

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 value 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 regions, 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.

Introduction

Vranec and Smederevka are the most common wine varieties of the Republic of Macedonia, predominantly cultivated in the regions surrounding the cities of Tikveš wine-growing region. Vranec takes up 75% of the areas of the red wine varieties. Smederevka takes up 70% of the total white wines varieties. The two varieties together cover 70% of the areas of all the wine varieties. They determine the type of Macedonian red and white wines (Bozinovik 2010). These two varieties yield the largest amount of manufactured dry pomace in the production of red and white wines. For these reasons, we used Vranec and Smederevka varieties in our research on the grape seed oil production possibilities.

Material and methods

Grape samples were collected from the Vranec and Smederevka varieties from two locations, Valandovo and Kavadarci, which are locations with ecological conditions that widely differ from each other. The samples were collected at the time of full maturity of the grapes, using a fully randomised design without setting the exact location. The chemical composition of the must was determined by analysing of the sugar and total acid content and pH following the standard OIV methods. As for the mechanical properties of the grapes, we analysed the cluster and berry weight, the number of the berries, and the mechanical composition of the berry. The moisture content of the grape seed was determined by drying the seed at 105°C to a constant mass, using the method No. 925.10 of AOAC (2006). The oil content was determined by Soxhlet method No. 920.85 (AOAC, 2006). A 10 g grinded seed sample (0.0001 g accurately weighed) was extracted in the presence of 10 boiling glass regulators with 300 mL *n*-hexane. After 6 h extraction, the *n*-hexane was removed from the extract using a rotary vacuum evaporator (40 °C, 200 mPa). The traces of *n*-hexane were removed by drying

at 40 °C and 105 mPa, followed by cooling in a desiccator and weighing. The steps of drying, cooling and weighing were repeated until the difference between two consecutive weights was less than 2 mg. The yield of oil was calculated based on the dry matter (DM) weight of the seeds. The statistical analysis was done by determining the basic indicators, mean values of standard deviation, and variance quotient.

Results and discussion

Table 1 shows the cluster and berry features of the Vranec and Smederevka varieties from two locations, Kavadarci and Valandovo. The Vranec variety is characterized by an average cluster weight of 336 g with the number of berries of 140, and an average berry weight of 2.24 g. The Smederevka variety has an average cluster weight of 358 g, the number of berries is 104, and an average berry weight of 3.28 g. The Smederevka variety cluster is 22 g heavier, has a berry larger for 1.04 g and 36 berries less in the cluster compared to the Vranec variety. The location has the greatest influence on the berry size in both varieties.

Table 1. Characteristics of cluster and berry

Variety	Vranec				Smederevka			
	Kav.	Val.	Aver.	CV%	Kav.	Val.	Aver.	CV%
Weight of grape	325	347	336	3,3	400	316	358	11,7
Weight of rachis	7.9	7.6	7.75	1,9	7.6	6.7	7.15	6,3
% of rachis	2.43	2.19	2.31	5,2	1.90	2.12	2,01	5,5
Number of berries	147	132	140	5,4	106	103	104	1,4
Weight of one berry	2.11	2.37	2.24	5,8	3.71	2.85	3.28	13,1

Table 2 shows the mechanical composition of the berry of the Vranec and Smederevka varieties from two locations, Kavadarci and Valandovo. The Vranec variety berry has an average flesh content of 89%, an average seed content of 3.6%, and an average skin content of 7.4%. The Smederevka variety berry has an average flesh content of 91%, an average seed content of 2.1%, and an average skin content of 6.9%. The Smederevka variety berry has a higher flesh and lower seed and skin content compared to the Vranec variety. The location has greatly influenced the skin content of the berries of the two varieties.

Table 2. Mechanical composition of berry

Variety	Vranec				Smederevka			
	Kav.	Val.	Aver.	CV%	Kav.	Val.	Aver.	CV%
Flesh (%)	86,4	91,6	89,0	4,1	91,2	90,8	91,0	0,3
Seeds (%)	4,5	2,8	3,6	33,4	1,7	2,6	2,1	30,3
Skin (%)	9,2	5,6	7,4	34,4	7,1	6,7	6,9	4,1

Table 3 shows the chemical composition of the must of the Vranec and Smederevka varieties from the two locations, Kavadarci and Valandovo. The Vranec variety must has an average sugar content of 240 g/l, an average total acids of 5.2 g/l. and an average pH of 3.58. The Smederevka variety must has an average sugar content of 200 g/l, an average total acid content of 4.3 g/l, and an average pH of 3.67. The Vranec variety must has a higher sugar and total acid content, but lower pH. The location has greatly influenced the total acid content of the must in the two varieties.

The quantity of dry matter and oil in seeds of the Smederevka and Vranec grape variety is shown in Table 4. The highest content of dry matter (92.02%) and oil (13.51% DM) was determined in the seeds of the Vranec variety collected in the region of Kavadarci. The oil content significantly depends on the region of collection. The lower values of oil content were determined in the grape seed of the Smederevka and Vranec varieties from Valandovo.

Table 3. Chemical composition of must

Variety	Vranec				Smederevka			
	Kav.	Val.	Aver.	CV%	Kav.	Val.	Aver.	CV%
Sugar (g/L)	235	244	240	2,7	210	190	200	7,1
Total acids (g/L)	5,5	4,9	5,2	8,2	4,5	4,1	4,3	6,6
pH	3,46	3,69	3,58	4,5	3,64	3,70	3,67	1,2

Table 4. Content of oil in seeds

Grape variety	Region	Dry matter (%) ¹	Oil (%) ¹	Oil (%) ^{1,2}
Smederevka	K	90.37 ± 0.06	11.00 ± 0.29	12.18 ± 0.30
	V	89.90 ± 0.25	8.87 ± 0.54	9.87 ± 0.61
Vranec	K	92.02 ± 0.05	12.43 ± 0.20	13.51 ± 0.21
	V	89.96 ± 0.21	9.25 ± 0.21	10.28 ± 0.26

K-Kavadarci; V-Valandovo; ¹Data are expressed as mean ± standard deviation (n = 3); ²Calculated according to the corresponding dry matter (DM).

The values of oil content specified in Table 4 are comparable with the published data in the literature. Lachman *et al.* (2015) determined the average oil content of 11.60 ± 0.33 g in 100 g seed dry matter.

Conclusions

We examined the oil content from the grapes of the Vranec and Smederevka varieties from two locations, Kavadarci and Valandovo. The seed, skin, and oil content is higher in the Vranec variety compared to the Smederevka variety. The location has a significant influence on the oil content. The two varieties have a higher oil content in Kavadarci compared to Valandovo.

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