

## INFLUENCE OF CRYOEXTRACTION ON THE MECHANICAL AND MINERAL COMPOSITION OF GRAPES

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The paper presents the results of studies on the influence of the process of artificial freezing of grapes on its mechanical composition and the content of macro and microelements.

**Keywords:** Grapes, freezing, mechanical composition, mineral composition, grape must, gravity must.

The process of obtaining wine consists of a series of successive technological operations aimed at extracting juice from grapes and turning it into wine. To understand the purpose of these operations, it is necessary to know the chemical composition of grape juice and other components of the grape bunch, with which the juice comes into contact for some time. At the same time, grape juice to some extent extracts substances found in the ridges, skins and seeds that affect the chemical composition and quality of wine.

The composition of berries and ridges in different bunches differs significantly in the content of certain substances in them [1]. The difference in composition in quantitative terms is observed not only in different varieties of grapes, but also in the same variety, depending on the climatic and soil conditions of the area where the vine grows, as well as on the meteorological conditions of the year, agricultural technology, diseases of grapes and other factors that affect the nutrition of the grape bush and the ripening of berries.

The mechanical composition shows the ratio of the mechanical elements of the bunch and grapes and characterizes the variety in terms of its most appropriate use and production characteristics.

Minerals affect the taste of grapes and products of its processing. They are necessary for yeast nutrition, some cations (iron, copper, manganese) are part of many vital enzymes and are involved in metabolism.

Since the determination of the mineral composition in grapes and wine can serve as an indication of naturalness and authenticity, studies on the study of mineral content are quite in demand.

In order to study the effect of low-temperature processing of grapes on the mechanical and mineral composition of grape must, two technical grape varieties grown in Uzbekistan were selected: a mediocre variety of Bayan-shirey, a late-ripening variety, medium or large clusters, loose, cylindrical or cylindrical-conical, dense. The berries are medium, almost large, round, greenish-yellow, with brown spots when overripe. The peel is of medium thickness, covered with a wax coating. The pulp is juicy. Productivity is 120-200 q/ha. Recommended for the production of dry wines and juices. Grapes are harvested with a sugar content of at least 18%.

Muscat Uzbekistan - a grape variety of the late ripening period. Clusters are very large, branched, medium density. The berries are large, obovate, greenish-yellow. The skin is dense. The flesh is fleshy and juicy, crispy, with a nutmeg flavor. Productivity is 400-450 centners-ha. Used for consumption in raisins and fresh [2-3].

A study was made of the mechanical composition of grape varieties Bayan Shirey and Muscat Uzbekistani before low-temperature treatment (control) and after cryoextraction (experiment).

The grapes were left on the vine until December, harvested artificially cryo-extracted at a temperature of -7°C ÷ -100C. Cryoextraction of grapes leads to a high degree of extraction, completeness and concentration of components and aroma in the final product. Ripe berries are dehydrated through constant icing and thawing.

The results of mechanical analysis of the studied grape varieties without low-temperature treatment are shown in Table 1, the technological parameters of cryo-extracted grapes are in Table 2.

**Table 1**  
**Mechanical indicators of a bunch of grapes**

Grape sort	Bunch of grapes		Grape bunch weight composition, %			
	mass, g	size, cm	pulp and juice	crests	skin	seeds
Bayan Shirey	340	22×11	87,3	4,6	4,6	3,5
Muscat Uzbekistan	322	18×13	92,5	1,9	2,6	3,0

**Table 2**  
**Technological indicators of cryo-extracted grapes**

№	grape varieties	Weight of grapes, kg	Pulp, kg	Gravity wort outlet	
				kg	%
1	Bayan Shirey	8,300	4,505	3,795	45,56
2	Muscat Uzbekistan	5,915	3,220	2,695	45,80

For technical grape varieties, a very important indicator is the must yield. According to this indicator, the yield of wort by gravity in the Bayan-Shirey variety was 45.56%, and in the Muscat variety - 45.80%.

After separating the wort by gravity, the mass of the remaining pulp was 4.505 kg for the Bayan Shirey variety with 8.3 kg, and 3.220 kg for the Muscat variety with 5.915 kg.

The conducted studies allow us to draw preliminary conclusions that the low-temperature processing of grapes at a temperature of -70C in the varieties Bayan Shirey and Muscat gives approximately the same yield of gravity must.

Data on the study of the mineral composition of grapes are given in table 3.

**Table 3**  
**Mineral content in grapes**

№	Element	Quantitative content, mg/kg			
		Bayan Shirey контроль	Muscat control	Bayan Shirey an experience	Muscat an experience
1	Calcium Ca	194,9869	139,3191	149,9812-	90,5894-
2	Potassium, K	1548,3021	1598,8356	1785,2653+	1658,4587+
3	Magnesium, Mg	885,936	1002,214	936,6352+	823,5263-
4	Natrium, Na	479,8974	245,6354	324,5851-	256,9876+
5	Phosphorus, P	1679,475	1235,6521	2093,6589+	1185,9635-
6	Sulfur, S	82,7714	71,7274	74,8754-	73,5648+
7	Copper, Cu	0,3665	0,3475	0,4356+	0,4912+
8	Iron, Fe	13,1054	30,3884	15,3941+	10,9211--
9	Manganese, Mn	1,1562	1,3256	0,8879-	0,9162-
10	Zinc, Zn	0,5412	0,5812	0,3265-	0,4051-
11	Selenium, Se	0,0046	0,0063	0-	0,0029-
12	Lithium, Li	0,1041	0,0951	0,1145+	0,0083-
13	Molybdenum, Mo	0,0236	0,0312	0,0114-	0,0069-
14	Bor, B	7,6589	5,4198	8,9312+	6,0154+

According to our results, it can be seen that, depending on the grape variety, the cryoextraction process affects the amount of macronutrients under study in different ways.

When examining Ca cations, a decrease in its concentration in grapes after low-temperature treatment is noted: in the Bayan Shirey variety - by 23%, in the Muscat variety - by 34%.

Low-temperature treatment affected the decrease in the quantitative content of such macroelements as Na and S in the Bayan Shirey variety and on the concentration of Mg and P in the Muscat variety.

The quantitative content of potassium after cryo-extraction increased in both varieties, magnesium and phosphorus - in the Bayan Shirey variety, sulfur and sodium - in the Muscat variety.

The results of the microelement composition show that in the Bayan shirey variety after freezing, compared with the control sample, the content of such trace elements as copper, iron, lithium and boron increased, while the content of manganese, zinc and molybdenum decreased. The content of selenium was initially practically not detected (only traces in the control variant). In the Muscat variety, the following picture was observed: the concentration of

copper and boron increased, the quantitative content of the remaining microelements under study decreased, and a particularly large difference is observed in the content of iron.

Thus, the change in the mineral composition of grapes during low-temperature processing for different varieties differs from each other. Therefore, the artificial cryoextraction of grapes is individual for each mineral element.

The mechanical composition shows the ratio of the mechanical elements of the bunch and is the most important indicator of grapes, which characterizes the variety from the position of the most appropriate direction of its use and evaluates the expected yield of must and finished product from 1 ton of grapes.

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