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STUDYING THE INFLUENCE OF GRAPE CRYOEXTRACTION ON THE TECHNOLOGICAL FEATURES OF GRAPE MUST

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Annotation. The paper presents the results of studies on the influence of the process of freezing grapes on its physical and chemical parameters.

Key words: *Grapes, low-temperature processing, grape must*

Currently, the processing industry of the Republic of Uzbekistan, in particular, the wine industry has received a new powerful impetus [1]. The main achievement of the industry was that in 2018 Uzbekistan joined the International Organization of Winemaking and Viticulture as the 48th country.

With the available amount of grapes, its high yields, planned plantings of varietal grapes, and at the same time low consumption of wine in the domestic market, an overabundance of production, with a low export orientation of the products, it makes sense to conduct an economic justification and conduct research on the production of ice wine, which is in high demand on the world market.

Solving the problems of the industry requires modernization, development of selection of technical varieties of grapes, development of varietal viticulture and winemaking, expansion of the range of export-oriented finished products.

In this regard, research on the study of technological methods for obtaining Icewine type wines in the conditions of Uzbekistan is relevant.

Focus on expanding research on innovative technologies for processing grapes in order to produce export-oriented wine products requires the actual freezing

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of the grapes. Cryoextraction - The word "cryoextraction" comes from the Greek word "krios" meaning frost or cold. Cryoextraction means that the application of cold or freezing will result in freezing or separation and. extraction of some substances of the juice, as a result of which the remaining part of the wort is concentrated. [2] The freeze-thaw cycle can be considered natural cryoextraction.

The principle behind cryoextraction is physico-chemical. A decrease in temperature causes the water in the berry to freeze and form ice crystals that are separated from sugars, acids and flavor components. Ripe berries are dehydrated through icing and thawing [3]. This wonderful process of concentration of sugars and other components of the grape berry, created by the natural process of freezing, determines the uniqueness of the aroma and the incredible freshness and aroma of this type of wine. In the future, they planned to use the wine material for wines such as Icewein.

There is natural and artificial cryoextraction. Natural cryoextraction occurs during early frosts, when the berries of a bunch of grapes that are preserved on the vine are iced up.

With artificial cryoextraction, grapes are frozen in refrigerators. The principle behind cryoextraction is physico-chemical and involves "freezing point depression" due to solute. In this case, the decrease in the freezing point of the liquid refers to the solute. The water in the berry freezes and forms ice crystals, which separate from the sugars, acids, and flavor components. Ripe berries are dehydrated through constant icing and thawing. This wonderful process of concentrating the sugars, acids and extractives of the grape berry enhances the varietal aroma. It is the high acidity, the acidity in perfect balance with the intensity of the sugar created by the natural freezing process, that determines the uniqueness and splendor of the finished product.

For research, two technical varieties of grapes grown in Uzbekistan were selected: mediocre grade Bayan-shirey, a late-ripening variety, clusters are medium or large, loose, cylindrical or cylindro-conical, dense. The berries are medium, almost large, rounded, greenish-yellow, with brown spots when overripe. The peel is of medium thickness, covered with a wax coating. The pulp is juicy.

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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 - late ripening grape variety. 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. It is used for fresh and raisin consumption.

The grapes were left on the vine until December, harvested and artificially cryo -extracted at a temperature of -8 °C ÷ -10 ^{0}C.

Variants of the experiment for obtaining wine material from grape juice subjected to:

Option 1 - grape must of the Bayan Shirey variety without cryoextraction;

Option 2 - grape must of the Bayan Shirey variety with cryoextraction;

Option 3 - grape must of Muscat Uzbek variety without cryoextraction

Option 4 - grape must of Muscat Uzbek variety with cryoextraction.

cryoextraction grapes, leads to a high degree of extraction, fullness and concentration of components and aroma in the final product. Ripe berries are dehydrated through constant icing and thawing. The juice in grapes contains water, sugars and acids. The sugars and acids are in solution and lower the freezing point of the juice in the grape so it doesn't freeze until the temperature reaches -7°C or -8°C. The water in the berry freezes and forms ice crystals, which separate from the sugars, acids, and flavor components. This process concentrates sugars, acids, extractive substances of the grape berry [4].

The wort was separated at a cooling temperature. After pressing, the ice crystals began to melt and the sugar level of the Bayan-shirey extractable juice increased by 17%.

The clarified wort was separated from the wort thick and subjected to fermentation. Fermentation was carried out on a pure culture of the yeast Saccharomyces vini Rkatsiteli 6, at room temperature 18 ^{0}C.

We subjected all samples of must and wine to physical and chemical analysis, using analysis methods adopted in the wine industry: mass concentration of sugars in

grapes - according to GOST 27198, mass concentration of titratable acids in terms of tartaric - according to GOST 14252.

The method for determining the amount of total protein is to determine nitrogen according to Kjeldahl, followed by conversion to protein. The essence of the method consists in the decomposition of the organic matter of the sample with boiling concentrated sulfuric acid with the formation of ammonium salts, the conversion of ammonium into ammonia, its distillation into an acid solution, the quantitative accounting of ammonia by the titrimetric method, and the calculation of the nitrogen content in the test material.

HPLC analysis of PTC-derivatives of amino acids. To isolate amino acids, the proteins and peptides of the aqueous extract were previously precipitated in centrifuge cups.

Table 1 shows the results of analyzes of samples of must and wine material obtained from grape variety a Bayan-Shirei and Muscat of Uzbekistan.

Physico-chemical parameters of samples of grape must

Table 1

No. p/p	Samples of grape must	Indicators	
		Sugar content, %	Titratable acid, g / dm ^{3}
1	Bayan-Shirei (original)	25.5	3.6
2	Bayan-Shirei (ice)	31.9	3.6
3	Muscat (original)	23.6	2.4
4	Muscat (ice)	29.6	3.2

At the cooling temperature, the wort was separated. cryoextraction grapes certainly contributed to the concentration of important components of the must. The sugar level of cryo-extracted wort of the Bayan-shirey variety increased by 17%, Muscat of Uzbekistan by 25%. The wort of Muscat of Uzbekistan during cryoextraction had sugar content slightly lower than that of Bayan-shirey (Table 1).

ISSN 2515-8260 Volume 10, Issue 5, 2023

Grape juice varieties Bayan-shirey had a constant amount of titratable acidity, equal to 3.6 g/dm ^{3}. The main part of tartaric acid is lost in grapes at a late harvest. The titratable acidity of Muscat grape must increased by 0.8 g/dm^3.

In the juices of frozen grapes subjected to cryoextraction, most of the organic acids are malic acid, which is not precipitated by crystallization like tartaric acid. Apparently, in the must of the Bayan Shirey grape variety, due to over-ripening, the amount of tartaric acid has sharply decreased, and since most of the tartaric acid is lost in the grapes due to freezing, which shifts the acid ratio strongly in the direction of malic acid, cryoextraction did not change the titratable acidity of the must .

Therefore, the process of cryoextraction of grapes, by concentrating the initial content of sugar and acidity, contributes to solving the problem of improving the quality of the finished product.

Further, the influence of the process of freezing grapes on the change in the content of protein substances was investigated. Protein substances play a role in ensuring the stability of wines. Table 2 shows the results of the study of the concentration of the total content of protein and nitrogenous substances of the wort. According to the results of the table, in samples with low-temperature treatment, the concentrations of amino acids decrease. But the content of protein and nitrogenous substances of grape varieties differ in quantitative terms and in the nature of the effect of low-temperature treatment on them. So, in the Bayan variety, nitrogen content (%) increases by 0.035%, and Muscat Uzbekistan loses this figure by 0.21%. The change in protein substances of each variety is insignificant, but also ambiguous. So, Muscat of Uzbekistan loses only 0.131% of protein, while Bayan Shirei has an increase of 0.219%.

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The content of total protein and nitrogenous substances of grape must

Table 2

No n/n	Samples / Indicators	Bayan Shirey		Muscat	
		(original)	(ice)	(original)	(ice)
1	Nitrogenous substances (%)	0.105	0.14	0.105	0.084
2	Protein (%)	0.656	0.875	0.656	0.525
3	Amino acids, essential, mg/ml	48.03 39%	25.85 19.81%	32.25 47.63%	53.21 44.51%
4.	Amino acids, mg/ml	122.2050	130.4691	67.71150	119.5241

It is known that the biological value of food products is determined by the quantitative content of essential amino acids.

Therefore, the process of cryoextraction of grapes, concentrating the initial content of sugar and acidity, forming a qualitative composition of amino acids , can contribute to solving the problem of improving the quality and expanding the range and volume of export-oriented wines.

Based on the results of physico-chemical, organoleptic analyzes, in-depth study of the qualitative and quantitative content of must components, we came to the conclusion that grapes grown in the natural and climatic conditions of Uzbekistan may well serve as a raw material for obtaining a unique wine such as "Ice Wine".

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