagated genotypes as well. The average fruit weights and kernel ratios were ranged from 6.11 to 11.91 g and 49.10 to 56.13% among genotypes, respectively. Total phenolic content were found between 1045-1671 mg GAE/100 g among genotypes and most of genotypes had higher phenolic content than cv. 'Sebin'. The total tocopherols content ranged from 33.0 to 42.1 mg/100 g of the extracted oil. The most common tocopherol in all samples was γ-tocopherol. The present results are indicated that the seed propagated walnut trees are very diverse and their fruits have a good potential for phytochemicals.

Keywords: walnut, diversity.

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BIOPOMOLOGICAL CHARACTERISTICS OF SWEET CHERRY VARIETIES ON *PRUNUS MAHALEB* ROOTSTOCK

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Abstract

Montenegro's production of sweet cherry (*Prunus avium* L.) doesn't fulfil its capacities nor the necessary market needs for this fruit. In order to increase and improve the production of sweet cherries an introduction of new and more productive cultivars in terms of higher fruit weight is needed, as well as the excellent pomological characteristics, good transportability characteristics and late season ripening. Cultivation of different ripening season cultivars is necessary in order to meet the demands of consistent and extended season offer. This study aims to examine the characteristics of the recently introduced sweet cherry cultivars in the agro-ecological conditions of Podgorica in order to select the most promising ones for intensive production. The research has been conducted in a collection orchard situated in the central part of Zeta valley- 10 km distance from Podgorica, covering the period 2014- 2016. The study includes 10 sweet cherry cultivars: Burlat, Sunburst, Isabella, New Star, Sweet Heart, Giorgia, Van, Bing, Kordia, Lapins while cultivar Stella was taken for control. Important biological and pomological characteristics were studied for these cultivars: time of ripening, fruit weight and stone weight, randman, fruit stalk length as well as the fruit quality parameters (dry matter content, total acids and organoleptic evaluation). The yield of the examined cultivars was mostly constant with average to good values except for the cultivar Bing which had showed relatively low yield during the studied period. The fruit weight in most of the examined cultivars was in the category of medium big to big (7 -12g) while the shape of fruit was within the range of 92,5-96,2%. The studied cultivars had the following dry matter content 7,3 -13,2 with somewhat lower total acids level. The fruit quality of the examined cultivars was relatively uniform.

Keywords: *Prunus avium* L., cultivars, pomological characteristics.

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BIOTECHNICAL CHARATERISTICS OF RASPBERRY FRUIT (*RUBUS IDAEUS* L.) IN THE MUNICIPALITY OF BIJELO POLJE

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Abstract

Raspberry (*Rubus idaeus* L.) has been one of the most important fruit species cultivated in Montenegro in the past decade, especially in the northern part which has the optimal agroecological conditions for its cultivation. It has been estimated that raspberry plantations have expanded to more than 100 hectares in the past few years with an average yield of 2 000 – 3 000 tons of fruit per year and variety Willamette having the biggest share in production while varieties Meeker and Tulameen participate with a smaller percentage. The largest part of raspberry fruits is frozen and sold to European market which encourages the need for production improvement especially when it comes to variety choice, quality and taste preferences of consumers in the highly selective global market. The purpose of our study was to examine the fruit quality of summer-fruiting raspberry varieties cultivated in specific agroecological conditions of the northern Montenegro – municipality of Bijelo Polje, with the main objective of verifying the quality and quantity of raspberry fruits from specific microlocations and choosing the best varieties. The vicinity of significant city markets of Bijelo Polje and Podgorica and the possibility of placing the fresh fruits thereat, gives this study more importance. The study was conducted on the fruits of following varieties: Willamette, Meeker and Tulameen in several locations within the municipality of Bijelo Polje: Nedakusi, Zaton, Livadice I, Livadice II i Femića krš. The earliest beginning of ripening stage was noted with the variety of Willamette in all of the examined locations. The highest content of soluble dry matter of 10, 52% and the total sugars of 9, 83% were noted with variety Willamette in location – Femića krš. The lowest content of total sugars was noted with variety Tulameen 9, 30% in location Zaton. The highest energy value 241, 33 KJ/100 g was noted in fruits of variety Willamette in location Livadice I.

Keywords: *Rubus idaeus* L., Willamette, pomological characteristics.

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EFFECT OF TREE-ROW MULCHING ON SOME SOIL CHARACTERISTICS, GROWTH AND PRODUCTIVITY OF THE PEAR TREES

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Abstract
The paper presents the results of the investigations of the effect of various mulching materials in the tree-row on the soil temperature, moisture conservation in the soil, vegetative growth, yield and fruit quality of Bartlet pear, grafted on a quince rootstock and Buerre Hardy as an interstock. The experimental orchard is established with planting distance 3.2 m x 1.3 m, drip irrigation and fertigation system were used and an anti-hail net was also installed. The soil surface between the rows was grassed with ryegrass. During experimentation the orchard was 6-8 years old. Treatments included mulching with: 1. straw, 2. conifer sawdust, 3. enriched black peat, 4. black plastic film, 5. cloth of polyester fabric, 6. clean cultivation using as a control. The results indicated that covering the soil with mulching material reduced the growth of weeds, had a significant effect on the reducing of summer soil temperature and improving conservation of water in the soil. Vegetative growth of the trees, the yield and average fruit weight were improved of the trees on mulched soil. The mulching of the soil had no significant effect of the fruit firmness and soluble solid content.
Keywords: *Pyrus communis*, ground maintenance, water conservation, yield.

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OBLACHINSKA SOUR CHERRY, GROWING ON OWN ROOT OR GRAFTED ON MAHALEB?

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Abstract

Oblachinska sour cherry originates from the population of sour cherry from the Balkan Peninsula. This variety has high economic value for the Balkan region. In the Republic of Macedonia oblachinska sour cherry is almost unique variety which is cultivated in commercial orchards. These orchards are mainly established by own rooted trees. Despite numerous advantages, own rooted plants have a lot of disadvantages such as: poor development of root system, drought sensitivity, suckering, and uniformity of the trees, mechanical harvest unsuitability, and root borer suffering in dry conditions. In order to eliminate these negative characteristics we carried out a comparative investigation of this variety planted on own roots and grafted on *Prunus mahaleb*. The research was conducted in productive orchard in Tikves region (Central part of Macedonia). The orchard was established in 2002 and the research was conducted in 4 consecutive years (2005-2008). Two variant of grafted trees on mahaleb were evaluated, grafted on height of 10 and 80 cm. Own rooted trees were used as a control. The vegetative growth of the trees, the yield and the fruit quality were followed during the investigation. An excellent compatibility on oblachinska sour cherry with mahaleb rootstock was noticed from the recorded dates. The trees are medium vigorous, they are more tolerant to drought and attacks of root borer. The high grafted trees have better growth, and the yield and the fruit quality are better compared to other variants.

Keywords: *Prunus vulgaris* Mill., rootstock, vigorousness, productivity.

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ANALYSIS OF DISTRIBUTION OF ROOT LENGTH DENSITY OF APPLE TREES CV. JONAGOLD GRAFTED ON M9 ROOTSTOCK UNDER VARIOUS PLANTING DENSITY

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Abstract
The influence of planting density on distribution of the root system at apple cv. Jonagold grafted on M9 rootstock is presented in this paper. The study has been performed in 7 years old apple orchard, established in Skopje region (North part of Macedonia). Experimental orchard has been established in 2002, with two variants of planting distance 4 x 1.5 m and 4 x 1 m. Trees were trained as slender spindle system. Following characteristics were evaluated: length and weight of the fine (fibrous) and coarse roots, depth distribution of the root system and horizontal spreading of the roots. Among evaluated variants and based on all evaluated parameters, the trees planted on smaller distance have smaller root system. The largest distribution of root system is recorded in the depth zone between 20-40 cm and zone of horizontal spreading between 0-50 cm. In total, depending of planting density length of fine roots was 13868 cm at trees planted 4 x 1 m, and 21948 cm at trees planted 4 x 1.5 m, and length of coarse roots was 3233 cm at trees planted 4 x 1 m, and 5107 cm at trees planted 4 x 1.5 m.
Keywords: *Malus domestica* Borkh., root distribution, coarse root, fibrous root.

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BIOMETRIC PARAMETERS OF FRUITS AND STONES OF NEWLY INTRODUCED FLAT FRUIT PEACH VARIETIES - *PRUNUS PERSICA* (L.) BATSCH. F. *COMPRESSA*

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Abstract

The new group of peaches and nectarines with a flat fruit shape is gaining ever greater commercial significance. The increased interest in these varieties is due to the emphasized sweet taste of the fruits, their specific flavor and a newer market look. The purpose of this study is to establish the biometric parameters of the fruits and stones from five new cultivars of the compressa group and to compare them. It was found that with the largest fruit is the cultivar 'Flat Queen' (136.00 g), and with the smallest the nectarine cultivar 'Mesembrine', whose fruit has an average mass of 65.23 g. Unlike traditional round fruit varieties, for the flat peaches, fruit height is the smallest dimension, ranging from 34.87 mm for 'UFO-4' to 43.66 mm for 'Flat Queen'. The stones are also flat in shape and often the tip protrudes above the level of the fruit.

Keywords: peach, *P. persica* f. *compressa*, biometry.

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MONITORING OF THE SHELF LIFE AT APPLES CHIPS PRODUCT OBTAINED BY OSMOTIC DEHYDRATION PRETREATMENT

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Abstract

The apples variety used in this study was Granny Smith and Red Delicious. The apple samples were cut with a special knife with thickness of 1 to 2 mm in the form of a disc with diameter of 18 mm. Osmotic pretreatment was performed in aqueous solution of sucrose with a concentration of 50 %. After the osmotic pretreatment the pieces of apples were dried in air-dryer at 100 ˚C. The dried pieces were packaged in small bags of metalized polypropylene under atmosphere of nitrogen and kept at room temperature in dry place. The stability of the product was monitored over 120 days in 15 days interval. The stability of the product was evaluated by the changes of water activity and color. The dried apple pieces from variety Granny Smith before packaging had water activity of 0.283, while pieces from variety Red Delicious had water activity 0.292. The chips from both variety was suitable for extended shelf life. The value of the browning index of the Granny Smith apples chips was 32.15 while the Red Delicious apples chips was 46.82. After 120 days of storage the water activity of the Granny Smith chips was slightly increased, to 0.320, while the chips of Red Delicious was 0,334. Browning effect and softening of the tissue of chips subsequently led to increased. The browning index reached value of 48.78 for Granny Smith and 54.09 for Red Delicious. The changes of the color of the dried apples chips during storage were not significantly different.

Keywords: apple chips, storage, water activity, color, texture.

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ESTABLISHING APPROPRIATE PARAMETARS FOR ROOTING OF MICROPROPAGATED PEAR ROOTSTOCK OHF X 333

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Abstract

The study was carried out in period September 2016 – April 2017, in the production laboratory for in vitro propagation of Fruit Growing Institute – Plovdiv. These rootstoks were obtained by hybridization of pear varieties of Old Home X Farmigdale in the American state of Oregon. Micropropagated plants in vitro were rooted on B (Dimanov, 1987) nutrient media in two different forms (solid and liquid) with different concentration of plants grow up regulators- auxins (IAA and IBA). Like explants were used tips and cuttings. The results show that the micropropagated plants of this rootstock are highly dependent from the nutrient media composition and concentration of grow up regulators for rooting. Plants with roots was produced 15 – 20 days after cultivated on nutrient media for rooting. According from forms (solid and liquid) and plants regulators –auxins (IBA and IAA), percent of the rooted plants it is different, between 0 and 100 %.

Keywords: pear rootstoks, rooting, micropropagated, *in vitro*.

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PRIMARY EFFECTS OF GAMMA RADIATION (CZ137) ON THE MORPHOLOGY OF LEAVES AT SOME SWEET CHERRY VARIETIES

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Abstract

The study has been conducted based on the presence of atypical leaf morphology, in relation to leaf shape, size, color, leaf stem length and leaf stem thickness, as a primary effect product in the first MV1 generation after the gamma radiation with Cz137 on Bigareau Burlat, Pobeda Krimska and Kozerska cherry varieties. The selected leaf radiomorphosys were used as conservative and accurate signs for early detection of somatic mutations caused by radiation. Graft branches were exposed with dosages of 25 Gy, 35Gy and 45Gy at the Institute of Radiobiology and Radiopreservation in Sofia. The grafting was performed with dormant buds onto *Prunus mahaleb* rootstock. The dosage augmentation caused average reduction of leaf dimensions and leaf stem lengths in all of the tested varieties. Also, with the augmentation of the radiation dosage, the percentage of chlorotic leaves increased from 1.1% at 25 Gy to 7.4% at 45 Gy. Leaves with atypical shapes were found in 47.5% from the analysed samples, with bigger differences between various varieties. The biggest percentage of leaves with atypical shapes was found in the tested plants treated with 45 Gy.

Keywords: *Prunus avium* L., ionizing dosage, leaf shape, leaf size and color, leaf stem length.

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PRODUCTIVITY PER LEAF AREA IN SOME INTRODUCED STRAWBERRY VARIETIES IN THE SKOPJE REGION

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Abstract

Results for yield and productivity per leaf area from 15 introduced strawberry varieties in R. Macedonia: Idea, Camarosa, Belrubi, Evita, Honeoye, Tethis, Chandler, Onda, Miranda, Paros, Elsanta, Eris, Madalene, Favette amd Marmolada and 2 standard varieties: Pocahontas and Senga Sengana are presented in this study. Fruit number and yield and fruit dry matter yield per m2 leaf area were analysed. The experiment was performed on the experimental fields of the Institute of Agriculture – Skopje, in v. Dolno Lisiche, Skopje, on open fields, in two-row lines, with planting distances 40x30 cm, mulched with black foil and drip irrigation system. The results were statistically analysed. The average fruit yield was 77.6 fruits/m2 leaf area. Most fruits were gained from the standard variety Pocahontas (114.8 fruits/m2), then from the standard variety Senga Sengana (114.8 fruits/m2) and the last was Belrubi (51.1 fruits/m2). Negative medium strong correlation between fruit weight and fruit number per m2 leaf area was observed (R= -0,621)
A strong positive correlation between fruit yield per plant and fruit number per m2 leaf area was determined. Correlation coefficients were 0.765 for 2002, 0.753 for 2003 and 0.758 for 2004. The average fruit yield was 0.69 kg/ m2 leaf area. The highest average fruit yield was produced by Honeoye and Pocahontas (92.3 and 89.1 g/m2) and the lowest was gained from Elsanta (40.0 g/m2).
Keywords: strawberry (*Fragaria* Linn.), leaf area, fruitful, yield, dry matter.

Section 7.
GENETICS, BREEDING AND GENETIC RESOURCES

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BREEDING FOR SUPER RICE IN EGYPT

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Abstract

The present investigation was carried out of the Rice Research and Training Center (RRTC), Sakha, Kafr El-Sheikh, Egypt during 2011 and 2012 seasons, to study the genetic variability and heritability of salinity and drought tolerance in two separate experiments The present study comprised 10 local and exotic rice cultivars. The result indicated that under that there were significant and highly significant differences between the mean values of all examined entries regarding all studied characters as affected by the different salinity levels and drought conditions in the two seasons of study. This was expected because of the differences between these entries in respective of their genetic back ground. Under the two conditions most of the investigated characters were deceased significantly except no. of days to heading which increased by increasing salinity levels. These findings suggested that the two entries of Gz1368 and Gz9057 a. level possess salinity tolerance beside a significant degree of drought tolerance and one of them or both could be selected to be grown under salt effected soil or under drought conditions and/or as a donor for these types of stresses in any crossing program towards breeding for Egyptian super rice. The results showed that PCV (phenotypic coefficient of variance) in general was higher than GCV (genotypic coefficient of variation) for various characters. However the difference between GCV and PCV was low for most of the characters studied. This indicates less degree of environmental influence on manifestation of these characters. High heritability coupled with high genetic advance were recorded for number of filled grains per panicle, no. of panicles/plant and grain yield/plant indicated the major role of additive gene action in the inheritance of these character and these characters could be improved by selection in segregating generation. Thus, these characters may serve as an effective selection parameter during breeding program for crop improvement.

Keywords: crop production, rice breeding, super rice, heritability.

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MORPHOLOGICAL CHARACTERISTICS OF FRUITS AND STRUCTURAL ANALYSIS OF YIELDS OF SOME PLUM CULTIVARS

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Abstract

Morphological characteristics of fruit of some plum cultivars was conducted: 'Čačanska lepotica', 'Čačanska Najbolja', 'Čačanska rodna', 'Katinka', 'Top first', 'Tegera', 'Hanita', 'Jojo', 'Elena' and 'Stanley' for the control cultivar. Studies were conducted in the region of Troyan in the climate conditions of the Fore-Balkan. The weight of fruits varied from 20.4g for 'Katinka' cultivar to 47.4g for 'Čačanska Najbolja'. Fruits of 'Čačanska lepotica', 'Čačanska Najbolja', 'Top first', and 'Jojo', exceeded in their size, the control cultivar of 'Stanley'. For all of them the main colour of fruit skin was blue in purple nuances. The content of total sugars in fruits was from 9.40% for 'Čačanska Najbolja' to 11.95% for 'Čačanska lepotica'. According to this indicator, all the cultivars yielded to the control where the total sugars were 11.95%. Structural analysis was conducted of the following cultivars: 'Čačanska lepotica', 'Čačanska rodna', 'Hanita', 'Jojo' and 'Katinka'. The yield was divided in fractions, according to a scale for each cultivar separately – large-sized, average-sized, small-sized and poor quality fruits. For all cultivars, the average-sized fruit fraction had the highest share, as for 'Čačanska rodna' it was 53.6%. The large-sized fruits had the highest percentage of the yield from 'Čačanska lepotica' and 'Katinka' – respectively 25.0% and 32.0%. The studied cultivars covered a harvesting period in the second decade of July till the second half of September. Fruits of 'Katinka' became ripen first, and fruits of 'Elena' were the latest. For the control cultivar of 'Stanley', in most cases fruits reach ripening stage in the end of August.

Keywords: plum, cultivars, morphological characteristics, yield, structural analysis.

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STUDY ON DIVERSITY OF APPLE CULTIVARS IN THE REGION OF TROYAN

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Abstract

This study was conducted on the genetic resources of genus Malus in the region of Troyan and its neighbouring villages in order to determine the main biological properties of local and already established old apple cultivars. The following perspective cultivars with valuable economic properties were selected: Cheshka Momina, Jonathan, Troyanka, Green Newtown Pippin, Reinette du Canada, Limonka, Manastirka, Shekerka, Perusha, Yellow Bellflower, Ayvaniya and Tsiganka. These cultivars were distributed widely in a greater part of the region. Additionally, the following cultivars, represented as single trees, were marked: Stefanka, Bozhechka, Amerikanka, Medena Yabulka, Ostreshka Reneta TSM, Marishnitsa 8/10, Winter Green, Yovovka and Kojesta Reneta. Most of the selected cultivars reached ripening stage in the second half of September and in October. Fruits of Green Newtown Pippin, Yellow Bellflower and Jonathan ripened earlier, whereas Ayvaniya, Tsiganka, Winter Green and Limonka were the latest in ripening. The average fruit weight ranged from 52 g (Cheshka Momina) to 172 g (Perusha). Most of the selected autochthonous cultivars showed an increased resistance to fungal diseases. All of the assessed apple cultivars showed field resistance to powdery mildew. The following cultivars showed low field susceptibility to scab: Ostreshka Reneta TSM, Stefanka, Medena Yabulka, Perusha, Ayvaniya and Shekerka.

Keywords: apple, cultivars, forms, genetic resources, morphology.

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BREEDING OF CEREAL CROPS AT DOBRUDZHA AGRICULTURAL INSTITUTE – GENERAL TOSHEVO, BULGARIA

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Abstract

The climate of Bulgaria is very diverse in spite of its small territory. The soil and climatic conditions in the region where Dobrudzha Agricultural Institute (DAI) is situated are suitable for obtaining high and stable yields from all winter cereals. The breeding program of the institute is aimed at developing high-yielding cultivars of common and durum wheat, triticale, malting and feed barley adaptable to growing under variable soil and climatic conditions. The aim of this investigation is to present the major directions, problems and achievements of the breeding work on the winter cereals at Dobrudzha Agricultural Institute. The results were summarized on several levels: Evaluation of the risk factors for the development, the yield formation and the quality indices; Developing and study on a gene pool of the best world and Bulgarian accessions; Developing of own initial material by using the methods of intervarietal hybridization, experimental mutagenesis and other biotechnology approaches; Developing of a more efficient methodology for field and laboratory evaluation of the breeding materials; Testing of new varieties and production of certified planting material. The portfolio of the institute is quite variable. From the cultivars developed here, 36 genotypes of common wheat and 5 genotypes of durum wheat, 11 triticale cultivars and 5 winter barley varieties have been included in the National Vareital List of Bulgaria.

Keywords: breeding program, wheat, barley, triticale, stress factors, productivity potential.

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DETERMINATION OF ASCORBATE PEROXIDASE GENE EXPRESSION IN THE LENTIL (*LENS CULINARIS* MEDIK) UNDER DROUGHT STRESS CONDITIONS

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Abstract

Ascorbate Peroxidase (APX) is a very important enzyme responsible for the detoxification of ROS family member H2O2 causing cellular damage. In this study, changes in the expression of APXI gene were investigated in the leaves and roots of drought-resistant lentils (*Lens culinaris* M cv Fırat-87) and drought-sensitive lentils (*Lens culinaris* M cv Özbek). For this purpose, lentils grown for 7 days were exposed to drought stress for 6, 13, 20 days without being irrigated. The effect of the stress was determined by measuring the relative water content (RWC). The relationship between drought stress and APXI gene expression was determined by quantitative real time PCR (Real Time qPCR). The increase in the APXI gene expression in the leaves was highest in the Fırat-87 variety on the 6th day (2 fold higher compared to the control plants), whereas a statistically significant increase was observed only on the 20th day of the Özbek variety known to be sensitive to drought. And this increase was relatively low compared to the Fırat-87 variety. Similar to the leaves, in the roots of the Fırat-87 variety, APXI gene expression reached the highest levels on 6th day, but no increase was observed on the 13th and 20th days. In the Özbek variety, unlike to its leaves, APXI gene expression reached the highest levels on the 6th and 13th days, and similar to the Fırat-87 variety there was no increase on the 20th day. In conclusion, in the present study, time-dependent relationship between drought stress and APXI gene expression was investigated in different varieties and tissues. The results of the present studies demonstrate that APXI gene expression is highly variable due to drought-induced stress in the leaves and roots.

Keywords: lentil, drought stress, Real-time qPCR, ascorbate peroxidase I gene.

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BREEDING OF SUNFLOWER (*HELIANTHUS ANNUUS* L.) AT DOBRUDZHA AGRICULTURAL INSTITUTE – GENERAL TOSHEVO

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Abstract

Dobrudzha Agricultural Institute – General Toshevo is the only breeding center for sunflower in Bulgaria. Since its establishment in 1951, over 50 varieties and hybrids of this crop have been developed here. There are more than 15 joint hybrids, the result from cooperation with our European partners, that have been registered abroad. The institute has a rich and variable collection of initial breeding materials. The methods we use in our breeding work are intraspecific, interlinear, interspecific and intergeneric hybridization, experimental mutagenesis, embryoculture, somaclonal variation, in vitro screening and selection. The methods for evaluation of resistance to economically important diseases and the parasite broomrape have been adapted to the working conditions at the institute. Morphological, biological, technological, biochemical and phytopathological characterizations of the released and registered hybrids and their parental lines have been made. Many new materials have been developed during the last decade, which possess valuable breeding properties. Over 6000 inbred lines are involved in the breeding work. Annually, 1400 new hybrid combinations are being tested in Bulgaria and abroad. Hybrids have been developed, which possess very good productivity and adaptability potential, and which have been registered in Bulgaria and in EU and other foreign countries. Some foreign companies included our new hybrids (Velko, Veleka, Yana, Divna, Valin, etc.) in their catalogs and are successfully organizing their seed production and marketing in the respective countries. A new direction of our breeding is the development of sunflower hybrids resistant to herbicides. Several hybrids - Enigma, Sunny imi, Desi, Viyani, Danaya, etc., are now within the system of official testing in Bulgaria and abroad. Their registration is forthcoming. The aim of this investigation was to present the current status and achievements of the breeding work on sunflower at DAI-General Toshevo during the last decade.

Keywords: sunflower, breeding, hybrids, lines, productivity, resistance.

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STUDIES ON SOME QUALITY COMPONENTS IN A LANDRACES COLLECTION TO CLIMBING BEANS (*PHASEOLUS VULGARIS* VAR. *COMMUNIS*)

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Abstract
The study aimed at evaluating a landraces collection to climbing beans regarding some characters that contribute to quality of grains or green pods. The biological material was formed of 56 landraces and 2 varieties of climbing beans from which can be used in food the grains or green pods. The landraces were collected from western and southwestern Romania. The experimentation was performed over three years in a experience type collection, arranged in three repetitions. As elements of quality were determined: the percentage of husks from beans, boiling coefficient, the percentage of the total protein of the beans, 1000 grain weight, the percentage of sugar in green pods. The experimental data were processed by analysis of variance and applying the t-test for determination of differences from the variety 'Aurie de Bacau' used as a control. The collection includes precious populations for all studied characters, but their number is reduced. For the percentage of grain husks and the protein content of grain, the most populations are below that the control variety. For sugar percentage in green pod and the coefficient of boiling, the landraces are similar to control variety. In the collection there are populations that can be processed by selection or can be used as parents in hybridization programs.
Keywords: climbing beans, landraces, quality.

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EFFECTS OF DIFFERENT VARIANTS OF STERILE AND FERTILE PLANTS ON MAIZE HYBRID YIELDS

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Abstract

Maize is exceedingly important field crop regarding both its distribution and sown areas in our country. The possibility of different modes of maize utilisation for food, feed and industrial processing has greatly contributed to the economic importance of this crop. The objective of the study was to perform the trial in particular locations in order to determine the effect of different fertile to sterile plants ratios on yield. The trials were set up according to the three-replicate randomised complete block design in the location of Zemun Polje under dry-land farming conditions. The mixture of different variants of sterile and fertile plants of the commercial hybrid ZPSC 341 was made. Statistical data processing encompassed the following: analysis of variance according to the randomised complete block design, regression and correlation analysis of grain yield and percentage of fertile plants in the hybrid ZPSC 341, with the aim to establish the changes in grain yield in relation to the percentage ratio of sterile to fertile plants. The highest (15.472 t ha-1), i.e. the lowest (14.046 t ha-1) grain yield was obtained with 80% and 5% of fertility, respectively. The coefficient of correlation points out to a poor dependence of the yield and the fertility percentage (rxy=0.101). Based on the coefficient of determination the established percentage of dependence between the yield and the percentage of fertile plants was low (R^2=0.010).

Keywords: cytoplasmic male sterility, maize, yield.

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USEFULNESS OF A LOCUS LEEF1A IN THE GENETIC DIFFERENTIATION OF TOMATO VARIETIES

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Abstract

The molecular techniques provide new possibilities to characterize advanced genetic materials for registration purposes and for the protection of breeders' rights. The microsatellites appear as suitable molecular markers due to their highly polymorphic character. Such microsatellites may generate polymorphism useful for the analysis of genetic diversity and relationships within the genus *Lycopersicon*. The focus of the following study was usefulness of the locus LEEF1Aa in the genetic differentiation among six morphologically different tomato varieties of *Lycopersicon esculentum* Mill. The fragment analyses were done using *Applied Biosystems* DNA analyzer (*ABI 3130*) and *GeneMapper®Software program*. The obtained data were analyzed using the specific program *Power Marker Software*. The number of detected alleles for the microsatellites locus LEEF1Aa was six in estimated tomato varieties (219-221-223-225-227-229 bp). The allele with the length of 229 bp was noticed only in *Lycopersicon esculentum* subsp. *cultum* var. *grandifolium*, while the alleles (221, 225 and 227 bp) in 4 varieties, the allele of 219 bp in 3 varieties and the allele of 223 bp in 2 varieties. The average PIC value for the locus LEEF1Aa was 0.7552 and it belongs to the group of high informative markers. Obtained results showed that the locus LEEF1Aa is good choice for genetic differentiation of tomato varieties in combination with other polymorphic microsatellite loci.

Keywords: DNA microsatellites, fragment analyses, locus LEEF1Aa, tomato.

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CHARACTERIZATION OF CAPRIFIG (*FICUS CARICA* VAR. *CAPRIFICUS*) ACCESSIONS SELECTED FROM VARIOUS LOCATIONS IN THE EASTERN MEDITERRANEAN REGION OF TURKEY

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Abstract

The study was conducted to investigate the some morphological and pollinizer characteristics on caprifig accessions selected from five locations (Adana, Hatay, Kahramanmaraş, Mersin, and Osmaniye) in Eastern Mediterranean region and six standard cultivars (‘Ak İlek’, ‘Armut İlek’, ‘Elma İlek’, ‘Hamza’, ‘Küçük Konkur’, and ‘Taşlık’) from Aydin location in the Aegean Region of Turkey. A total of 22 characteristics included profichi crops of caprifigs were observed in Adana (12 accessions), Hatay (37 accessions), Kahramanmaraş (17 accessions), Mersin (22 accessions), and Osmaniye (9 accessions) locations and six standard cultivars in 2014 and 2015 years. The average fruit weight per profichi crop of the cultivars (30.33 g) in Aydın location and caprifigs (27.41 g) in Hatay location were the highest compared with the caprifigs selected from Adana (23.14 g), Mersin (19.84), Kahramanmaraş (17.57 g), and Osmaniye (16.10 g) locations. The caprifigs in Mersin location had the darkness fruit skin color (Chroma=36.19). The number of gall flowers was highest in cultivars (634.07), whereas the number of male flowers was found to be highest caprifigs (142.41) in Adana location. The pollen viability of caprifigs ranged between 90.51 (Cultivars) and 65.76% (Mersin). The highest of pollen number per profichi fruit were found caprifigs in Adana (824.188). The cluster analysis showed that Hatay caprifigs and standard cultivars and also Kahramanmaraş and Osmaniye caprifigs were partly similar to each other according to morphological and pollinizer characteristics.

Keywords: caprifig, morphology, location, pollinizer characteristics.

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HYBRIDIZATION BETWEEN CULTIVATED SUNFLOWER AND WILD SPECIES *HELIANTHUS BOLANDERI* A. GRAY

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Abstract

Interspecific hybridization was carried out between sterile analogues of cultivated sunflower lines with normal cytoplasm and wild annual *Helianthus bolanderi* accession E-009 from collection of DAI-General Toshevo. Hybrid plants were produced using classical breeding methods and the biotechnological method embryo rescue. The degree of crossability was determined. The obtained F1 progenies were characterized from morphological, biochemical and phytopathological point of view. They were distinguished with diversity of seed oil content. The most variable phenological phases of hybrid plants from all crosses were duration of flowering period and germination. The hybrid plants from crosses 325 A x E-017, 217 A x E-017 and 704 A x E-017 were characterized with higher seed oil content than the other studied crosses. Hybrid forms distinguished with resistance to stem canker, downy mildew and the parasite broomrape were obtained. The hybrid plants, carriers of Rf genes for CMS Pet 1, could be used in sunflower breeding programs for developing restorer lines.

Keywords: hybridization, sunflower, *Helianthus bolanderi*, resistance.

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GENETIC CHARACTERIZATION OF APPLE GERMPLASM RESOURCES FROM COASTAL LINE OF EASTERN BLACK SEA REGION IN TURKEY BY SSRS

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Abstract

Turkey has a diverse apple germplasm, and Northeastern Anatolia region of it had a significant contribution on the domestication of the Malus genus. A lot of local apple cultivars have been successfully grown at the Coastal Line of Eastern Black Sea Region of Northeastern Anatolia without any pesticide applications and despite to high rainfall (900-2300 mm) and humidity (70-85%) for centuries. In this study, the results of genetic analysis by SSR markers of 212 apple genotypes were presented. Total of 234 alleles (average 18) were generated by 13 SSR markers. The average He was 0.859 with a range of 0.775-0.929 and the average Ho was 0.760 with a range of 0.556-0.872. Large genetic variation was detected among the genotypes that genetic similarity extended form 11% to 96%. Several loci yielded three alleles indicating triploidy in 39 accessions. The SSR data, will be valuable for future germplasm management efforts as well as for comparative studies that investigate genetic relationships of apples from Northeastern Anatolia

Keywords: *Malus*, apple germplasm, genetic analysis, molecular markers, SSR.

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POLLEN VIABILITY IN QUINCE CULTIVARS

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Abstract

In this paper, the results of the two-year reserarch (2011-2012) of pollen viability of eight quince cultivars (Leskovacka, Vranjska, Morava, Pazardzijska, Hemus, Asenica, Portugal and Triumph), were presented. Testing of pollen viability was performed using two methods: the staining of pollen with aceto carmine (indirect method) and pollen germination in vitro with sucrose and agar agar (direct method). Studied cultivars were differed significantly in terms of pollen viability. The lowest percentage of stained pollen grains was detected in Leskovacka cultivar (70.29%) and the highest in the cultivars Asenica, Hemus and Triumph (over 90%). Similarly to that, the lowest percentage of pollen germination was obtained in Leskovacka cultivar (62.86%) and the highest in the cultivars Morava, Asenica, and Triumph (over 80%). With the exception of Portugal cultivar, the values of pollen viability determined by staining with aceto carmine were higher for 3-15% compared to the pollen germination in vitro. However, values obtained using these tho methods are highly positively correlated. On the basis of obtained results, the both methods can be recommended as reliable tests for pollen viability of quince, although priority should be given to the method of pollen germination in vitro, because it is more accurate. All tested cultivars are distinguished for high pollen viability, and can be successfully used as male parents in hybridization. In addition, they also can be recommended as a good pollenisers when are planting new quince orchards.

Keywords: *Cydonia oblonga*, pollen staining, pollen germination *in vitro*, breeding.

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STUDIES OF LEAD INFLUENCE ON THE MORPHO-CYTOLOGICAL DEVELOPMENT OF *CAPSICUM* SP.

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Abstract

The present study investigated the effects of lead on morphological and cytological parameters of *Capsicum annuum* L. treated with three different concentrations (10, 50 and 100 ppm) of the metal. The material used for this study was collected from west Romania. Morphological features of the species were made measured the plant parts included: leaf length, leaf width, petiole length, fruit diameter, length and average plant height under the effect of lead. The different treatment variants induced significant changes regarding decrease cells division frequency and an increase of mitotic aberrations. Remarcably, there was a progressive decrease in mitotic indices and increase in the total percentage of abnormalities (chromosomal breaks, chromatin bridges, vagrants chromosomes) due to lead. On the basis of these results, it was concluded that lower concentrations of metal did not significantly affect the cyto-morphology of pepper, while higher concentrations of lead were found to be more toxic and mutagenic.

Keywords: morpho-cytology, lead, *Capsicum*.

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FORMATION OF CENTRAL AND EAST EUROPEAN COMMON BEAN CORE COLLECTION

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Abstract

Common bean (*Phaseolus vulgaris* L.) is the most important edible food legume for direct human consumption in the world as it represents a valuable source of proteins, carbohydrates, dietary fibre and is a rich source of other components with nutritional and health benefits. In the last decade several thousand accessions were collected in different parts of Southern and Eastern Europe and stored in European Gene Banks, including AIS, with approximately 1500 accessions. Multi-crop passport descriptors and seed characteristics of common bean genotypes were used to establish a set of 782 genotypes with distinct phenotypes and covering diverse environments of the studied area. Phaseolin type was determined to classify accessions according to the gene pool of origin. Several different DNA marker techniques were implemented in the project with a goal to clarify genetic relationships among accessions. Based on the collected molecular data we have formed a core collection comprising of 87 accessions originating from different habitats and showing diverse phenotypic and genetic profiles. Nutritional and nutraceutical beans characteristics have not been considered in crop breeding programs so far. Nutritional characterization and evaluation of core collection of common bean accessions will include analysis of crude proteins, crude fibre, elements (minerals), phenolic compounds, antioxidant potential, folates (folic acids), fatty-acids, and nutrient profiling. Screening of core collection for traits of interest will be carried out through implementation of molecular tools, such as functional QTL determined markers. The focus will be on traits associated to our ongoing research (drought tolerance, *Colletotrichum* sp. resistance, nutritional analysis of seeds) and special interests (symbiotic relationships). Core collection will be a robust tool to tackle challenges arising from rapidly changing environment as it will provide materials for evaluation of germplasm, identification of trait-specific accessions, gene discovery, allele mining, genomic studies, marker development, and molecular breeding.

Keywords: *Phaseolus vulgaris*, genetic diversity, nutritional value, abiotic stess, biotic stress.

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APPLICATION OF BIOTECHNOLOGICAL METHODS AT SUNFLOWER BREEDING PROGRAM IN DOBROUDJA AGRICULTURAL INSTITUTE, GENERAL TOSHEVO, BULGARIA

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Abstract

Biotechnological methods used to support sunflower breeding applied in DAI-General Toshevo included gamma induced parthenogenesis, embryo culture, in vitro mutagenesis, somaclonal variation and new molecular methods. Using biotechnological approaches hundreds inbred lines were obtained, distinguished with their valuable agricultural characters and resistance to economic important diseases and parasite *Orobanche cumana*. Lines 10004 R, 10178 R, 10595 R, 10671 R and 10681 R were produced applying induced parthenogenesis method. Mutant restorer line 12002 R was developed by irradiation of immature zygotic embryos with gamma rays. Mutant restorer line 12003 R was developed by treatment of zygotic immature embryos with ultra sonic. All seven lines were included in commercial hybrids.

Keywords: embryo culture, *in vitro*, gamma induced parthenogenesis, gamma irradiation.

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DETERMINATION OF GENETIC VARIABILITY OF EASTERN AND SOUTHEASTERN ANATOLIA REGION TOBACCOS

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Abstract

Tobacco establishing various ecotypes in different ecological zones is one of the crop plants having high genetic variability. In previous years, tobacco ecotypes were conserved by tobacco farming controlled governmentally. But now tobacco sector is privatized. As a result of privatization, companies in tobacco sector have adopted a few ecotypes based on tobacco farming. This phenomenon has increased the risk of extinction for the present genetic variability and now some cultivars are nearly extinct. In this study, conducted to prevent genetic resource erosion, different tobacco ecotypes were determined by visiting the tobacco fields in Eastern and Southeastern Anatolia Region. Some morphological, technique and yield characters of the cultivars were compared by farming them in field via seed. 12 characters of the cultivars were tabulated. Seeds of cultivars, characters of which were determined were delivered to Seed Gene Bank of Turkey.

Keywords: ecotypes, genetic variation, *Nicotiana tabaccum* L.

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IN VITRO PROPAGATION ON SOME *ONOBRYCHIS* SPECIES

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Abstract
Finding and selecting stress tolerant genotypes from rich genetic diversity and propagating them by in vitro techniques is an attractive alternative approach in recent years. Wild *Onobrychis* species have a very rich genetic diversity for adaptation to biotic and abiotic stress conditions. So, in this study a metod for in vitro propagation of some wild *Onobrychis* species was developed to use in vitro selection in further studies. For this purpose, cotyledon nodes of *Onobrychis stenostachya* Freyn subsp. *sosnowskyi*, *Onobrychis fallax* var. *longifolia*, *Onobrychis elata* and *Onobrychis viciifolia* were cultured on Murashige and Skoog (MS) media containing various concentration of meta-topolin (0.5-2 mg/L). The highest shoot number per explant was obtained on media containing 2 mg/l meta-topolin from *Onobrychis fallax* var. *longifolia*.
Keywords: *Onobryhcis* species, tissue culture, meta-topolin.

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GENETIC DIVERSITY EVALUATION OF MACEDONIAN SCARLET RUNNER BEAN (*PHASEOLUS COCCINEUS* L.) LOCAL POPULATIONS

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Abstract
In order to evaluate the genetic diversity of 50 local populations of scarlet runner bean *Phaseolus coccineus*, morphological and productive traits were characterized in two-years trial (2010-2011) in village Crvivci, Kichevo (640m elevation) using randomized block design with 3 replications. According to the *Phaseolus coccineus* Descriptor list (1983), the populations were characterized for 21 qualitative (growth type; leaf color, shape and persistence; color of calyx, wings, standard and open flower; flower bud shape; cross section, base color, curvature, suture strings, wall fibre, position and shape of beak of pods; seed coat pattern, darker color, lighter color, brilliance and shape) and 17 quantitative traits (plant height; number of nodes per stem; length of leaves, pods, flower buds and inflorescence; pod width; locules per pod; number of seeds and pods per plant; number of seeds per pod; mass of seeds per pod and per plant; seed length, width, height and volume). The ANOVA analysis of variance confirmed that all quantitative traits had high total variability, thus showing that the populations represent valuable genetic base for their further improvement. Correlation analysis was performed between fifteen quantitative traits. Highly yield-correlated traits were tested with path coefficient to determine their direct effect on yield. The strongest positive direct effect had grain mass/pod and number of pods/plant. The obtained results will be used for selection of superior populations for commercial production, after evaluation of their stability in different environments. Furthermore, this research will contribute to establishment of breeding program for future improvement of this crop.
Keywords: scarlet runner bean, *Phaseolus coccineus*, local populations, variability, correlation analysis, path coefficient.

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S-GENOTYPING OF SOME SWEET CHERRY CULTIVARS RELEASED WITHIN BREEDING PROGRAMMES IN THE BALKAN REGION

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Abstract

Sweet cherry (*Prunus avium* L.) cultivars generally exhibit S-ribonuclease (S-RNase)-based gametophytic self-incompatibility and require pollination with pollen of compatible genotypes, which are indispensable to stable fruit production. Therefore the determination of S-genotype provides relevant information for sweet cherry breeders and growers. The aim of this study was to identify the S-allelic constitution and incompatibility group in eight sweet cherry cultivars which were named and released at Fruit Research Institute, Čačak, Republic of Serbia (Asenova Rana and Čarna), Research Station for Fruit Growing, Iasi, Romania (Alexus, Bucium and Margonia) and Fruit Growing Institute, Plovdiv, Republic of Bulgaria (Kossara, Rosalina and Rosita). The use of the polymerase chain reaction (PCR) method with consensus primers for the first and second introns of S-RNase, as well as primers specific for S1-S6 and S9 alleles enabled determination of the following S-genotypes in the assessed cultivars: S1S2 (Alexus), S1S4 (Čarna), S2S9 (Kossara and Rosita), S3S6 (Bucium), S3S9 (Asenova Rana and Rosalina) and S5S6 (Margonia). Based on the obtained S-allelic constitutions, the cultivars were assigned to the following incompatibility groups: I, VI, IX, XV, XVI and XLIII. The results generated in this study provide a valuable resource for cross design in developing new cultivar and for orchard management in the efficient high-yielding fruit production.

Keywords: *Prunus avium*, S-RNase, incompatibility group.

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BIOLOGICAL PROPERTIES OF NEWLY-RELEASED AND PROMISING SOUR CHERRY GENOTYPES DEVELOPED AT FRUIT RESEARCH INSTITUTE, ČAČAK

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Abstract

The work on the improvement of sour cherry (*Prunus cerasus* L.) genotypes at Fruit Research Institute, Čačak has been under way since 1960. The major breeding goals are to develop a self-fertile genotypes with consistent yields, superior fruit quality, suitability for industrial processing and fresh consumption, as well as with different ripening time. A special attention has been paid to obtaining genotypes tolerant/resistant to *Blumeriella jaapii* (Rehm.) v. Arx. and brown rot (*Monilinia laxa* /Ader et Ruhl./ Honey ex Whetz.). The main method is planned hybridization within Prunus cerasus. In addition, clonal selection from natural sour cherry populations of Balkan has been applied. The paper presents results of the two-year (2013−2014) study of flowering and ripening time, morphometric properties and biochemical composition of fruits, and field resistance to economically important diseases and pests of newly-recognized sour cherry cultivars [‘Iskra’ (‘Köröser Weichsel’ × ‘Heimanns Rubin’), ‘Nevena’ (‘Köröser Weichsel’ × ‘Heimanns Konserven Weichsel’) and ‘Sofija’ (‘Čačanski Rubin’ × ‘Heimanns Konserven Weichsel’)] and promising genotypes obtained from planned hybridization [II/40 (‘Köröser Weichsel’ × ‘Heimanns Konserven Weichsel’ and V/106 (Köröser Weichsel’ × ‘Heimanns Konserven Weichsel’)] and clonal selection from natural population (‘G-6’ and ‘G-10’), compared to the standard cultivar (‘Heimanns Konserven Weichsel’). ‘Sofija’ and ‘G-10’ can be singled out owing to their early ripening time (beginning of second decade of June), exceptional potential for fruit size (7.20 g and 6.83 g, respectively), well-balanced parameters of biochemical composition of fruits, and field-resistance to causal agents of cherry diseases and pests. Due to the numerous positive biological and agronomical properties, sour cherry genotypes developed at Fruit Research Institute, Čačak, deserve to be given a place in commercial orchards, as well as parents within sour cherry breeding programmes worldwide.

Keywords: *Prunus cerasus*, cultivars, hybrids, pomological characteristics, field-resistance.

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‘SUMMIT’ SWEET CHERRY CULTIVAR ON DIFFERENT ROOTSTOCKS

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Abstract

The goal of this study was to examine the effect of seven cherry rootstocks (‘Gisela 5’, ‘Gisela 6’, ‘CAB 6P’, ‘Alkavo 2’, ‘F 12/1’, ‘MaxMa14’ and ‘MaxMa 60’) on the growth and productivity of ‘Summit’ sweet cherry cultivar. The trees were planted in the spring 2008 at distances of 4.0 x 3.0 m, shaped in freely growing crown and irrigated by spraying over the crowns. Tree vigour (trunk cross-sectional area and crown volume), yield, yield efficiency and fruit quality were recorded each year in the period 2008-2016. The results clearly showed the influence of rootstocks on the trees growth. Nine years after planting the most vigorous rootstock was ‘MaxMa 60’ and the weakest were ‘Gisela 5 and Gisela 6. The highest 4-year cumulative yield per tree was obtained with ‘MaxMa 60’, followed by ‘CAB 6P’ and ‘MaxMa 14’. Rootstocks ‘Gisela 5’ and ‘Gisela 6’ negatively influenced yield and fruit size.

Keywords: trunk diameter, yield, yield efficiency, fruit size.

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ASSESSMENT OF NEW APPLE HYBRIDS

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Abstract

As a result of breeding activity at the Institute of Agriculture in Kyustendil are received a large number of apple hybrids. In the article are presented data for 5 promising hybrids. The study was carried out during the period 2012-2016. The trees are grafted on rootstock MM 106 and planted in the spring 2007 at distances of 4.5 x 2.5 m. Ten years after planting the largest trunk cross-sectional area (TCSA) had the trees of hybrid № 2/30 and the smallest of hybrid № 2/28. The highest average yield per tree was obtained from hybrid № 1/3 (‘Mollie’s Delicious’ – open pollinated) - 25.8 kg, followed by № 1/5 (‘Malus robusta’ x ‘Liberty’) - 24.9 kg. The fruit of № 1/5 were the largest - 230 g. The fruit of hybrid № 1/26 (‘Melrose’ x ‘Kent’) had the highest fruit flesh firmness - 9.05 kg/cm2, while those of hybrid № 2/28 (‘Prima’ x ‘Florina’) and № 2/30 (‘Prima’ x ‘Sekai Ichi’) had the lowest firmness - 7.28 and 7.36 kg/cm2, respectively. The highest percentage of soluble solids (17,8%) and total sugar (8,7%) were contained in the fruit of hybrid № 1/3.

Keywords: TCSA, yield, fruit size, fruit firmness, chemical composition.

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INVESTIGATION ON THE EFFECTS OF THE GENOTYPE X ENVIRONMENT INTERACTION IN SOME NEW BULGARIAN COMMON WINTER WHEAT CULTIVARS

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Abstract

Fifteen new Bulgarian winter wheat cultivars were investigated for ecological plasticity and stability in a randomized experiment in four replications during 2014 – 2016. The applied two-factor dispersion analysis proved the different genetic potential of the group of cultivars according to the investigated indices at the highest degree of statistical significance, as well as of the effect of the climatic conditions. For all indices, the genotype x ecological conditions interaction was significant; this was a necessary prerequisite for applying AMMI models to assess of the ecological plasticity and stability of the cultivars by the investigated indices.

The use of the AMMI models allowed the assessment of the ecological plasticity based on the statistical parameters ASV and of the ecological stability based on the reliability index I. According to the index yield, cultivar Laska demonstrated the highest plasticity and stability, ranking first among all cultivars. According to the complex of all indices, cultivars Laska, Progress, Enola, Bezostaya 1, Kristy and Yantar showed high ecological stability and plasticity.

Keywords: wheat, genotype x environment interaction, ecological stability, ecological plasticity, AMMI models.

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EVALUATION OF GENETIC DIVERSITY FOR AGROMORPHOLOGICAL TRAITS OF WHEAT GERMPLASM

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Abstract
Assessment of genetic diversity in wheat and its further application for breeding can result in enhanced and sustainable production. Wheat germplasm, consisted of 484 genotypes originating from Macedonia, Kazakhstan and Georgia were evaluated in two vegetative seasons (2014/2015 and 2015/2016), on two locations (Skopje and Gradsko). The genotypes were tested in a simple 22 x 22 lattice design experiment, with two replications, in order to assess days to heading, days to flowering, days to maturity, plant height, spike length, number of spikelets per spike, number of seeds per spike and 1000 kernel weight. The obtained data were subjected to PCA (principal component analysis), cluster analysis and genotype by trait biplot analysis. The analyses showed that a significant genetic variability existed among the tested wheat genotypes. The traits accounting for the highest percentage of variability between the genotypes were identified and the genotypes were classified according to the analyzed traits. The results from this study indicated the presence of excellent opportunity to improve the selected genotypes, based on their overall performance, through hybridization
Keywords: *Triticum aestivum*, agromorphological traits, multivariate analyses.

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MOLECULAR IDENTIFICATION OF *OCHLEROTATUS RUSTICUS* FROM TURKEY

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Abstract

Mosquitoes are threatening humans as they are the vectors of devastating diseases. Accurate and rapid identification of these vectors is vital in epidemiological studies of mosquito-borne pathogens. However, the morphological identification of mosquito species can be difficult even for experts. Most morphological characters important for identification can easily be destroyed through the collection process such as trapping, transporting, and even identification. Additionally, the most serious drawbacks of only using morphological keys for species identification is the fact that some traits or characters are apparent only during certain life cycle stages or in one gender. Thus, molecular tools can be applied for species identification in all developmental stages as well as for damaged specimens, and therefore can greatly improve the reliability of species identification. Among mosquito vectors, *Ochlerotatus* is a large highly varied group of cryptic species with similar morphological characters shared by members of species complexes. In this study we presented molecular identification of *Ochlerotatus rusticus* using a short fragment of the mitochondrial cytochrome c oxidase subunit I (COI) sequence serving as a DNA bio-barcode. We analyzed immature mosquito specimens collected from different habitats of Muğla Province, Turkey. A 658 bp region of the COI gene was used as a universal marker in order to identify mosquito species. BLASTn results indicated that ten samples out of 350 specimen belonged to the species O. rusticus and all analyzed COI sequences showed the highest identity of up to 99-100%. Neighbor-joining tree based on K2P genetic distances of sequences from the mitochondrial COI gene of our previously identified *O. caspius*, *O. detritus* and *O. provocans* barcodes and other mosquito species was created. Barcoding a broad range of mosquito species will allow a broader knowledge of the mosquito species and prevalence which is of major importance for an effective control of vector borne diseases.

Keywords: cytochrome c oxidase oxidase subunit I, DNA barcoding, *Ochlerotatus rusticus*, phylogenetic analysis.

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PROMISING BAY LAUREL (*LAURUS NOBILIS* L.) GENOTYPES FROM NATIVE FLORA FOR FRUIT PRODUCTION

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Abstract

This study was conducted to determine bay laurel genotypes with different and high quality characteristics among bay laurel trees which grown intensively in Hatay flora of Turkey. 149 female trees were selected firstly and their fruit aspects were determined. The fruit weights of genotypes were varied between 0.67 and 2.26 g. the fruit lengths were between 11.09 and 24.43 mm and the fruit width were between 8.93 and 14.86 mm. The ovalite coefficient of the genotypes was between 0.96 and 0.49. The stone weight of the genotypes was varied between 0.42 and 1.45 g and stone ratio between 40.38 % and 77.44 %. The dry matter ratio of the fruits were varied between 40.84 % and 74.72 %. the fruit oil ratio were between 18.73 % and 38.04 %. the fruit flesh oil ratio were between 19.96 % and 68.13 % and the stone oil ratio were between 11.49 % and 27.49 %. The fatty acid compositions of the fruits of female trees were analyzed and main compounds were determined. As regards to fatty acids. average value of lauric acid was 16.57 %. palmitic acid was 18.57 %. oleic acid was 38.08 % and linoleic acid was 23.90. As a result. K9. K2 and HB5 labeled genotypes as regards to lauric acid ratio were found to be promising genotypes. The studies should be continuing on these genotypes and the nursery trees of these genotypes should be used in the new plantations of laurel orchards.

Keywords: *Laurus nobilis*, fatty acids, selection.

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DETERMINATION OF SOME MORPHOLOGICAL AND CHEMICAL CHARACTERISTICS OF SARSAPARILLA (*SMILAX ASPERA* L. AND *SMILAX EXCELSA* L.)

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Abstract

Sarsaparilla, belonging the *Liliaceae* family is perennial, wrapping, climber, prickly plant. *Sarsaparilla* is traditionally used in the treatment of rheumatism, rheumatoid arthritis, stomach pain, bloating and skin diseases such as leprosy and psoriasis. These plants carry saponins at their roots and are used among the people because of the diuretic and sedative effect. Two *Sarsaparilla* species *Smilax aspera* L. and *Smilax excelsa* L. shows the natural distribution in Hatay flora. In the study, some phenological and morphological characteristics of *Smilax* species collected from different locations were determined. The plants were also examined in terms of antioxidant capacity and fatty acids. In the study, the highest 100 fruit weights with 37,69 g were obtained the plants of *S. aspera* L. species collected from Yayladağı (Kışlak 2) location and the highest 100 seed weight with 24,47 g from Yayladağı (Kışlak 1) location. In terms of antioxidant capacity of the leaves and fruits, significant differences among the species and locations were not observed. The antioxidant capacity of leaves were changing 1,00 to 1,04 mmol.Fe+2/kg while fruit antioxidant capacity were ranged 1,03 and 1,07 mmol Fe+2/kg. The highest value of seed crude oil with 12,03% were obtained from the plants collected in İskenderun (Suçıkagı) locations. Analysis conducted in fatty acids, vaccenic acid designated as the main component of the *Smilax* oil and the highest rate of vaccenic acid with 32.71% were obtained in the plant of *S. excelsa* L. species collected from Defne (Sinanlı) location.

Keywords: *Smilax excelsa*, *Smilax aspera*, antioxidant, fatty acids.

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POMOLOGICAL AND GENETICAL ANALYSIS OF THREE DOGROSE (*ROSA CANINA* L.) GENERATIVE OFFSPRINGS

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Abstract

Dog rose (*Rosa canina* L.) is a cosmopolitan plant species and a successful colonizer inhabiting a variety of habitats. Its phylogenetic development has not yet been completed and there are difficulties in labeling the species boundaries. Because of its nutritional value, it has potential for use in medicine, cosmetics and the food industry. Because of this, there is an interest in the development of varieties and hybrids and the increase of production in conventional and ecological farming. Three generative offsprings of three indigenous genotypes from different biogeographic regions of Croatia were analyzed on the most important pomology and genetic properties of dog roses. The same samples were analyzed by the molecular-genetic microsatellite (SSR) method to determine the genetic distance and the taxonomic status. The analysis used 23 SSR markers, six of which are descriptive. The used SSR markers and pomological analyzes will be used to determine the level of polymorphism and the degree of genetic distance between the genotypes. Different pomological properties such as fruit length, fruit width, single weight, single-flesh weight, fruit flesh count, shape index and total dry matter were measured on the genotypes of dog roses extracted from natural populations during two vegetation years. Molecular quantitative characteristics of the mentioned genotypes were analyzed by the methods of univariate statistics and presented by standard statistical indicators. For statistical analysis it was used SAS computer program. Using the SSR markers and pomological analyzes, the taxonomic status of Croatian wild-type genotypes and the level of polymorphism and degree of genetic distance between Croatian populations were determined. Among the examined generative offsprings, the level of genetic variability for agronomically important properties was determined.

Keywords: *Rosa* sp., SSR markers, taxonomy.

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BREEDING OF OIL CRUCIFERA IN SERBIA: FROM MENDEL TO MOLECULAR MARKERS

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Abstract

Institute of Field and Vegetable Crops in Novi Sad (IFVCNS) remains the only institution in Serbia dealing with oil crucifera breeding, biotechnology, agronomy, seed production and other forms of research. IFVCNS germplasm collection comprises several different crucifera species, four of which are included in breeding: rapeseed (*Brassica napus* L.), mustard (white *Brassica alba* L. and black *Brassica nigra* L.) and false flax (*Camelina sativa* (L.) Crtz.). All collected accessions of our collection were phenotypically characterized: flower morphology, pollen features and number of chromosomes. While rapeseed has been receiving an increased attention in Serbia during past few decades, camelina has never been a dominant oil crop. In all of the mentioned crops, Mendel's rules are the basis for development of methods in breeding from varieties to hybrids. Systematic use of Mendel's rules has led to significant crop improvement at IFVCNS resulting in development and registration of 12 rapeseed autumn-sown rapeseed cultivars and 1 hybrid, 2 spring-sown rapeseed cultivars and 2 mustard cultivars, while 2 false flax varieties are in a procedure for registration. The conventional methods in breeding are nowadays accompanied by the use of various molecular tools. So far, the most prominent role in assisting the selection of genotypes with desirable traits had RAPD and SSR molecular markers. By combining Mendel's rules, classical breeding methods and the latest developments in the field of molecular genetics and breeding, future progress is expected in the field of oil crucefera breeding with an emphasis on quantitative traits such as biomass, seed and oil yield. Breeding oil crucifera in Serbia has numerous achievements contributing to local and European research and production and may anticipate a much broader integration of the oil crucifera programmes in other West Balkan Countries into the existing research carried out in the European Union to the common benefit.

Keywords: brassicas, rapeseed, camelina, mustard, germplasm collection.

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MOLECULAR EVALUATION OF RUST RESISTANCE GENES IN SPRING WHEAT (*TRITICUM AESTIVUM* L.) WITH SSR AND STS MARKERS

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Abstract

Rusts unconstructively affects the yield and quality of wheat grain as well as forage. Three kinds of rust diseases show aggression wheat crop. These include leaf (brown) rust, stripe (yellow) rust and stem (black) rust. Leaf rust caused by *Puccinia triticina* f.sp. *tritici*, stripe rust caused by *Puccinia striiformis* f.sp. *tritici* (Pst), whereas stem rust is caused by *Puccinia graminis* f.sp. *tritici*. Leaf and stripe rusts can persistently reduce wheat yields in almost 63% and 46% of the wheat growing areas in the world, if susceptible cultivars are grown. Leaf rust can cause up to 25% yield losses where environment is advantageous for its development. Stripe rust can cause 55% yield losses at 90% disease severity, whereas moderate level of stripe rust severity can cause 35-47% yield losses. Breeding of resistant varieties is an economical and environment friendly method to minimize wheat losses caused by stripe rust. DNA markers can significantly assist the selection of parents with rust resistance genes at early stage of plant growth. The present study was conducted to detect stripe rust resistance (Yr), stem rust resistance (Sr), leaf rust resistance (Lr) genes using subsequently reported DNA markers in 40 Pakistani wheat lines included in National Wheat Disease Screening Nursery (NWDSN) and National Uniform Wheat Yield Trials (NUWYT) of 2014-15. Stripe rust resistance gene Yr29 was found in 22 to 35, whereas Yr26 was present in 39 and Yr19 was found in 17 wheat lines studied. Stem rust resistance gene Sr25 was found in 30 to 38 in wheat lines. Leaf rust resistance Lr34 was found in 6-36 wheat lines, whereas Lr14 was present in 12 and Lr60 was found in 37 wheat lines.

Keywords: DNA markers, rust resistance genes.

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CONTRIBUTION OF ALTERNATIVE CROPS TO ORGANIC AGRICULTURE IN THE FUNCTION OF BIODIVERSITY CONSERVATION

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Abstract

In this paper the following alternative crops interesting to be cultivated in Balcan cuntries in order to enlarge the biodiversity are discussed: broomcorn, grain sorghum, proso millet, small and large headed italian millet, canarygrass, buckwheat, oil pumpkin, hemp, flax, tobacco, medicinal, aromatic and spice species as well as amaranth. Alternative crops occupy a relatively small acreage but their contribution to the diversification of field crops production is consi- derable. Natural biodiversity is of high relevance considering the ecosystem stability and productivity. A high level of agro-biodiversity is very important because of wider crop rotations, growing leguminous crops for the nitrogen input, and the need for specific site and system adapted species and cultivars, also when considering special marketing strategies. For the further improvement of the production of alternative crops expanded literature, selected cultivars and innovative production and procesing technologies are necessary. It works best if covering and integrating the whole value chain including wholesalers, retailers, and consumer.

Keywords: organic agriculture, agrobiodiversity, alternative crops, biodiversity conservation, breeding and seeds selection.

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VARIATION OF TECHNOLOGICAL QUALITY COMPONENTS IN WINTER WHEAT GENOTYPES (*TRITICUM AESTIVUM* L.) IN DIFFERENT TWO-YEARS CONDITIONS

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Abstract
Technological quality of wheat is very important for milling and baking industry production. Quality traits determined by genetic and environmental factor and its interaction. The aim of this work was investigation of variability technological quality characteristics (grain protein content, sedimentation volume, dry gluten content, water absorption capacity of flour) in 10 wheat genotypes grown under different environmental conditions. The 10 genetically divergent wheat genotypes (G-35174, G-3046, G-35185, G-3620, G-36522, G-3668, G-36252, G-3606, G-36172, Partizanka) were tested in two year experiment was performed in randomized block design on 5m2 plots and 5 repetitions on the experimental field. In the first year (2005/6) of investigation quality parameters values were different for analyzed wheat genotypes. In average in the ten wheat genotypes quality parameters value were higher in second year (2006/07) than in first year of experiment. The highest sedimentation volume (52ml; 58ml) had genotype G-35174 in both years of investigation. Genotype G-36172 in both years of investigation had the highest dry gluten content (15.00%; 16.24%), grain protein content (14.80%; 15.40%) and water absorption capacity (65.0ml; 64.8ml). The lowest values of investigated quality parameters in both year of investigation had the genotyp G-35185. Compared to the standard cultivar Partizanka, three genotypes had higher values of protein sedimentation volume, three genotypes had higher dry gluten content, two genotypes had higher water absorption capacity, and six genotypes had higher grain protein content.
Keywords: wheat, protein, sedimentation volume, gluten content, water absorption capacity.

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INVESTIGATION ON THE INHERITANCE OF THE TRAITS NUMBER OF SEEDS PER PLANT AND 1000 KERNEL WEIGHT IN SUNFLOWER HYBRIDS

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Abstract

The investigation was carried out during 2013 – 2016 at Dobrudzha Agricultural Institute – General Toshevo. The traits number of seeds per plant and 1000 kernel weight are of primary importance; they influence the increase of yield. This investigation included 8 hybrid combinations and the parental forms involved in the crosses. The additive-dominant relations of the traits were analyzed through the ratio between the parameters d/a. In crosses 217A x 88R, 813A x 97R, 813A x 100R, and 2003A x 98R, super dominance according to the parental forms was observed. Higher number of seeds per plant and 1000 kernel weight was achieved in these hybrid combinations in comparison to the parental forms. Incomplete domination of these traits was found in combinations 217 x RW666 and 217 x 138R.

Keywords: sunflower breeding, inheritance, quantitative traits.

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GENETIC BASE AND METHODS FOR THE USER-CENTRIC OAT BREEDING

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Abstract

The oat breeding at the Cereal Research NP Co. follows successive strategy. After pre-screening process of the basic genetic material from different genotype collections targeted crossing programmes have started. During the last five years 420 oat cultivars, composite lines, landraces and advanced oat lines were examined in micro-plots. The winter, spring or facultative oat genotypes from different climatic regions were parallel tested in the nursery to predict their winter hardiness associated with extra grain, biomass and straw yield capacity. Their germination fitness, frost tolerance, homogeneity, height, resistance to lodging, virus and fungal diseases, slab structure and tendency to shatter were visually characterized. Yield, TKW, threshing properties and the cleaning loss were measured. Analytical tests for specific nutritional components were also done by NIR, HPLC and spectrophotometric ways. The selection of the parents for the targeted crossings was based on the complex analysis of their yielding, quality and resistance parameters. The main targeted oat types fit to the actual market expectation: a) economically grown high-yielding spring cultivars; b) hull-less types for human and bio use; c) oat cultivars for silage and green forage mixtures; d) fodder oats with specific nutritional value; e) high yielding winter oats; f) facultative oats. The outcome of the one-billet selection work is a winter type, high-yielding oat candidate GK A19.14 with strong stem, tolerant to frost and can be recommended to grow even under high input. In comparison to other cereals species, the oat breeding requires lot of care; however, its advantageous specificities can allow shorter breeding time, flexible and multi-way selection to chemical composition and resistance parameters to abiotic stresses.

Keywords: facultative oat, winter hardiness.

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POLYMORPHISM OF GLIADINS IN *TRITICUM DURUM* AND *TRITICUM AESTIVUM* HYBRIDS I. ANALYSIS OF IVA X SKOPJANKA COMBINATION

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Abstract
Wheat quality is determined by the molecular structure of the wheat storage proteins, that controls the pasta and bread-making quality. The composition of gliadins are known to have significant influence on wheat breeding and to the viscosity and extensibility of gluten. At the present study parental wheat genotypes from *Triticum durum* Desf., variety *iva* and *Triticum aestivum* L., and their hybrid progeny of F_2 generation was evaluated by acid polyacrylamide gel electrophoresis at low pH (A-PAGE). Gliadin electrophoretic patterns were determined on the basis of the number, relative mobility (Rm) and relative intensity (Ri) of bands. The genetic models of the different gliadin bands in parents were evaluated on the basis of their segregation ratios of presence or absence of gliadin bands in hybrid generation. Chi-square tests were used for the fit to different gene hypothesis for gliadin components. Independence of gliadin bands and presence of recombination was also conducted. Polymorphism analysis of gliadins confirmed 17 gliadin bands in *iva* and 18 gliadin bands in *skopjanka*. Only, 3 mutual bands (ω31, β63, β68) were found. Twenty nine gliadin bands were different. Only ω and γ regions from Gli-1 locus were analyzed. *Iva* has alleles *m* and *m* in Gli-A1, Gli-B1 locus and *skopjanka* has b, l and k in Gli-A1, Gli-B1 and Gli-D1 locus, respectively. Genetic studies indicate that storage protein genes usually exhibit simple co-dominant inheritance. The results from hybrid progeny showed that, 9 bands (ω15, ω18, ω21, ω22, ω39, ω40, γ48, γ56, γ58) were confirmed to be controlled by two genes and exhibit co-dominant inheritance. Rye translocation is present in parent *skopjanka* and gliadin bands from *l* allele are inherited as blocks. Highest recombination (57,4±6,7%) was observed between gliadin bands ω15/18/21 derived from *skopjanka* and ω22 from *iva*. Hybrid combination *iva* x *skopjanka* has co-dominant model of inheritance.
Keywords: wheat, gliadins, electrophoresis, A-PAGE, inheritance.

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EVALUATION OF THE EFFECT OF THE NEW FRACTION PAIR 1DX1.5+1DY10 ON SOME QUALITATIVE INDICES IN THE PROGENIES OF SYNTHETIC WHEAT VARIETIES (BBAUAUDTDT, 2N=42)

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Abstract
The effect of the new fraction pair 1.5+10, coded by Glu-D1 locus, on the qualitative indices protein, lysine and sedimentation value in synthetic hexaploid wheat varieties was investigated in comparison to common winter wheat standards. For this purpose, in two successive harvest seasons (2013 and 2014), grains from plants of progenies of the synthetichetic xaploid wheat genotypes 106, 107 and 32 were analyzed; preliminary SDS-PAGE analysis determined that they were carriers of the new allele ah inherited from the Glu-Dt1 locus of *Ae. tauschii*. Data were analyzed with the help of descriptive statistics, t-criterion, correlation and regression analyses, which were at the basis of the conclusions made. The obtained results allow the assumption that in the synthetic hexaploid wheat genotypes the new allele ah, coding for the expression of the new fraction pair 1.5+10 in D-genome, has positive effect on the qualitative indices protein, lysine and sedimentation in contrast to the standard common wheat cultivars, which do no carry this subunit.
Keywords: synthetic hexaploid wheats, *Aegilops tauschii*, HMW-GS.

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MOLECULAR CHARACTERIZATION OF BREAD WHEAT GENOTYPES FOR LEAF RUST DISEASE RESISTANCE

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Abstract

Research in 2010 and 2011 under the ecological conditions of the region of Thrace, Hayrabolu, Malkara, Central, Şarköy and the Palace was carried out in five different locations. In addition, 23 different varieties of bread wheat, Tekirdag Agricultural Faculty of the field trial, over one of the fields in the form of the sun's rays pass closed greenhouse with a white cloth, and the other in the same area using the same varieties were grown in open-top Jogging normal field. The sunn pest damage rates in wheat varieties grown in the open area was found range of 6.0. to 0.10 %. The sunn pest damage rates in bread wheat varieties grown in closing area was changed between ranged from 10.37 to 23.17 with a significant increase. Sunn pest damage in two years, respectively, compared to the average of the highest 15, 10, 1, 11 and 16 cultivars were obtained, while the lowest values are 4, 13, 8 and 3 have been varieties. For bread wheat varieties to reveal differences in genotypic varieties according to the results of SDS-PAGE analysis of protein bands ranged from 17 to 21 units, the band in terms of density and molecular weight bands were significant differences among the varieties. Omega protein bands mainly in the varieties distracted, gamma and beta regions, the number of bands was lower, while in Alpha band was observed.

Keywords: sunn pest, SDS PAGE, open and closed area, bread wheat, damage rate.

Section 8.
NATURAL RESOURCES MANAGEMENT AND ENVIRONMENT PROTECTION

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RURAL DEVELOPMENT THROUGHT SUSTAINABLE USE OF NATURAL RESOURCES

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Abstract

The regional project: "Rural Development through Integrated Forest and Water Resources Management in Southeast Europe (LEIWW), is a joint project of the Standing Working Group for Regional Rural Development in South Eastern Europe (SWG RRD) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Lead executing agencies are the ministries competent for agriculture, forestry and water resources, through their membership in the regional organization SWG RRD. The project targets Western Balkan countries/territories: Albania, Bosnia and Herzegovina, Kosovo, Macedonia, Montenegro and Serbia. The program builds regional capacities for sustainable management of forest and water resources within the framework of developing rural areas. As part of the EU (pre) accession process, the countries of South-East Europe are faced with the necessity to harmonize their strategies, policies and legislation with those of the EU and to create the required conditions and capacities for their implementation. Since natural resources management is a cross-border issue, and the EU accession process represents a common framework for the countries, this issue affects, in addition to the national level, especially the aspect of regional coordination and cooperation. The three central fields of activity are 1) Regional inter-sectoral coordination processes at the interface between rural development/agriculture, environment, forests and water, 2) Integration of environmental objectives into national rural development and agriculture policies in line with the targets of EU accession processes, and 3) Planning and implementation of integrated forest and water management in selected cross-border pilot regions. A second focus is placed on developing models for generation and diversification of income from the use of natural resources in cross-border regions.

Keywords: rural development, natural resources management, regional cooperation.

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MODELLING THE ADAPTATION CAPABILITIES OF SUNFLOWER AND WINTER WHEAT TO CROP ROTATION AND POSSIBLE CLIMATIC CHANGE IN THRACE

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Abstract

In agriculture, most changes in atmospheric conditions are uncontrolled factors that are caused by climate change or variability that could have effects in different sectors. Globally, major important sector is agriculture by means of supplying food on Earth. Determination of positive and negative effects of climate change to make provision for possible future conditions could be executed using Crop-Climate models. Developed by the Food and Agriculture Organization (FAO), the AquaCrop is an explanatory Crop-Climate model, which could be used to analyze such relationships between climate change and food productivity. In this research, variations in the growth and yield parameters associated with rotation between the sunflower and winter wheat were investigated using AquaCrop between the periods of 2014 and 2016 in the Kırklareli and Edirne cities, which have specific climates and soil types in the Thrace Region. Moreover, main yield-related outputs of the model have been validated by means of applying variations in some of the field applications together with future climate projections.

Keywords: AquaCrop, simulation, crop rotation, Turkey.

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COMPARISON OF MEASURED AND MODELLED SOIL WATER CONTENT BY SWAP

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Abstract
Agricultural drought is associated with the availability of water in the root zone of crops. In the world, however, continuous measurements of the soil water content in the root zone of the crops are not usually measured. For this reason, the soil water content is modeled during the growing period. Soil water content can be estimated by the crop growth models based on mathematical equations using measured parameters through direct measurement methods. These models vary according to the type of crops and based on various equations and calculations in order to obtain the results. This study was performed by a crop growth simulation model, SWAP (Soil, Water, Atmosphere and Plant) to simulate soil water content for different soil depths (0-30, 30-60 and 60-90 cm). In order to test model simulations and make comparisons, measurements and observations during 2014-2015 growing period of wheat crop from the city of Kırklareli, Turkey were used. According to the comparisons, the relative error was found the highest for near the surface (0-30 cm). Furthermore, with regard to the different climate change scenarios, sensitivity of model was performed.
Keywords: soil moisture, drought, crop growth simulation models.

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SOIL HEALTH IN THE VICINITY OF ZAGREB LANDFILL

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Abstract

Soil health and agricultural production were analyzed in 2012 and 2013 in the area around municipal waste disposal site Prudinec Jakusevec, Zagreb, Croatia. Within the land use analysis, in the radius of about 2 km, based on photo interpretation, and Corine Land Cover 2000 classification, 13 different classes on total area of 3749 .7 ha were diagnosed. Thirteen land use classes were thematically grouped into four major groups: water: 4.97%, forest: 1.59 %, agricultural land: 48.27 %, and city: 45.17 %. It is important to emphasize that agriculture (1810.1 ha) as a branch in the urban area of Zagreb has a very great importance, regardless of the proximity of the landfill. According to the General Soil Map of Croatia (1:50 000) in the investigated area in landfill surroundings, two soil units were classified: calcareous alluvial sandy loam soils and alluvial carbonate, sometimes poorly colluvial loam soils. In the evaluation of soil health 24 soil surface (0-30 cm) samples were taken and analyzed in the vicinity of landfill (agriculture production - 17, grazing meadow - 2, cover soil - 2, inundation of Sava river - 3). Soil pH, EC, organic matter, texture, plant available P and K, carbonate content, total C, N and S, the content of fluoride, chloride, nitrite, nitrate, sulfate, phosphate, sodium, ammonium, potassium, calcium, and total Cu, Zn, Cr, Ni, Pb, Cd, Hg, As, Co and Mo were determined. Results showed that soils are weakly alkaline (~ 7.5) and medium to strong carbonated, with great differences in OM content (1.3 – 10.1) % and texture (sand: 8-50 %; silt: 43 -74 % and clay: 7-23 %) despite relatively short distance between locations. In some soil samples concentrations of Ni, Zn, Hg, Pb and Cd were higher than natural.

Keywords: agriculture, Prudinec, Jakusevec, land use, arable land.

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INFLUENCE OF PRECIPITATION UPON DRAINAGE RUNOFF IN TWO DIFFERENT CLIMATIC REGIONS

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Abstract

The goal of three-year investigations was to determine the influence of precipitation upon drainage discharge (runoff) in two different climatic regions (Croatia and Lithuania) at two different pipe drainage spacings in each region-first region with drainage spacing from 15 m and 20 m and second region with drainage spacing from 12 m and 18 m, calculate soil water balance according to Thornthwaite's method and compare measured drainage discharge and calculated surplus of water in soil. Investigations were carried out at the experimental amelioration site in the central Sava Valley (Croatia) and Middle part of Lithuania, in the period 2009, 2010 and 2011 year, on hydroameliorated Gleyic Podzoluvisol soil and hydroameliorated Hypogleyic Luvisol soil. Research results show that drainage runoff and its duration depended on the amount and distribution of precipitation during the study period. There isn't the difference in total drainage runoff between tested drainpipe spacing in each investigation year, but there are differences in duration of drainage discharge both at the annual and drainpipe spacing. In each year duration of drainage runoff was smaller at drainpipe spacing from 15 m than at drainpipe spacing from 20 m. The calculated surplus of water followed the monthly amounts of precipitation, but in all years were higher calculated data than drainage discharge.

Keywords: precipitation, pipe spacing, drainage runoff, surplus soil water.

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ELECTROCHEMICAL CHARACTERIZATION OF HERBICIDES AT THE MERCURY ELECTRODE

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Abstract
Sorption/desorption processes of the pesticides have a major impact on their fate in the environment. The adsorption of organic compounds at the mercury electrode is an extensively studied model system. Because of its nonpolar and hydrophobic character, the mercury /water interface may serve as good model surface for adsorption of hydrofobic organic molecules. In this work, we have investigated the adsorption behaviour of herbicides (diflufenican, mesosulfuron-methyl, iodosulfuron-methyl-sodium) at the hanging mercury drop electrode (HMDE). Studies were performed using electrochemical methods, i.e. phase sensitive alternating current (AC) voltammetry. The investigated compounds are active substances of the herbicide Alister Grande 190 OD manufactured by Bayer CropScience. Some studies have demonstrated that a mixture of those substances exerted varied effects on the microbiological and enzymatic properties of soil. In our previous, preliminary work, we have investigated the adsorption behaviour of the mixture of herbicide (Alister Grande), too. Investigations were performed in a concentration range from 6.6 μg/L – 0.1 g/L and apparent adsorption isotherm was obtained. The strong adsorption effect was observed for all concentrations range. The stronger adsorption was recorded in diluted solutions, pointing to the prevailing adsorption of more hydrophobic mixture compounds. Permeability of adorbed organic film have been tested by specific electrochemical methods with Cd^{2+} as a electrochemical tool. This work is supported by the project "The Sulphur and Carbon Dynamics in the Sea and Fresh-Water environment" (IP-11-2013-1205 SPHERE).
Keywords: adsorption, adsorption isotherm, electrochemical methods.

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AGRICULTURAL PRACTICES CONTRIBUTION TO THE POLLUTION OF LAKE OHRID

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Abstract
The working hypothesis of this research was that agricultural activities carried out in the vicinity of the lake Ohrid have no impact on the lake pollution. In order to confirm or deny the working thesis a questionnaire was distributed among 150 individual growers in the region of Ohrid, Struga and Debarca, with different distances from the lake and different crops (cereals, vineyards, orchards and vegetables). Separate questionnaire was made for the agricultural pharmacies in the region – 15 in total, in order annual quantities of fertilizers and plant protection products to be estimated. Based on the previous research on the content of nitrogen and phosphorus as well as some residues of the most frequently used pesticides in the past the water from Ohrid Lake is not eutrophic. However, based on the results of our research this situation can aggravate in the future if the total arable land (compared to the current 41%) would be exploited for agricultural activities. Taking into consideration the global trends for increased food production, it can be expected that the percentage of agricultural land will be larger in future. The traditional agricultural practices that are currently used by the growers, in that case will present additional problem. Therefore it is of crucial importance to introduce good agriculture practice and integrated crop management. The main principles of good agriculture practice that are implemented in Macedonian legislation are given as a recommendation. In conclusion, agricultural activities, on the present area and volume, for the time being, do not have significant impact on the pollution in Ohrid Lake.

Keywords: eutrophication, good agricultural practices, plat protection products, fertilizers.

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AGROCHEMICAL INVESTIGATIONS OF SOIL IN THE PRODUCING REGION OF PRILEP AND RECOMMENDATIONS FOR RATIONAL FERTILIZATION

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Abstract

This research started by the end of 2014 at the initiative of tobacco companies in the Republic of Macedonia, with the aim to determine the fertility of soils on which tobacco is grown and, based on results obtained, to make recommendations for proper and rational fertilization. During the three-year investigation, 572 soil samples were collected from a larger number of sites in the Prilep tobacco producing region. Soil samples were tested for the following parameters and methods: pH reaction – electrometrically (ISO 10390), humus content by the Tyurin method, total nitrogen – using modified Kjeldahl method (ISO 11261), carbonates – volumetrically (ISO 10693), available phosphorus and potassium – by Al method, and physical clay - by sodium pyrophosphate method. According to the obtained results and classification, poor humus and nitrogen content was found in 60.14% (344) of samples, medium content in 31.99% (183) and insignificant percentage of samples have low and very high content of these elements. The pH reaction varies widely but is within the limits that are suitable for growing a small-leaf tobacco of the type Prilep. The phosphorus content in soil was very uneven. Very low and low phosphorus content was found in 41.26% (236) of samples , medium and optimum content in 37.06% and significant percentage of soils (21.67%) have high to extremely high content of this element. With regard to texture, the soils are predominantly loamy (85.68%). Fertilization in this region is mainly performed with complex mineral fertilizers 8:22:20 and 8:16:24 that meet the requirements in most of the investigated soils. However, the presence of extremely poor soils, as well as those with high to extremely high supply of nutrients must not be neglected. Therefore, soil analysis and recommendation for proper fertilization are indispensible measures to provide cost-effective and rational tobacco production.

Keywords: soil, fertility, agrochemical parameters, fertilizer recommendations.

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INFLUENCE OF ADSORBED SALTS ON PHYSICAL CHARACTERISTICS AND WATER/AIR REGIME OF MOLLIC VERTIC GLEYSOL

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Abstract

In arid and sub-arid regions, the process of accumulation of salts in soil profile is one of the most common type of land degradation. Main goal of our research was the assessment of salts on soil physical characteristics of mollic vertic gleysol in Pelagonija valley. The total content of soluble salts was determined by conductometer, while the presence of certain anions was determined qualitatively. The lowest values of soluble salts were determined in the top layer of typical subtype of mollic vertic gleysol (0.029%) while the highest content of soluble salts was detected in the subsurface layer of alkaline sub-type (1.152%). Cation exchange capacity (CEC) is highly dependent to the soil organic matter (SOM) content and clay content and vary in the ranges of 13.68 cmol(+) kg^{-1} in the subsurface layer of typic subtypes which have low SOM and clay content, up to 46.61 cmol (+) kg^{-1} in vertic subtypes reach in clay. The content of adsorbed sodium have its highest values in sub-surface layers of saline and alkaline subtype 8.96 cmol (+) kg^{-1}. The content of soluble salts have high impact on soil structure and stability of soil aggregates. A significant increasing of micro-aggregates after wet sieving is observed in saline and alkaline subtypes, which is due to the presence of soluble salts and adsorbed sodium. On the other side, a considerable decrease of macro-aggregates (1-5 mm) of more than 23% in hor. AC of saline and alkaline subtypes.

Keywords: soluble salts, CEC, soil structure, soil aggregates.

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THE COMPARISON OF SOCIAL ATTITUDE REGARDING FOOD WASTE IN HUNGARY AND POLAND

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Abstract

The limitless consumption growth of modern societies induces a significant amount of waste. Humanity consumes 700 times more resources nowadays than it did 100 years ago. This phenomenon is not only the result of increasing population but stands for the wasteful lifestyle of the current society. The same pattern applies to the food consumption trends. The notion of waste is unknown in natural ecosystems, since the output of an organism would always serve as input for another. Considering this fact, the waste of nutrients entirely compromises natural principles and means a more significant problem than other household products turning into garbage. This paper presents a comparative analysis regarding the tendencies of food waste in Hungary and Poland. The two Central-European countries have similar social and economic conditions, yet the consumer awareness and attitude seems more advanced in case of the latter. The present research aims at investigating the validity of this statement and discovering the main drivers behind the possible behavioural differences by employing primary research methods. According to initial results, half of the Hungarian respondents waste food on a weekly basis. Surprisingly, the main attribute in relation with this habit is not the financial situation of people, but rather their education level and the household type they live in. The most conscious Hungarian consumers come from poorly educated families without children.

Keywords: circular economy, food waste, consumer behaviour, Central-Europe.

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MORPHOMETRIC CHARACTERISTICS OF SPRING BARLEY DURING MODEL PAHS CONTAMINATION

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Abstract

The tendencies of benzo[a]pyrene (BaP) bioaccumulation was studied to assess the toxic effects of soil contamination by polycyclic aromatic hydrocarbons (PAHs) with using of spring barley. Studies were conducted on the Haplic Chernozem, virgin, the 0-20 cm topsoil of the State Soil Preserve "Persianovsky reserved steppe", Rostov region (South of Russian Federation) located far from possible contamination sources. This soil revealed the following physical and chemical properties: organic carbon content (Corg)=3.4%; pH =7.3; cation exchange capacity (CEC) = 37.1 mmol(+)/100g; $CaCO_3$ =0.1%; the content of physical clay =53.1% and clay =32.4%. The new method of subcritical water extraction based on subcritical water properties was used for extraction of BaP from soil and plant samples. The morphometric characteristics of spring barley was determined in model experiment with soil spiking by BaP (spiked doses: 0-800 µg/kg dry wt). Condition and doses of BaP during 4 years of model experiment affected spring barley morpho biometric characteristics and level of BaP uptake by plants. Exposure to the growth characteristics containing at least 20 µg/kg caused an induction of inhibitory activity by absorbing BaP root system of plant. In contrast, the total barley length decreased while increased concentration of BaP in soil amid falling increasing of roots length. In soil exposed to the highest doses (> or = 200 µg/kg) had decreased in the total weight of plants and quantity of the sprouted seeds. Quantifiable levels of BaP uptake by spring barley roots exceeded vegetative part more than in 2.5 times in all polluted variants. Thus, the BaP uptake by spring barley from chernozem soil contribute to the bioindication responses during environmental monitoring to assess the impact of exposure. This research was supported by Ministry of Education andc Science of Russian Federation no. 5.948.2017/PP, RFBR no. 16-35-60051, 16-35-00347, Grant of President of Russian Federation no. MK-3476.2017.5.

Keywords: bioaccumulation, model experiment, benzo[a]pyrene, pollution.

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EFFECT OF SALINE IRRIGATION WATER ON SOIL CHEMICAL PROPERTIES

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Abstract

Usage of saline groundwater for irrigation increases the risk of soil salinization and consequently plant salt toxicity. A field survey was conducted at private property, near Novi Sad, Serbia. The investigated soil belongs to loamy clay. Sprinkler system was used for irrigation of tomato cultivar. Irrigation was scheduled on the basis of soil water balance method. The quality of water for irrigation belongs to C3S4, according to U.S. Salinity Laboratory, meaning that the water is high-salinity and very high sodium water, which is generally unsatisfactory for irrigation. Disturbed soil samples were taken before and after irrigation season, as well as from the rainfed plot, by 10cm layers, from the soil surface up to 40cm depth. Basic chemical properties of soil were analyzed: the amount of total soluble salts %, electrical conductivity (dS/m), pH values measured in saturated soil paste and in the water extract, sodium adsorption ratio, the soil's qualitative and quantitative content of cations (calcium, magnesium, sodium and potassium ions) and anions (carbonates, bicarbonates, sulphates and chloride) determined from the water extract. The obtained results showed the increased values of salinity on irrigated variant after season. However, no significant differences were found when compared values prior to irrigation and rainfed variant. This indicates to rainfall-induced leaching due to substantial seasonal rainfall. It can be concluded that there has been no major detrimental effect on soil due to irrigation with saline water, but constant monitoring of soil and water quality is necessary.

Keywords: irrigation, soil salinity, ion bilance.

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INDICATIONS OF POLYGENETIC FORMATION OF SOME CROATIAN STAGNOSOLS

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Abstract

Stagnosols (Pseudogleys) are the most widespread soils in the Pannonian region of Croatia. They largely formed on non-calcareous loess materials. These loess materials probably originated from different sources and were deposited in partially different environments. Hence, the loess-derived parent materials of Croatian Stagnosols may be considered polygenetic. However, Stagnosols on these parent materials seem to have developed primarily by normal (top-down) pedogenesis. In this study, we wanted to investigate if the three Stagnosol profiles, which we studied along the mean annual precipitation (MAP) gradient (700-1100 mm) in the Pannonian region of Croatia, formed by normal pedogenesis. Several morphological soil properties agreed with the MAP gradient. However, pH and base saturation were the only two chemical properties that were in line with the MAP gradient. Clay content and CEC were not in line with MAP mainly due to heterogeneity of loess-derived parent materials across the study area. Mineral compositions of heavy and light mineral associations of the investigated parent materials, which were obtained by modal analysis, confirmed that there was more than one source of loess material in the study area. Most redoximorphic features in each soil profile formed in situ, by pseudogleization as a still active process. Moreover, in each soil profile, vertical distributions of clay, coarse silt, and fine silt indicated top-down pedogenesis. However, high content of organic C at the bottom of one soil profile may be the result of erosion/sedimentation processes. And an unusually high content of clay throughout the subsoil of another profile may be largely caused by sedimentation of loess in a paleo-swamp or some similar (shallow) water body. Given the cases studied in this paper, we concluded that some Croatian Stagnosols should be considered polygenetic.

Keywords: pseudogleys, loess parent materials, Pannonian region of Croatia, forest soils, modal analysis.

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APPLICATION OF METHODS BASED ON SYNCHROTRON RADIATION FOR SPECIATION OF HEAVY METAL IN SOIL

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Abstract
The study is aimed at analyze a local atomic and electronic structure of Cu (II) and Pb (II) ions in the artificially contaminated soil and its mineral components using X-ray absorption spectroscopy methods based on synchrotron radiation. Soil sampling was taken in the 0-20 cm topsoil of the Haplic Chernozem of the South Russia. In a model experiment the samples taken were artificially contaminated with higher portions (2000 and 10000 мg/kg) of nitrates and oxides of Cu and Pb. The experimental X-ray absorption (XANES and EXAFS) spectra at the K-edge of Cu and LIII-edge of Pb were performed at the Structural Materials Science beamline of the Kurchatov Center for Synchrotron Radiation (Moscow) in the fluorescence regime. The features of XANES spectra indicate different orbital transitions in the electron shells of Pb (II) and Cu (II) ions for monoxide and soluble salt, which affect the ion properties and determine the individual structure of the coordination sphere. Analysis of the EXAFS revealed that Cu (II) ions are incorporated in the octahedral and tetrahedral sites of minerals and bonded with humic materials at the expense of covalent bond and the formation of coordination humate copper complexes. Lead ions in soil are incorporated in the positions of the inner-sphere complex replacing some aluminum ions in the octahedral sites. This results in changes the Pb–O distances in Pb-bearing octahedrons. We may suggest that Pb (II) is also sorbed by dimer (Pb–Pb) silicate and/or aluminum groups. The work was supported in part by the Russian Science Foundation, project no. 16-14-10217.
Keywords: XANES, EXAFS, Cu (II), Pb (II), contamination.

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ASSESSMENT OF HEAVY METALS ACCUMULATION BY DIFFERENT HERBACEOUS SPECIES WITHIN THE TECHNOGENESIS ZONE

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Abstract
The aim of the work was to assess the accumulation of Ni, Mn, Cd, Cu, Pb, Cr and Zn by different herbaceous species and soils on the technogenic areas from the results of the 16-year-long long-term monitoring observations. Soil and plant samples were taken annually from monitoring plots on the areas around Novocherkassk power station (NPS) (Rostov region, South of Russia). Vegetative part of such plants as *Ambrosia artemisiifolia* (L.), *Achillea nobilis* (L.), *Artemisia austriaca*, *Tanacetum vulgare* (L.), *Elytrigia repens* (L.), *Cichorium intybus* (L.) was under the study. Heavy metals (HM) in plants were prepared for analyzing by dry combustion at 450˚C. The content of HM in extracts from plants was determined by FAAS. The results showed that the accumulation of HM in plants and soils depends on the distance from the pollutant emission source, the physicochemical properties of soils and the plant species. An increase in the contents of all studied HMs was revealed in the wild plants growing within 5 km from the NPS along the predominant wind direction. The highest absolute content was found for Mn in the soil and for Zn in plants. The contents of HM in plants growing on sandy alluvial-meadow soil were higher than in the neighbouring light clayey meadow-chernozemic soil by 1.2-2.7 times. All the considered plant species were contaminated with Cd, Ni, Pb and Cr. *Achillea millifolium*, *Artemisia austriaca* and *Ambrosia artemisiifolia* accumulate the highest contents of HM in their aboveground parts under technogenic pollution. This research was supported by Ministry of education and science of Russian Federation, project no. 5.948.2017/PCh; the Russian Foundation for Basic Research, project no. 16-35-60055.
Keywords: plants, soil, monitoring, contamination.

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POSSIBILITIES OF APPLYING BIOMASS FOR THE PURPOSES OF ENERGY PRODUCTION AND ENVIRONMENTAL PROTECTION

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Abstract

The aim of the paper is to raise, direct and encourage awareness of the importance of biomass in energy production, as well as to present various possibilities of its use. Increasing demands for energy and growing environmental issues impose the need for energy production from renewable resources. Fossil fuel reserves are finite and their deficit is projected for the coming period. Biogas is one of the renewable resources. The said gas consists of a large amount of methane gas produced by means of fermenting organic substances from biomass, manure or any other biodegradable material in anaerobic conditions. Electricity production from renewable resources on farms needs to meet numerous conditions, such as environmental protection, bio-safety and animal welfare, as well as a series of technical, organisational, construction, manufacturing and economic requirements imposed by this kind of production. The Lazar Company Ltd. from the town of Blace owns a farm with 600 dairy cows, a dairy which processes 60 000 litres of milk per day, as well as an energy production plant based on biogas, with the capacity of 1mW/hour. In addition, special attention is paid to organic farming, where biomass is said to have multiple applications in energy production in the context of a long-term development trends of certain industries.

Keywords: biomass, energy, agriculture, environment.

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CONTENT OF HUMUS OF THE SOILS FORMED UPON LIMESTONES AND DOLOMITES

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Abstract
The soils formed on limestones and dolomites in different locations of the territory of the Republic of Macedonia have been examined. The filed researches have been performed in the course of 2010, 2011 and 2012 during which 52 basic pedological profiles were excavated, 34 of which are Rendzic Leptosol, 13 Chromic Leptic Luvisol on hard limestones and 5 profiles of Rhodic Leptic Luvisol on hard limestones. The genesis of these soils, the evolution, classification, and the chemical properties have been described. These soils are characterized with a profile type O-A-R; A-R; A-(B)rz-R. Rendzic Leptosols are characterized with the highest content of humus in relation to the other soils formed on limestone and dolomite. The subtype organogenic Rendzic Leptosols has highest mean value (19.47%). The content of humus in the Amo horizon amounts to 8.50% on average, and in the cambic horizon (B)rz 5.18%. In the Rhodic Leptic Luvisol on hard limestones, the average content of humus in the Amo horizon amounts to 5.33%, and in the cambic horizon B(rz) it amounts to 2.13%. pH in H_2O in the subtype organogenic Rendzic Leptosols is an average of 6.99, average value of (6.93) belong to the organomineral Rendzic Leptosols. In the Amo horizon with the cambic Rendzic Leptosols is 6.12 and in the cambic horizon (B)rz, 6.68. In Chromic Leptic Luvisols on hard limestones there is decarbonization and weak acidification, due to which the soil solution is weak acidified and in the Amo horizon and (B)rz the average value of pH in H_2O is 6.63. In the Rhodic Leptic Luvisol on hard limestones the average pH in H_2O in the humus-accumulative Amo horizon is 6.94 and in the cambic horizon (B)rz 6.72.
Keywords: humus, soil, limestones, dolomites.

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AGRO-ECOLOGICAL ZONING OF MUNICIPALITIES IN KYUSTENDIL AREA

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Abstract

It has been done agroecological zoning of nine municipalities in Kyustendil area - Bobovdol, Boboshevo, Kocherinovo, Kyustendil, Nevestino, Rila, Sapareva bania, Dupnitza and Treklyano. Agro-ecological zoning is done based on certain environmental characteristics, basic of which are: prevailing soil type; an extreme manifestation of certain climatic factors; altitude; relief features and other. In the presented paper were analyzed and described: weather conditions; soil resources; agronomic suitability of land for organic growing of suitable for the region crops. There were considered the potential threats of soil erosion, acidification and compaction. It was prepared land evaluation regarding the potential for growing grape and fruit, vegetable crops, meadows and pastures.

Keywords: soil type, soil resources, climatic characteristic.

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CONTENT OF HEAVY METALS IN RIGOSOLS FROM THE AREA OF VELES

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Abstract
The scope of the investigations was to determine the quantity of total forms (Cu, Mn and Zn) and available forms of heavy metals (Cu, Fe, Mn and Zn) in rigosols from the area of Veles. Digestion of soil samples was performed with concentrated HCl and HNO_3 in a 3:1 ratio. The available forms of heavy metals were extracted with the DTPA method. Determination of the content was performed on atomic absorption spectrophotometer Agilent 55. The results of the investigation showed that the total zinc contents in all soil samples were lower than the reference value. Total copper content in 3 soil samples is lower than the reference values, while in 5 soil samples had higher contents than reference value, but much lower than intervention value. Total manganese content is lower than the maximum allowed concentration for agricultural soils. The quantities of available copper are in the ranges of low to very high, of iron and zinc is between very low to medium, while of manganese between low to high.
Keywords: soils, zinc, copper, iron, manganese.

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GENESIS, EVOLUTION AND CLASSIFICATION OF THE SOILS FORMED ON LIMESTONES AND DOLOMITES IN THE REPUBLIC OF MACEDONIA

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Abstract

The soils formed on limestones and dolomites in different locations in the Republic of Macedonia have been examined. The soils formed on limestones and dolomites differ in their genesis, evolution and properties from soils formed on other substrates and have a number of specificities. Knowing their genesis and evolution is of great importance, because these soils are formed only on certain substrates (pure and hard limestones and dolomites), whereby all properties largely depend on the parent material. They occupy much of the soil cover of the Republic of Macedonia. Most of them are under high mountainous pastures, some plots are under meadows and fields. They have great importance for the faster development of some industries in the country, forestry, tourism, as well as the agricultural development in the hilly and mountainous underdeveloped areas. The preservation of these soils in the R. Macedonia is especially important due to the higher extent of erosion, forest cutting, fires, excessive grazing, that made these researches even more significant.

Keywords: soil, genesis, evolution, classification.

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EVALUATION OF CROP ALBEDO OF DIFFERENT WINTER WHEAT AND SUNFLOWER CROP ROTATION CULTIVARS AND ITS EFFECT ON LATENT HEAT FLUX

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Abstract
Surface albedo is expressed as the fraction of incoming shortwave solar radiation that is reflected by the surface. Surface albedo is one of the primary factors influencing regional and global climates as well as ecological and biophysical processes especially in the study of water and energy fluxes of ecosystems. In these research areas, accurate determination of net radiation plays a vital role. In this study, it is aimed to determine crop albedo values of six winter wheat and three sunflower cultivars in the northwestern part of Turkey where winter wheat and sunflower production is represented by country's production. It can be seen that crop albedo values are related to crop and meteorological factors like crop phenology, soil moisture. Crop albedo also varies each cultivars of winter wheat and sunflower. Moderate Resolution Imaging Spectroradiometer (MODIS) albedo values and in-situ measurements were compared. In the light of these perspective, albedo is a considerably sensitive parameters and has influence on latent heat flux. Also, comparison between calculated latent heat flux from MODIS data and in-situ measurements were investigated.
Keywords: albedo, winter wheat, sunflower, latent heat flux, MODIS.

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MECHANICAL COMPOSITION AND CHEMICAL PROPERTIES OF CALCOMELANOSOLS AND CALCOCAMBISOLS ON THE JABLANICA MOUNTAIN

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Abstract

In this paper are presented the results of research mechanical composition and some chemical properties of soils formed on limestones and dolomites on Jablanica mountain. On different localities of the Jablanica mountain were excavated 18 basic pedological profiles of calcomelanosols with subtypes: organogenic (5) organomineral (12) and brownized (1) and 4 profiles calcocambisols with a typical subtype. Field and laboratory research were performed according to generally accepted methods in our country and the former Yugoslavia. The content of clay is high and growing from the organogenic to brownized calcomelanosols and calcocambisols. With the evolution of calcomelanosols in brownized calcomelanosols and calcocambisols the humus content decreases. The examined soils are noncalcareous in fineearth but some profiles are established minimum amounts of CaCO3. By the reaction of water calcomelanosols fall into three classes (moderately acidic, slightly acidic and neutral). Hor.A of calcocambisols falls into 3 classes (very strongly acidic, strongly acidic and neutral), while cambic horizon in class (very strongly acidic, moderately acidic and neutral). Total nitrogen content of calcomelanosols is high and ranges from 0.21 to 1.95%. Total nitrogen content of calcocambisols range from 0.31 to 0.56% of hor.A, and from 0.18 to 0.27% of hor. (B) rz. The examined soils are poorly provided with easyavailable phosphorus, while easyavailable potassium are sufficiently secured.

Keywords: soil, clay, humus, pH, total nitrogen.

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FORECASTING CO2 FLUX BY USING SUPPORT VECTOR REGRESSION

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Abstract

Increasing carbon concentration in the atmosphere is one of the main causes of global climate change. Measuring carbon fluxes from different sources such as forest, wetland, urban areas and agricultural areas for different climate conditions to understand ecological systems has great importance. Eddy covariance technique (EC) is one of the most essential tools to conduct such flux study. Besides, it is most used technique, EC station numbers are not still enough to monitor global carbon fluxes precisely. Because of its high cost and field study difficulties, stations are not well distributed over the world. So that, forecasting carbon fluxes via measured meteorological variables such as wind velocity, precipitation, solar radiation, temperature with various technique, namely Artificial Neural Network, Support Vector Regression (SVR) has become popular. SVR, which is nonlinear generalization algorithm, is a state of the art method which has a great capability to understand nonlinear process. In this study, measured carbon fluxes of a vegetation surface via EC were forecasted by using SVR. The results are encouraging.

Keywords: carbon flux, eddy covariance, support vector regression, time series forecasting.

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WATER HOLDING POLYMERS OF THEIR USE IN AGRICULTURAL IRRIGATION

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Abstract

World population is increasing at an alarming rate and expected to the major challenges of the near future. Population growth and the water demand is expected to be 50% higher than today. Using of Water Holding Polymers in agriculture has provided solutions to the problems of the present day agriculture increasing of the soils capacity to store water. Water holding polymers potentially influence soil evaporation and infiltration rates of water through the soils. Particularly, the polymers reduce irrigation frequency and compaction tendency, stop erosion and water run off. This study has been put together the possible effecs water holding polymers in water scarcity on yield and water using of the crops during critical periods of water. Polimers store rainwater in the soil in dry conditions. As a result, this review aimed to given information about the benefits of water holding polymers in the arid and semi-arid regions of the world.

Keywords: agricultural irrigation, water holding polymers, water scarcity.

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EVALUATION OF WATER DELIVERY EFFICIENCY IN IRRIGATION CANAL UNDER DIFFERENT MANAGEMENT STRATEGIES USING HYDRAULIC MODEL

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Abstract

Managing water distribution in irrigation canals aims timely and in needed quantity implementation of supplies of water to irrigated area without excessive spillage i.e at reduced conveyance losses and adequate water use for irrigation of the crops. This article analyzed management practices of water distribution in irrigation canal in view of efficiency. The study was carried out for an existing main irrigation canal. The operational water loss was evaluated by an indirect quantitative approach. Hydraulic simulation model of the irrigation canal was created using hydraulic software HEC-RAS. Changes in hydraulic conditions due to existing structures along the canal course was taken into account in the model. The water conveyance loss was determined by simulation with HEC-RAS model in steady state conditions. The model was used to study the influence of the operating conditions on the the size of losses. Results obtained show the influence of the management practice of the water distribution and operation conditions and maintenance of the canal on the extent of operational losses. The results of irrigation canal hydraulic modeling can be useful in the redesign of the old canals during of reconstruction procedure and for choosing of an appropriate procedure for operational management.

Keywords: management, water losses, steady state, simulation, HEC-RAS.

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SELECTION OF APPROPRIATE TRANSPORT FORMULAS FOR ESTIMATION OF TRANSPORT AND DEPOSITION RATES AT BABREKA CANAL

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Abstract

Siltation is a significant factor, affecting the efficient operation and maintenance of the irrigation canals which influence the hydraulic behavior of the canals and economic benefits of irrigation. In last 25 years a tendency of silting up at the irrigation canals in Bulgaria is observed due to the following reasons: decreased area under irrigation, fluctuation in supply, non-regime section, "berming" of the canal, economic, crime and safety situation. The large number of bed load and permissable velocity formulas available and the significant differences between obtained results enforce selection of appropriate sediment transport formulas in each particular case. Discharge and velocity approach are used in this study for estimation of sediment transport and deposition rates at Babreka Canal, Malka Vitska Irrigation Project in Bulgaria. In this study seven equations for prediction total bed load transport rates and five equations for minimum permissible velocity are compared. The results show substantial differences in performance. Two formulas for total bed load and two formulas for minimum permissible velocity are selected as appropriate for study canal.

Keywords: sediment transport, irrigation canal, Malka Vitska Irrigation Project, Bulgaria.

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ANALYSIS OF ENVIRONMENTAL AWARENESS AMONG SECONDARY SCHOOL STUDENTS IN A RURAL LOCATION

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Abstract

The new generation of young people have different level of knowledge about environmental awareness and environmentally friendly behaviour. The online space is one of they most valuable keys among others which can help to spread this kind of behaviour even more. In this study, secondary school students' awareness of environmental issues and the level of their active participation in environmental activities have been identified either in the online space like how the social media can help in the environmental awareness by the help of smartphone applications. The study was carried out in Gyöngyös city by conducting a survey on students in high school. The results of the study showed a high level of environmental awareness among participant students. Students also gain experiences in the field of environment from mass media, social media.

Keywords: environmental awareness, environmentally friendly behaviour, online space, social media, high school students.

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SOCIAL DIMENSIONS OF ENERGY DEVELOPMENT IN RURAL AREA

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Abstract

Any human intervention in any impact on the environment. The professionals try to complete their work resulting in improvement in quality of life of local communities. Whether city or the countryside, this goal is basically influenced by the economic environment and the local communities who live there with the existing natural conditions, geographical location, one that can be considered the most dominant. The life of the communities, the direction of development of the local governments greatly influence their decisions often determine the situation of the town for years. It plays a key role in the development of the economies of municipalities beyond the protection of the environment, rational management of the resources available. Interventions primarily and directly serve the environmental dimension of sustainability is strengthening, but also indirectly contribute to the promotion of economic growth. The aim of the research is to make a comparative study on the use of renewable energy sources is a municipality of the population. examined attitudes towards the municipality and the public for green energy, and the effects of local energy development on the local community, our primary research.

Keywords: Government, rural development, sustainability, green energy.

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STUDY OF SALINITY AND SOIL TEXTURE ON GROWS PARAMETERS OF *AGROPYRON ELONGATUM* (HOST) P. BEAUV.

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Abstract

To evaluate the effect of soil texture and salinity on speed of germination and growth rate of Tall wheatgrass (*Agropyron elongatum*) experiment in a factorial randomized complete block design with three replications for each treatment was performed. Although this species to drought and alkaline, are relatively resistant. But the interaction of soil texture and electrical conductivity on germination and growth rate is the problem of this study. Treatment of the study include three levels of salinity with zero electrical conductivity (as a control) 8000 and 16000 Micro mhos per centimeter and three soil texture, light, medium and heavy respectively. Results showed that salinity, soil texture and their interaction on germination and growth rate (including time started to grow, time to grow 90 percent) has had significant influence. Increased soil salinity and heavy texture (clay to increase the percentage of sand in soil) both increased germination time and germination time was 90 percent. Growth rate and germination percentage with increasing soil salinity and heavy texture decreased. The maximum germination percentage of 78 percent control less than 65 percent and 16 percent in 8000 and 16,000 Micro mhos per centimeter electrical conductivity, respectively. Germination percentage of 83 percent in light tissue to tissue, 75 percent moderate and 12 percent in heavy tissue decreased. The interaction of salinity and soil texture was a double negative effect. The salinity of 8000 and 16000 Micro mhos per centimeter heavy tissue reduce germination and growth rate were observed. In general, increased salinity and soil texture on the seedling growth rate has had negative effects. When these two factors be considered together, the effect of unfavorable more than when that each factor is alone.

Keywords: wheat grass, seed germination, growth rate.

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POTENTIAL IMPACT OF CONTROLLED DRAINAGE IN ARID REGIONS UNDER IRRIGATED CONDITIONS; KONYA BASIN SAMPLE IN TURKEY

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Abstract

The objectives of a subsurface drain system are to lower shallow water tables and remove excess water from the root zone soil profile. This allows agricultural field operations to take place in a timely manner and prevents crop damage from excess soil water. In practice, drainage systems are usually over-designed, as they are sized for the crop most sensitive to water logging, and also usually have additional capacity to allow for determination of the drainage function over time. Controlled drainage is a practice that allows farmers to control drainage outflows, storing water in the soil profile for use by crop and reducing losses from the system. Controlled drainage is employed to conserve water by reducing drainage outflows, and sub-irrigation is used in dry periods to raise the water table in the field.

Keywords: drainage, controlled drainage, irrigation, water table.

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ADVANCES IN USAGE OF SYSTEMS ANALYSIS TECHIQUES FOR MANAGING WATER RESOURCES IN AGRICULTURE

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Abstract

Systems analysis (SA) receives an emerging interest of both researchers and practitioners in all fields of human activity. A need for systematic assessment and evaluation of engineering and management issues related to water resources within agricultural systems was early recognized. However, only along with developments in ICT it was possible to fully implement SA and reach ambitious goals in water management, agricultural production, inter-sector synergies etc. ICT supported SA applications in various segments of bio-system engineering and at different spatial and temporal scales include: production and installment of facilities and equipment for livestock, design of agricultural structures, usage of renewable energy sources, planning and management of water systems, etc. This is the main reason why we can talk today about precise agriculture, sustainability and robustness of solutions identified by systems analysis and its tools. This contribution puts a stress on the importance of using SA in agricultural studies, particularly in searching for 'best solutions' in water resources uses for agriculture. We comment on importance of using modern techniques such as evolution inspired algorithms, weak optimization models, and sub-optimization and simulation approaches. We also show how the use of heuristics and metaheuristics may help analysts, decision and policy makers to formulate, develop and judge alternatives and their consequences, perform risk analyses and produce wide range of unbiased but soft solutions, easy to handle and evaluate before application. In that course, different concepts and methods are discussed based on experience and lessons learnt in Serbia and Macedonia in few recently completed studies.

Keywords: systems analysis, biosystems, agricultural systems, water resources planning and management, multi-criteria decision making.

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DYNAMICS OF SOIL MOISTURE CONTENT IN DIFFERENT IRRIGATION AND FERTIGATION TECHNIQUES OF PRUNED PEPPER

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Abstract

The primary objective of this study was to determine the soil moisture dynamics in different irrigation and fertigation techniques of pepper. Also, one of the goals of the study was to determine the influence of soil moisture dynamics on pepper yields. For this purpose, three year field experiment was conducted with pepper grown in plastic house in Skopje region during the period of May to September in 2005, 2006 and 2007. Four experimental treatments were applied in this study. Three of the treatments were drip fertigated (D1, D2, D3), while the last one was furrow irrigated with conventional fertilization (ØB). The results obtained from this investigation showed that soil moisture dynamics and pepper yields depends from irrigation and fertilization techniques. Namely, the highest marketable average pepper yield of 71.11 t/ha has been realized in the treatment D1, then comes the treatments D2 with 68.40 t/ha and D3 with 62.61 t/ha, and then come the treatment ØB with the lowest yield or 54.74 t/ha. The low pepper yield in ØB in our study is associated with inadequate soil moisture and nutrient content affected by irrigation and fertilization technique. Furthermore, our results showed that drip fertigation frequency positively affects on soil moisture dynamics and pepper yields. Namely, drip fertigation frequency at two and four days (D1 and D2) resulted in higher yields when compared with drip fertigation scheduled by tensiometers (D3), which is a result of the continuous maintenance of easily available moisture in the soil over the 85% of field capacity. On the other hand, D3 shown more intensive fluctuation compared to D1 and D2. Such fluctuations in D3 are result of irrigation intervals, which in this case wary from eight to nine days at the beginning of vegetation and to five or six days during the flowering and mass fructification.

Keywords: drip fertigation, furrow irrigation, conventional fertilization, pepper yield.

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PHYSICAL-CHEMICAL PROPERTIES OF WATER IN CRNA RIVER IN THE PELAGONIA REGION

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Abstract

The main purpose of this paper is to examine the physical-chemical properties of water in Crna River in the Pelagonia Region. Therefore, four locations along the Crna River in the Pelagonia Region were taken as target measuring points of the physical-chemical properties of water: measuring point 1 (near village Novaci), measuring point 2 (before the inflow of water to the fifth channel), measuring point 3 (Crna River after the inflow of water from the fifth channel) measuring point 4 (Skochivir). The water samples for analysis were taken in January and July in 2012, 2013 and 2014 and the following physico-chemical parameters were analyzed during our investigation: the water temperature (determined with a digital thermometer), turbidity (by turbidimeter), suspended solids, total organic carbon (TOC), biological oxygen demand (BOD), chemical oxygen demand (COD) and dissolved oxygen (determined with UV PASTEL-instrument). From the obtained results in our investigation it can be concluded that the highest average turbidity is noted in measuring point 1 (24,4 mg/L) in July. The highest average BOD is measured in point 3 (14,1 mg/L) in July, as a result of the water inflow from the fifth channel. The lowest average amount of TOC was noted in January in measuring point 1 (2,0 mg/L), while the content of dissolved oxygen in same measuring point show the highest value (11,53 mg/L).

Keywords: pollution, indicators for oxygen regime, turbidity, suspended solids.

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WATER RESOURCES PLANNING AND CLIMATE CHANGE SCENARIOS: USE OF EXPERTS' KNOWLEDGE TO COPE WITH VARIABILITY

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Abstract

Water resources planning is aimed at finding the optimal, effective and sustainable use of water in multiyear horizon. It includes defining different management scenarios, analysis of its implications and selection of most suitable one according to given criteria. All these steps are complex, and usually data, time and effort consuming. Although inevitable, introducing the uncertainties of climate change into analysis makes planning process more complex and may induce considerable variations in runoff scenarios and consequently in vulnerability, reliability or sustainability of the water system. In one recent study, 21 scenarios were created changing the temperature and rainfall which produced very different results. From recent IPCC report two representative concentrations pathways were chosen to assess impact of climate change on water content in the upper soil layers. Uncertainty in models increased also uncertainty in management plans. Since policy and decision makers need robust predictions to decide on, the question of usability of such different results arises. In order to reduce the number of alternative water management plans and increase the ability of policy makers to reach optimal decision, in this paper we analyze several methods of estimating the likelihoods of climate change scenarios through experts' knowledge elicitation. Changed surface water balance will require water resources planning in different sectors, especially in agriculture. Influence of uncertainties of models will be elaborated and quantified. Comparative analysis will reveal advantages and disadvantages of different methods.

Keywords: water resources planning and management, climate change, uncertainty, variability, experts' knowledge elicitation.

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COMPUTING THE SEDIMENT DELIVERY USING THE RIVER BASIN MODEL: A CASE STUDY OF THE S5-1 CATCHMENT OF THE SHIRINDAREH WATERSHED, IRAN

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Abstract
Soil erosion models have been developed to estimate soil erosion intensity and to quantify the volume of sediment, a final result of soil erosion processes. We used the River Basin erosion model of Spalevic, which is based on the Erosion Potential Method of Garilovic to estimate sediment yield from the S 5-1 catchment of the Shirindareh Watershed from the North Eastern Iran. Studied region is prone to erosion as it is subject to long dry periods followed by heavy erosive rainfalls, falling on steep slopes with soils prone to erosion. Average river basin altitude, Hsr, is 1323.90 m; Average elevation difference of the river basin, D, is 254.90 m; Average river basin decline, Isr, is 22.65%, what indicates that in the in the studied river basin prevail steep slopes. Of the total river basin area (13.6 km²), related to the river basin structure, (Xa, is 0.62) mountain pastures are the most widespread plant form, 87%; orchards and shrubs covering 9%; plough-lands, 4%. (A)symmetry of the river basin, a, that is 0.47 indicates that there is a possibility for large flood waves to appear in the river basin. With 2762 m3 yr-1 of sediment yield, and an area-specific sediment yield of 202 m3km-2yr−1, the studied basin belongs to the Iranian river basins with the low sediment discharge. With this study we provided new information about the recent state of the sediment yield of the S 5-1 catchment, of the Shirindareh Basin in the North Khorasan province of Iran in formats that can simplify the management in the watersheds, demonstrating the possibility of Soil Loss Estimation using the River Basin Model.
Keywords: soil erosion, sediment yield, river basin model, watershed.

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DETERMINATION OF THE BIOMASS ENERGY POTENTIAL FROM THE FIELD CROPS RESIDUES (NIĞDE PROVINCE'S EXAMPLE-TURKEY)

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Abstract

Environmental pollution, which does not cause and renewable energy sources, are geothermal energy, solar energy, hydraulic energy, hydrogen energy, biomass energy, marine energy and wind energy origin. All substances that contain carbohydrate components of biomass materials as a basis in the structure, whether vegetable or animal, can be used in a structure. From biomass; physical processes (size reduction, drying, filtration, extraction and briquetting and transformation processes (biochemical and thermochemical processes) with fuel is obtained. In the world; at a rate much less than clean energy production from biomass renewable energy sources are performed. The cultivation of crops occupies a separate place in agricultural areas. In Niğde, that field crops grown are wheat, barley, rye, potatoes, chickpeas, and beans the corn plants. Harvest residues from the production of field crops in Nigde province in the study of the theoretically calculated amount of biomass, the contribution to the economy of the province of Nigde and converted into electrical energy with the potential to meet the electricity needs of the province was calculated. For this purpose, the energy potential of field crops grown in Niğde post harvest waste have been calculated theoretically. The calculation of the plant fields, product quantity and calorific values of dry weight value by using energy potentials (GJ), products of the energy values (MWh) and amounts of biochemical products that may occur from ethanol(lt) have been theoretically calculated. As a result of the study; of energy potential of harvest residues of field crops according to the product type has changed, and in harvest residues of field crops grown in the province is used as a source of biomass energy production if the rate that can meet the energy needs of the province of Nigde has been demonstrated theoretically.

Keywords: field crops, plant residue, energy potential, biomass, Nigde-Turkey.

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TURKEY'S BIGGEST AGRICULTURAL PROJECT GAP AND USE OF SOIL RESOURCES

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Abstract

Soil is the only entity that can not be produced or reproduced by means of artificial means within vegetable production inputs. Soil resources, which are a safe food production environment, come into play in a very long time, but they lose their skills in a short time due to misuse. On the other hand, when there is a need for wider land resources for food needs every day, on the contrary, spatial reductions occur.The world population is expected to be 6 Billion in 2000, 7 Billion in 2011 and 9 Billion in 2050. 98% of this increase is from developing countries and today 840 million people suffer from chronic malnutrition, starvation problems and 1.3 billion people suffer from poverty. The per capita arable land in the world is estimated to be 0.45 hectares in 1960, 0.25 hectares in 1998, and 0.15 hectares in 2050. In Turkey, the agricultural land subsidy is 28,05 Million hectares in 1983, 26,60 Million hectares in 2005, 24,39 Million hectares in 2010 and 23,80 Million hectares in 2013.This decrease in agricultural land is gradually diminishing due to erosion, misuse, pollution. If the amount of agricultural land per capita in our country is 0,54 decares in 1985, 0,45 decares in 1995, 0,37 decares in 2005 and 0,31 decares in 2013. The amount of agricultural land per person decreased by 31% over the 20 years period between 1985 and 2005.Our land, which is one of our most important natural assets after erroneous and improper use, is either eroded due to erosion, industrial and residential use, corruption and pollution, or is inefficient and deteriorated for many years and expensive investments in order to reach old productivity. The problems of our country's lands can be examined in four main groups.

Keywords: GAP Project, soil, economy, irrigation.

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LAND-MINED AREAS AND AGRICULTURAL FIELDS IN SAP REGION, TURKEY

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Abstract

Agricultural land, as large as two Cyprus's total land, in Sanliurfa, Mardin, Kilis, Hatay, Gaziantep, Sirnak regions is currently unproductive because of land mines. Removal of mines from these unattended lands will provide an opportunity for the formation fields suitable for organic agricultural production. Distribution of mined lands, according to the agricultural enterprise scale, to the local growers may lead to establishment of 2-5 thousands of family enterprises. Another specific feature of this land is its suitable climate conditions for early harvesting besides fruit growing, livestock breeding, organic or industrial agricultural production.When agricultural lands are no longer used for agriculture and allowed to recover its natural vegetation, soil organic carbon can accumulate in the soil. Measurements of soil organic carbon and aggregate stability changes under various forms of land use are needed for the development of sustainable systems. Therefore, comparison of soil samples taken from both agricultural and nearby area close to land-mined fields where no agricultural practices have been done since 1956 can be a good approach to evaluate the effects of tillage and agriculture on soil quality.

Keywords: SAP Region, Sanliurfa, organic agriculture, mine.

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CHARACTERISTICS OF WATER FROM FIRST AQUIFER BENEATH HALOMORPHIC SOILS IN THE VOJVODINA PROVINCE, SERBIA

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Abstract

On the territory of the Vojvodina Province, the most common cause of soil salinization is the water in the first aquifer which is frequently saline and/or alkaline above the critical level. In this study, we analyzed water from the first aquifer sampled in locations classified as solonchaks in the soil map of Vojvodina and subsequently classified again into solonchak, or reclassified into solonetz types of soil from the halomorphic order. Processes of desalinization and soil type change have occurred in these locations due to human activities (including the construction of drainage canals). Based on salt or alkali levels above the critical and the quality of water in the first aquifer (especially high to very high sodium levels), it was concluded that there exists a serious risk of secondary salinization and/or alkalization of the root zone of agricultural crops.

Keywords: first aquifer, secondary salinization, solonchak, solonetz.

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WIRELESS SENSOR NETWORK AND DATA ANALYSIS FOR PRECISION AGRICULTURE

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Abstract

The spread of Information and Communications Technologies (ICTs) throughout the food industry reflects its structure. The farms are equipped with sensors (WSNs), drones and camera for monitoring and control of the production process. Sensors will be configured to collect data for various applications. Spatially-enabled mobile sensing technologies will provide detailed analysis of field conditions such as the humidity in different soil layers, the amount of nutrients in the soil, temperature, luminosity, solar visible radiation, rainfall, wind direction and speed, atmospheric pressure, leaf wetness and fruit or trunk diameter measurement (dendrometer). Precision agriculture follows the crop growth cycle in all its steps from seeding, planting, application of fertilisers and pesticides, through harvesting. In this paper we will present our WSN which will contains: Sensor unit (node) - a unit that contains all the sensors for measuring the required parameters and radio transceiver for sending them to the server application, Server application for aggregation and data processing and Client application for review and visualization of measured values. A decision support system (DSS) for whole farm management has the goal of optimizing returns on inputs while preserving resources. To achieve this, we must use the collected raw data and converts it into valuable information with data mining techniques. Data mining applications contains a lot of algorithms, models and techniques that are available to extract valuable information for our decision support system. With predictive modelling, machine learning and data mining techniques, we can also make prediction about the future diseases and use this for better decision support service.

Keywords: crop, sensor unit, data mining, predictive modelling.

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SOIL MOISTURE CONTROL: LITHUANIAN CASE ON EIP OPERATIONAL GROUP

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Abstract

The agricultural European Innovation Partnership (EIP) works to foster competitive and sustainable farming by achieving more from less. Operational Groups (EIP-OG) is meant to tackle a certain practical problem, a need from practice, that may lead to an innovative solution. Therefore, EIP-OG are intended to bring together multiple actors such as farmers, researchers, advisers, businesses. EIP is being implemented under Rural Development Programme 2014-2020, which envisages two stages: comprising selection of projects‘ feasibility studies and selection of projects that will be financed. In Lithuania nearly 75% of the agricultural land was drained up to 1990. However, the drainage intensity required for agricultural production is not the same. While wetness is the major concern, weather conditions vary so that crops periodically suffer from drought stress. Intensive drainage systems often remove more water than necessary during drier periods. Additionally, there is demand to reduce nitrate leaching. In 2015 discussions between scientists, farmers, advisory service were organised and main problems raised by farmers was droughts mitigation and reduction of nutrients leaching by drainage systems. The idea of controlled drainage was introduced and discussed as in such system annual drainage outflow duration can be shorter by 40–62% and nitrate leaching – 20–28% lower. Groundwater table control in single-acting drainage systems is feasible and has a positive hydrological and environmental impact. With aim to demonstrate the credibility of the new approach, engage actors the feasibility study “Soil moisture control” was prepared with main task to understand the available resources and potential, to highlight opportunities in a region and highlight the benefits it might generate to those involved. The outputs of the feasibility study were considered and in 2017 the EIP-OG project “Soil moisture control” started with aim to assess the efficiency and adaptiveness of scientifically based technological measures for soil moisture control.

Keywords: European innovations partnership, agriculture, controlled drainage, bottom-up approach, rural development programme.

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DESIGN OF A REAL TIME IRRIGATION SCHEDULING BASED ON WIRELESS SENSORS AND AGRO-METEOROLOGICAL METHODS

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Abstract

The explosive growth of smart objects embedded with sensors, wireless connected to internet, forming a Wireless Sensor Network (WSN), enables the interaction with the environment including end users. These network provides collection and analysis of data, in our case soil moisture which can be used for irrigation scheduling. Cloud computing, with its high storage and processing capabilities, is used for data collection and storage. This paper presents an automation of the irrigation systems and the assess plants water needs for agriculture, based on the communication between microprocessors based Wireless Sensor and Actuator Network (WSAN). This solution monitors and controls a set of sensors and actuators, respectively, to assess plants water needs. An irrigation management system is of benefit to farmers for efficient water management and decision making. The system presented in this paper is based on agro-meteorological methods for determining when and how much to irrigate. The proposed irrigation system is based on ICT technology, software application, hardware, wireless electronic sensors and control systems for solving irrigation problems in agriculture.

Keywords: irrigation of agricultural crops, cloud computing, soil moisture sensors, Internet of things, ICT technology.

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ATMOSPHERIC AND SOIL DROUGHT IN AGRICULTURAL REGIONS OF SOUTH BULGARIA

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Abstract

Drought is an extreme phenomenon, which affects agriculture. Soil drought occurs when the soil water balance is impaired and this cause deterioration of the physiological state of the plants directly which affects the yields. Due to the climatic features of the country, some of the main agricultural crops in South Bulgaria suffer from insufficient humidity, during the vegetation season, because water reserves in soil are insufficient. High frequency of extreme phenomena, in particular drought, as well as the several of such observed in the first decade of the 21st century in Bulgaria and different parts of the world is a premis for extended monitoring. The forecast of the intensity and the probability of drought acquire high importance. The soil moisture index (SMI), developed by NOAA, determines the drought intensity by assessing the available water for the plants in the soil, relative to the maximum quantity for a given soil type. SMI classifies the agricultural lands by measuring soil moisture values in a crop, which allows the degree of drought to be determined for a particular crop. The Standardized Precipitation Index (SPI) is widely used to assess atmospheric drought. The relative simplicity of the calculations, as well as the few required input data - only a quantity of the rainfalls make it a universal index of assessing moisture conditions. Its application in operational practice is significant. The aim of the study is to asses a connection between occurrence of atmospheric drought and soil drought in the agricultural regions of Southern Bulgaria. For this purpose, (SPI) and (SMI) are used and in the sense of an indicator of impending soil drought during the vegetation period. Representative dry, normal and wet years were selected. The potential for implementation of SPI as an indicator of imminent soil drought has been assessed.

Keywords: Soil Moisture Index (SMI), Standardized Rain Index (SPI), soil moisture, drought, forecast.

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MISUSE OF AGRICULTURAL FIELDS AND ITS EFFECTS: EXAMPLE OF ADANA

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Abstract

The agriculture stands one of the most important sectors of today, like old times. This is not only due to the fact that people living in rural areas have agriculture as a source of income but also because the food security that has an important place in the future plans of the countries. The nutrients needed for human life can be obtained as a result of agricultural resources on nowadays as it has been in the past. One of the primary and certainly the most important resource used in the production of these products is undoubtedly the soil. In the agricultural sense, the soil is a natural entity with a vast community of creatures on it and within it, a source of food and shelter for people, animals and plants. Yet, the soil is a valuable asset that has formed over a very long time, but its improper use may easily give result in a deterioration; and if deteriorated, its recovery takes a period of thousands of years. In summary, the soil is a necessary but limited resource for human life. In this paper, secondary data was used to show misuse of agricultural fields and how it badly affects environment. This study will put down the fact of the misuse of the status of agricultural lands by the effects the industrialization, the urbanization and the other factors in Adana province well-known for its fertile soil with a high potential of agricultural products. From past to present, the agricultural-economic impacts caused by the bringing into use of fertile agricultural areas to other usage areas will be studied to be determined and the solution-focused proposals are tried to be developed.

Keywords: misuse, environment, agriculture, sustainability, extension.

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SOIL AND WATER RESOURCES AS A FUNCTION OF THE AGRICULTURAL PRODUCTION IN THE REPUBLIC OF MACEDONIA

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Abstract

Soil is one of the world's most important natural resources. One of the major soil functions is production of biomass through agriculture and forestry. Some other soil functions (provision of the physical basis for infrastructural development and sourcing raw material) reduce area for agricultural production. Considering that soil has unlimited reserves for biomass production is wrong and soil productivity should be permanently managed. The Republic of Macedonia is considered as an agrarian country, and this further emphasizes the importance and the role of agricultural soil. Agricultural land in The Republic of Macedonia represents 49.16% of its territory in year 2016. Pastures account for 29.17%. Only about 19.95% is arable land and high percentage of it belongs to the lower solvent classes. This modest fund should be managed properly by applying the most efficient agrotechnical and ameliorative measures to protect and improve its productivity. Macedonia is rich in water and currently, water resources are not a limiting factor to the development. The balance of surface and ground water shows that Macedonia has large amounts of water unevenly distributed in space and time. Total annual available surface water resources are assessed as 6.372 billion m^3. 3 There are 37 major and more than 100 smaller reservoirs, with a total live storage of about 1.850 million which provide sufficient water throughout the year. In recent years, we have witnessed the unusual and extreme impacts of weather events in our country, no matter whether they are in the form of floods or droughts. The importance of irrigation and drainage is increasing and analyse of the present state, and plans for the future is required, particularly due to low water use efficiency. With correct and rational management of water resources it is possible to supply all needs in near future.

Keywords: soil resources, soil productivity, water resources, irrigation and drainage, agriculture.

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UKRAINIAN EXPERIENCE OF QUARRIES RESTORATION IN CREATING SUSTAINABLE AGROECOSYSTEMS ON REPLACED MINING OVERBURDEN

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Abstract

Ukraine has a solid experience in creating sustainable agroecosystems on replaced mining overburden. Replaced overburden from strip mining in Ukraine frequently lacks topsoil, making productive use difficult. Soil factors limiting sustainability change with time after replacement and with different types of vegetation. Various sequences of legumes and legume-grass mixtures were used in trying to create a sustainable, minimum-input ecosystem. Five years of alfalfa followed by several years of a legume-grass mixture can prepare the reclaimed land for profitable production. Soil improvement was greater using sequence 1 (4 yr of alfalfa, 5 yr of sainfoin, and 9 yr + 10 yr of legume-grass mixtures with a total of 4 seasons of grains and fallow interspersed) than in sequence 2 (4 yr of alfalfa, 17 yr of small grains, row crops, and fallow, and 9 yr of legume-grass mixture). In 32 years, humus was increased from 0.25 to 1.3 % at 0-5 cm, and to 0.9 % at 0-20 cm. We are trying to determine the species mix, management, and fertilization strategy that will provide the most vigorous and enduring growth of the legume-grass mix, resulting in maximum soil improvement in the shortest time at a low cost and with fewest replanting of the mix. Phytoamelioration of mining overburden replaced without stratification can be accomplished with minimal fertilizer input, but requires many years before field crop production can be sustained. Legume-rhizobium contribute substantial N to current and future N requirements of non-legumes. It appears biological mobilization of phosphorous can be improved by a small initial application of phosphorous and by encouragement of mycorrhizal associations. The annual energy equivalent of accumulated residual phytomass in the replaced overburden was almost equal to that on nearby agricultural fields of natural black soils, but later on was increased by 448 GJ ha-1 (16 to 22%) in subsequent 32 years.

Keywords: quarries, phytoamelioration, mining, grasses.

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CHERNOZEMS CONSERVATION PRACTICES IN UKRAINE

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Abstract

Chernozems are the common soils in Ukraine covering 34 million ha, which account for 62% of all agricultural lands and approximately 78% of these soils have been cultivated. It is estimated that over 8-10 million ha of farmland or 24.6-30.8% of arable lands is degraded and 4.5 million ha of farmland are in the moderate and severely eroded stages. In order to reduce continued increases of chernozems degradation, Ukraine needs to implement conservation tillage and other sustainable land management. The adoption of minimum tillage under winter crops in the South and South-East regions of Ukraine was successful, and about 50% of arable land area is now under minimum till though conventional tillage practices are prevalent in the humid and semi-humid regions of Ukraine on Spodosols and Alfisols, respectively. Our study, has been conducted on a Haplick Chernozem over a 7-yr period showed increasing bulk density, infiltration rate, pH, soil organic carbon concentration, carbon in humic and fulvic acids, and molecular weight fractions humic acids with minimization tillage. Crop rotation can affect soil properties and increase crop production. Percentage of water stable aggregates sized 0.25-7 mm from the Steppe mollisols cultivated with alfalfa was 92.6%, and was decreased to 88.1% in pea, 87.7% in winter wheat, 85.8% in barley, 76.2% in corn, 77.4% in sugar beet, and 74.2% in sunflower. Contour farming is not recommended for areas where the slope is less than 1° and the slope is not long. For the field with 1-7° slopes, common practices are: plowing along the lines of the contours, buffer strips, wide forest belts, contour ridges or channels, mulching and application of an additional 10-15% chemical fertilizers.

Keywords: molissols, chernozem, conservation practices.

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TESTING THE POTENTIAL FOR BIOACCUMULATION OF LEAD (Pb) AND CADMIUM (Cd) IN CERTAIN PLANT SPECIES ON CONTAMINATED LAND

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Abstract
In this study we have investigated the possibility of using plant spacies: nettle (*Urtica dioica*), spelt (*Triticum spelta*), spinach (*Spinacea oleracea*), phacelia (*Phacelia tanacetifolia*) and buckwheat (*Fagopyrum esculentum*), for the remediation of flooded land of basin of river Bosnia and Spreča which is more or less contaminated with heavy metals: cadmium - Cd and lead - Pb. The aim of the research was to determine which mentioned plant species and which of their plant organs are most accumulated with lead (Pb) and cadmium (Cd) on flooded land and whether it is worthwhile technology for remediation of heavy metals that could be used in biomonitoring of soil. In plants and soil samples were found concentrations of lead (Pb) and cadmium (Cd) higher then allowable, as a result of anthropogenic redistribution caused by the flood wave of the river Spreča and Bosnia and excessive emissions from metallurgical and thermal power plant. The results confirmed the hypothesis that some plant species show a high coefficient of phytoaccumulation potential. The highest content of lead (Pb) in the root (2.07 mg / kg) and in above- ground parts (2.64 mg / kg) was found in spinach, and the lowest total content was found in spelt (1.81 mg / kg). The contents of cadmium (Cd) in the root and in aboveground parts (1.22 mg / kg) was found in spinach, and the lowest was found in buckwheat (0.22 mg / kg). Presented results of these studies, especially interaction effects of the investigated metals and plants species, have exact significance for the improvement of methods of phytoremediation.
Keywords: contaminated soil, plant species, bioavailability, heavy metals, accumulation, phytoremediation.

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INOCULATION OF MULTI-TRAITS BACTERIA BASED BIO-FORMULATIONS ON YIELD AND ENZYME ACTIVITIES OF TEA IN ACIDIC SOIL 1

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Abstract

The objective of this study was to evaluate possible effects of mineral fertilizer (NPK), one commercial and three N2-fixing, P-solubilizing and/or ACC deaminase-containing bacteria based bio-fertilizers in triple strains combinations (BFK9: *Bacillus megaterium* 47/9+ *Paenibacillus macquariensis* 69/6 + *Pseudomonas fluorescens* 9/7; BFK10: *Bacillus megaterium* 66/5 + *Paenibacillus macquariensis* 38/2 + *Pseudomonas fluorescens* 9/7; BFK11: *Bacillus simplex* 6/4 + *Pseudomonas putida* 3/10 + *Burkholderia pyrrocinia* 13/4) were evaluated for their growth and enzyme activities of tea under acidic soil conditions, in three years. The experiment was conducted in a completely randomized design with six treatments and four replicates (each having five tea bushes). Bio-fertilizers formulations stimulated overall plant growth, including leaf area, green leaf yield, chlorophyll content and enzyme activities in tea. However, plant-growth responses were variable and dependent on the bio-formulations, enzyme activity, and growth parameter evaluated. In addition, inoculation with bacterial formulation, activities of the different enzymes like glutathione reductase, glutathione S-transferase, glucose-6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase, polyphenol oxidase, peroxidase, urease, 5-dehydroshikimate reductase, and alcohol dehydrogenases also changed. Since rhizobacteria-based bio-formulations inoculation caused a differential increase in leaf defence and quality-related enzymes like alcohol dehydrogenase and polyphenol oxidase activity, as well as activation of other enzymes, this may indicate that activation of these enzymes in tea leaves would be differentially affected by different formulations. The selected effective acid-tolerant multi-traits bacteria based bio-formulations could play an important role in understanding the plant tolerance and adaptation to stress, processing technology, and may contribute to the concept of the quality of tea products. Inoculation of bio-fertilizers formulations in acidic soil resulted in significant increase in the growth of young tea bushes and helped in the reduction of the use of mineral fertilizers application in tea orchard soil.

Keywords: *Camellia sinensis* L., bio-fertilizers, yield and quality, plant growth promoting rhizobacteria.

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COMPARISON OF MODELS' PERFORMANCE IN DETERMINING THE EFFECTS OF CLIMATE CHANGE ON THE YIELD IN THE THRACE REGION OF TURKEY

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Abstract
Agricultural production is extremely critical in terms of sustainability of the human life. For this reason, it is especially important for decision-makers to know how future possible climate change may affect agricultural production. Because these effects have some social and economic influences. One of the most important tools used for predicting the effects of climate change on agricultural production is the models that simulate the crop development taking place in soil, plant and atmosphere. There are different modeling approaches in the world. For this reason, the same results cannot be obtained even if the same inputs such as meteorological, soil, crops, etc. are used. By some calibrations, models can be used to predict the future. This study represents one of the first aforementioned steps taken at a location in the Thrace Region by means of investigation of the possible future variations in maize yields. All necessary input data in models such as meteorological, soil, crop and agricultural management information were collected and recorded directly using an agrometeorological station and observations. Then, calibration procedure was applied to two crop growth models, namely DSSAT and WOFOST by considering one recent growing season (2009-2010) of the selected maize field in the Kırklareli city of the Thrace. Later, the calibration is repeated also for the representation of long term (1975-2010) mean maize growth of the field. Finally, the outputs of a regional climate model (RegCm4) were adapted into crop models for the estimation of the future periods between the years 2013 and 2040. In this study, the predictions of models will be presented.
Keywords: yield, maize, crop growth simulation models, Thrace.

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VARIATION OF ECOSYSTEM RESPIRATION FOR WINTER WHEAT IN KIRKLARELI, TURKEY

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Abstract
Climate change is a result of global warming and therefore greenhouse gas accumulation in the atmosphere. In climate change, where human beings are the biggest influence, there are emission and sink sources of greenhouse gases. Unlike energy and industry sectors, agriculture has a role both sink and emission the greenhouse gases to and from the atmosphere. However, it cannot be said that there is enough research on the amount of greenhouse gas released in the atmosphere at agricultural areas in the world and these studies are homogeneously distributed. Crops have also increasing effect on the atmospheric carbon dioxide concentration. In this study, CO2 exchange by ecosystem respiration over a winter wheat field was measured and analyzed in Kırklareli city located in the Thrace region of Turkey to estimate the carbon dioxide fluxes of winter wheat using the Eddy Covariance method during the growing season and after the harvest.
Keywords: CO2 exchange, respiration, winter wheat, carbon sequestration.

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EFFECTS OF BACTERIA ON GROWTH, YIELD AND MORPHO-PHYSIOLOGICAL BEHAVIOUR IN SUGAR BEET UNDER DIFFERENT WATERING REGIMES

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Abstract

Drought stress may affect the yield and sucrose accumulation of sugar beet by restricting leaf and root growth. Two experiments were conducted in order to investigate the effect of nine ACC deaminase-containing, IAA-producing, N2-fixing and/or P-solubilizing bacteria, on the growth, yield, chlorophyll, macro- and micro-nutrient content, and selected morphological and physiological parameters of sugar beet, under five watering regimes (150, 100, 75, 50, and 25% of water-holding capacity: WHC). The experiment was set up in two sets; and the first set was harvested after 65 days and the second set was done after 130 days. Inoculation with multi-traits bacteria stimulated overall plant growth, including sugar content, fibrous and storage roots development, dry root and leaf yield and the leaf chlorophyll contents, and macro- and micro-nutrient uptake, which might partly contribute to the activation of the processes involved in the alleviation of the effect of water stress. According to the results, at the level of 75, 50 and 25% of WHC under water constraint, beet yield parameters *Pseudomonas putida* RC310, *Bacillus subtilis* BS6/3, *Bacillus subtilis* R3/3, *Pseudomonas fluorescens* T26 and *Variovorax paradoxus* RC21 bacterial inoculation was found effective. As an average of the five water regimes, bacteria inoculation increased dry storage root weight by 0.3-41.5% and 2.1-45.6% at the first and second trials, whereas, mineral fertilizers (NP) increased root weight by 20.2 and 31.8%, respectively, compared with control. Moreover, drought stress in sugar beet plants was alleviated partially by the inoculation with PGPR strains. Our results provide strong evidence that the role of PGPR in the performance of sugar beet plants in stressful environment of soils not only the improved plant growth, yield, and macro- and micro-nutrient content, but also the alleviation of water deficit and waterlogging stress.

Keywords: water deficit and waterlogging stress, nutrients uptake, plant growth promoting bacteria.

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PHOTOSYNTHESIS OF VEGETABLES AND FIELD PLANTS IN RESPONSE TO BIOCHAR TREATMENT

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Abstract

The requirements of modern agriculture include besides obtaining maximum yields of crops also maintaining and improving soil fertility and environmental protection. In recent years, interest of usage solid phase (charcoal or biochar) obtained by pyrolysis as soil improver, increases.Biochar is a solid material obtained from the thermo chemical conversion of biomass in anoxygen-limited environment. Additions of biochar to soil have generally been shown to be beneficial for growing crops. From an agronomic perspective it is suggested that biochar could improve soil health by increasing nutrient retention. The present pot experiment was conducted to investigate the effect of biochar application on the plants photosynthetic activity. The experiment was carrying out on two soil types, treated with different BC ratio. The plants grown on cinnamicpseudopozolic soil show a high content of plastid pigments in comparison with these on alluvial meadow soil. The aim of study is to evaluate the biochar agronomic impact on the plants growth, development and quality indicators.

Keywords: chlorophyll content, brix, plant development.

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BIOLOGICAL CONTROL OF BACTERIAL SEEDLING BLIGHT OF WATERMELON USING BACTERIAL ANTAGONISTS

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Abstract
Turkey is one of the significant watermelon producer around the world with almost four million tonnes per year. Bacterial fruit blotch caused by *Acidovorax citrulli* is a destructive disease of watermelons. The bacterium causes water soaked lesions on cotyledons resulted in seedling blights under high humidity and warm conditions in nurseries. Due to lack of efficient chemical control, copper based fungicides as disease protective compounds are in use for disease management both in nurseries, greenhouse or field productions. Since the seeds are primary inoculum source, biological, chemical or physical seed treatments were studied for years. In this study, the efficacy of eight bacterial antagonists (Antg-12, Antg-57, Antg-97, Antg-101, Antg-189, Antg-197, Antg-198 and Antg-273) on disease development were evaluated in greenhouses. The experiment repeated twice. The pathogen and bacterial antagonists were sprayed onto watermelon leaves and disease severity scored using 0 to 9 scale. According to mean of two experiments, seven antagonists reduced disease development between 45-82%, except Antg-189. The study suggested that three bacterial antagonists (*Pseudomonas oryzihabitans* strain Antg-12, *Curtobacterium flaccumfaciens* strain Antg-198 and *Pseudomonas fluorescens* strain Antg-273) can be included into integrated disease management of bacterial fruit blotch. Combined treatments of those three bacterial antagonists on bacterial fruit blotch is under progress. This study was financially supported by Cukurova University Scientific Researches Unit with the ID:ZF2012D16.
Keywords: *Acidovorax citrulli*, fruit blotch, biocontrol.

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ANTIBACTERIAL ACTIVITY OF PLANT ESSENTIAL OILS ON BACTERIAL SEEDLING BLIGHT CAUSED BY *ACIDOVORAX CITRULLI*

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Abstract
Watermelon is one of the most grown and consumed vegetable crop in Turkey. Watermelon seedling blight agent, *Acidovorax citrulli* is a destructive pathogen of watermelon growing areas throught the world including Turkey. Symptoms on cotyledons and fruits are water-soaked, brown, sunken, necrotic spots or large necrotic lesions. In most countries where it occurs, *A. citrulli* seems to appear sporadically but it can lead to very severe losses when climatic conditions are favourable. Disease management strategies are mainly based on the use of uncontaminated seed lots and application of copper-containing fungicides. In this study, twelve individual plant essential oils from *Citrus sinensis*, *Eucalyptus* sp., *Foeniculum vulgare*, *Juniperus* sp., *Laurus nobilis*, *Lavandula angustifolia*, *Lavandula stoechas*, *Mentha* sp., *Pimpinella anisum*, *Rosmarinus officinalis*, *Syzygium aromaticum* and *Thymus* sp., were tested for their antibacterial activity on bacterial seedling blight *in vitro* conditions using paper disc method. All essential oils except lavender inhibited *A. citrulli* development in petri appearing clear inhibition zones. The inhibition zones ranged from 2 mm to 36 mm, in which, *Thymus* sp., essential oil exhibited the highest pathogen inhibiton. These treatments showed the potential for essential oils use in the control of this pathogen in the frame of an integrated disease management strategy. Further studies are required to evaluate their potential in planta.
Keywords: watermelon, inhibition, antimicrobial, efficacy.

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CROSS INFECTIVITY POTENTIAL OF *COLLETOTRICHUM GLOEOSPORIOIDES*, THE CAUSAL AGENT OF LEMON ANTHRACNOSE, IN THE MEDITERRANEAN REGION OF TURKEY

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Abstract

Colletotrichum gloeosporioides causes anthracnose in both preharvest and postharvest season on several plant species in tropical, subtropical, and temperate regions. The objective of this study was to test the ability of *C. gloeosporioides* isolated from lemon in Mersin province of Turkey. *C. gloeosporioides* isolates were identified using morphological characters and confirmed with multilocus sequence analysis. Mature fruits of lemon cv. Kütdiken, apple cvs. Golden, Starking delicious, Amasya, pear, banana, and avocado were used to assess the cross infectivity of *C. gloeosporioides* lemon isolate. Each fruit was spot inoculated with single spore isolate of *C. gloeosporioides*. Disease severity of fruits infected and the diameter of lesions were recorded. Fifteen fruits from each crop were sterilized by dipping in 2% NaOCL for 2-3 min, and wounded 5 mm in diameter. The spore density of *C. gloeosporioides* was adjusted to a concentration of 1×106 spore/ml, and inoculated to wounded fruits using the wound/drop method. Control fruits were only treated with sterile distilled water. All fruits were incubated in humid chambers for 48 hours at 25°C. After incubation, fruits were taken out from moist chambers. Lesions were observed 15 days after inoculation. The disease severity on apple cvs. golden, starking delicious, Amasya and pear fruit by lemon isolate of *C. gloeosporioides* was 100%. But, disease severity on banana and avocado, respectively, occurred as 80% and 70%. Average maximum lesion size was 40 mm for lemon fruit. The mean lesion sizes (mm) on other fruits were 33 for golden, 27 for Starking delicious, 30 for Amasya, 30 for pear, 25 for banana, and 25 for avocado. In result, lemon, apple, and pear fruits were the most susceptible, and banana and avocado were least susceptible to *C. gloeosporioides*.

Keywords: cross infectivity, *Colletotrichum gloeosporioides*, lemon.

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EMPLOYMENT OF MALDI-TOF MASS SPECTROMETRY FOR IDENTIFICATION OF ANTAGONIST AND PLANT GROWTH PROMOTING BACTERIAL ISOLATES

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Abstract

The development and application of new techniques for microorganism isolation and identification are of importance in order to determine the most appropriate disease management strategy. As well as molecular techniques, matrix-assisted laser desorption/ionization time of fligt mass spectrometry (MALDI-TOF MS) has been developed as a new method for the rapid identification of pathogenic and non-pathogenic bacteria. Over the past few years, MALDI-TOF MS has been used in specific studies that have essentially its ability to identify different bacterial genera mainly in medical, food and environmental sciences. Recent researches have led to the possibility of biological control as a realistic option for the management of plant pathogens. Biological control provides an environmentally safe alternative to chemical control. Antagonist and plant growth promoting bacterial (PGPB) isolates have been found to protect plants against diseases through their potential to serve as: source of agro-active plant growth-promoting bio-fertiliser and bio-pesticide for plant diseases. This study evaluated potential use of MALDI-TOF MS for the identification of putative antagonist and PGPB isolates obtained from the surface as epiphyte and interior of the roots and stems of several healthy plants species. Using morphological, biochemical tests and MALDI-TOF analyses system, these bacterial isolates were identified as species belonging to *Serratia*, *Pseudomonas*, Burkholderia, *Microbacterium*, *Bacillus*, *Enterobacter*, *Rhizobium*, *Arthrobacter*, *Ochrobactrum*, *Micrococcus*, *Stenotrophomonas* and *Pantoea* genera. Consequently, based on the primarily results of in vitro antagonism assays against different plant pathogenic disease agents, these putative antagonist bacterial isolates appear to be a good source of potential biocontrol agents against several seed-borne, soil-borne and foliar plant disease agents.

Keywords: MALDI-TOF, antagonist, biological control, plant diseases, PGPB.

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BIOCONTROL POTENTIAL AND MODE OF ACTION OF SERRATIA MARCESCENS AGAINST SOIL-BORNE FUNGAL PATHOGENS OF CYPRESS TREES

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Abstract

In developed and developing countries, chemical pesticides have been proved to cause adverse environmental effects and result in health hazards to humans, besides other beneficial microorganisms. Biological control of soil-borne plant pathogens is also a potential alternative for using of chemical pesticides. Bacterial antagonist is responsible for biological control and may function by antibiosis, competition or parasitism. The rhizosphere is the first-line defence for roots against by fungal plant pathogens. Therefore, there is an excellent opportunity to find bacteria which are potential biocontrol agents in the rhizosphere. *Serratia marcescens* is widely expoited as biocontrol agents because of its efficacy against various plant pathogens. Fungal diseases caused by *Macrophomina* spp., *Fusarium* spp. and *Pestalotiopsis* spp. are important factors reducing seedling production of several cypress trees, particularly in forest nurseries. These fungal disease agents are the most common fungal diseases of conifer seedlings causing root rot and wilt diseases. The complexity of these diseases and the variety of pathogen races has led to the indiscriminate use of fungicides for their control in forest nurseries. In this study, *Serratia marcescens* was isolated from rhizosphere of cypress trees and identified using biochemical tests and MALDI-TOF MS identification system. Its potential to control the growth of *Macrophomina phaseolina*, *Fusarium oxysporum* and *Pestalotiopsis funerea* was assessed in vitro by dual plate. *S. marcescens* was more effective in inhibiting mycelial growth of *P. funerea* (56.12%) than *M. phaseolina* (52.78%) and *F. oxysporum* (34.67%). *S. marcescens* was found to be an efficient biocontrol agent of *Macrophomina phaseolina*, *Fusarium oxysporum* and *Pestalotiopsis funerea* in dual plate. Antifungal volatile compound(s), siderophore production and phosphate solubilisation were determined as possible mode of action of the antagonist isolates against fungal suppression detected in vitro conditions.

Keywords: antagonist, siderophore, cypress, biological control, soil borne fungal pathogen.

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IN VITRO EVALUATION THE EFFECTIVENESS OF NEW FUNGICIDES FOR CONTROL OF *RHIZOCTONIA SOLANI* IN TOBACCO SEEDLINGS

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Abstract

Healthy and quality seedlings is the base of successful tobacco production. But the damping off disease of tobacco seedlings caused by the pathogen *Rhizoctonia solani* causes a huge damage. The limited number of products are used in protection from the disease, but lately new fungicides appeared on the market.The aim of these investigations was to determine the effectiveness of new fungicides in control of this pathogen, compared with commonly used. The tests were carried out in conditions in vitro, with 8 fungicides. Two fungicides were evaluated in 2 or 3 concentrations.All tested fungicides showed exstremly high effectiveness in the control of this pathogenic fungus – the percentage of inhibition of radial growth ranges from 80, 45 to 100%.A preparate Orvego (300 g / l ametoctradin + 225 g / l dimetomorph) is exception –it showed 48.05%.The best effectiveness showed contact fungicides Manfil 80WP (800 g/kg mancozeb) and Enervin WG (120 g/kg ametoctradin + 440 g/kg metiram) as well as systemic Signum 33 WG (267 g/kg boscalid + 67g/kg pyraclostrobin) and Quadris 25 SC (250 g/l azoxystrobin) with 100% inhibition of pathogen's development.Fungicides with such high effectiveness in control of *R.solani* will ensure their use in protection of tobacco seedling from the damping off disease.

Keywords: disease, pathogen, active ingredient, radial development, reduction.

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PHYSIOLOGICAL SPECIALIZATION OF WHEAT LEAF RUST (*PUCCINIA TRITICINA* ERIKSS.) IN BULGARIA DURING 2010-2012

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Abstract

Brown rust on wheat caused by *Puccinia triticina* Erikss is a disease widespread in all parts of the world where wheat is a main cereal crop. The race, pathotype and genetic variability of the pathogen's population in Bulgaria were investigated during 2010-2012. The investigation was carried out under controlled climatic conditions suitable for the development of the crop and the pathogen. The virulence of the pathogen population was studied on Thatcher near isogenic lines with genes Lr1, Lr 2a, Lr 2b, Lr 2c, Lr 3, Lr 9, Lr 11, Lr 15, Lr 17, Lr 19, Lr 21, Lr 23, Lr 24, Lr 26 and Lr 28. A total of 221 isolates were analyzed. Seventy-one phenotypically different pathotypes were identified. Pathotypes 63562, 63573 and 63762 had the highest frequency of occurrence. For the first time in this population 25 entirely new pathotypes were identified. The genetic variability was represented by 86 genetic formulae for virulence. The most common combination was 1, 9, 15, 19, 24, 28 / 2a, 2в, 2c, 3, 11, 17, 21, 23, 26 (37.9 %). The genes for resistance demonstrated variable efficiency. Absolutely efficient during this period were genes Lr 22a, Lr 22b and Lr 43. Genes Lr 1, Lr 3ka , Lr 9, Lr 19, Lr 25, Lr 28, Lr 40, Lr 41, Lr 42, Lr 45, Lr 47 and Lr 50 demonstrated very good to high efficiency. During the investigated period, pathotypes were found which were overcoming the resistance of the two strong genes Lr 9 and Lr 19.

Keywords: *P. triticina*, pathotypes, virulence, effectiveness, Lr genes.

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STUDY OF EFFICACY AND RESPONSE OF POTATO CULTIVARS TO PRE AND POST HERBICIDES

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Abstract

Field trial was conducted during 2012 at private land in G.Sedlarce, Tetovo region. The objective of the study was to evaluate PRE and POST herbicide efficacy in control of weeds. Also, response of five potato cultivars to herbicides and their yields were evaluated. Pendimethalin, linuron and metribuzin (applied PRE and POST) as well as untreated and weed-free control were included in the study. Studied potato cultivars were Desire, Condor, Ultra, Carlita nad Arnova.The weed population was consisted mainly of annual spring and summer, some perennial weeds. The weediness was relative high. Weed density in the untreated control plots was 135.6 plants per m-2. *Solanum nigrum* L., *Amaranthus retroflexsus* L., *Echinochloa crus-galli* (L.) Beauv. and *Galinsoga parviflora* Cav. infestations were heavy throughout the experimental area. Efficacy of herbicides was ranged of 89.2% (pendimethalin) followed by 92.1% (linuron) and 95.1% (metribuzin applied POST) to 97.4% (metribuzin applied PRE).Transient injuries with weak chloroses mainly on the first leaves were recorded to potato cultivars Carlita and Arnova, caused by linuron and metribuzin applied PRE and POST, respectively.Potato yield was markedly affected by herbicide efficacy, whereupon a yield was similar or higher to that of the weed-free control. It was ranged of 22.2 t/ha (pendimethlin) to 29.7 t/ha (metribuzin applied PRE) in Desire cultivar; from 27.8 t/ha (pendimethalin) to 31.6 t/ha (metribuzin applied PRE) in Condor cultivar; from 29.3 t/ha (metribuzin applied POST) to 32.9 (meribuzin applied PRE) in Ultra cultivar; from 24.6 (metribuzin applied POST) to 32.0 t/ha (linuron) in Carlita cultivar and between 23.3 t/ha (metribuzin applied POST) and 31.1 t/ha (linuron).

Keywords: potato cultivars, weeds, herbicides, phytotoxity, yield.

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THE PROGNOSIS OF *CYDIA POMONELLA* L. AS A SIGNIFICANT PRECONDITION FOR APPLICATION OF INSECTICIDES IN RASINA DISTRICT

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Abstract

The prognosis of *C. pomonella* L.appearance in apple plantations enables proper undertaking of protective measures without harmful effects on man and usefuil organisms. The indication of deadlines for pest extermination improves the efficacy of protection and diminishes the appearance of toxic substances in apple fruit. The aim of this work is to point out to the significance of methods for prognosis of pest appearance as the basis for pest suppression and racional application of pesticides. The paper is accompanied by a flight of butterflies *C. pomonella* L. at two sites in Rasina district. The determination of the pest presence visually, by the usage of feromone traps, by calculation of efficient temperatures, enables proper application of chemical protective measures, as well as production of healthy organic food and achieves the preservation of the environment.

Keywords: prognosis, indication, codling moth, apple.

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BIOLOGICAL CONTROL POTENTIAL OF AN APHIDOPHAGOUS PREDATORS, CANNIBALISM AND INTERSPECIFIC COMPETITION

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Abstract

Aphidophagous predators have a great importance in biocenosis as bio-regulators of aphids. Specific relationships between predators, interspecific competition and cannibalism, have an important role in biological control. The focus of this study was on biological control potential of predators, interactions between larvae of *Coccinella septempunctata*, *Chrysopa carnea*, *Sphaerophoria scripta*, *Aphidoletes aphidimyza* and incidence of cannibalism. Observations were made in Prilep region (Macedonia) 2012-2015 and there was applied method of survey of 20 randomly selected tobacco stalks infested with aphids. Predatory larvae were reared with *Myzus persicae* in petri dishes under laboratory conditions. All experiments, prey consumption, interaction between predators and cannibalism were conducted in the laboratory. *C. septempunctata*, *C. carnea*, *S. scripta* and *A. aphidimyza* are primarily predators and they occupy the third trophic level of food chain (tobacco-*M. persicae* -predator). The growth of population of predators continuously follows the growth of aphid population on tobacco. During investigations, 5861 predators were determined in 2012 and 3788 in 2013. According investigations during 2013 they are voracious predators of aphids. In laboratory conditions, adults of *C. septempunctata* consume in average 468 and larvae 350 aphids, *C. carnea* larvae 458 aphids, *S. scripta* 333 aphids and *A. aphidimyza* 200 aphids. Interspecific competition and cannibalism are important factors in rearing conditions of predators. The outcome of interactions between predators 2014/2015 mainly depends on the body size of the competitors. In general large individuals behaved as predator while small individuals became prey. Eggs and L1 were extremely vulnerable in regard to larger larvae. Cannibalism in *C. septempunctata* and *C. carnea* occur when eggs or young instar larvae are kept together with larger larvae, in the absence of aphids. Predators are often used as biological control agents in Integral Pest Management, so mass rearing techniques must be developed which guarantee higher survival rates of predators.

Keywords: biological control, aphids, specific relationships.

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THE INVESTIGATIONS ON PENTATOMID (HETEROPTERA) SPECIES DAMAGING BUDS AND FRUITS OF THE CULTIVATED AND WILD GROWN CAPERS (CAPPARACEAE) AND THEIR EGG PARASITOIDS IN SOUTHEASTERN ANATOLIA REGION OF TURKEY

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Abstract

The studies were conducted on bud and fruits of cultivated and naturally grown caper plants in order to determine pentatomid species, their damage and egg parasitoids in Adıyaman, Diyarbakır, Mardin and Şanlıurfa provinces of Southeastern Anatolia region of Turkey between July and September in the years 2010-2012. As a result of the study, *Acrosternum millierei* (Mulsant & Rey, 1866), *Bagrada abeillei* Puton 1881, *Bagrada amoenula* (Walker, 1870), *Carpocoris fuscispinus* (Boheman, 1851), *Codophila varia* (Fabricius, 1787), *Dolycoris baccarum* (Linnaeus, 1758) and *Eurydema ornata* (Linnaeus, 1758) were determined as pentatomid species from Heteroptera order and *Trissolcus semistriatus* Nees., *T. grandis* Thomson and *T. vassilievi* Mayr (Hymenoptera, Scelionidae) were recorded as their egg parasitoids. The nymph and adults of the pentatomid species are fed on bud and fruits; therefore, it was determined that they caused to be deformity in buds and formation of spotted fruit in fruits. Consequently, we could suggest that the current studies conducted here might be a significant reference for further studies to be conducted on the cultivated and wild grown caper plants.

Keywords: caper, pentatomid species, damage, egg parasitoids, Southeastern Anatolia Region, Turkey.

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BIOLOGICAL CONTROL OF *VENTURIA INAEQUALIS* – THE CAUSE OF APPLE SCAB IN APPLE

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Abstract
The main goal of the experiment was to study the possibility for biological control of apple scab by use of innovative biofungicide Vacciplant (a.m. Laminarin) and to compare the results of biological control with those from standard chemical control of this disease. Experiment was conducted during the 2016 in region of Prespa and region of Tetovo, on two apple varieties, idared and golden delicious. In untreated variant in region of Tetovo, was observed very high level of infection (77,21% on the leaves and 24,35% on the fruits), which demonstrated the destructive potential of this apple disease in our country. In region of Prespa, significantly lower level of infection was observed in untreated variant (30% on the leaves and 9,5% on the fruits).Regarding the efficacy of tested fungicides, in region of Tetovo, standard fungicide Merpan (a.m. captan) used in chemical variant provided considerably lower degree of efficacy on leaves and fruits (71,38% and 60,86% respectively), compared with biofungicide used in biological variant (95,13% and 94,78% respectively). In region of Prespa, the efficacy performance of standard fungicides on the leaves and fruits (98,33% and 100% respectively) was almost equal with the performance of biofungicide (99,16% and 100%).
Keywords: apple scab, biological control, Vacciplant.

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BIOLOGICAL CONTROL OF GRAY MOLD DISEASE IN GRAPES

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Abstract

Bunch rot disease of grapes, caused by the necrotrophic fungus *Botrytis cinerea* is a chronic and serious problem in most of the vineyards in Republic of Macedonia. Control against this fungal disease is mostly achieved by application of synthetic fungicides. However, chemical control of *B. cinerea* is often difficult and incomplete, especially in vineyards where resistant strains have developed. A promising alternative strategy that could replace or be combined with fungicides are biofungicides. The main goal of the experiment was to observe the possibility for biological control of Botrytis bunch rot disease by the use of three novel biofungicides (Serenade Aso, Polyversum and Timorex gold). Experiment was conducted during the 2016 in two vineyard regions of Republic of Macedonia (Negotino and Kavadarci), on two grape varieties, Chardonnay and Cardinal. The destructive potential of this grape disease was confirmed in the untreated variant of the Chardonnay variety, where the disease incidence was higher than 48%. Biofungicides Serenade Aso (a.m. *Bacillus subtilis* QST 713) and Timorex gold (extract of Malaleuca alternifolia) had similar efficacy, with average of 89% reduction of disease incidence in the region of Negotino and 91,66% in the region of Kavadarci. Biofungicide Polyversum (a.m. *Pythium oligandrum* M1), applied as preventive sprays achieved more than 85% reduction of gray mold disease in both regions. The results showed that all tested biofungicides have a prospective use for control of bunch rot disease in grapes.

Keywords: biofungicides, Botrytis bunch rot, biocontrol.

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ANTIBIOSIS OF *PAENIBACILLUS ALVEI* STRAIN DZ-3 AND *ERWINIA AMYLOVORA* ON APPLE FLOWER STIGMAS

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Abstract

Fire blight, caused by *Erwinia amylovora*, is a major disease threat to apple in Prespa Region, Macedonia. Antibiotics are the most effective controls used in North America but these are not permitted for agricultural use in Macedonia. Within this experimental research it is determined the efficacy of a newly pre-registered biological control product Bio-Vital®, based on the antagonist *Paenibacillus alvei* strain DZ-3 against *Erwinia amylovora* on apple flower stigmas. Fifty grams of compost were taken and added to 250 ml sterile distilled water in a 500 ml Erlenmeyer flask. The flask was shaken on an orbital shaker for 30 min at 27°C and serial dilutions from 10-1 to 10-6 were performed. From each dilution aliquots of 0.5 ml was placed on Muller Hinton agar with cycloheximide (5 g mL-1) using pour plate technique and incubated at 27°C for 1 week. After the incubation period, the plates were observed for microbial colonies which had formed a clear zone of inhibition. The identification of isolates was based on the analysis of 16S ribosomal RNA (rRNA) sequences. The most potent isolate was *P. alvei* strain DZ-3. One hundred microliters of *E. amylowora* were transferred into 15 ml of appropriate molten medium at 45°C and poured into a empty sterile petri plate. The agar was allowed to solidify for about 30 minutes and 10 µl of Bio-Vital® were transferred on 5 mm sterile filter paper disks, previously placed on properly marked places on the surface of agar plates. Plates were incubated in a static condition at 28˚C for 2 days and zone of inhibition was measured. The identified Bio-Vital® shows strong antibacterial activity against tested *E. amylowora* with a 58 mm inhibition zone.

Keywords: Bio-Vital®, *Paenibacillus alvei* strain DZ-3, *Erwinia amylovora*, antibacterial activity.

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DETERMINATION OF POPULATION DENSITY AND DAMAGE RATES OF PEACH TWIG BORER, *ANARSIA LINEATELLA* ZELLER (GELECHIIDAE: LEPIDOPTERA) ON EARLY APRICOT ORCHARDS IN TURKEY

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Abstract

Peach twig borer (PTB), *Anarsia lineatella* (Gelechiidae: Lepidoptera), is one of the important pests of apricot in Turkey. The study was conducted in 2013-2014 to determine the population density and damage rates of PTB in Anamur district of Mersin province. The study was conducted in five early apricot orchards of the villages Kalınören (Trintina), Ören (Trintina), Cerenler I (Nimfa), Cerenler II (Trintina) and İskele (Trintina) of Anamur. The peach twig borer of pheromone (E-5 Decenyl acetate 5,0 mg/capsul E5 Decenol 1,0 mg/capsul) was used in Econex polillero trap + DDVP impregnated tablet. The traps were hanged at South-East direction of the trees about 1.5-2 m above ground, checked weekly and the caught adults were counted and cleaned. Pheromones in the traps changed in every 40 days with the new ones. Randomly chosen 20 trees' twigs and fruits were checked, apart from the trap hanging trees, in order to determine the damage rates. A total of 46 PTB adults were caught by the pheromone traps in 2013. The first adults were caught on 14 April, and the highest number of catch was on 12 May. The highest number of PTB adults was in May with 67.4% followed by in April with 32.6%. A total of 66 PTB adults were caught by the pheromone traps in 2014. The first adults were caught on 13 April, and the highest number of catch was on 11 May. The highest number of PTB adults was in May with 68.2% followed by in April with 31.8%. It was observed that PTB has one generation and the pest did not cause any significant damage on early apricot varieties.

Keywords: peach twig borer, *Anarsia lineatella*, pheromone traps, Turkey.

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CONTRIBUTION TO THE SYRPHIDAE (DIPTERA) FAUNA IN THE CEREAL FIELDS OF SOUTEASTHERN ANATOLIA, TURKEY

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Abstract
The larvae of the hoverfly (Diptera, Sryphidae) are important predators, feeding especially on aphids that attack cereal and others plants. The adults are considered to be significant insect in the pollination of some plants. This study was carried out to determine to belong species of Syrphidae family in cereal fields of Adıyaman, Diyarbakır, Şanlıurfa and Mardin provinces of Southeasthern from 2006 to 2009. In surveys, Syrphidae species were collected with sweep net and preserved within tubes being 70% alchole. As a result of study, *Episyrphus balteatus* (De Geer), *Eristalinus aeneus* Scop., *Eristalinus megacephalus* Rossi, *Eristalinus sepulchralis* (L.), *Eristalis arbustorum* (L.), *Eristalis tenax* (L.), *Eupeodes corollae* (F.), *Ischiodon scutellaris* (F.), *Melanostoma mellinum* (L.), *Paragus bicolor* (F.), *Paragus tibialis* (Fallén), *Sphaerophoria scripta* (L.), *Sphaerophoria turkmenica* Bankowska, *Syritta pipiens* (L.), *Chrysogaster* sp., *Eumerus* sp., *Merodon* sp. and *Sphaerophoria* sp.in Şanlıurfa, *T. olivaceus* in Mardin were determined. Three species of among them were recorded for the first time in these provinces.
Keywords: *Syrphidae* species, cereal fields, Souteasthern Anatolia, Turkey.

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THE INFLUENCE OF THE CLIMATE AND SYSTEM OF PRODUCTION ON THE POPULATION DYNAMICS OF *TUTA ABSOLUTA* (MEYRICK, 1917)

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Abstract

In this research the presence of *Tuta absoluta* (Meyrick, 1917) (Lepidoptera: Gelechidae) in tomato, in greenhouses in the region of Gevgelija and Valandovo, in the period 2015/2016 is determined. The main goal of our research is to show a correlation between the population dynamics *T. absoluta* and climate, in the two different production systems - integral and conventional, over two seasons, spring / autumn.The presence of *T.absoluta* is proven by morphological analysis of the collected species, and the influence of climate and method of production on the population dynamics *T. absoluta* in tomatoes, in greenhouses is shown through statistical analysis of the results obtained by applying the software package for statistical processing of the results SPSS 19.The results of the analysis show that there is a distinct correlation value between the number of insects and climatic conditions in the two different production systems, integrated and conventional, over two seasons spring/autumn, in the period 2015/2016.

Keywords: *T. absoluta*, correlation, population dynamics, tomato.

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INVESTIGATION ON SOME PESTS AND DISEASES OF BASIL (*OCIMUM BASILICUM*) IN HATAY-TURKEY

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Abstract

Basil (*Ocimum basilicum* L.) is an ornamental and aromatic herb, and several genotypes and varieties are used extensively for culinary in the dishes made with "bulgur wheat" and ornamental purposes in Turkey. *Ocimum basilicum* is cultivated in or border of the fields where other cultivated plants such as pepper, potato and tobacco in Hatay. *Ocimum basilicum* samples were taken from plants showing systemic yellow mosaics, crinkling and stunting, growth reductions, chlorotic or ring spots, leaf distortion, and stem necrosis symptoms in 2011 and 2012. Total of 43 samples were investigated for presence of main viruses as Alfalfa mosaic virus (AMV), Cucumber mosaic virus (CMV), Potato virus Y (PVY), Tobacco mosaic virus (TMV), Tobacco rattle virus (TRV) and Tomato spotted wilt virus (TSWV) by DAS-ELISA. *Ocimum basilicum* samples were found to be infected with AMV (12/43) and TSWV (8/43) by DAS-ELISA. Severe symptoms related to phytoplasma diseases were observed such as chlorosis, stunting, proliferation, altering of floral parts into green leafy structures with no seeds (virescence and phyllody) in *O. basilicum* plants in fields at the end of the summer. Suspected samples were detected by molecular and DAPI staining methods for presence of phytoplasmas. It is thought that basil plants may be a potential source of inoculum for phytoplasmas and their vectors, which they can be spread from *O. basilicum* to other cultivated plants by the vectors. Wilting, brown mottles and necrosis caused by fungal agents were commonly observed in early autumn. *Aphis gossypii*, *Cicadulina bipunctella*, *Coccus hesperidum*, *Empoasca* spp., *Frankliniella occidentalis*, *Liriomyza trifolii* and their damages were mainly observed on basil plants. Lepidoptera larvae of geometridae species and their severe damage were also observed in a few plants. To our knowledge, this is the first report of AMV, TSWV and phytoplasma infections and some pests of *Ocimum basilicum* in Turkey.

Keywords: AMV, aphid, *Ocimum basilicum*, phytoplasma, TSWV.

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VIRUS DISEASES OF MINT (*MENTHA* SPP.) IN HATAY-TURKEY

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Abstract

Mint (*Mentha* spp. Lamiaceae) is one of the oldest cultivated plants and the best known medicinal and aromatic plants (MAPs). Hatay is one of the most important mint production areas of Turkey. General stunting and chlorosis, deformations, mosaics or yellow mottles on leaves, or reducing in size of top leaves were observed on *Mentha spicata* in mint fields and on *Mentha pulegium* in their natural habitats in Hatay province of Turkey. In 2015, a total of 35 samples (*M. spicata* (25) and *M. pulegium* (10)) were collected from symptomatic plants and detected for presence of some common viruses (Alfalfa mosaic virus: AMV, Cucumber mosaic virus: CMV, Potato virus Y: PVY, Tomato spotted wilt virus: TSWV and Tomato yellow leaf curl virus TYLCV) by DAS-ELISA. AMV and CMV infections were determined in *Mentha spicata* samples mainly showing chlorosis or yellow mottles and mosaics on leaves by DAS-ELISA (11/25 and 7/25, respectively). Only CMV was detected in *M. pulegium* samples (2/10). Aphid (*Myzus persicae*) colonies were observed in plants exhibited inward curling of leaves and yellowing symptoms in fields. Transmission experiments were conducted with groups of at least 50 viruliferous aphids taken from suspected samples and transferred onto healthy test plants for 5 days of virus inoculation. Test plants were observed in an insect-proof room with controlled conditions at 16-8 (light:dark) photoperiod and 24°C±2 for six weeks and tested by DAS-ELISA. It is thought that the aphids may have an effect on the spread of these viruses from infected mint plants to the new hosts. Further studies should be conducted to determine diseases and pests of MAPs such as mint and their control methods in Turkey. To our knowledge, this is the first report of AMV and CMV infections on Mentha spicata in Turkey.

Keywords: AMV, CMV, *Mentha pulegium*, *Mentha spicata*, *Myzus persicae*.

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ANTIOXIDANT RESPONSE OF *ARABIDOPSIS THALIANA*, SUBJECTED TO SIMULTANEOUS SALINITY STRESS AND CUSCUTA INFECTION

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Abstract

Considering the growing problem with salinization of arable lands, the possibility that salt stressed plants are more susceptible to parasitic plants infection represent a further obstacle to sustainable agriculture practice. Parasitic plants comprise a group of flowering plants and most of them are adapted to heterotrophic lifestyle, do not photosynthesize and acquire organic compounds, water and mineral nutrients from their hosts through structures called haustoria. Members of the genus *Cuscuta* (dodders) are among the agriculturally most important parasites, causing significant crop yield losses due to their detrimental effect on their hosts' growth. Despite the significant efforts to unravel the mechanisms of plant-to-plant parasitism, little is known of the combined effect of abiotic (salt) and biotic (Cuscuta infection) stress on host plants.The model host plant, *Arabidopsis thaliana*, subjected to irrigation with 0.05 and 0.15 M NaCl solution was tested for its susceptibility to *Cuscuta campestris* infection and a variety of antioxidant enzymes were characterized by zymographic analysis. Although the growth of the parasitic plants was substantially decreased in terms of biomass and delayed in time on salt-stressed hosts, their ability to establish haustoria and to develop secondary stems was not compromised. Simultaneously, the combination of abiotic and biotic stress showed detrimental and dose-dependent effect on the host plants. The following antioxidant enzymes: peroxidases, ascorbate peroxidases, glutathione reductases and superoxide dismutases increased in activity and number of isoforms in response to salinity and additionally in response to dodder infection. The response was most pronounced at the site of haustoria formation but also induced in leaves away of the infection. The additional pressure of biotic stress hampers hosts' ability to adapt to salinity.

Keywords: antioxidant enzymes, haustoria, parasitic plants, peroxidases, zymography.

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INVESTIGATION ON PESTS AND DISEASES OF LAUREL (*LAURUS NOBILIS*) IN HATAY-TURKEY

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Abstract

Laurel (*Laurus nobilis*, Lauraceae) plant is a medicinal and aromatic evergreen tree and is native to the Mediterranean Basin. Laurel is known as "Defne" in Turkey. Defne district of Hatay province is considered as the place of Apollo and Daphne myth. Hatay is one of the most important natural growing and commercial production areas of laurel in Turkey. Different virus -like symptoms such as leaf curling and deformations such as volatility or thinning of leaves at the top of the shoots, vein clearing and small yellow spots on young leaves were observed on a few laurel plants in Hatay in recent years. Dark brown or black spots on shoots, leaves or fruits symptoms related fungal infections were also inspected on some old plants. Wax scale (*Ceroplastes floridensis*, Coccidae) and psyllid (*Trioza* sp., Psylloidea) individuals were mainly found on plants located edges of plantations or near roadsides. Leaf distortions, gall formations with pale green, yellowish or reddish colorations were observed on leaves infested with both of the pests. The yield and quality of laurel crop are reduced because of wax scales and psyllids damages by producing toxic saliva or causing the growth of fumagine fungus. Symptomatic plants detected for presence of some viruses (Alfalfa mosaic virus: AMV, Arabis mosaic virus: ArMV, Cucumber mosaic virus: CMV, Potato virus Y: PVY, Tomato spotted wilt virus: TSWV and Tomato yellow leaf curl virus: TYLCV) by DAS-ELISA. Suspected results were obtained for ArMV in laurel samples by DAS-ELISA. Further studies are in progress to determine the viral agent/s in laurel. Little is known about the virus diseases of *L. nobilis*. Detailed studies should be necessary to determine pests and diseases of laurel in Turkey. This is thought to be the first record of *C. floridensis* and psyllids (*Trioza* sp.) on *Laurus nobilis* in Hatay-Turkey.

Keywords: *Ceroplastes floridensis*, MAPs, *Laurus nobilis*, psyllid, virus.

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PESTS AND DISEASES OF THYME (*THYMUS VULGARIS* L.) IN HATAY-TURKEY

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Abstract

Thyme (*Thymus vulgaris* L.) is mostly collected from ecological sites, began to be produced commercially in Hatay province of Turkey in recent years. Leaf samples were obtained from producers or collected from plants showing less growth and vigor, reduced numbers and size of leaves, chlorosis or necrosis in fields. Aphid colonies were commonly observed in plants with inward curling of leaves, yellowing and deformation symptoms. Heavy infestations of *Myzus persicae* were observed on *T. vulgaris* plants in some fields in Hatay province of Turkey in spring period for many years. Leafhoppers (*Eupteryx* spp. and *Psammotettix* spp., Cicadellidae), *Zygaena* sp. (Zygaenidae) and *Tetranychus urticae* (Tetranychidae), and their damages were observed on *T. vulgaris* plants in fields. Dark brown lesions related to fungal diseases were also inspected on stems of some plants. A total of 22 suspected *T. vulgaris* samples tested for presence of mainly aphid transmissible viruses (Alfalfa mosaic virus: AMV, Cucumber mosaic virus: CMV, Potato virus Y: PVY) and Tomato spotted wilt virus: TSWV by DAS-ELISA. Only, TSWV infection was determined in T. vulgaris samples mainly showing chlorosis or necrosis on leaves by DAS-ELISA (4/22). Plants exhibited proliferation, severe chlorosis or redness were examined by 4'-6-diamidino-2-phenylindole (DAPI) staining and fluorescence microscopy technique. Characteristic fluorescence was observed in the sections of phloem tissues from shoots samples of suspected plant and it has suggested that these *T. vulgaris* plants may be infected with phytoplasmas.There is a lack of knowledge about diseases and pests of thyme in the region. Producer is not familiar with the pests of T. vulgaris and their management strategies in the region. It is important to protect the seedlings in early stage as well as the more mature plants from diseases and pests of thyme. TSWV and phytoplasma infections were firstly reported on *Thymus vulgaris* plant from Turkey.

Keywords: DAPI, *Myzus persicae*, phytoplasma, TSWV, virus.

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PREY DENSITY-DEPENDENT POPULATION GROWTH OF *CHRYSOPERLA CARNEA* (NEUROPTERA: CHRYSOPIDAE)

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Abstract

Population growth rate of the green lacewing, *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae), was investigated on different densities (5, 10, 20, 40, 80, and 160) of the mealy plum aphid (MPA), *Hyalopterus pruni* (Geoffroy) (Homoptera: Aphididae) which is an important pest of stone fruit trees in Lake Van Basin, Turkey. Studies were carriet out in Petri dishes under laboratory conditions at 25 ± 1°C, 60 ± 5 % RH, and a photoperiod of 16:8 (L:D) h. Development, survial and fecundity data were recorded daily. Raw data were analyzed using the age-stage, twosex life table in order to accurately depict the population growth and predation rate while taking the stage differentiation and both sexes into consideration. Larvae of the predator were able to complete their development at each of the six prey densities, but increased prey densities reduced development time and mortality rate. Increased prey consumption did not change longevity, but resulted in a higher intrinsic rate of increase (r), the finite rate of increase (λ), net reproduction rate (R0), and shorter mean generation time (T). These findings will be useful in developing an IPM and biological control program for the MPA.

Keywords: *Chrysoperla carnea*, *Hyalopterus pruni*, life table.

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WOLBACHIA INFECTION FREQUENCY IN SUNN PEST, *EURYGASTER INTERICEPS*

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Abstract

Bacterial endosymbionts have a broad array of effects on their hosts. Beyond nutrient provisioning, symbionts can directly affect the ecology and evolution of their host. In a number of insect systems, facultative associations contribute to resistance toward natural enemies, provide tolerance to heat shock or impact host transmission of viruses. The parasitic bacterium, *Wolbachia*, which are widely prevalent in diverse insect taxa, influence host reproductive biology and have an impact on host population dynamics via mechanisms such as cytoplasmic incompatibility, parthenogenesis induction, feminization and male killing. *Eurygaster* spp., commonly known as sunn pest is a major constraint to wheat and barley. By far the most economically important species of the sunn pest are *Eurygaster integriceps* Puton, *Eurygaster maura* (L.) and *Eurygaster austriaca* (Schrank). The pest feeds on both the vegetative and generative stages of the plant and also affects the quality by releasing digestive enzymes that greatly reduce the baking quality of the flour. Although *Eurygaster species* feed on the same host they show different patterns of geographical distribution.The objective of this study is to determine Wolbachia infection frequency in different *E. intericeps* populations. Whole genomic DNA was extracted from surface sterilized of individual sunn pest samples from 15 different geographic localities in Turkey. PCR-based screening of DNA was undertaken by using the outer surface protein (wsp) gene in terms of Wolbachia infection. To our knowledge, this study represents the first report of sunn pest naturally harboring Wolbachia infection in Turkey. The dynamics of Wolbachia infection will give clues in terms of using symbionts as an important tool in developing alternative control strategies against sunn pest populations.

Keywords: *Eurygaster integriceps*, *Wolbachia*, endosymbiont, Turkey.

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NEW TARGET GENES FOR MANAGEMENT OF EGYPTIAN COTTON LEAFWORM: ODORANT BINDING PROTEINS IN *SPODOPTERA LITTORALIS* (LEPIDOPTERA: NOCTUIDAE)

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Abstract

The Egyptian cotton leafworm, *Spodoptera littoralis* (Boisd.), is one of the most destructive agricultural lepidopterous pests which gives rise to extensive damages in many vegetable, fodder, and fiber crops. Chemical-based control methods are still used as a management strategy for this polyphagous pest, though resistance has been developed to different types of insecticides. An extensive use of insecticides has negative effects on the environment, besides killing non-target organisms. Olfactory system is the most important sensation system for insects which has become very prominent model in recent years with the functional studies. Odorant binding proteins (OBPs) are involved in the first biochemical step of receptor events in olfaction and are mostly expressed in antenna, which play major role to detect chemical signals. In the present study, two transcripts encoding OBPs (SpliOBP12 and SpliOBP18) were annotated from a cDNA library generated from the nervous system of the last instar larvae of *S. littoralis*. The putative SpliOBP12 identified in the library had the predicted domain of insect pheromone/odorant binding protein domain. Both SpliOBP12 and SpliOBP18 showed 99% amino acid identity with *Spodoptera litura* OBP12 and OBP18, respectively. Additionally, a phylogenetic analyses based on putative protein sequences were generated, where amino acid identities in genus *Spodoptera* was found relatively high. Further functional studies can be useful to get understand roles of OBPs and to plan new insect management strategies in *Spodoptera* species.

Keywords: Odorant Binding Proteins, *Spodoptera littoralis*, transcriptome analysis, pest management.

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VIRULENCE DIFFERENCE OF 37 ISOLATES OF LEAF SPOT DISEASE [*RHYNCHOSPORIUM COMMUNE* (ZAFFARANO, MCDONALD&LINDE)] IN SEEDLING STAGE OF SOME BARLEY CULTIVARS

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Abstract

Rhynchosporium commune, the causal agent of leaf spot disease and also known as barley leaf blight, affects plant growth and accordingly yield in barley growing areas. In this study, a total of 37 isolates, obtained from Ankara, Konya, Eskişehir, Kırşehir and Çorum provinces during surveys conducted in 2013 and 2014, were used. To reveal virulence difference of the isolates on the susceptible 2-row barley variety Aydanhanım and commercial varieties, cv. 6-row Çetin 2000 and cv. 2-row Tokak 157/37, the study was carried out in the seedling stage under the controlled conditions in Ankara. Disease assessments of the cultivars inoculated artificailly were done using 0 to 4 scale. In the study, set up a factorial design in randomized block with three replications, differences determined among isolates used and varieties tested and isolate x variety interactions were found to be significant statistically ($P<0.01$, R2 0,94). In the cluster analysis, the isolates were separated into five different groups. Mean disease index (DI) of the isolates on the cultivars was 1.92, while they were 2.59, 2.05 and 1.14 in cv. Tokak, Aydanhanım and Çetin 2000, respectively. Disease values of the *Rhynchosporium commune* isolates varied from 0,01 to 3,5. As the average of the 3-cultivars, the highest values were determined from the isolates, 31 (2,66) and 37 (2,83), whereas the lowest values were detected from 10 (1,17), 11 (1), 12 (1), 13 (1) and 25 (1). The highest disease values of cv. Aydanhanım were found on the isolates of 17,31 and 37,while it was determined on the isolate 37 in cv. Çetin 2000 and the isolates of 8, 29 and 33 in cv. Tokak157/37. On the other hand, the lowest disease values (LDV) of cv. Aydanhanım were found on the isolates of 10, 11, 12, 13 and 21, but LDV of cv. Çetin-2000 were established from the isolates of 10, 11, 12, and 13, while LDV of cv. Tokak 157/7 was on the isolate 25. In conclusion, virulence of the isolates of R. commune were different significantly among the barley cultivars tested. Considering virulence differences among *R. commune* isolates, other studies regarding *R. commune* should be conducted.

Keywords: *Rhynchosporium commune*, isolate, virulence, barley, seedling stage.

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CMV, AAMV, PVY: DYNAMICS OF VIRUS ANTIGEN ACCUMULATION IN SINGLE AND MIXED INFECTIONS

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Abstract

Pepper plants cultivated in open fields are highly susceptible to plant viruses. That is why, apart from single, viruses appear and in mixed infections. The aim of this study was to examine the eventual interactions in the mixed infections between the three most common viruses on pepper plants in R. Macedonia, such as Cucumber mosaic virus (CMV), Alfalfa mosaic virus (AAMV) and Potato virus Y (PVY). Virus antigen accumulation was measured with the use of DAS-ELISA method. The dynamics of the antigen accumulation was observed three times during the vegetation in a three-year trial. Single infections were observed to be more spread than mixed infections during the tested period. Mixed infections appeared in 2 – 12% from the inspected plants. Most of the mixed infections included CMV, being the most spread virus in the tested period. During this trial, a significant interaction between the virus antigen accumulations of the tested viruses in the mixed infections could not be observed, leaving space for further and more profound examinations.

Keywords: DAS-ELISA method, viruses, pepper production.

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USE OF RT-PCR TECHNIQUES IN DETECTION OF PLANT VIRUSES IN PEPPER IN REPUBLIC OF MACEDONIA

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Abstract
Plant viruses can be a limiting factor and cause economically significant damage in the agricultural production. That is why, early and precise detection is very important in prevention of significant yield losses. In this study, early detection of plant viruses was performed on pepper, as one of the economically most important crops in Republic of Macedonia. Pepper plants were tested for Cucumber mosaic virus (CMV), Alfalfa mosaic virus (AAMV) and Potato virus Y (PVY), being plant viruses that are the most common in pepper production. These are RNA viruses and their detection was performed using Reverse transcription – Polymerase chain reaction (RT-PCR). The RNA was extracted using TRIzol method from the collected leaf samples. RT-PCR was performed for each of the viruses separately due to the differences in the annealing temperatures of the used primers. In order to prevent RNA degradation of the plant viruses, each step of manipulation with the plant material was carefully optimized. The gained amplicons after RT-PCR, associated with different viruses are as follows: for CMV the amplicon was 773 bp, for AAMV was 669 bp, while for PVY 902 bp, respectively. The RT-PCR method exhibited high sensitivity, detecting the viruses in the early stages of infection, before observation of any visible symptoms on the pepper plants and measuring negative OD absorbance by DAS-ELISA.
Keywords: molecular detection, CMV, AAMV, PVY.

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DETERMINATION EFFECTIVENESS OF VARIOUS ATTRACTANTS FOR MEDITERRANEAN FRUIT FLY, *CERATITIS CAPITATA* (WIEDEMANN) (DIPTERA: TEPHRITIDAE) ON PERSIMMON IN TURKEY

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Abstract

The Mediterranean fruit fly (Medfly), *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae), is a serious pest on persimmon fruits in Turkey. The study was conducted to compare effectiveness of different attractants for Medfly in persimmon orchards in Hatay province of Turkey. A two studies were conducted in Antakya and Dörtyol districts of Hatay province with different attractants; ammonium acetate (AA), ammonium carbonate (AC), trimethylamine (TMA), putrescine (P), cadaverine (C) (Diaminoalkane). Each of the attractant was mixed with different concentrations, propylene glycol (10%) and DDVP (4%) in the lab conditions. A homemade plastic wipes were prepared and contained a 25 ml concentration from mixed attractants. The Decis traps were used as traps hanged with homemade plastic wipes at 1-1.30 m above ground on the tree branches. The study was conducted as randomized complete blocks design with five replicates. The first study was carried out in Antakya district. A total of 12522 Medfly adults were caught by attractant traps during the sampling periods. The highest catch of Medfly adults were caught by TMA+AA+C attractant traps, while the lowest catch of Medfly adults were caught by AA attractants traps. The second study was carried out in Dörtyol district. A total of 470 Medfly adults were caught by attractants traps during the sampling periods. The highest catch of Medfly adults were caught by AA+AC attractant traps, whereas the lowest catch of Medfly adults were caught by AC attractants traps.

Keywords: Medfly, *Ceratitis capitata*, persimmon, attractants traps, Turkey.

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DETERMINATION OF EFFECTIVENESS OF VARIOUS ATTRACTANTS FOR MEDITERRANEAN FRUIT FLY, *CERATITIS CAPITATA* (WIEDEMANN) (DIPTERA: TEPHRITIDAE) ON POMEGRANATE FRUITS IN TURKEY

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Abstract

The Mediterranean fruit fly (Medfly), *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae), is a serious pest on pomegranate in Turkey. The study was conducted in 2016 compare effectiveness of various attractants for Mediterranean fruit fly, Ceratitis capitata (Wiedemann) (Diptera: Tephritidae) at pomegranate orchards in Hatay province of Turkey. The study was conducted on Hicaz and Katırbaşı pomegranate orchards with different attractants; ammonium carbonate (AC), ammonium acetate (AA), putrescine (P), trimethylamine (TMA) and Diaminoalkane or cadaverine (C). A homemade plastic wipes were prepared and contained a 25 ml concentration from mixed attractants, propylene glycol (10%) and DDVP (2%). The Decis traps were used as traps hanged with homemade plastic wipes at 1-1,30 m above ground on the tree branches. Traps were arranged as 3 trees/trap. Two studies were conducted as randomized complete blocks design with five treatments and five replicates. A total of 2485 Medfly adults were caught by attractants traps on pomegranate variety of Hicaz. The highest catch of Medfly adults were caught by AA+AC attractants traps, whereas the lowest number of Medfly adults were caught by AA+TMA+P attractants traps. A total of 5482 Medfly adults were caught by attractant traps on pomegranate variety of Katırbaşı. The highest catch of Medfly adults were caught by AA+TMA+C attractants traps, while the lowest number of Medfly adults were caught by AA+TMA+P attractants traps.

Keywords: Medfly, *Ceratitis capitata*, pomegranate, attractants traps, Turkey.

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EVALUATION POPULATION DENSITY AND DAMAGES RATES OF MEDITERRANEAN FRUIT FLY, *CERATITIS CAPITATA* (WIEDEMANN) (DIPTERA: TEPHRITIDAE) IN PERSIMMON ORCHARDS IN HATAY PROVINCE OF TURKEY

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Abstract

The Mediterranean fruit fly (Medfly), *Ceratitis capitata* (Wiedemann) (Diptera: Tephritidae), is one of the important pests of persimmon in Hatay province of Turkey. Studies were conducted in 2013-2014 to evaluate the population density and damage rates of Medfly at persimmon orchards in Defne, Antakya, Dörtyol and Belen districts of Hatay province of Turkey. The Econex trimedlure (95%), Econex DDVP impregnated tablets and Econex Invaginated EOSTRAP were used. The Econex traps were weekly checked and captured Medfly adults were counted and then cleaned. The Econex trimedlure (95%) and Econex DDVP impregnated tablets in the traps were replaced with the new ones in every 90 days. Damaged fruits were counted 5 times in 2013, and 7 times in 2014 by assessing randomly chosen 300 fruits in each of the orchards, except the ones from the trap hanging tree. In 2013, a total of 13944 Medfly adults were caught by traps. The highest number of the Medfly adults were caught by pheromone traps in Belen (6758), followed in Defne (3061), Antakya (2923), and Dörtyol (1202) districts. In 2014, a total of 10575 Medfly adults were caught by traps. The highest number of the Medfly adults were caught by traps in Belen district (4844), followed in Defne (4227), Antakya (1108), and Dörtyol (396) districts. In both years, the highest ratio of Medfly damaged fruits were recorded as 100% and 95% in Antakya district, while the least were observed with 3.35% and 2.44% in Belen district.

Keywords: Medfly, *Ceratitis capitata*, traps, persimmon, damages rates, Hatay.

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THE IMPORTANCE OF PREDATORS IN CEREAL CROP AGROBIOCENOSIS IN LESKOVAC

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Abstract

The monocultural way of grain crop production may cause the massive emergence and development of both harmful and useful organisms in agrobiocenosis. Predators as natural enemies give a significant contribution to the reduction of pest population. The aim of the research was to monitor the biodiversity of predators and establish the differences in their faunistic composition, with regard to the agrobiocenosis of both spring and winter crops.The following standard entomological methods were used throughout the research: visual inspection, examination of above-ground parts of a plant, the sweep net method and laboratory processing of gathered material. The research was carried out from 2011 to 2013 on the experimental plot of the Agricultural High School in Leskovac. The research shows that the diversity maintenance and natural bioregulatory mechanisms are the basic rule in preservation of the grain agrobiocenosis against harmful insects. The predatory activities towards leaf lice were registered among the following five species of ladybirds belonging to the family of Coccinellidae: *Coccinella septempunctata* L., *Adalia bipunctata* L., *Hippodamia variegata* Goeze, *Propylea quatouredecimpunctata* L. and *Calvia quatourdecimpunctata* L. and 2 predators of family Chrysopidae: *Chrysopa perla* L. и *Chrysopa carnea* Steph. The research results showed similarity among ogranisms present in respective agrobiocenoses of spring and winter crops that were compared.

Keywords: bioregulatory mechanisms, Coccinellidae, Chrysopidae, spring crops, winter crops.

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THE INFLUENCE OF THE ANTHROPOGENIC FACTOR ON THE BIODIVERSITY OF CODLING MOTH NATURAL ENEMIES

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Abstract

The human role in bioecological examinations of codling moths is of crucial importance for the integral protection of pome fruit and the production of healthy and safe food. The codling moth (*Cydia pomonella* L.) is one of the most significant apple pests in terms of causing the diminished yield and poorer fruit quality in apples. As such, the codling moth requires daily monitoring by agricultural producers. The aim of this research was defined by the need for establishing the presence of codling moth natural enemies and the estimation of their codependence in apple plantations with various methods of protection. The examinations were carried out on the territory of Southern Serbia from 2005 to 2008. During the research, the standard entomological methods, such as pheromone traps, branch beating and placing bands around tree trunks, were used to track the presence, number and population dynamics of the codling moth and its natural enemies. The research results revealed the dominant role that the anthropogenic factor has in many segments of the integral apple protection and the production of high-quality apple fruit. Faunistic researches are inevitable for the correct determination of human actions, due to the clear composition of autochthonous natural enemies of the codling moth. The natural enemies of the codling moth whose presence was determined during the research belong to the following orders: Hymenoptera, Diptera, Dermaptera, Neuroptera, Coleoptera and Heteroptera. The analysis that has examined the human influence on the autochthonous natural enemies of the codling moth also contributes to the preservation of biodiversity and agrobiocenosis, as well as to the production of high-quality, safe food.

Keywords: human influence, faunistic researches, *Cydia pomonella* L., integral protection, Southern Serbia.

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NEW OPPORTUNITIES FOR CHEMICAL CONTROL OF *VENTURIA INAEQUALIS* AND *PODOSPHAERA LEUCOTRICHA* IN APPLE ORCHARDS IN MACEDONIA

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Abstract
The main goal of the experiment was to assess the efficacy of the novel fungicide Sercadis (a.m. fluxapyroxad) in the control of *Venturia inaequalis* and *Podosphaera leucotricha*, which are the most economically important apple diseases in Republic of Macedonia. Experiment was conducted during the 2016 in the region of Prespa and the region of Tetovo, on two apple varieties, Idared and Golden delicious. Considerably high level of infection of apple scab (43%) and moderate level of infection of powdery mildew (18,2%) was observed in untreated variant in region of Tetovo. On contrary, in the region of Prespa, the intensity of infection of apple scab was quite moderate (15,2%), while the intensity of infection of powdery mildew was high (36%). Regarding the efficacy of tested fungicides, in the region of Tetovo, the two tested fungicides, Sercadis and standard fungicide Indar 5 EW, provided excellent efficiency against apple scab (92,65% and 94,58%, respectively) and powdery mildew (98,68% and 98,18%, respectively). In the region of Prespa, the efficacy performance of standard fungicide against apple scab and powdery mildew (95,65% and 94,44% respectively) was almost equal with the performance of fungicide Sercadis (94,53% and 96,66%).
Keywords: apple scab, powdery mildew, Sercadis.

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CHEMICAL CONTROL OF SEPTORIA LEAF BLOTCH IN DIFFERENT BREAD WHEAT VARIETIES

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Abstract

Septoria leaf blotch is one of the most economically important foliar wheat disease worldwide. In the last few years, due to the extremely favorable conditions for development of this disease (humidity), serious damages were observed in many wheat production regions in the Republic of Macedonia.The experiment was conducted in Kumanovo region (Romanovce) during the vegetative cycle 2014/2015. The main goal of study was to evaluate the efficacy of 7 different fungicides (Duett ultra, Opera Max, Amistar Extra, Artea, Caramba, Prosaro and Falcon), which are registered for control of Septoria leaf blotch, on 6 different bread wheat varieties (Ingenio, Moason, Amazon-150, Super zitarka, Lepoklasa and Katarina). All tested fungicides were applied twice (stage of stem elongation + stage of end of heading and beginning of flowering). In order to assess the harmful potential of this wheat disease and to evaluate the efficacy of tested fungicides, control variant (untreated) was included for all wheat varieties. Moderate to high intensity of infection (15-40%), due to the different susceptibility, was observed in the untreated variants of all tested varieties. All tested fungicides, applied as preventive sprays, achieved more than 90% efficacy and significantly reduced the incidence of Septoria leaf blotch in all wheat varieties.

Keywords: *Septoria tritici*, wheat, fungicides, efficacy.

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CHARACTERISTICS OF *ERWINIA AMYLOVORA* STRAINS ISOLATED FROM ORNAMENTAL SHRUBS

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Abstract

This paper presents the characteristics of *Erwinia amylovora* strains isolated from *Cotoneaster horizontalis* and *Pyracantha coccinea* on the territory of Nis District in Serbia, as well as biochemical and physiological characteristics of these strains. Identification of *Erwinia amylovora* strains was made according to internationally recognized methods, such as: Biolog test, immunofluorescence, ELISA test and agglutination test, and biochemical and physiological characteristics of the isolates of *Erwinia amylovora* were determined by levan production, oxidase and catalase activity, hydrolysis of gelatin and esculin, VP - test, MR - test, and glucose metabolism. Characteristics of the isolated strains fully coincide with the control strains which were isolated from pome fruits.

Keywords: *Erwinia amylovora*, fire blight, *Cotoneaster horizontalis*, *Pyracantha coccinea*.

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MONITORING OF POTATO CYST NEMATODES (*GLOBODERA* SPP.) IN SOUTHWEST BULGARIA

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Abstract

The potato cyst nematodes, *Globodera pallida* and *Globodera rostochiensis*, can cause significant economic damage to potato production, and their management is a difficult process. They are quarantine pests for Europe and are regulated by different directives specific to different regions. The main objective of the study was to provide data of the determination of the spread of potato cyst nematodes in Southwest Bulgaria in order to limit their further dissemination outside the infected areas.In the period 2015-2016, the monitoring of potato cyst nematodes was carried out in six major potato-producing regions in Bulgaria (Samokov, Pernik, Kyustendil, Pazardzhik, Blagoevgrad and Smolyan). The monitoring covered seed production areas and potato areas intended for human consumption and/or for processing. The results confirmed the presence of both species in the observed potato-growing areas. The distribution and density of nematodes of the genus *Globodera* varies between regions. *G. rostochiensis* was the most common species in all areas. The species was found by itself in a higher level than in joint populations of *G. pallida*.

Keywords: *Globodera pallida*, *G. rostochiensis*, distribution.

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SEMI *IN VIVO* EFFICACY OF ANTAGONISTS AND COMMERCIAL BIOLOGICAL PRODUCTS ON BLOSSOM INFECTIONS OF FIRE BLIGHT DISEASE

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Abstract
The bacterium, *Erwinia amylovora*, causes its severe infections in blossoms. Due to restriction of antibiotics and phytotoxicity of copper based compounds at blooming stage in Turkey, investigation of alternative control strategies is important while plant trees are bloomed. Biological control of fire blight using commercial biological products provides an effective disease management on blooming period. In this study, the efficacy of commercial biological products (Blossom Protect containing *Aureobasidium pullulans* andSerenade Opti *Bacillus subtilis*) and 99 individual antagonists (92 bacteria and seven yeasts) isolated from natural floras of five district provinces in Turkey during 2014 and 2015 were investigated for their antagonistic effects on blossom infections of fire blight disease using apple blossom tests under semi *in vivo* conditions. Trials repeated twice in 2016 and 2017 years. In the first year experiment, antagonistic microorganisms suppressed disease development among 8-58%, however, the suppressions was among 20-36% in 2017. the most effective antagonistic bacterium was suppressed pathogen development by 58,33% and 32%, respectively.According to experiments, the efficacy of this antagonist was higher than applications of streptomycin and Serenade Opti. The other commercial biological product Blossom Protect was the most effective application with a suppression rate of 36%. Treatments of antagonists and biological products are still under progress in apple orchards. This study was financially supported with the Project number FBA-2016-5287 from Cukurova University.
Keywords: *Erwinia amylovora*, antagonist, antimicrobial effect, Blossom Protect, Serenade Opti, antibiotic.

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MANAGEMENT AND CONTROL OF *AGRILUS AURICHALCEUS* REDT. (COLEOPTERA: BUPRESTIDAE) IN BIOLOGICAL RASPBERRY PRODUCTION

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Abstract
The study was carried out in a raspberry plantation (2013-2015) in the experimental field of the Institute of Agriculture – Kyustendil. The purpose of this study is to investigate the effect of organic fertilizer application on the stock larvae of *Agrilus aurichalceus* and population management using biological plant protection products. According to the results of this study, it has been was proved that fertilizing with organic fertilizers has a reductive effect on the survival of the *A. aurichalceus* population and does not affect the population of the larval endoparasitoid *Ttrastichus heeringi* in the cultivars Willamette and Lyulin. The relationships between *A. aurichalceus* and *T. heeringi* in the conditions of organic raspberry production have been studied. The established degree of parasitism of the larvae by *T. heeringi* (32.7-68.4%) is capable of reducing and controlling the population of *A. aurichalceus* in the Willamette without chemical control. Two treatments with bioinsecticides have been carried out for the protection of plants from cultivar Lyulin due to a significantly lower degree of parasitism (18.1-50.0%). The most effective insecticides to the control of adults of *A. aurichalceus* have been identified: Pyrethrum FS EC-0.05% and NeemAzal®-T/S - 0.3 %. The adult control scheme involves two treatments with bioinsecticides of infested shrubs. The first treatment should be done during the buttoning, the second treatment during the mass flight of beetles (only at an established density of 3-4 beetles/m2).
Keywords: reptile varieties, organic fertilizers, biological control.

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A NEW IMMUNE-RESPONSE RELATED GENE, SUPEROXIDE DISMUTASE IN *S. LITTORALIS*

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Abstract

Insects have to rapidly adapt to changing environmental conditions which have physiological effects on their development, growth, survival, reproduction and aging. Superoxide dismutases (SODs) are a group of major antioxidant defense enzymes which are needed for life span and oxidative stress resistance. The Egyptian cotton leaf worm, *Spodoptera littoralis* (Boisd.), is one of the most destructive agricultural polyphagous pests that attack various economically important crops including vegetables, ornamental plants, and cotton. Currently, chemical-based control methods are mostly used as pest management strategy, which have led to the emergence of resistance for *S. littoralis*, besides polluting environment and killing non-target organisms. In recent years, different target genes have been identified for pest management through transcriptome studies. SODs could be represented as a new target protein with its major role in anti-oxidative process and cellular stress in insects.In this study, a full length cDNA sequence of SOD was obtained and denoted as SpliSOD in the cDNA library from the nervous system of the fifth instar larvae of *S. littoralis*. Nucleotide sequence of SpliSOD contained a putative open reading frame of 462 bp encoding 153 amino acid residues. The deduced amino acid sequence showed high identity to SODs from *Spodoptera exigua* (identity value: 88%), *Helicoverpa armigera* (80%), and *Papilio machaon* (81%) in genus *Lepidoptera*. Characteristics of SpliSOD amino acid sequence showed that SpliSOD was a member of Cu/Zn Superoxide dismutase superfamily. Finally, a phylogenetic analysis was generated based on the protein sequence, where amino acid identities in genus Spodoptera were found relatively high. Future functional studies of defense mechanisms of SODs might be helpful to identify their roles in *S. littoralis*.

Keywords: *Spodoptera littoralis*, superoxide dismutase, gene identification.

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SUNN PEST, *EURYGASTER INTEGRICEPS* PUTON (HEMIPTERA: SCUTELLERIDAE) DAMAGE ON THE GRAINS IN DIFFERENT WHEAT VARIETIES IN NORTHERN CYPRUS

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Abstract

The Sunn pest, *Eurygaster integriceps* Puton (Hemiptera: Scutelleridae) is a primer insect pest of cereal in Northern Cyprus. This study was conducted for determination of Sun pest damages on grains in different wheat varieties in Lefkoşa (Nicosia), Gazimağusa (Famagusta), Girne (Kyrenia), Güzelyurt (Morphou), and İskele (Trikomo) districts of the Turkish Republic of Northern Cyprus in 2014 and 2015 years. For this, 2-3 kg wheat samples were collected at harvest time and rates of grain piercing damage analysis was performed. At the end of analysis, the rate of damaged on grain of different wheat varieties in Northen Cyprus were determined. The rates of kernel damaged by Sunn pest, *E. integriceps* was found average 4.46% and average 1.22% in 2014 and 2015 years respectively. The most damage rates was determined as 10.1% in Adana 99 bread wheat variety in Alayköy village in Lefkoşa district in 2014 year and 4.7% in the same wheat variety in Hamitköy village in Lefkoşa district in 2015 year.

Keywords: sunn pest, *Eurygaster integriceps*, wheat varieties, grain damage, Northern Cyprus.

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FUNGAL DISEASES CAUSING ROOT ROT OF CHICKPEA (*CICER ARIETINUM* L.) IN THE AEGEAN REGION AND DETERMINATION OF RESISTANT GENOTYPES AGAINST *FUSARIUM OXYSPORUM* F. SP. *CICERIS*

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Abstract

This study was conducted to determine fungal pathogens causing root rot in the chickpea (*Cicer arietinum* L.) production areas in the Aegean Region and resistance resources against in 2016 and 2017. In 2016, a total of 39 diseased fields in chickpea production areas of Uşak, Manisa, Afyonkarahisar, Denizli and Kütahya provinces in the region were surveyed and fungi isolated from the root samples taken were tested for pathogenicity on susceptible genotype ILC482 and accordingly, fungal pathogens were detected. These pathogens were *Fusarium oxysporum* f.sp. *ciceris*, *Fusarium solani*, *Rhizoctonia solani*, *Helminthosporium solani*, *Alternaria solani*, *Pythium* sp., *Macrophomina phaseoli*, and *Trichotecium roseum*. In the reaction studies, 35 ICARDA materials (Chickpea International Elite Nursery-Winter-2015) and 5 registered cultivars (Sarı-98, İzmir, Menemen, Cevdetbey and Aydın) of Aegean Agricultural Research Institute were used. In the study, inoculum was prepared in a concentration of 106 spores/ml by mixing 5 the most virulent isolates of *F.oxysporum* f.sp. *ciceris*, found as the most common pathogen, from the each Provinces. Seeds of the genotypes tested were soaked in a distilled sterile water for 3 days and then inoculated with the inoculum and sown the pots by maintaining normal cultivation procedures. After nearly 50 days, 10 plants were evaluated in each pot. In the evaluations, 0 to 4 scale (0=0%, 1=1%-33, 2= 34-66%, 3=67-100%, 4=Death plant) was used. No genotypes tested was found in the 0 scale category (SC), while cv. Sarı-98 (22,5%) and cv. Menemen (20%) were in the 1 SC, genotypes, FLIP09-220C (37,5%) and FLIP09-231C (62,5%) were in the 2 SC, and the others were in the 3 SC and 4 SC. The study suggested that cv. Sarı-98 and cv. Menemen were can be used as resistance resources in breeding programs.

Keywords: Aegean region, chickpea, root rot, *Fusarium oxysporum*, reaction.

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VIRUSES OF SOME GARLIC ECOTYPES IN CROATIA

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Abstract

In recent years, there is increasing demand in the market for autochthonous ecotypes of garlic (*Allium sativum* L.) in Croatia. Many local ecotypes of garlic are developed due to specific climatic-soil conditions and producer's selection. However, the average yield of garlic is not in the European average range, since the classical vegetative propagation of garlic from cloves usually results with virus infections that cause significant yield reduction. Viral diseases are considered one of the garlic's most important group of pathogens. The research was set up to determine infection rate in plant material of garlic ecotypes grown from cloves in different regions. Plants were collected from commercial fields in Zadar County (coastal part of Croatia) and Vukovar-Srijem County (eastern Croatia) and were tested by enzyme-linked immunosorbent assay (ELISA) on the presence of three viruses: Onion yellow dwarf virus (OYDV), Leek yellow stripe virus (LYSV) and Garlic common latent virus (GCLV). As a potential source of antigen leaf tissue was used and tests were conducted according to manufacturer's instructions (Bioreba AG, Switzerland). In plants from Zadar County dominant was OYDV, followed by GCLV and LYSV. All tested plants originating from Vukovar-Srijem County were infected with three tested viruses. Plants infected with OYDV showed symptoms of leaf yellowing and reduced growth, while those infected with LYSV expressed yellow stripes. Symptoms were most evident at the beginning of vegetation. Due to high infection rate, deteriorated sanitary status, and increased interest in use and production of local ecotypes of garlic, work on their sanitary selection will be important part of revitalization program.

Keywords: *Allium sativum* L., ELISA, symptoms.

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PATHOGENIC VARIABILITY OF *ASCOCHYTA LENTIS* IN BULGARIA

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Abstract

Ascochyta blight, caused by *Ascochyta lentis*, is an important foliar disease of lentil with worldwide occurrence and is a serious threat to lentil production. The investigation involved 11 isolates of *Ascochyta lentis*. The patogen was isolated from naturally infected lentil plants in various locations of Bulgaria, using an agar plate method. Inoculum was also produced by growing isolates on LDA. Ten plants (3 weeks old) of each of the cultivars were sprayed with a freshly prepared spore suspension (105 conidia mL-1). Disease symptoms were scored 14 days after inoculation.The virulence of the isolates was determined with the help of 11 lines and cultivars lentils (ILL 358, ILL 5480, ILL 2429, ILL 5725, ILL 7537, Laird, Ilina, Bella, Nadejda, Naslada, Zornica). Based on the reaction of the used genotypes, the investigated isolates of *Ascochyta lentis* were grouped into seven pathotypes (Pt). The observations of the present study revealed a significant variation among the isolates of *Ascochyta lentis* for morphological traits as well as the pathogenicity.

Keywords: Ascochyta blight, pathotype, virulence, isolates.

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GENETICS OF VIRULENCE AND RESISTANCE TO *VENTURIA INAEQUALIS* (COOKE. (G. WINTER)) FOR DIFFERENT APPLE VARIETIES

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Abstract
The apple has a huge economic value. In the Republic of Macedonia, the apple is the most abundant type of fruit. *Venturia inaequalis* as a pathogen has a big economical value in apple production. In agricultural ecosystems, the high homogeneity and population of one host together with the low diversification of the host, causes quick changes on the pathogen. Appearance of the new mutants of the pathogen is proportional and correlated with the increasing number of generations. The resistance genes are causing specialization and evolution on the population of the *V. inaequalis*. Until now there are described eight resistance genes: Va, Vb, Vbj, Vf, Vfn, Vm, Vr, и Vr2. Main source for resistance genes is the species *Malus floribunda*. *V. inaequalis* is a well-known pathogen for quick and easy overcoming of the resistance genes who are originating from *M. domestica* and other *Malus* species.
Keywords: apple, *Venturia inaequalis*, genes, *M. domestica*, evolution.

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IMPORTANT DISEASES OF VIOLA, CHRYSANTHEMUM AND GERANIUM IN SERBIA

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Abstract

The ornamental plants in Serbia, including the horticulture, in recent years show expansion. New conditions in technology production provoked occurrence of many diseases. The investigation was performed in the period of 2014-2016 years. Samples were collected from greenhouse production (15 localities in Serbia), from the most cultivated horticultural plants: viola (*Viola* spp.), chrysanthemum (*Chrysanthemum* spp.) and geranium (*Pelargonium* spp.). Occurrence of diseases was continuously monitored. Diseases samples were taken for further analysis. On the most locations in seedling stage *Rhizoctonia solani* was determined on chrysanthemum and geranium, while *Phytium* spp. was found only on the viola. Foliar diseases identified on viola were mainly from genera *Cercospora* and *Septoria*. On chrysanthemum leaves *Septoria* spp. was also determinated, as well as *Alternaria* spp. Bacterial blight caused by *Xanthomonas hortorum* pv. *pelargonii* was identified on geranium in 10 investigated locations. *Botrytis cinerea* as the most significant disease in greenhouse production was found in all locations and is still a large problem in viola, chrysanthemum and geranium production.

Keywords: ornamental plants, greenhouse production, pathogens.

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PATHOGENS OF SWEET AND SOUR CHERRY LEAVES IN SERBIA

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Abstract

In recent years the area under sweet and sour cherry in the region increase. In production conditions of Serbia, pathogens causal agent of leaf diseases presents limiting factor in the successful production of sweet and sour cherries. In the period 2012-2016. monitoring of the plant health status of cherries was carried out. Leaf pathogens identificated during this period were phytopathogenic fungi (*Wilsonomyces carpophilus* - *Stigmina carpo*phila, *Blumeriella jaapii*, *Mycosphaerella cerasella* - *Cercospora cerasella*) and bacteria (*Pseudomonas syrin*gae pvs. - *syringae* and *morsprunorum* race 1). Intensive (young) cherry plantations and orchards diseases caused by phytopathogenic fungi usually are not the greatest problem, due to adequate chemical application. However, the problem are phytopathogenic bacteria *P. syringae* pvs. causal agents of bacterial canker, which also cause bacterial leaf spot. In extensive production (older orchards) with minimized chemical protection phytopathogenic fungi *B. jaapii*, *W. carpophilus* and sometimes *M. cerasella* occur in much greater intensity, leading to premature defoliation.

Keywords: cherries, leaf, fungi, bacteria.

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THE APPEARANCE OF PECTOBACTERIUM CAROTOVORUM SUBSP. ON SOME BRASSICA PLANTS

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Abstract
The causal agents of soft rot (*Pectobacterium carotovorum*) presents a significant phytopathogens in the production of vegetable crops. Investigations was conducted in 2015 and 2016 on cabbage, cauliflower and broccoli at several locations in Vojvodina Province (Serbia). During August, September, and October the decay of plants was observed. On cauliflower and broccoli symptoms of soft rot were present on floret and stem, while on cabbage first symptoms were observed in lower stem area in the form of water-soaked lesions and than expand repidly. From diseases samples two to three days after isolation on NAS medium were formed small, shiny, grayish-whitish colonies of bacteria. All investigated strains were gram-negative, non-fluorescent, facultative anaerobes, growth at 37°C, oxidase negative and catalase positive. Pathogenicity was checked on potato, carrot and host plants. Based on obtained results investigated isolates belong to Pectobacterium carotovorum subsp. Intensive appearance of *P. carotovorum* was observed in the fields where the *Brassica* grown in monoculture or in a much shorter rotation.
Keywords: soft rot, cabbage, cauliflower, broccoli.

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BIOLOGICAL CONTROL WITH CANDIDATE ANTAGONIST BACTERIA AGAINST *PSEUDOMONAS SYRINGAE* PV. *TOMATO* AND *PSEUDOMONAS SYRINGAE* PV. *PHASEOLICOLA*

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Abstract

Pseudomonas syringae is a gram-negative bacteria that infects a wide variety of plants and causes necrotic syptoms in leaves, stem and fruit. The pathogen is characterized by the ability to produce toxin such as phaseolotoxin, coronatin, tabtoxin. The strains cause disease on their hosts through the release of toxin. *Pseudomonas syringae* is globally important plant pathogenic bacteria. Different strategies have been employed for controlling the disease such as cultural control and sanitary methods, chemical control and biological control. Since antibiotics are restricted in Turkey, investigation of alternative control strategies is important. The aim of this study was to evaluate the effectiveness of rhizosphere associated soils bacteria against *Pseudomonas syringae* pv. *tomato* and *Pseudomonas syringae* pv. *phaseolicola* in *in vitro* conditions. The study consisted of two parts; isolation and purification of the potential antagonist; *in vitro* screening of potential antagonists. Totally one hundred and twenty four candidate antagonist bacteria were obtained from rhizoshere of healty tomato and bean plants. The effect of candidate antagonist bacteria over phytopathogens *P. s.* pv. *tomato* and *P. s*. pv. *phaseolicola* were performed by antagonistic activity measured by inhibition zone diameter. Eight of candidate bacterial strains inhibited growth of the pathogen with inhibition zone diameter ranging from 10.0 to 17.7 mm for *P. s*. pv. *phaseolicola*. And according to *P. s*. pv. *tomato* results, interstingly among effective antagonist bacteria, three of them totally inhibited the growing ability of pathogen *P. s*. pv. *tomato*. This study indicated that antagonist bacteria showing potential for biological control was particularly important in the management of diseases.

Keywords: bean, tomato, rhizosphere, candidate bacteria, inhibition zone.

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WEED CONTROL IN SUNFLOWER CULTIVATION BY A SUN-EXPRES TECHNOLOGY

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Abstract

During the period 2013–2014 the efficacy of some soil and vegetation herbicides in sunflower, hybrid P64 LE 25, grown by a sun-Expres technology in the area of Chernogorovo, the region of Pazardzhik was studied, with sowing rate of 60,000 harvested plants per hectare. The experiment was set by the block method with 8 variants in 4 replications, the size of the experimental plot – 21 m2. The following herbicide variants were tested: Express 50 SG 4 g/da; Stomp Aqua + Express 50 SG; 400 cm3/da + 4 g/da; Dual Gold 960 EC + Express 50 SG; 150 cm3/da + 4 g/da; Express 50 SG+ Fusilade forte; 4 g/da + 130 cm3/da; Express 50 SG+ Agil 100 EC; 4 g/da + 80 cm3/da; Express 50 SG + Stratos Ultra; 4 g/da + 200 cm3/da. The highest efficiency during the two years of study (from 84.4 to 88.0%) was established with the herbicide combinations Express 50 SG at 4 g/da + Stratos ultra in a dose of 200 cm3/da (87.2%), and Express 50 SG at 4 g/da + Fusilade forte at a rate of 130 cm3/da (83.3%).

Keywords: sunflower, weeds, herbicides.

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EFFICACY AND SELECTIVITY OF THE HERBICIDE FLAZASULFURON IN FRUIT-BEARING PEACH PLANTATIONS

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Abstract

The study was carried out in the period 2014-2015 at the Fruit Growing Institute – Plovdiv, in a fruit-bearing peach plantation. The herbicidal effect and the selectivity of active substance flazasulfuron, alone and in combination with surfactants and glyphosate was investigated. The Suncrest, Redhaven and Glohaven cultivars were included in the experiment. The herbicides were applied in early June by treating the in-row strips and with the green mass of the trees carefully protected. The manifestation of first signs of phytotoxicity, the duration of the herbicidal effect on weeds, the occurrence of external symptoms of phytotoxicity on trees and visible suppression of tree growth were evaluated. The influence of the herbicide combinations on tree growth was monitored by recording the biometric characteristics: annual increment (cm) and trunk cross-sectional area (cm^2) of the trees.In the variants with combination of active substances was observed rapid and durable effect on all vegetating weeds. In the variants with flazasulfuron applied alone, the primary occurrence of phytotoxicity on weeds was delayed. No phytotoxicity or reducing of tree growth were observed for all variants with herbicide treatments. These results allow to recommend the herbicide flazasulfuron, alone and in combination with surfactants and glyphosate, for effective control of weeds during vegetation in fruit-bearing peach plantations.

Keywords: herbicides, weeds, phytotoxicity.

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THE BIOLOGY AND CONTROL OF TOMATO LEAF CURL NEW DELHI VIRUS IN THE WESTERN MEDITERRANEAN

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Abstract

Tomato leaf curl New Delhi virus is a bipartite begomovirus transmitted by the whitefly *Bemisia tabaci* that causes serious losses in solanaceous and cucurbitaceous crops in several countries of Asia. Since 2013 a new strain of this virus has been introduced and distributed in Spain, causing considerable damages in greenhouse as in outdoors, in zucchini, and to a lesser degree in melon and cucumber. Apart from cucurbits, also spontaneous and cultivated crops from the Solanaceae have been found infected. In the western Mediterranean crops, the virus is associated with the MED-Q1 species, which is highly adapted to crops in this region and an effective transmitter of many viruses. Control of the virus would be through vector control. Integrated and biological control of *B. tabaci* is successfully applied in solanaceaous crops species but not yet in cucurbits. This would be the current challenge in virus control.

Keywords: whitefly, virus, epidemiology, control, horticrops.

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THE EFFICACY OF MONOTERPENOID COMPONENETS ON PARASITION PERFORMANCE OF *TICHOGRAMMA BRASSICAE* (HYMENOPTERA: TRICHOGRAMMATIDAE)

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Abstract

Synthetic pesticides have been used for 50 year and have provided fast, economical, and effective pest control. However, excessive use of chemical products has caused some adverse effects such as pesticide resistance, resurgence of new pests, side effects on nontarget organisms, and environmental contamination. Some of the disadvantages of synthetic pesticides can be avoided by using more biodegradable pest control materials with greater selectivity. Consequently, interest in alternatives to synthetic pesticides has greatly increased in recent years. One such alternative is the use of new botanical insecticides that are effective against target organisms and have shorter persistence in ecosystems. However, the impact on the natural enemies of these insecticidal compounds haven't been yet fully understood. In this study, Dialil disulfid and Limonen were tested on the egg of *Ephestia kuehniella*. After *Trichogramma brassicae* were interference to the egg, applications were done on within 24 hours respectively. The essential oil Limonen 50 µL and100 µL including two doses were applied on 2th, 4th, 6th and 8th days. The maximum output rate applied to the 8th egg 1 µL, ıt is calculated as 38,43% individuals. The lowest output of the application rate 4th 100 µL %15,53 units daily egg individuals have been identified. Applied at both doses was observed in the 2 daily eggs any output. Dialil disulfid compounds were previously dealt with another onoterpenoid when applied to the 1 and 2.5 µL doses of scrambled eggs no output has been observed.

Keywords: *T. brassicae*, monoterpenoid components, insecticidal effect.

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EPOST AND LPOST GF-2296 (CYHALOFOP-BUTYL + PENOXULAM) APPLICATION IN CONTROL OF DIRECT WET-SEEDED RICE WEEDS

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Abstract

The field trials were conducted at two localities during 2015 to evaluate different EPOST and LPOST GF-2296 (cyhalofop-butyl + penoxulam) application in control of direct wet-seeded rice weeds. The weediness in locality of Sokolarci was relative high with average 257.7 plants per m^2 (21.0 grass, 175.1 broadleaf weeds and 61.6 sedges). The most prevailing among the 6 weed species was *Heteranthera reniformis* with 138.8 plants per m^2. The weediness in locality of Grdovci was nearly doubled compare with the previous trial- 439.7 plants per m^2 (47.8 grasses, 77.1 broadleaf weeds and 314.8 sedges). The most prevailing among the 6 weed species were *Cyperus difformis* L. (191.3 plants per m^2) and *Scirpus maritimus* L. (123.5 plants per m^2). *Echonochloa crus-galli* (L.) Beauv. control at 14 days after EPOST treatment with GF-2296 applied at 2.5 and 3.0 L/ha was ranged between 93.8% and 96.2%. 28 days after EPOST treatment, both rates of GF-2296 provided 100% control of *Echonochloa crus-galli* (L.) Beauv. GF-2296 (cyhalofop-butyl + penoxulam), showed excellent (100.0%) EPOST efficacy in control of sedges in Sokolarci locality, regardless estimation time. EPOST GF-2296 efficacy in *Echonochloa crus-galli* (L.) Beauv. control in Grdovci locality was high, 90.0% and 92.7%, respectively, 14 days after EPOST treatment, and between 96.9 and 100.0% 28 day after EPOST treatment. 14 days after LPOST treatment, lower GF-2296 rate provided 79.1% control of *Echonochloa crus-galli* (L.) Beauv., while higher GF-2296 rate provided 81.6% control of the same weed. 28 days after LPOST treatment. GF-2296 applied at 2.5 L/ha and GF-2296 applied at 3.0 L/ha provided *Echonochloa crus-galli* (L.) Beauv. control of 94.8 and 97.9%, respectively. Sedges control at 14 days after EPOST treatment with GF-2296 applied at 2.5 and 3.0 L/ha was ranged between 94.3% and 96.4%. 28 days after EPOST treatment, efficacy was ranged between 96.9 (GF-2296 applied at the 2.5 L/ha) and 99.0 (GF-2296 applied at the 3.0 L/ha). 14 days after LPOST treatment efficacy in sedges control with both rates of GF-2296 was nearly identical-94.0 and 94.3%, respectively. 28 days after LPOST treatment. GF-2296 applied at 2.5 L/ha and 3.0 L/ha provided efficacy of 95.8 and 97.7%, respectively.

Keywords: *Echinochloa crus-galli*, sedges EPOST and LPOST treatments.

Section 10.
VEGETABLE, FLOWER AND DECORATIVE PLANTS PRODUCTION

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COMPARATIVE TRIALS ON KAPIA TYPE PEPPER CULTIVARS

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Abstract

The experiment was carried out on two locations in the region of Strumica – Boriovo village and Dobrejci village. Four pepper cultivars kapiya type have been examined kaloca, KP2, KP3 and KP4. All four have been compared to the referent variety, well known on the markets, slonovo uvo. The following traits and characteristics have been recorded and processed: duration of different phases of vegetation [days], plant height [cm], number of fruits per plant (percentage of pollination) [%], fruit weight [g], pericarp thickness [mm], consumable fruit portion [%], total yield [t/ha] and chemical composition of the fruit. In general, among the examined cultivars grown in the region of Strumica in comparison to the reference cultivar slonovo uvo, the best results were registered in the cultivars kaloca and KP2. As a result of the excellent plant structure, good uniformity, the shape and the color of the fruit, these two cultivars can be well established on the markets in Republic of Macedonia. Both cultivars have exhibited better results in comparison with the referent variety regarding the number of fruits per quality class, better and true type characteristics of the fruit, and as the most significant nutritional value, the vitamin C content was also higher. The cultivar кaloca obtained total yield 75 t/ha, with statistical difference on the level 0,05 in comparison to reference cultivar while KP2 obtained 68,37 t/ha with no statistical differences in comparison to reference cultivar. It can be concluded that these two cultivars meet all the criteria for a high quality final product. Their placement on the market will result with relevant income for the growers, on one hand, but it will also fulfill the expectations of the fresh product consumers and processing industry, on the other hand.

Keywords: varieties, greenhouse production, yield, fruit quality.

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THE EFFECT OF FERTILISERS ON THE QUALITY OF *PETUNIA X HYBRIDA* „DOUBLE PIROUETTE PURPLE“

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Abstract

The survey was conducted in order to determine the quality of the seedlings of *Petunia x hybrida* „Double pirouette purple“. It was produced and treated with different fertilizers, including different concentration.Three different types of liquid fertilizers – Magnicvet with NPK 7-1-5 + ME, Magnihortal with NPK 10-5-5 + ME and Humifulvil, with three different concentrations were used in the experiment. According to the methodology of work and the objective of the examination, following biometric parameters were analysed: plant height (cm), stem thickness (mm), number of branches, number of flower buds and number of flowers. These biometric parameters were measured 40 days after planting into pots.The highest stem thickness has the plants fertilized with Magnihortal with concentration of 0,3 %. The highest number of flower buds and number of branches has the plants fertilized with Magnihortal with concentration of 0,4 %. The highest plant height has plants fertilized with Magnicvet with concentration of 0,3 %. The highest number of flowers has plants fertilized with Magnicvet with concentration of 0,4 %.On the basis of the results of all the examined biometrical parameters, it is determined that the nutrition with Magnihortal has shown the best results.

Keywords: Magnicvet, Magnihortal, Humifulvil, biometric parameters, concentration.

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THE EFFECT OF FERTILISERS ON THE QUALITY OF *PETUNIA X HYBRIDA* „DUVET PINK“

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Abstract

The research was conducted in order to analyse the effect of different types of fertilizers on morphological parameters of *Petunia x hybrida* „Duvet pink“.Three different types of liquid fertilisers – Magnicvet with NPK 7-1-5 + ME, Magnihortal with NPK 10-5-5 + ME and Humifulvil, with three different concentrations were used in the experiment. According to the methodology of work and the objective of the examination, following biometric parameters were analysed: plant height (cm), stem thickness (mm), number of branches, number of flower buds and number of flowers. These biometric parameters were measured 40 days after planting into pots.The highest stem thickness and number of branches has the plants fertilized with Magnicvet with concentration of 0,4 %. The highest number of flower buds has the plants fertilized with Magnicvet with concentration of 0,3 %. The highest plant height has plants fertilized with Magnihortal with concentration of 0,4 %. The highest number of flowers has plants fertilized with Humifulvil with concentration of 0,5 %.The analysed biometric parameters have shown that the liquid mineral fertiliser Magnicvet is more appropriate compared with the liquid mineral fertiliser Magnihortal and Humifulvil.

Keywords: biometric parameters, concentration, measurements.

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AGRONOMIC EVALUATION OF TOMATO HYBRIDS FOR GLASS-HOUSE PRODUCTION

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Abstract

Tomato is the most widely cultivated vegetable crop, both in glass-houses and in-walk tunnels. The objective of the trial is to make a recommendation for tomato hybrids intended for protected crops production in the Republic of Macedonia. It was carried out in the region of Sv. Nikole (Central Macedonia) in glasshouses. The following newly introduced tomato hybrids, by four different producers, have been examined: Fito - Meriva F1, Enza Zaden - Lezoforta F1 and Amaneta F1, Syngenta - Zouk F1, Clause - Loreli F1. The applied experimental design was randomized block system in five replications. Beside the dynamics of germination, flowering, and ripening and harvesting, the productive traits of each hybrid we analyzed using ANOVA. It has been confirmed that the hybrids Zouk F1 and Loreli F1 had earliest germination and the latest was Amaneta F1. Shortest period between germination and flowering has been recorded in hybrid Loreli F1, and the longest in Lezoforte F1. The period between flowering and fruit ripening was shortest in the hybrid Zouk F1, and the longest one in Amaneta F1. Shortest period starting from germination to the beginning of ripening was recorded in the hybrid Amaneta F1 and longest in Zouk F1. In reference to the productive traits, it has been recorded that largest number of flowers per cluster had the hybrid Loreli F1. Largest percent of fruit sets had the hybrid Loreli F1. Lowest percentage of fruit sets per plant had the hybrid Lezoforte F1. Largest average fruit mass was observed in the hybrid Meriva F1. Largest yield per plant was recorded in the tomato hybrid Meriva F1. Finally, the highest yield was recorded in the hybrid Meriva F1 (173.73 t/ha).

Keywords: protected crops, vegetable production, yield.

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POSSIBLE DEVELOPMENTS ISSUES IN ORGANIC VEGETABLE PRODUCTION IN R. OF MACEDONIA

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Abstract

Due to the presence of rural regions clean from industry and pollution, the usage of own inputs in the crop production, Republic of Macedonia has favorable pre-conditions for development of organic agriculture. As a result of that the certified area under organic production increased from 226 ha in 2005 to 3,239.88 ha in 2016, while the number of farms from 50 increased to 562, for the same period. But despite satisfactory conditions for the development and increase of the organic production in RM, very experienced vegetable growers with long tradition of cultivating several crops there are still a number of issues that obstruct its development and need careful attention and effort by all stakeholders in the process of organic production in order to overcome them. Among these limitations primarily are included: lack of organic seeds and other inputs, lack of machines for cultivation of the soil, lack of markets for selling the products, inappropriate application of agro-technical measures (cultivation, crop rotation, plant protection, fertilizing, irrigation, harvest), disconnection of farmers in rural areas, poor infrastructure to the city markets, failure to meet market and consumer requirements regarding quality, quantity and continuous supply of organic plant products, lack of information for the new technology in the organic production, inadequate transportation, lack of storage facilities and very important package, economic crisis, etc. Although some of the plant protection products and fertilizers for organic production are present on the market, the reproductive material still remains to be the largest constrain for organic vegetable production. In that regard there are two categories of farmers: those that use their own seeds and ones that use non-treated seeds from well-established varieties. From 2017, there is only one Macedonian company representative of organic seed from Swiss company that available for import of organic seeds, but the prices are much too high for the local producers. These limitations are probably the reason for low participation of organic vegetable production in the overall organic scheme. Currently there are only 93.17 ha under organic vegetable crop, that is only 2.87% (both organic and conversion to organic) of the total organic production.Assumed the fact that the interest in organic products increases in our country (especially in large cities) and in the European countries, which is a good challenge, it is necessary to take appropriate measures to overcome the above constraints for accelerating the development of organic production in Macedonia. As future steps must be considered: connecting of the farmers that have a common interest in associations, cooperatives, in order to supply cheaper raw materials, group certification, support of trainings, information technology and so on.

Keywords: organic vegetable production, Republic of Macedonia, development, issues.

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CHALLENGES FOR THE VEGETABLE SUB-SECTOR DEVELOPMENT IN THE REPUBLIC OF MACEDONIA

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Abstract

The Republic of Macedonia has approximately 260 ha of agricultural cultivable area under glasshouses, but the exploitation of the facilities ranges between 75-80%, of their total capacity, leaving around 20-25 % of the facilities not being used. The area cultivated under plastic tunnels is not precisely known, but it is estimated between 4000 and 6000 ha for the cultivation of tomatoes, cucumbers, peppers and cabbage. The open field production is gradually decreasing especially for production of tomatoes, cucumber and peppers due to lower productivity and increased problems with diseases. For other vegetables (melons, potatoes and onions) open production and strong seasonal aspects are dominating. The ex-Yugoslavia, considered as one market, traditionally has been and is still the largest consumer of the Macedonian fresh. The position of Macedonian vegetable exporters in these markets is under threat for three reasons: market requirements shifting towards EU standards, related to the arrival of modern retail operations. The large producers are using local or international help which is very costly. There are no available financial instruments that stimulate the farmers to invest in new technologies and production, and the limited profits, mainly that the primary producers are making. High cost of input (energy) for production (energy is app.70% of the cost of the product) and the weak organization and cooperation of the stakeholders (vertical cooperation, horizontal cooperation and small sized production) are also significant challenges that should be dealt with in future. However, the biggest problem that causes weakness in this sub-sector is the limited Governmental and local investment in research. Due to that, there are no local producers of quality seeding material that causes higher cost of inputs and uncertainty of the quality of materials.

Keywords: vegetable production, markets, research.

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STUDY OF SEAWEED EXTRACTS AS BIO-FERTILIZER TO STIMULATE PLANT DEVELOPMENT OF LETTUCE AND TOMATO

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Abstract
The effect of water extracts of four seaweeds *Sargassum muticum* (SM), *Ascophyllum nodosum* (AN), *Fucus vesiculosus* (FV) and *Saccorhiza polyschides* (SP) as seaweed liquid fertilizers (SLFs) on germination, growth and production have been studied. Different concentrations, 25%, 75% and 100% for SM and AN and 5%, 10%, 15%, 20% and 25% with FV and SP were prepared. Plants used for the experiment were lettuce (green and purple variety) treated with SM and AN and tomato variety treated with FV and SP extracts. 50 seeds were soaked in each SLF concentration distributed in various Petri dishes for 2 days, whereas water-soaked seeds were used as controls. Seed germination was the highest (99 and 95%, green and purple lettuce seeds, respectively) with 25% SLF concentration of SM and for FV and SP (86 and 89% of tomato seeds) with 10 to 15% SLF concentration, respectively. Similarly, shoot length, root length, fresh and dry weights of seedlings were significantly increased in lettuce plants, as compared with the control, at 25% concentration of either *S. muticum* or *A. nodosum* with a higher effectiveness of the former seaweed. The auxin content in SLF showed maximum enhancement, being *F. vesiculosus* holder of higher concentration (0,331 mg/mL) while *S. polyschides* presented lower concentration (80,314 mg/mL). The study showed that the concentration of 25% of SM in SLF is required for optimum lettuce growth and development. In case of tomato, optimum plant growth depends on the stage of development, 10 – 20% increased number of leaves but 20 to 25% of seaweed extract accelerated the fruit development, thus obtaining better yield.
Keywords: *Sargassum muticum*, *Ascophyllum nodosum*, *Fucus vesiculosus*, *Saccorhiza polyschides*, yield.

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CYTOKININ APPLICATION ENHANCE TOMATO PLANT GROWTH PARAMETERS UNDER SALINITY STRESS CONDITIONS

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Abstract

Plant morphology changes due to high soil salinity can be partly attributed to changes in the metabolism of plant hormones. These changes are particularly related to plant hormones cytokinins whose level in the leaves are reduced by 50% after stress exposure. Much evidence suggests that cytokinins (CKs) are the major leaf senescence-inhibiting hormones, since senescence is delayed after the exogenous application of CKs. Foliar application of cytokines will influenced cell division, de novo bud induction, leaf growth stimulation, flower and fruit development. Changes in the plant growth parameters (plant hight, plant diameter, leaves number, inflorescences number) and total yield in the two tomato hybrids (Buran F1 and Berberana F 1) subjected to two salinity levels (6.95 dS m-1 and 9.12 dS m-1) were analyzed during the fruiting phase. The obtained results clearly indicate a connection between cytokinins application and morphology improvement in stressed plants. Application of cytokinins had statistically significant and highly significant influence on plant hight, plant diameter, leaves number and inflorescences number. Cytokines mostly led to increase of those characteristics under stress conditions caused by salinity stress.

Keywords: plant hormone, *Lycopericon esculentum*, morphology.

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SEED CHARACTERISTICS DIVERSITY IN SPONGE GOURD (*LUFFA AEGYPTIACA* MILL.) GERMPLASM FROM HATAY REGION IN TURKEY

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Abstract

Sponge gourd is cultivated Asia and Africa and widely used as a vegetable in India, China and other Asian countries. Mature fruits of sponge gourd are used fibres for hygienic washer in Hatay. However, it is very little knowledge in cultivation of Turkey. Therefore, growers aren't available for a commercial varieties. Plant genetic resources or germplasm are fundamental sources for plant breeding, and the assessment of the genetic diversity among germplasm accessions is useful to facilitate more efficient use of plant genetic resources. A mini-core collection of sponge gourd germplasm (36 landraces collected in Hatay and two genotypes other country China and South Korea), from diverse geographic regions of Hatay, was assessed for morphological performance and some seed traits. The objective of this study was establish a sponge gourd core collection with the germplasm collected throughout the Hatay region. There were substantial variations for the investigated seed length, seed width, seed size, seed colour, seed-coat surface, 100-seed weight, as a seed characteristics. The analysis of variance revealed that the differences among 38 accessions were significant for all the studied characters. Seed length and width were changed with 15.12-8.97 mm and 9.71-6.25 respectively. Seed size were determined with small (31 DÖ 06) and big (31 DE 04). Seed colours were changed with black and white, also some of them have a brown like a 07 AN 01. Seed coat surface weren't changed too much. Hundred seed weights were determined with 16.43 g (31 AL 02) and 7.41 (31 DÖ 06). This collection of sponge gourd will be useful traits in the gene pools and a wide range of phenotypic variation that provides a good source of diversity for use in develop of sponge gourd cultivars breeding program.

Keywords: *Luffa cylindrica*, *Luffa acutangula*, seed characteristics, collection.

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THE SEEDLING CHARACTERISTICS AND EMERGENCE PERFORMANCE OF ORNAMENTAL PEPPER GENOTYPES

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Abstract
Seventeen genotypes, which are seedbank of Horticulture Department, Faculty of Agriculture of MKU were compared in this work. All genotypes generally have small heights because of they are selected as ornamental pepper. The lower height plants are preferred for potted ornamental pepper. Comparison of genotypes were investigated for seedling emergence percentage (%), mean emergence time (days), T50 (days), emergence index, vigour index, hypocotyls colour, hypocotyls pubescence, cotyledon colour, and cotyledon shape. Differences were determined among genotypes for all investigated properties. They were changed 19-100% in emergence percentage, 6.1-28.8 days in mean emergence time, 6.10-28.60 days in T50, 0.07-3.98 in emergence index, 1-393 in vigour index. Hypocotyl colours were changed with purple and green. Accessions have got low or medium pubescence in hypocotyls. Cotyledons colour is changed purple and green, but some of them have a variegate like a MKÜ-106. Cotyledons shapes were also showed differences. The lowest seedling emergence percentage was determined from MKU 35. While mean emergence time was highest in MKU 35 and MKU 44, it was lowest in MKU 84. The shortest mean emergence time was obtained from MKU 84. The longest mean emergence time belongs MKU 35 with approximately 30 days. MKU 84 and MKU 117 are higher emergence index than the other genotypes except for Alpçelik.
Keywords: *Capsicum baccatum* var. *pendulum*, morphological characterization, T50, emergence index.

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EXAMINATION OF SOIL FERTILIZERS IN SPATHIPHYLLUM WALLISII REGEL PRODUCTION

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Abstract

Nowadays, potted plants has become increasingly important because of the urbanization and increased building density. The potted plants also need the suitable medium and nutrient supply due to the development and health. During our work, three kinds of soil fertilizers Austrian Volldünger® Linz, Hungarian FitoHorm® Complex Plus and FitoHorm® for potted plants were applied in Spathiphyllum wallisii production. Two experiments were set. First the effects of the two FitoHorm agents were examined on the leaf size. In the second experiment, FitoHorm agents and Volldünger were compared, leaf size, chlorophyll content, fresh and dry weight were measured. The FitoHorm agents had not got significant difference on leaf size, but the groups treated with FitoHorm were bushier. In the second experiment, Volldünger and FitoHorm Complex Plus had positive effect on chlorophyll content, Fitohorm Complex Plus and Volldünger significantly increased it comparing to the control. None of the treatments showed significant difference of leaf length and width, fresh and dry weight comparing to the control or each other. Best dry weight rate was measured by Volldünger treatment. In conclusion, Volldünger® Linz, FitoHorm® Complex Plus and FitoHorm® for potted plants had positive effects on vegetative growth and chlorophyll content, therefore these agents can be recommended in ornamental plant production.

Keywords: FitoHorm, Volldünger, potted plants.

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INFLUENCE OF DIFFERENT GROWTH REGULATORS ON MICROPROPAGATION OF PINK DIANTHUS (*DIANTHUS CHINENSIS X BARBATUS*)

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Abstract

Approximately 156 ornamental species are cultivated via tissue culture in different commercial laboratories worldwide. *In vitro* plant culture is one of the key tools in plant biotechnology that utilizes the totipotency of plant cells. Pink dianthus (*Dianthus chinensis* x *barbatus*) is an important ornamental plant which are grown on balconies, in flower gardens, parks and other during summer period.In this research the influence of different concentrations and combinations of growth regulators on meristem buds and cotyledons from pink dianthus as starting explants was studied: A - MS + 2 mg/l BA + 0,1 mg/l IAA + 0,1 mg/l GA3; B - MS + 2 mg/l BA + 0,1 mg/l NAA; C - MS + 2mg/l BA and D - MS + 5 mg/l BA + 5 mg/l NAA. The meristem buds cultivated on MS medium supplemented with certain growth regulators developed merely shoots. All combinations of growth regulators under this study resulted in development of roots from shoots in pink dianthus. The newly regenerants were acclimatized with their transfer to sterile mix of perlite and peat (1:1) in high moisture conditions.

Keywords: pink dianthus, *in vitro,* growth regulators, meristem, cotyledon, shoots, rooting.

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RESEARCH ON FINDINGS ABOUT CULTIVATION AND USE OF ANNUAL AND BIENNIAL FLOWERING PLANT SPECIES IN THE REGION OF ŠIBENIK AND KNIN – THE REPUBLIC OF CROATIA

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Abstract
Most plant species that are cultivated in climatic conditions prevailing in the Republic of Croatia as annual or biennial flowering plants originate from warm and temperate climate zones of the planet. The plant groups in question are primarily used in privately-owned gardens and on various landscapes. They can be planted in raised flower beds, as well as used for landscape edging, rock gardens, decorative pots and they are also used as cut flowers. They are cost effective and provide the premises with a decorative value added. The objective of the survey research was to verify the findings about cultivation and use of annual and biennial flowering plants that are frequently used in gardens and landscaping in Šibenik and Knin. The survey research was conducted in May 2016 on a sample comprising of 30 respondents (for annual species) and 29 different respondents (for biennial species) from the region of the cities Šibenik and Knin and their outskirts. The respondents assessed the decorative features of six selected species per individual flower group and the method of their maintenance with an average grade (4). The participants in the survey showed a higher level of knowledge on annual flower species (67.7%-100%) compared with the knowledge on biennial flower species (57.9%-75.9%). The persons questioned correctly assessed the use of various species according to their function in the premises. Most respondents used decorative pumpkins (*Cucurbita pepo*) amongst annual flower plants for decoration of premises, whilst amongst biennial plants they primarily opted for daisies (*Bellis perennis*). The data provided can be used for the promotion of cultivation and use of flowering plants in practice.
Keywords: gardens, landscape, knowledge.

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INFLUENCE OF COMPOST MIXTURE ON THE LETTUCE YIELD AND QUALITY FORMATION

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Abstract

In Bulgaria there are many natural materials that present an interest for human activity in relation of their use and properties. Five natural products were tested. In base of their quantity and quality characteristics was offered different mixture in various combination of vermiculites, ash from straw biomass, wood biomass and pig manure. The aim of the study is based on the characterization and evaluation of the proposed natural products. Different ratio of mixtures was tested as a soil improver and their impact on yield and chemical characteristic of plant production. Pot experiment with lettuce is set out in the following versions: control, 2, 5, 7, and 11% by soil weight. The highest yield is obtained in variants with 11% of all compost mixture. In mixtures (2, 3 and 5) with large manure content has been observed highest increase of yield as a result of more imported nutrients by organic manure.Chemical characteristics of lettuce crop production, with the participation of all variants of compost mixtures shows that the main nutrients - nitrogen, phosphorus and potassium are to normal for plant species. The level of tested heavy metal is below toxic concentration. The results of total sugars content and photosynthetic activity correspond with data obtained in biomass harvesting in pot experiment. In all variants with 7-11% compost mixture was observed the highest level of photo-synthetically active chlorophyll "a".

Keywords: pot experiment, plant chemical characteristic, photo-synthetically activity.

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STUDY OF ENVIRONMENTAL, HABITAT AND ECOLOGY OF *EREMURUS SPECTABILIS* IN KHORASAN RAZAVI

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Abstract

Foxtail lilly (*Eremurus spectabilis*) is a perennial plant liliaceae family its dried roots are sticky when powdered and exposed to water. This research was conducted to study habitat characteristics, phonology, morphology, root system and factors affecting regeneration. In two sites, phonological stages were recorded in 10-15 days intervals during 3 years. In order to determine relations between soil and plant , some physiochemical characteristics of soil such as: texture , PH , EC , Na+ , K+ , lime and gypsum were studied. Geology of provenance was studied using geological maps and field check. Results showed that this species exists in rocky foothills in all geographical orientations and slops of 12% to 68%. Phonological stages varied in different altitudes and years. Vegetation growth initiate when reset leave appear in middle march, followed by floral initiation in aplil and then florets blooming during May. Fruit setting initiates from late in May. In early June seed are in dough stage, then roe and shed in early July. Phenological stage delayed 6-7 days for every 200 meter increasing in altitude. A plant flowered in current year may flower again next year or not for several years. Precipitation varies from 200 to 600 mm and annual mean temperature is between 5 15degree centigrade. 50 percent of location is located in cold semi arid climate. This species prefer sandy loam, silty loam and well drainage soil with pH = 7. Low EC indicates less salt-tolerance of this species. Parent materials are sheil, lime and volcanic stone. This species regenerates by seed (Sexually), and root dividing (Asexually) was not. Successful Seed require cold pre-treatment to germinate. After 4 month 50 percent or seeds germinated in laboratory condition. Leaves of *Eurytoma* sp. damaged 40-50 % of seeds. Roots were usually harvested traditionally after leave drying when seed are not completely matured (milky to dough stage). These caused severally reduced regeneration.

Keywords: phenology, regeneration, propagation, germination, *Eurytoma* sp.

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MINERAL RATIOS IN BEETROOT UNDER DIFFERENT FERTILIZATION

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Abstract

Besides the absolute values of mineral content in plant tissue, particularly is important their relative relationship. Imbalance in nutrient uptake very often is result of extensive fertilization with one nutrient, which is then in excess, so can prevent uptake of other nutrients what may cause disturbances in metabolism. Therefore, the goal of present research was to determine the influence of fertilization on mineral ratios in beetroot. A field trial (2003-2005) was set up in a hilly part of Croatia according to the Latin square method with four types of fertilization (control, 50 t stable manure ha-1, 500 and 1000 kg NPK 5-20-30 ha-1).It was determined that fertilization with stable manure resulted with the highest ratios of P/Zn, Fe/Mn and K/Mn (76, 2.5 and 609, based on mg kg-1 in dry weight, respectively), while the highest ratio of N/Zn (702 based on mg kg-1 in dry weight) was determined in fertilization with 1000 kg NPK 5-20-30 ha-1. In order to achieve high mineral content and its favorable ratio is necessary to combine the organic and mineral fertilizers.

Keywords: *Beta vulgaris* var. *conditiva* Alef., iron, manganese, nutrient, phosphorus.

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THE POSSIBILITY OF IMPROVING THE PRODUCTION OF FLOWERS IN THE REPUBLIC OF SERBIA

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Abstract

Flower production is highly intense production, which does not require large areas, but requires knowledge and organization of the overall production and sales. In recent years there has been growing interest of individuals, in the context of their family households, on small estates, organize the production of flowers. Production is mainly concentrated around the major cities and it deals with around 2,115 farms on a total area of 382.24 hectares. In terms of production structure dominates production of seedlings of seasonal flowers, and the manufacture of some types of suitable for cut flower (rose, chrysantemum, lilies, gladiolus, kala). The volume of annual production of 2500 t does not meet the needs of the domestic market. For these reasons, the import of flowers is several times higher than exports.Starting from the fact that the Republic of Serbia not only has significant land resources, but also scientific institutions in the field of agriculture which have made are significant scientific results, improvement of the total production of flowers, can significantly reduce imports but at the same time significantly increase the export of flowers to other countries.

Keywords: agriculture, production, floriculture, Serbia.

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THE EFFECT OF SUBSTRATE TYPE ON THE QUALITY OF WATERMELON SEEDLINGS

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Abstract

Watermelon is one of the leading vegetable crop grown in R. Macedonia. It is produced either by seed or more frequent by seedlings. The objective of the research was to determine the influence of the type of growing substrates on the quality of watermelon seedlings, variety Fantasy F1. It was used three different substrates as follows: homemade substrate mixture of organic cattle manure and soil in ratio 1:1 (reference treatment), commercial Brill substrate with trichoderma (treatment 1) and mixture of homemade substrate and Brill substrate with trichoderma in ratio 1:1 (treatment 2). According to methodology of the research several biometrical parameters were measured in order to determine quality of the watermelon seedlings as follows: height of the seedling (cm), mass of the above part of the seedling (cm), thickness of the stem (mm), number of leaves, mass of leaves (g), length of the root (cm) and mass of the root (g). The seedling were measured 18 days after sprouting. Results showed that seedlings grown in Brill substrate with trichoderma had the best parameters for mass of the above part of the seedling (5.10cm), thickness of the stem(3.30mm), number of leaves (6.27), mass of leaves (9.04g), length of the root (17.17cm) and mass of the root (13.95g). Only seedlings from treatment 2 were highest (16.23cm) in comparison to reference treatment (14.6cm) and treatment 1 (14.73cm).

Keywords: hybrid, growing medium, biometrical parameters.

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TOWARDS SUSTAINABILITY IN THE PROTECTED HORTICULTURE OF ALMERIA, ANDALUSIA, SPAIN

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Abstract

There are more than 30,000 ha of vegetables greenhouses in the province of Almería, Spain. Almost 2,000 of them are certified in organic farming according to EU Regulation and more than 70% in integrated production management or other quality standards. Grower indicators show an average age of 44.3 years, with approximately 12% of women entrepreneurs, and more than 80% of farmers officialy trained. More than 70% of them have internet connection. Growers own an average area of 2.14 ha, mainly multichapel greenhouses, with drip irrigation in its totality and an high presence of family labour force. IFAPA's transfer project Participatory Innovation for a Sustainable Protected Horticulture, approaches current topics about horticulture through different research and transfer actions developed with the participation of agribusinesses. The main objective is to contribute to the sustainability and profitability of the system at long term, including among other objectives, technical solutions to specific phytosanitary issues. Biological control is widely implemented in protected crops, reaching 97% of total farms in pepper and currently enhancing the management of habitat for conservation biological control, by means of planting external perimeter hedges in greenhouses and building insect hotels. Solarization is the main soil disinfestation technique in the area, currently working in biosolarization of soil and substrates, and in the search for resistance/tolerance to soilborne pathogens of Meloidogyne, Fusarium, Pythium and Phytophthora genera in Cucurbita pepo and hybrids with other cucurbitaceae. The results are disseminated to the advisor and production sector through different formats, including demonstrative training days, virtual advisors, and knowledge platforms (SERVIFAPA), as well as institutional training to specialized training on demand, attending around 30,000 students per year.

Keywords: sustainability, greenhouses, vegetables, plant health, solutions, transfer.

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NEW CROPS TO PROMOTE DIVERSIFICATION OF VEGETABLE PRODUCTION IN GREENHOUSES OF ALMERÍA (SPAIN)

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Abstract

The intensive vegetable production of Almería, one of the most important areas of protected crops in the old continent, is based in 8 main crops with a production that suppose 1807 million €: Tomato, Pepper, Cucumber, Melon, Watermelon, Courgettes, Aubergines and Green Beans. The diversification in this area is a result of the incorporation of them along the last sixty years: some crops has been increasing its productivity in last years while other crops disappeared after a period of production, as strawberry.IFAPA, the Institute of Agricultural Research in Andalucía region (Spain), promote and potentiate the diversification selecting new crops to be tested in greenhouse systems. These are made following two concrete lines of work: One is to test new specialties of existing crop, and the second focus on test new exotic vegetable species.In order to incorporate new specialties of crops of relevance in Almería, as tomato or pepper, we tested varieties with significant differences in colour, shape, size, flavour that need new ways of commercialization. This is the case of specialties of pepper known as sweet bites, of reduced size, with differences in colour among varieties and with a high level of sugars that make really sweet the fruit. More than 10 varieties have been tested in greenhouse, showing differences among them, not just in morphology, but in production, sugar contents. Additionally, landraces are sources of diversity and are adapted to areas of production, maintaining valuable traits for the consumers, as has been tested with tomato landraces. On the other hand, exotic species has been incorporated habitually in the systems of production of Almería, and represents an innovative source that promotes, among others, extemporaneous harvesting or increasing production. Winter squash (*C. pepo*) has been tested in our institute to check alternative periods of harvesting and the production.

Keywords: diversification, vegetables, greenhouses.

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EFFECTS OF FOLIAR FERTILIZING ON THE YIELD OF PEPPERS GROWN IN PROTECTED SPACES IN STRUMICA REGION

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Abstract

The influence of foliar fertilizing with organic fertilizers on the yield of two pepper cultivars grown in protected spaces in Strumica region was examined. The experiment was set in four variants and three repetitions for each cultivar separately. The variants in the experiment were: Control (untreated); NPK+Ever green (55% organic matter, 2%w/w Mg, 2%w/w Fe, 2%w/w Zn, 2% w/w Mn, 0.5 %w/w Cu, 0.5 %w/w B); NPK+Biolinfa (34% organic matter, 3 %N, 5.80 % K2O); NPK+Oligomix (1.20 % B, 0.10 % Cu, 4 % Fe, 1.50 % Mn, 0.10 % Mo, 2 % Zn).The experiment was set in 18 rows, and in each variant and repetition were included 62 plants separately. During the vegetation were made 7 foliar treatments with named before fertilizers at a concentration of 0.4%.Before setting up the experiment agrochemical analysis of the soil were made and was determined good soil fertility with available nitrogen and potassium, and medium fertility with available phosphorus.After harvesting and measuring pepper yield was determined that the foliar fertilizing had a positive influence on both analyzed cultivars. In three variants treated with different foliar organic fertilizers was determined higher yield of peppers in both cultivars compared to control untreated variant. The highest yield of 64.35 t/ha for white long cultivar and 70.31 t/ha for dora cultivar were determined in variant 2 (NPK+Ever green (55% organic matter, 2%w/w Mg, 2%w/w Fe, 2%w/w Zn, 2% w/w Mn, 0.5 %w/w Cu, 0.5 %w/w B).

Keywords: foliar fertilizing, peppers, yield.

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CHARACTERISATION AND EVALUATION OF PEPPER LANDRACES AS ETHNO-BIOLOGICAL HERITAGE FROM SOUTH SERBIA

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Abstract
Biodiversity and agrobiodiversity coexist, in complex system in which ethno-biological diversity (genetic, specific, ecosystemic) integrates with culinary diversity, express the ethno-gastronomic heritage at the local level. Whole dry pepper fruits are the part of rich ethno-biological heritage from Balkan region, specifically from southern Serbia. Pepper fruits dried in traditional way slowly in a draught are used in preparation of local ethno-gastronomic specialities, with special position in local customs related to dietary habits during the spring Orthodox fasting period. Landraces (*Nizača, Lokošnička* and *Turšijara*) from South Serbia used traditionally for this purpose were grown under the same agroecological conditions using two traditional production methods: from seed and from transplants. Besides the basic morphological properties and composition, the features characterizing fruit colour and pericarp anatomy were determined in order to analyze and systematize the traits relevant from the aspect of traditional end use of examined landraces. Landraces *Lokošnička* and *Nizača*, characterized with higher force needed to puncture fruit skin, larger number of mesocarp layers, thicker endocarp and thicker collenchyma tissue, followed with higher total soluble solids content are more suitable for intended traditional use than *Turšijara*. Fruit colour of examined landraces was mainly influenced by production method and point out that production from transplants should be favoured in order to obtain more uniform, darker red fruit colour with less involved yellow tones, as well as higher yields.
Keywords: *Capsicum annuum*, landraces, sensory attributes, morphological properties, fruit anatomy.

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DIFFERENT SOILLESS CULTURE SYSTEMS AND THEIR MANAGEMENT

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Abstract

In the Mediterranean Region, protected cultivation has an important place among horticultural activities that are practiced on 300,000 hectares in greenhouses and under low tunnels. Production is realised by the help of prevailing climatic conditions under simple structures. Production is still generally made in soil but soilless culture is one of the most important strategy to replace MeBr. There are two types of soilless cultivation. Water culture is the growing of plants in nutrient solution without a solid substrate. However, substrate culture systems have a solid substrate for the plant roots. Soilless culture systems are further categorized, as open and closed systems. The open systems where the water and nutrients are supplied as in conventional soil culture and the surplus nutrient and water is allowed to run to waste. In closed systems nutrient solution is recirculated and thus water and nutrients loss is reduced. Among soilless culture systems, open substrate culture seems to be more promising due to its similarity to soil production results in high adaptability to the farmers' conditions. However, there is a need to shift from open systems to the recirculated ones due to the increase of water, nutrient and pesticide use efficiency in those systems and reduced of environmental impact. This presentation aims to summarize different soilless culture systems and the potential of their use in the Mediterranean Region.

Keywords: cultivation, soilless culture systems, management.

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MINERAL COMPOSITION IN BERRY SKIN, SEED AND PULP OF SOME GRAPE VARIETIES

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Abstract
This research was conducted during 2012 and 2013 year on Tannat, Viognier, Merlot, Shiraz, Malbec, Cabernet Frank, Cabernet Sauvignon, Yalova incisi, Cirbet, Sire, Banki, Kirmizi, Bogazkere, Okuzgozu, Hatun Parmagi, Kizil, Tahannebi, Genc Mehmet and Vanki grape (*Vitis vinifera* L.) varieties. The purpose of this research was to determine the mineral compositions of grape berry skin, seed and pulp. NFe (ppm), Zn (ppm), Mn (ppm), B (ppm), P (ppm), K (ppm), Ca (ppm), Mg (ppm), Na (ppm) and S (ppm) element analyses were conducted on the grape berry skin, seed and pulp to determine the mineral compositions of grapes.The highest mineral element at the end of the research was stated to be in the Cabernet Sauvignon, Bogazkere and Okuzgozu grape berries. Fe (ppm), Zn (ppm), Mn (ppm), K (ppm), Ca (ppm), Na (ppm) and S (ppm) elements were found highest in the pulp, Mg (ppm), P (ppm) and Cu (ppm) highest in the seed, and B (ppm) highest in the skin.
Keywords: grape, mineral composition, berry, skin, seed, pulp.

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OIL CONTENT IN THE SEEDS OF WINE GRAPE VARIETIES IN THE REPUBLIC OF MACEDONIA

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Abstract
Modern studies worldwide suggest a high nutritional and medicinal composition of the grape seeds. Oil for human consumption produced from the grape seed is already in everyday use in the diet in the economically developed countries. Seeds are also characterized by a rich composition of phenolic substances from which supplements recommended for cardiovascular system improvement are produced. Recent studies indicate the possibility of their use in the treatment of cancer. Grape seeds are not used for these purposes in the Republic of Macedonia. We tested two varieties that are most widely cultivated in the Republic of Macedonia, the red wine variety, vranec and the white wine variety, smederevka. Grapes were collected from two sites, Kavadarci and Valandovo, regions that are most important for the production of these two varieties. All tests were carried out in three repetitions. The mechanical and chemical composition of the grapes were analysed following the OIV (International Organisation of Vine and Wine) methods. We used statistical analysis of the completely randomized design. We detected rich chemical composition in the seeds, which indicates the great seed use value of the tested varieties.
Keywords: wine grape varieties, vranec, smederevka, grape seeds, oil.

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THE EFFECTS OF IN VITRO DROUGHT STRESS ON SOME BIOCHEMICAL PROPERTIES OF TWO GRAPE ROOTSTOCKS

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Abstract
Rootstocks affect the resistance of the graft to abiotic and biotic stress factors by modulating its physiological and biochemical properties. Usage of rootstocks in viticulture is mainly for their resistance to phylloxera but also for their tolerance to different soil conditions. Abiotic stress factors like drought, salt, heat, heavy metals etc. stimulate the synthesis of some osmoprotectans in plants. Osmotin and proline are some of these metabolites and their accumulation remarkably increase during stress.In this study we use 5BB and Ramsey rootstocks to evaluate their tolerance to drought in in vitro conditions. MS (Murashige-Skoog) medium was used for culture and four different stress conditions were applied by adding different amount of PEG 8000 (0, 2, 4, 6%) in the media. Proline amounts were measured spectrophotometrically according to Bates et al. (1973) on the 1st, 3th and the 7ht days following the applications. Osmotin gene expressions were determined by real-time PCR by using OSM1 gene (Genebank acces. no:Y10992.1). Data were evaluated statistically.
Keywords: grape, Ramsey, 5BB, drought, osmotin.

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EFFECT OF BACTERIAL FERTILIZER ON GROWTH, YIELD AND GRAPE QUALITY OF POTTED CABERNET SAUVIGNON (*VITIS VINIFERA* L.)

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Abstract

The goal of this study was to investigate the effects of application of bacterial fertilizer on some agrobiological properties of grapevines in the early years of vine development. In these studies, one commercial bacterial fertilizer - BactoFil B10 was used during the first two growing seasons. The influence of the fertilization was investigated on the vine growth – total leaf area, shoot diameter and pruning weight, and fresh root weight. Grapevine grafts were planted in pots (20 l) containing of the pre-prepared substrate Terracult TC8, to which was added perlite (10% of vol.) and mineral fertilizer Osmocote (30 g per pot). The BactoFil was added in several occasions by planting to the growing season in both years. The most expressed effect of Bactofil application was in the first vegetation when increases of the total leaf area of 9%, shoot length of 6% and shoot pruning weight of 14.6% were obtained in comparison to the control. At the end of the second vegetation, plants were removed from the pots and the fresh root weight was measured. It was found that used treatment was not influenced on the variations of the average root weight. The first grapes were obtained in the second vegetation. Treatment with BactoFil was not influenced on the differences in the yield, grape and berry weight. Also, treatment was not influenced on the must quality which was expressed over the dry matter content and total acid content. According on these investigations, it can be concluded that the application of BactoFil B10 has a positive influence on the development of the aboveground parts of the vine, i.e. elongation of shoots and leaf area.

Keywords: bacterial fertilizer, vigour, yielding, grape structure, must quality.

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BORON APPLICATION ON VINEYARDS OF TEREK-KUMSKIY SANDY SOIL

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Abstract

The effect of different doses and time of boron fertilization on growth and development of grape plants were studied on the soils of Terek-Kumskiy sands of Chechen Republic, Russian Federation. The aim of research is to study the content of boron in the soil and to identify the physiological response of the vine plants on boron fertilizer. The obtained data of the boron total content in the studied sandy soil showed that in 0-60 cm layer of the soil the boron total content ranges from 0.4 to 0.5 mg/kg, in 60-150 cm soil layer - from 0.75 to 0,78 mg/kg. Fertilizing with boron allows to increase the sugar content of the berries up to 0.8-1 4 g/cm3, while substantially reducing the acidity of the juice. The yield of grape crystal grade in the variant with background + N90R90 K90 + 2 kg of active boron addition was 76.8 t/ha, which is higher than in the control at 34.2 t/ha. The increasing of sugar berries in this variant was from 0,8 up to 1,4 g/cm3. The highest rates for plants productivity were observed by introducing a complex of boron micronutrients, cobalt, manganese, molybdenum, zinc in the form VIII, wherein the yield totally was 89.4 c/ha.The use of boric acid as a fertilizer stimulating the formation of new points of stems and root growth, increased the number of shoots, improved growth, increased the sugar content and taste of the fruit. The use of boron fertilizers allowed to increase the sugar content, acidity, tasting score grapes up to 12-38%. The most effective dose of boron fertilization is 3 kg/ha in the background N90P90K90 applied to the phase of start of sap flow. This research was supported by Project of President of Russian Federation MK-3476.2017.5, RFBR№16-35-60051, 16-35-00347.

Keywords: boron, grape plants, sandy soil, vineyards.

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EFFECTS OF NEW ORGANIC PREPARATIONS BASED ON ZEOLITE AND DOLOMIT OVER SOME CHARACTERISTICS OF THE GRAPE IN R. MACEDONIA

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Abstract

In our research are covered the results of applying new organic products of mineral origin based on zeolite and dolomite. The specific substances processed at our paper represent minerals geographic origin of the mining localities in R. Serbia and the same are protected by intellectual property. In R. Macedonia are implemented on several agricultural crops including the grapevine. According to the method of application to plants can be as improvers of soil features which are applied on the soil of planted place, as well as their other formulations that are applied as fertilizer on the foliage (leaves). Way of their influence is based on improving the health and conditions and capacity of plant organisms and strengthening the entire immune system of the plant. Usually affect an increase in foliage and Equating the flowering and fertilization. Thereby receive yields that have improved quantity and quality. They represent formulations which are allowed to apply organic production of grapevine. In this examination are presented results of treating many varieties of grapevine on several localities in R. Macedonia. They are chosen at plantations with low condition and individual plantings for periods of two years. Were obtained visible results in increasing the useful leaf mass and in a timely and evenly flowering. Also, this year, these preparations improve the situation with the frozen vineyards.

Keywords*:* organic, mineral origin, zeolite, dolomite, flowering, grapevine.

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DETERMINATION OF SOME PHYSICAL AND CHEMICAL PROPERTIES OF CRIMSON SEEDLESS GRAPE VARIETY GROWN SOILS IN VINEYARDS OF ALAŞEHIR DISTRICT IN MANISA

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Abstract

This study was conducted in 2015 aimed to determine some physical and chemical properties of Crimson Seedless grape variety grown soils in vineyards of Alaşehir district, which is the largest grape producing vineyard area of Manisa Province in our country. According to the results of vineyard soil samples analyses; 80% loamy and 20% soil samples had clay–loamy structure; 20% soil samples were found with strong alkaline, the 60% having slight alkalineand 20% mild acid, 100% salt–free. These soil samples are placed into low class category in terms of total organic matter due to its 80% low and 20% calcareous level. Soil samples contain 60% medium, 20% high and 20% very high level of P; 20% very low, 30% low and 50% medium level of K. Soil samples having 20% low, 40% medium and 40% high Mg level; also containing 40% very low, 20% low and 40% medium level of Ca. Soil samples possessing 40% low and 60% critical level of Zn; also having 60% critical and 40% adequate Fe. Nitrogen contents were found low while Cu and Mn contents in sufficient amount in case of all soil samples. In addition to this, the presence of significant bilateral relations relating to some physical and chemical properties of vineyard soils were also determined.

Keywords: *Vitis vinifera* L., Crimson Seedless grape variety, physical and chemical properties of soil, nutrient, Alaşehir/Manisa.

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DYNAMICS OF RIPENING OF AFUS-ALI TABLE GRAPE VARIETY

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Abstract

The afus-ali variety, together with the muscat italia, cardinal, victoria, ribier, and palieri, is the most important table grape variety in the Republic of Macedonia. We studied the dynamics of ripening of the afus-ali table grape variety from two locations Kavadarci and Valandovo where this variety is most commonly cultivated in the Republic of Macedonia. To determine the timing of ripening, we examined the dynamics of ripening by randomised sampling in the period from early August to the ripening of the grapes in early September. Four samples with three repetitions for each sample were taken every 10 days.We analysed the mechanical and chemical composition and mechanical properties of the cluster and berries following the OIV (International Organisation of Vine and Wine) methods. We used statistical analysis of the completely randomised design. The changes that occur during ripening of the afus-ali variety are the indicator of its technological ripeness. The results can be applied in the planning of the vintage depending on the market placement and duration of refrigerator storage of grapes.

Keywords: table grape variety, afus-ali, dynamics, ripening.

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IMPACT OF THE NUMBER OF CLUSTERS ON CARDINAL VARIETY PRODUCTION RESULTS

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Abstract
The Cardinal variety is a leading very early ripening table grape variety in the Republic of Macedonia. The grape quality largely depends on the applied production technology. The aim of our research is to determine the impact of the number of retained clusters per m2 on the production results of the Cardinal variety, grown on pergola tendon trellis (odrina) system in the Gevgelija - Valandovo wine region. The load of 3, 4, and 5 clusters/m2 respectively was noted. Based on the results, we found a significant impact of the number of clusters on the yield, dynamics of ripening, and quality of grapes. By increasing the number of clusters, the weight of the cluster decreased from 489 g in the 3 clusters/m2 variant to 446 g in the 5 clusters/m2 variant. The weight of the berry ranged from 7,6 g in the 5 clusters/m2 variant to 8,4 g in the 3 clusters/m2 variant. Total weight of packaged grapes ranged from 1,4 kg/m2 for the 3 clusters/m2 variant to 1,9 kg/m2 for the 5 clusters/m2 variant. There was a significant difference in the dynamics of ripening, i.e., the quantity of packaged grapes in the first harvest. The highest weight of 1,55 kg/m2 of packaged grape in the first harvest was obtained from the variant with 4 clusters/m2, and the lowest of 1,29 kg/m2 from the 3 clusters/m2 variant. The best quality of 9.6 points was observed in the variant with 3 clusters/m2 and the lowest of 7.9 points in the grapes of the variant with 5 clusters/m2. From these results, it can be concluded that the best results for the Cardinal variety are obtained by leaving 4 clusters per m2.
Keywords: table grape, production tehnology, yield, dinamics of rippening, weight of the cluster, organoleptic evaluation.

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TECHNOLOGICAL CHARACTERISTICS OF VARITY AFUS ALI AND HIS CLONES ISV 6

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Abstract

During the period from 2015 to 2016, we investigated some agro-biological and technological characteristics for two variants of Afus Ali table grape standard and clones ISV 6, certificated seedlings material was introduced from Raushedo VCR from Italy, compared to standard traditional Afus Ali table grape. The researches were held in the location Terstenik of Tikvesh vineyard region, in Republic of Macedonia. Technological characteristics were examined; mechanical composition of the bunch of grape and barriers, mechanical properties of the bunch of grape and barriers (transportability and reaction strength), chemical composition of grapes and organoleptic evaluation, using the standard ampelographic methods of OIV. The studied and analyzes were carry out in faculty of Agriculture sciences and food, department of Viticulture and Oenology, in Skopje and laboratory of Stone castle Rahovec in Kosovo. From the investigation we saw that there were some significant differences between clones and standard.

Keywords: table grape, variety Afus Ali, clones ISV 6, technological characteristics.

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YIELD PLANNING IN TABLE GRAPE PRODUCTION ON STRASHINSKI GRAPE VARIETY

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Abstract

Table grape production takes considerable place in the total grape production in Republic of Macedonia. Central Povardarie wine regions, especially Tikvesh wine district has good conditions for producing table grape for consumption in fresh state. Obtaining optimal yield and quality table grape demands aplication of suitable ampelotechnical measures such as: yield planning per vine and hectare, pincage of grape cluster, partial defoliation, use of biostimulators, use of modern packing centers and use of adequate packing for the table grape. The purpose of the research was yield planning with leaving specific numbers of grape clusters per vine to get high yield and high quality table grape. Three Variants were researched with 18, 23 and 27 grape clusters per vine and Standard with leaving of all grape clusters per vine. Measuring of the yield per vine and per hectare was conducted, percentage of packed grape and remnants, mechanical analysis of the grape cluster and berry, pressure resistance of the berry, resistance of cluster stem breakage and chemical analysis. The results and information received from the yield per vine and hectare, percentage of packed grapes and remnants, the chemical analysis of sugar content and total acid content are showing that the best results are achieved at the Variant with 27 grape clusters per vine.

Keywords: table grape, Strashinski, pincage, yield planning per vine and hectare.

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FRAJLA AND DIONIS, NEW WINE GRAPE VARIETY FOR ECOLOGICAL GROWING

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Abstract

Reducing pesticide use in vineyard production in order to preserve the environment and human health is possible by growing cultivars tolerant or resistant to fungal diseases. At the experimental field of University of Novi Sad, Faculty of Agriculture in Sremski Karlovci, during last four decades, several cycles of interspecies crossings were made, putting emphases on quality improvement and resistance maintenance. The research results of the last generation of new wine grape varieties Frajla and Dionis are presented. Using molecular markers, it was found that Frajla variety carries Rpv3 and Ren3 genes , while the variety Dionis carries Rpv3 and Rpv 12 genes. The presence of the genes Rpv3 and Rpv 12, (downy mildew resistance) and Ren3 (powdery mildew resistance), were confirmed in the field conditions. Biological and production characteristics of new varieties were observed during the period 2012-2016. Frajla (Vertes csillaga x Petra) is an early ripening variety (30. 08.), solid yield (1.02 kg/m2), with high sugar content in the must (24.5%), and enough acids (8.2 g/l) to produce high quality white wine, with discreet muscat aroma. Variety Dionis (Cabernet franc E11x Panonia), is a late ripening (01. 10.), with solid productivity (1.11 kg/m2), accumulates high content of sugar in the must (24.8%). Dionis demonstrated a high degree of tolerance to fungal diseases, resistance to frost and excellent quality of red wines. New varieties are recommended for ecological viticulture and winemaking.

Keywords: wine quality, resistance, frost, fungal diseases.

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EXAMINING THE STATUS CYTOGENETIC ON SOME AUTOCHTHONOUS VARIETIES A GRAPEVINE IN R. MACEDONIA ACCORDING O.I.V. SYSTEM

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Abstract
In R. Macedonia has many domestic (autochthonous) or domesticated varieties of vines. Many of them are similar to some varieties of from neighboring countries, and some of them are very different between them, and are also differ from the other varieties. It depends on heritable traits of their ancestors and their origins, from the centers of origin. They represent undiscovered source of many genes that are carriers of positive properties and predominantly transmitted to future generations. Many of them are unidentified and not known their exact origin. Therefore efforts are made with certain adequate methods to identify (ampelographic, ampelometric, DNA identification). In our research we covered several table and wine varieties of grapevine from different vineyards through R. Macedonia. In the trials used methods for determination of cytogenetic status according O.I.V. system of descriptors - (number of chromosomes, ploidy level, germination of pollen, meiosis, type and characteristics of the flower, etc.). We used statistical computer processing by (SPSS) program. Obtained are interesting results in terms of the structure of the flower and the cell division that indicate the similarity between them and their common origin.
Keywords: autochthonous varieties, identification, description, cytogenetic status, meiosis.

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CLONAL SELECTION OF THE GRAPEVINE CULTIVAR ŽUPLJANKA

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Abstract
Clonal selection can be applied to newly developed grape cultivars in order to improve some of the cultivar production characteristics. Župljanka is a local cultivar created in Sremski Karlovci - Serbia in 1970 (Prokupac x Pinot noir) and it renders a high quality white wine. It is a good yielder, it accumulates fair amounts of sugar and it has good resistance to gray mold. The individual clonal selection of this cultivar was started in 1991 in Sremski Karlovci, on Experiment field of the Faculty of Agriculture in Novi Sad, in order to separate the vines from župljanka population with good yield and good acid composition in wine (tartaric acid and malic acid). This paper presents the results of the 1st and 2nd phase of clonal selection of the župljanka cultivar, during which four clones were selected: SK-30, SK-34, SK-37 and SK-60. Wines made from these clones contained increased contents of tartaric acid compared with malic acid, which improved the quality of these wines. The clones were officially approved in 2015 and they are on the national list of cultivars of Serbia.
Keywords: yield, sugar, acids, wine quality.

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TECHNOLOGICAL CHARACTERISTICS OF SOME NEW PROKUPAC CLONES

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Abstract
The research carried out in experimental vineyard-collection at Faculty of Agriculture experimental field Radmilovac, which is located at GPS coordinates N 44º 45' 21" and E 20º 34' 53". Experimental vineyard is located at southeast part of Belgrade, at an altitude of 130 m and covers southern exposure. It belongs to Šumadijsko-velikomoravski vineyard area, Belgrade sub-region and Grocka vineyard region. Rows were extending in southeast-northwest direction with line spacing of 3 m and 1 m between vines in row. In experiment tested clones were under codes 40/2, 42/1, 43/1 and 43/3. From technological characteristics in paper is presented data related to weight of biomas discarded in pruning, yield, mechanical composition of berries and cluster, structural indicators of berries and bunches and qualitative parameters-sugar and acid content. The biggest mass of pruning shoots was determiner at clone 40/2 (1.008 kg/vine). The highest yield is recorded at clone 42/1 (7.1 kg/grapevine) and the smallest for clone 43/1 (3.6 kg/vine). Maximum cluster mass was recorded at clone 43/1 (276 g), whereas for clone 40/2 was determined the largest weight of berries meat (254 g) and the biggest seeds number per 100 berries (208). Clones 42/1 and 43/1 are characterized with the highest recorded skin weight of 100 berries (10 and 23 g/100 berry). Same trend was recorded for percent of stem, skin and seed in cluster. Clone 42/1 had the lowest percent of meat in berry (88.21%). According to sugar content were founded the highest level for clones 42/1 (24.1%) and 40/2 (22.4%). Same trend of variation is determined for acid content in grape juice.
Keywords: technological characteristics, berry, grape, clone, Prokupac.

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PRODUCTIVE CHARACTERISTICS OF TWO RIESLING CLONES – 1089 AND 1091 IN THE WINE-GROWING REGION OF NORTHERN BOSNIA

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Abstract

Riesling is a grapevine cultivar and has its origin somewhere in the valley of the river Rhine in Germany. Nowadays Riesling is grown on over 90,000 ha of land on six continents. As a part of a modern grapevine breeding, clonal selection today plays a very important role for locating and sustaining of genetic resources of different grapevine cultivars. New clonal selections show the differences which can significantly influence productive characteristics as well as the quality of wine. Studies of newly released clones in particular climatic condition are important to do define the most reliable. Two French clones of Riesling - 1089 and 1091 have been studied within the climatic condition of Northern Bosnia growing region during 2015. and 2016. Both clones show better productive characteristics during 2016. comparing 2015. Average bunch height of clone 1089 was 75.04 g in 2015. and 87.01g respectively in 2016. Clone 1091 had a smaller bunch in both studied years. There were found differences in average yield among studied clones ranged from 855 kg/ha for clone 1091 in 2015. till 1862 kg/ha in 2016. in clone 1089. There was a influence of year on production characteristic but not to quality as well. The sugar content was very similar to both studied year even there was found some difference in the acid content. Clone 1089 shows slightly better productive characteristics in wine growing region of Northern Bosnia.

Keywords: *Vitis vinifera* L., yield, quality of grape.

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SENSORY CHARACTERISTICS OF VRANEC WINES INOCULATED WITH MALOLACTIC BACTERIA

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Abstract
Sensory evaluation is important technique to study the aroma and taste of wines. In this study, the sensory characteristics of Vranec wines produced applying controlled malolactic fermentation with six commercial malolactic bacteria from different producers (Lalvin VP41, Lalvin Elios 1, Enoferm Beta – Lallemand; Viniflora CH16, Viniflora Ciné - Chr. Hansen; MaloStar Fruit - La Littorate and Erbslöh Group) were compared with two control wines produced without inoculation of malolactic bacteria. The sensory characteristics of produced wines were evaluated by eight sensory evaluators (professional oenologists and experts for sensory evaluation of wine) according to a descriptive procedure. Wine sensory tasting sheet was used for assessment of the sensory characteristics for the following descriptive characteristic: appearance (viscosity and color), aroma (intensity and quality), taste (intensity, persistence and quality) and overall general impression, obtaining total score of 100 points [1,2]. Both control wines obtained an average scores of 67,5±7,23 and 75,8±4,20, while wines inoculated with malolactic bacteria had scores between 80,0±3,38 and 86,0±4,78. Wine inoculated with Lalvin Elios 1 (Lallemand) obtained highest score (86,0±4,78), followed with the wines inoculated with MaloStar Fruit (La Littorate) and Enoferm Beta (Lallemand) mallolactic bacteria, with average scores of 84,8±7,55 and 83,8±4,53, respectively. In general, malolactic fermentation influenced wine sensory properties resulting in wines with more intensive fruit flavor and aroma.
Keywords: wine, sensory characteristics, malolactic bacteria.

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ANALYSIS OF SPECTROMETRIC CHARACTERISTICS OF DIFFERENT BLENDS OF WINES FOR PRODUCING AND PREDICTING OF "CUVÉE" WINE AGING

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Abstract
The "Cuvée" term is used to imply prestige or quality wine, though it is not officially regulated, and therefore can appear on the labels of very ordinary wines. It is French term which has a few different meanings and deriving from cuve, meaning vat or tan. But elsewhere the term most commonly refers to a blend, either of more than one grape, or wine, from specially selected tank of wine put to some purposes.As very popular term, Cuvée wines were produced by blending three base (mono varietal) wines Vranec, Caberne Sauvignon and Merlo in Skovin winery. One of the reason is to attenuate the astringency of Vranec, as one of our important local varieties which can be extremely tannic when is young. Blending with Merlot and Cabernet Sauvignon astringency attenuations can be achieved accompanied with influence on chemical properties and sensory profile of wine. Although wine blending also introduced the possibility of mislabeling and fraud. With aim to investigate the influence of different blended wines on color changing, phenolic content and their aging potential, 16 samples were analysed (different mixing ratio of three wines including single varietal) by using Cary 50 UV-Vis spectrophotometer, Varian. Based on the estimated adsorbanca of all blended wines and mono varietal according Sommers's method and its modification by Boulton were determined sixteen parameters. The obtained results for that parameters shown that all cuvée wines are susceptible to aging, but higher content of Vranec have much higher influence on intensity of color, anthocyanins, total phenols and reduced hue. Those wines have greater stability of color, unlike the wines with higher share of Merlot and Cabernet, and have much higher potential for aging.
Keywords: wine blends, spectrosopic parameters, aging potential.

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THE INFLUENCE OF VARIETY AND VINTAGE ON THE CHEMICAL COMPOSITION AND SENSORIAL PROPERTIES OF THE RED WINES IN PODGORICA SUBREGION (MONTENEGRO)

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Abstract

This paper present the results of investigation of the influence of variety and vintage to the chemical composition of Vranac, Kratosija and Cabernet Sauvignon wines in Podgorica subregion (Montenegro) in vintages 2012 and 2013. The varietal wines were produced, from the grape from the four different localities, according to a uniform manner (traditional method) in the winery of the Biotechnical Faculty, located at the experimental farm in Podgorica, at the vineyard location of Ljeskopolje. The analysis of basic chemical parameters of wines and sensorial testing of wines was carried out. The research findings show that variety and vintage (climate conditions) affected significantly to the chemical composition of wine. The higher content of alcohol and extract was measured in 2012 vintage, while the total acid content in wine was higher in 2013, as a result of frequent rainfall during the growing season, especially in August and September. The highest content of alcohol, extracts and total acids was found in wine Kratosija, then in Cabernet Sauvignon, while the lowest content was found in wine Vranac in both vintages.

Keywords: red wine, Vranac, Kratosija, Cabernet Sauvignon, variety, site, chemical composition of wine.

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DESCRIPTION OF THE MORPHOLOGICAL AND TECHNOLOGICAL CHARACTERISTICS OF THE PLANT GOJI BERRY AND ITS FERMENTING INTO A FINISHED PRODUCT SIMILAR TO WINE

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Abstract

Goji berry is relatively a new plant introduced in the Republic Macedonia. It is prevalent on limited small plantations to a controlled breeding conditions and providing a yield which is immediately placing on the market and awakens interest in further expansion of its production. This plant (*Lycium barbarum* or *Lycium chinense*), belongs to the family Solanacea and characterized by very favorable chemical composition of the fruit with high nutritional, energy and antioxidant value. Therefore, this plant is a large application in dietary recommendations for the prevention of many diseases and as a natural organic product for general strengthening of the human organism. From another aspect, goji berry requires minimal growing conditions aimed at irrigation and treatment with pesticides and it belongs in adaptable resistant plants for organic production. Also, this plant has good genetic predispositions, easily reproduced and has favorable characteristics; germination of seeds, regenerative ability, ability to clonal selection and in vitro - propagation. Its morphological construction is easy for examination of scientific purposes. Considering that in the fruit of this plant has similar chemical substances as it has in the grape, but enormously more, in our research experience made by fermentation (actually vinification) of the two types of Goji berries - sweet and bitter. The goal was to get fermented products similar to wine, but with improved chemical composition and strong antioxidant power. But after analyzing the obtained product, it can be concluded that by increasing the quantity of antioxidant substances during the vinification, however sensory evaluation of the final product is low. Goji berry should be consumed in fresh or dried form or may be a supplement of some special wines (with high sensory evaluation and strong antioxidant substances).

Keywords: goji berry, antioxidant substances, germination of seeds, ermentation, vinification.

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DIFFERENT LENGTHS OF PRUNING IN SOME VINE CULTIVARS IN TIKVESH WINE REGION

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Abstract

Wine grape is cultivar that grows for many years, but every year in the vegetation period creates large number of winter fertile buds from which in the next vegetation new shoots will develop. To keep it's shape, to plan it's yield and growth and also the quality of the wine grape it's necessary to make pruning every year until the start of the vegetation to remove all the unnecessary shoots that developed. Wine grape from the whole assortment in Republic of Macedonia take place in 70% from the whole grape production. The research is focused on the possibility of using different ways of pruning to have the best results in the yield and quality of the ripped grape and also for introduction of machine pruning and machine harvest. The research is conducted on the wine grape varieties: Cabernet Sauvignon, Merlot, Chardonnay and Rhein Riesling. On all 4 researched grape varieties there are 4 variants on vine training from which one is Control. On all researched variants and grape varieties, the percentage of developed shoots is calculated, potential fertility, number of clusters per vine and shoot, cluster mass per bud and variant, grape yield per vine and hectare, total sugars and total acids. Results from the research in 2016 for the grape yield per vine and per bud, yield per vine, chemical analysis for sugar content and total acids show that the best variant from the Cabernet Sauvignon is Variant 2, for the Merlot is Variant 3 and the Rhein Riesling is Variant 2.

Keywords: wine grape, Cabernet Sauvignon, Merlot, Chardonnay, Rhein Riesling, vine training, yield.

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AGRO BIOLOGICAL AND TECHNOLOGICAL CHARACTERISTICS OF VINE CULTIVARS CHARDONNAY AND RHEIN RIESLING IN TIKVESH WINE REGION

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Abstract

Chardonnay and Rhein Riesling are white grape varieties that are used in producing high quality white wines. In Macedonia the production of wine grape is more than 2/3 from the whole grape production. With specific vine training we can plan the yield, make the shape and also to produce the desired quality of the wine grape. All the unnecessary shoots that are developed are removed until the start of the vegetation. The research is focused on the possibility of using different ways of pruning to achieve the best results in the yield and quality of the grape and also for introduction of machine pruning and machine harvest. The research is conducted on the wine grape varieties: Chardonnay and Rhein Riesling. On the two researched grape varieties there are 4 variants of vine training from which one is Control. For the researched variants and grape varieties, the percentage of developed shoots is calculated, potential fertility, number of clusters per vine and shoot, cluster mass per bud and variant, grape yield per vine and hectare, total sugars and total acids. Results from the research in 2016 for the grape yield per vine and per bud, yield per vine, chemical analysis for sugar content and total acids show that the best variant from the Chardonnay is Variant 3 and the Rhein Riesling is Variant 2.

Keywords: wine grape, Chardonnay, Rhein Riesling, machine pruning, machine harvest.

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AGRO BIOLOGICAL AND TECHNOLOGICAL CHARACTERISTICS OF TABLE INTERSPECIES VARIETY VIERUL 59

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Abstract
The grape varieties of grapes are always economically important in any agricultural production, especially the new hybrids that provide good qualitative and quantitative characteristics and correspond to our local climatic conditions. This scientific paper contains presentation of two-year results of the agro-biological and technological analysis of table interspecies variety Vierul 59, which is created in Kishnev (Moldova) by crossing the coal mine x 20-366, by the author N. Guzun, and is grown in climatic conditions in the Republic of Macedonia on agricultural land at JNU Agricultural Institute in Skopje, sector Vineyard, experimental collection - Butel. The variety is distinguished by a beautiful and large cluster of reddish crop, and belongs to the group of high-grade grape varieties. It is resistant to Uncinula necator and plasmopala viticola , but is sensitive to the gray rot due to the size of the botritis. It is significant for integrated table grape production in the Republic of Macedonia. The reduced costs for the production and the positive organoleptic characteristics will help for the gradual expansion on the markets in the Republic of Macedonia, and the EU market. This scientific approach to the study of the agro biological and technological characteristics of the table interspecies variety Vierul 59 will improve the perception of the qualitative and quantitative characteristics of the variety which is grown on the territory of the Republic of Macedonia. The study will also assist with expanding of the varietal list with another high yield variety and its introduction on the local market, and the possibility of producing integral (integrated) table grape production in the Republic of Macedonia.
Key words: Vierul 59, agricultural production, grapes, introduction.

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ВАША СЕМЕЈНА АПТЕКА
HEALTHY FOOD BY ZEGIN

1866
LOZAR
WINERY

HOLMA

ЗК ПЕЛАГОНИЈА
а.д. Битола, МАКЕДОНИЈА


DS
Smith


PronexHem


T
TIKVEŠ
SINCE 1885


sinpeks
CARE ABOUT QUALITY

VEZE SHARRI

LECKER

AGROUNIJA SKOPJE

AGRICOM 100% ORGANIC

SOCOTAB

S.E.K.E.

АГРОХЕМИЈА

СЕКОГАШ ВО ЧЕКОР СО ВРЕМЕТО

ПРОИЗВОДСТВО, ДОРАБОТКА И ПРОМЕТ НА СЕМЕ

СЕМЕНАРСТВО

ПРОМЕТ - ДООЕЛ

ЕВГЕНИ

МРЕЖА ЗА РУРАЛЕН РАЗВОЈ
НА РЕПУБЛИКА МАКЕДОНИЈА

RURAL DEVELOPMENT NETWORK
OF THE REPUBLIC OF MACEDONIA

ЕКО ЈАЈЦЕ
Фарма Агрипро
Валандово

Challenge
Јазичен центар

<u>Цвеќарница Орхидеја</u>

мелница
фурна
ДИМЕ

GORSKA
water

CIP - Каталогизација во публикација
Национална и универзитетска библиотека "Св. Климент Охридски", Скопје

631/635(048.3)
338.43.01(048.3)

INTERNATIONAL symposium for agriculture and food - ISAF 2017 (3 ; 2017 ; Ohrid)
Book of abstract / [3pd International symposium for agriculture and food - ISAF 2017,18-20 October 2017, Ohrid, Republic of Macedonia]. - Skopje : Faculty of agricultural sciences and food, 2017. - 443 стр. ; 25 см

ISBN 978-9989-845-68-0

а) Земјоделсто - Апстракти б) Земјоделска економија - Апстракти
COBISS.MK-ID 104287754