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CATIONS IN THE RED GRAPE JUICE FROM VARIETY JVARISULA OBTAINED AS A RESULT OF INTER-VARIETAL CROSSING OF GRAPES

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КАТИОНЫ В ВИНОГРАДНОМ СОКЕ ИЗ КРАСНОГО СОРТА «ДЖВАРИСУЛА» ПОЛУЧЕННОГО В РЕЗУЛЬТАТЕ МЕЖСОРТОВОГО СКРЕЩИВАНИЯ

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Abstract. The paper presents a quantitative and qualitative study of mineral cations in the grape juice obtained as a result of the European processing of the Jvarisula red grape variety's raw materials, resulting from the inter-varietal crossing of grapes.

Аннотация. В работе представлено количественное и качественное исследование минеральных катионов в виноградном соке, полученном после переработки европейским методом красного виноградного сырья сорта «Джварисула» полученного в результате межсортового скрещивания.

Keywords: grapes, Jvarisula, cations, minerals, grape juice

Ключевые слова: виноград, Джварисула, катионы, минералы, виноградный сок.

The raw materials of clones and hybrids of grapes obtained as a result of inter-varietal crossing are less often used in wine production, since the wines produced from them have less pleasant hybrid tones. The raw materials of red grapes of clones and hybrids are environmentally friendly, as practically no chemical and synthetic means are used in their cultivation process. In addition, their seeds and skins contain an increased amount of phenolic compounds and, accordingly, are the best raw materials for the production of strong antioxidant polyphenolic extracts and concentrates. As for grape juice, it is also environmentally friendly and rich in biologically active substances, and after thermal treatment, it does not lose its sensory bouquet and is actively used in the juice sector [1- 3].

The mineral content in the grape juice varies within 3-5 g/l and is mostly represented by potassium, calcium, and magnesium salts. Their content in individual parts of the grapes is due to many factors, in particular, the grape variety, natural-climatic and soil conditions, agricultural measures, pesticides, the degree of ripeness, etc. [4-6].

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The content of mineral cations in grape juice also depends on the type of primary processing of grapes. For example, grape stem is exceptionally rich in iron ions (it contains 10 times more iron than grape juice and pulp) [7].

The aim of the research was to determine the quantitative and qualitative content of mineral cations in Jvarisula variety grape juice.

Materials and Methods

We harvested the Jvarisula variety red grape raw material in accordance with OIV requirements in the Baghdati (Georgia) viticulture and winemaking microzone in physiological ripe, that is, when the glucoacidometric index and phenolic index (i.e., the maximum content of anthocyanins in the grape raw materials) were within the desired limits.

We determined the cations of mineral substances by high-pressure liquid chromatography.

Detector Waters 432 (Conductivity) Column IC-Pak Cation MD, Eluent 3 mM HNO3/0.1 mM EDTA, Back conductivity 1250 ±50 µS, Base Sensitivity 2000 µS, Integrator Sensitivity µS, column temperature 35^0C, Polarity-negative.

Research results and their analysis

We harvested the raw materials of the Jvarisula variety colored grapes during the period of technical ripeness, when the sugar content was 21-22%. We passed them through a Baby INOX company's crushing-destemming machine, and the destemmed grapes were pressed in an Atollo hydraulic press. The resulting grape juice is supplied for filtration, thermal treatment, and bottling.

The research aimed to determine the content of mineral cations Li^+, Na^+, NH^{4+}, K^+, Ca^{2+}, Mg^{2+} in Jvarisula variety grape juice after filtration and heat treatment. We determined the content of cations of mineral substances by high-pressure liquid chromatography (Figure 1).

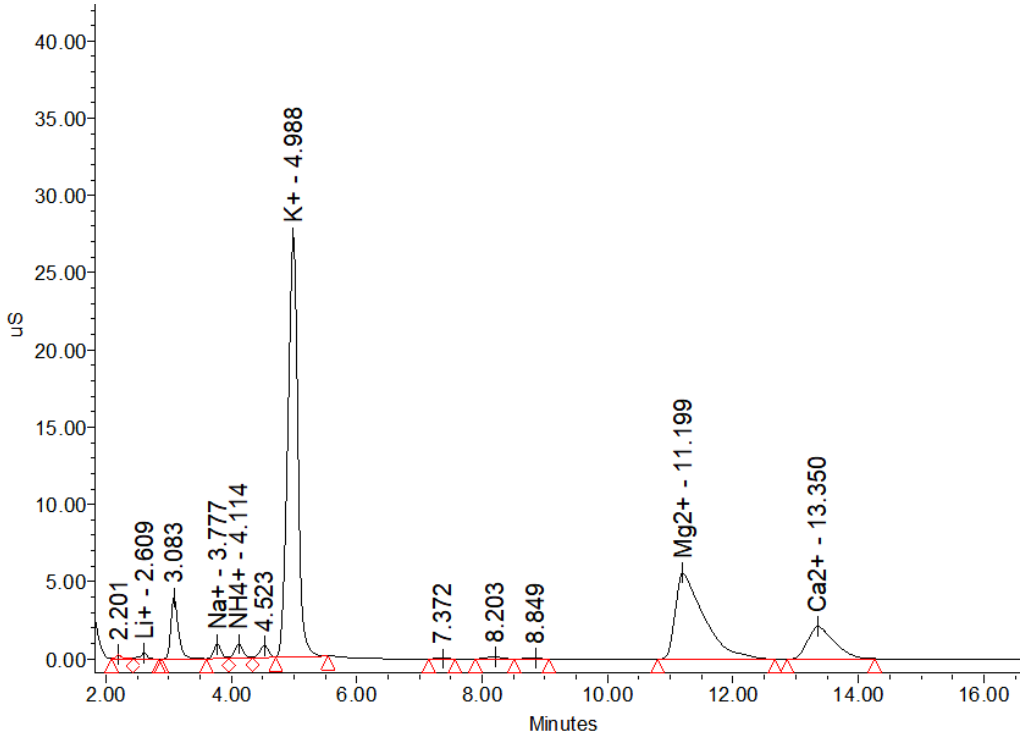

Figure 1. Chromatogram of cations in the juice of the Jvarisula grape variety

As the chromatogram indicates, potassium, magnesium, and calcium cations dominate in grape juice. Other cations are present in relatively small amounts.

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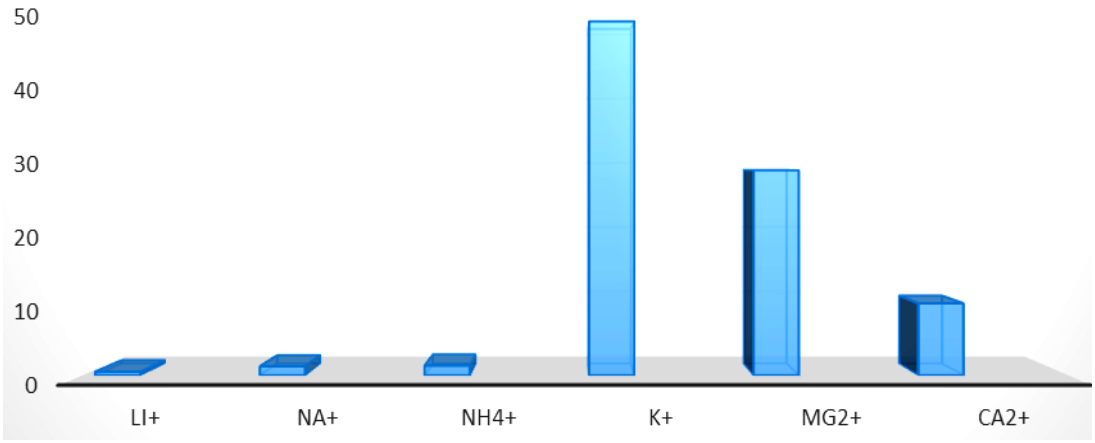

Figure 2. Percentage of cations in grape juice, %

Sodium (Na^+) content is within 41.2 mg/l in grape juice, but its content can be slightly increased if sodium metabisulfite is added to the grape juice before settling-filtration.

Potassium (K^+) is a base cation, the content of which is within 891.5 mg/l, and its content in grape juice depends on many factors. The magnesium (Mg^{2+}) content is within 89.3 mg/l (Table).

Table

CATION CONTENT IN GRAPE JUICE, mg/l

K^+	Mg^{2+}	Ca^{2+}	$Na+$	$NH4+$	$Li+$
891,5	89,3	58,8	41,2	43,7	25,7

If we thermally process the destemmed grapes of the variety Jvarisula in special tanks under constant stirring until the temperature reaches 67-70^{0}C and then press them hot, the grape juice becomes much richer in biologically active compounds, including mineral cations.

In general, metatartaric and ascorbic acids are used for the grape juice preservation. Metatartaric acid is added to the grape juice at a concentration of 0.01–0.05% before filtration and prevents the precipitation of potassium and calcium salts of tartaric acid. Ascorbic acid is added to the juice before bottling and enriches the juice with vitamin C and, together with compounds with P-vitamin activity, makes the juice a strong antioxidant and beneficial to the human body.

Conclusion

As studies have shown, the grape juice obtained as a result of the so-called “white method” processing of the variety Jvarisula is rich in mineral cations, and the main or dominant cations are potassium (K^+) 891.5 mg/l, magnesium (Mg^{2+}) 89.3 mg/l, and calcium 58.8 mg/l.

References:

1. Gvinianidze T.N. Wine technology and technochemical control / Gvinianidze T.N. / Monograph. Kutaisi. Science. 2023. 420

2. Kekelidze, N., Kekelidze, T., Akhalbedashvili, L., Mirtskhulava, M., Maisuradze, G., Kvirkvelia, B., ... & Liparteliani, V. (2017). Some mineral components in Georgian red wines Saperavi and Kindzmarauli. Sciences of Europe, (12-2 (12)), 4-8.

3. Gvinianidze, T. (2017). The grape skins and seed polyphenolic extracts. *Bulletin of Science and Practice,* (9), 81-91. https://doi.org/10.5281/zenodo.1488145

4. Shimizu, H., Akamatsu, F., Kamada, A., Koyama, K., Iwashita, K., & Goto-Yamamoto, N. (2020). Variation in the mineral composition of wine produced using different winemaking

techniques. Journal of bioscience and bioengineering, 130(2), 166-172. https://doi.org/10.1016/j.jbiosc.2020.03.012

5. Karataş, D., Aydin, I., & Karataş, H. (2015). Elemental composition of red wines in Southeast Turkey. Czech Journal of Food Sciences, 33(3), 228-236. https://doi.org/10.17221/58/2015-CJFS

6. Gvinianidze, T. N. (2024). The Vitis labrusca (fox grape) family's red grape seed extracts and liquid concentrates. Химия растительного сырья, (3), 138-143. https://doi.org/10.14258/jcprm.20240314482

7. Dutra, M. D. C. P., Rodrigues, L. L., de Oliveira, D., Pereira, G. E., & dos Santos Lima, M. (2018). Integrated analyses of phenolic compounds and minerals of Brazilian organic and conventional grape juices and wines: Validation of a method for determination of Cu, Fe and Mn. *Food Chemistry, 269*, 157-165. https://doi.org/10.1016/j.foodchem.2018.07.014

Список литературы:

1. Гвинианидзе Т. Н. Технология вина и технохимический контроль. Кутаиси: Наука. 2023. 420 с.

2. Kekelidze N., Kekelidze T., Akhalbedashvili L., Mirtskhulava M., Maisuradze G., Kvirkvelia B., Liparteliani V. Some mineral components in Georgian red wines Saperavi and Kindzmarauli // Sciences of Europe. 2017. №12-2 (12). P. 4-8.

3. Gvinianidze T. The grape skins and seed polyphenolic extracts // Бюллетень науки и практики. 2017. №9 (22). С. 81-91. https://doi.org/10.5281/zenodo.1488145

4. Shimizu H., Akamatsu F., Kamada A., Koyama K., Iwashita K., Goto-Yamamoto N. Variation in the mineral composition of wine produced using different winemaking techniques // Journal of bioscience and bioengineering. 2020. V. 130. №2. P. 166-172. https://doi.org/10.1016/j.jbiosc.2020.03.012

5. Karataş D., Aydin I., Karataş H. Elemental composition of red wines in Southeast Turkey // Czech Journal of Food Sciences. 2015. V. 33. №3. P. 228-236. https://doi.org/10.17221/58/2015-CJFS

6. Gvinianidze T. N. The Vitis labrusca (fox grape) family's red grape seed extracts and liquid concentrates // Химия растительного сырья. 2024. №3. P. 138-143. https://doi.org/10.14258/jcprm.20240314482

7. Dutra M. C. P. et al. Integrated analyses of phenolic compounds and minerals of Brazilian organic and conventional grape juices and wines: Validation of a method for determination of Cu, Fe and Mn // Food Chemistry. 2018. V. 269. P. 157-165. https://doi.org/10.1016/j.foodchem.2018.07.014

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