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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

IMPROVING OF THE PRODUCTION TECHNOLOGY OF CAHORS-TYPE WINES

Specialty: **3309.01- Food technology**

Field of science: **Technical sciences**

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GENERAL DESCRIPTION OF THE RESEARCH

Relevance and degree of completion of the topic. In the 80th of the last century, 92-95% of the wines produced by the wine industry of Azerbaijan were distilled wines. Many of them have gained worldwide fame. One of the most famous in this regard was the Kurdamir Cahor, made according to the local "Kurdamir technology". In the former USSR, 23 types of wines were produced using the Kurdamir technology. Of these, Shamakhi Cahors, Kazakh, Nektarsky, Chumaysky, Syrninsky doctor, etc. can be shown. Many of them are still being produced.

For the Cahors of both France and Azerbaijan, red grape varieties are used. However, the technologies of preparation of these wines are radically different from each other. Azerbaijani Cahor, obtained by the Kurdamir's method, is a dessert wine obtained by distilling Kurdamir, while French Cahor is a natural wine obtained by heating Kurdamir.

The production of sparkling wines with historical traditions has recently been experiencing a period of stagnation. As the main reason, the changes that have occurred recently in the production and assortment of wines are indicated. However, the world's centers of production of dark wines have not yet abandoned these wines and successfully continue this work.

In this regard, it is important to expand the production of Cahors wines, which have been produced since the beginning of the last century and have formed a kind of consumers. But in recent years, the country's vineyard assortment has been enriched with such valuable varieties as Merlot and Cabernet Sauvignon, which were not previously used for Cahors, and the processing industry is equipped with the most modern equipment. Therefore, the current conditions create the need for new research. As you can see, the field faces a scientific problem that needs to be solved.

Purpose and objectives of the study. The aim of the study is to improve the technology of Cahors-type wines using native and introduced grape varieties.

It is advisable to solve the following tasks:

- research and evaluation of raw materials for Cahors;

- study of the influence of different grape varieties and methods of influence on the change in the content of phenolic compounds, vitamins and volatile components;
- study of the influence of grape processing by various methods on the physical and chemical composition of wines of the Cahor type;
- study of the influence of the method of alcoholization and the nature of the alcohol-forming component on the physico-chemical and organoleptic properties of wines of the Cahors type;
- comparative study of methods of extraction of substances from solid parts of a solid melt;
- conducting industrial tests and evaluating the expected economic impact of the improved technology.

Research methods. The objects of the study are the varieties of red grapes cultivated in local conditions, grapes, juice, bunch, comb, wine material, wine, cooking methods, equipment and production processes.

In the process of wine materials and winemaking, the penetration of substances from the solid part into the liquid part is ensured through the use of different temperatures, extraction modes, extractants, and exogenous enzymatic maceration. The quantitative and qualitative composition of substances, including polyphenols, vitamins and volatile components that play an important role in the formation of Cahors wines, in raw materials, semi-finished products and finished wine is studied along with traditional methods using gas and gas-liquid, as well as high-performance liquid chromatography.

Based on the research materials, an improved hardware and technological scheme for the production of Cahors wines was developed and tested, and economic efficiency was calculated.

Main provisions to be submitted for defense:

- carbohydrate-acid and phenolic potential of grape varieties for Cahors, determination of the optimal proportions of monosaccharides for harvesting.;

- with the results of chromatography and spectral analysis of clay components, including juice and skin;

- distribution of the color of the rolls on the skin of the seeds and seeds of cherries and ways to regulate the technology that ensures its penetration into the wine;

- with a choice of the type of alcohol to be used for filling, and the shape of the spirit lamp;

- with the guarantee of electrophysical control of wine quality, especially completeness, extractivity and viscosity;

- ways to solve the optimal operating parameters of hot processing of crushed stone;

- moderate hot-fermentative maceration fermentation of wort and intensive extraction with intermittent alcoholization;

- with hardware development and application efficiency for the production of Cahors wines.

Scientific novelty of the research. The carbonate-acid potential, phenol-aromatic compounds, and the mechanical composition of the raw materials were studied, chromatograms and spectra of clay components at different wavelengths were obtained for the first time, and the number of bark seeds and late-blooming pollen was determined. Effective methods of extraction of substances, including polyphenols, from the solid parts of loam and bone are developed, the transformations occurring with modern methods of analysis and its role in the formation of the properties inherent in loam are justified.

The possibilities of assessing the quality of wines by the electrophysical method are justified, the method of hot-enzymatic maceration fermentation and alcoholization with intervals is developed, which allows to intensify the extraction processes, the hardware and technological scheme of its implementation is improved.

Theoretical and practical significance of the study. Determination of wavelengths favorable for the determination of anthocyanidins in juice, extracts and hydrolysates of the bark, and their spectra using solvents of various compositions, determination of composition indicators at various stages of winemaking, in particular phenolic compounds, nitrogenous substances, volatile components, transformations occurring in their cationic composition, intensive extraction of substances from the solid parts of the fruit using thermofermentative maceration fermentation and alcoholization at inter-

vals of winemaking and this is of theoretical importance for the science of canning.

Carbohydrate-acid potential of raw materials, phenol-justification of a more optimal ratio of monosaccharides for harvesting by variety, optimization of hot processing modes of wort, electrophysical determination of wine quality, selection of the type of alcohol and the material for alcoholization that provides more intensive extraction, determination of extractants for better extraction of substances from the solid parts of the fruit, development and justification of improved hardware and technological support for the production of Cahors-practical tasks for the wine industry.it matters.

Approbation and application of works. The main provisions of the dissertation were presented at scientific and practical conferences of the faculty, doctoral students and masters of the Faculty of Agrotechnology of the Azerbaijan State Agrarian University (Ganja, 2016-2020), the International Scientific and Practical Conference at the Ganja State University (Ganja, 2018), the International Scientific and Technical Conference in the Republic of Belarus (Mogilev, 2020).

A technology has been developed that allows the production of highly extractive Kogorsky wines, and implemented by JSC "Az-Granata" as part of an improved hardware and technological scheme. The use of the improved technology allowed us to obtain economic efficiency in the amount of 10,507.31 manats for 3 thousand bottles per year.

The name of the organization where the dissertation work is performed. The dissertation work was carried out at the department of " Engineering and examination of food products” Azerbaijan State Agrarian University.

The total volume of the dissertation with an indication of the volume of the structural sections of the dissertation separately. The dissertation work consists of an introduction, four chapters, a conclusion, a list of references in the number of 149 and appendices. There are 34 figures, 53 tables and 3 appendices. The content of the dissertation contains an introduction of 6 pages and 11777 characters, the first chapter 27 pages and 50964 characters, the second

chapter 17 pages and 21898 characters, the third chapter 53 pages and 81744 characters, the fourth chapter 34 pages and 43750 characters, conclusions 3 pages and 4176 characters, recommendations for production 1 page and 388 characters and a list of references 149 numbers The volume of the dissertation is 164 pages of computer text, the total volume is 252799 characters (218399 characters excluding the list of references and appendices).

CONTENT OF THE WORK

In the introduction, the relevance of the topic, the problem statement and the general characteristics of the dissertation are given.

First chapter. This chapter is entitled «Literature review, research goals and objectives". Here the role of antioxidants in nutrition and free radical reactions, the study of grape polyphenols and its biologically active properties, intensive methods of extraction of pomace, conditions for the production of extractive Cahors wines, Azerbaijani Cahors and its distinctive properties are given.

To. K.P.Dyakov, I.M. Andrushenko,A.I. Denisov, G.V. Glamazdin, V.T.Chernyarov, I.S.Kass, Z.T.Dubinin, A.A.Egorov, V.A. Datsik, L.I.Shleiner, H.K.Fataliev, A.A.Nabiev,T.M.Panakhov, V.S. Mikailov and other scientists had great achievements in the development of modern technology of alcoholization of juice and hops, subsequent cultivation and storage of liqueurs and sweet wines. Theoretical foundations of dessert winemaking M.A. Khovrenko, M.A. Gerasimov, Z.N. Kishkovsky, A.A. Preobrazhensky, as well as N. S. Okhramenko, A.K. Rodopulo, K.K. Almashi. This is reflected in the research of other scientists.

But the research done to realize the proteins used (storage in crushing, fermentation in crushing, heating in crushing, etc.)) has not been able to completely eliminate the complex equipment and hard work required. Apparently, the development of new technological methods that eliminate the noted shortcomings and allow the production of high-quality wines remains a scientific problem.

Second chapter is entitled It is called “Object and methods of research". The objects of the study are native and introduced varieties of red grapes Madrasa, Khadogni, Saperavi, Cabernet Sauvignon and

Shirvanshah, as well as grapes, juice, bunch, wine material, wine, comb, bone enzyme preparation, technological methods and equipment.

Physico-chemical and organoleptic analyses are carried out sequentially during the entire growing period by preparing and storing samples. Metals are determined by atomic emission spectroscopy, the amount of amino acids-by high-performance liquid chromatography, the hardness of organic acids - by capillary electrophoresis using the device "Kapel-105P" GOST R 58841-07..

The total antioxidant capacity of grape juice, grape peel extracts, and extract hydrolysates was determined spectrophotometrically by CUPRAC-normal, cuprac-ingubation, and ABTS/XRP, the total amount of phenolic compounds was determined by Folin-Ciocalteu, and the total amount of flavanoids was determined by Al Cl_3/Na NO_2. The total amount of anthocyanins in red grape juice, red grape bark extracts, and extract hydrolysates were measured at different pH values.

Third chapter under the title "Experimental research". In this chapter, the mechanical composition of the bunch in the grape varieties used for Cahors is studied, and the structure, totals, and structure of the bunch by variety are given.

The grape yield index for the studied varieties ranged from 52.5-90.9. According to this indicator, Cabernet Sauvignon was the first, and the Madrasa variety was the last. In the varieties of Cabernet-Sauvignon and Merlot, the structure index was 4.3, in the varieties of Madrasa-5.3 and, finally, in the varieties of Khadognu-6.1.

The conducted analyses have shown the possibility of using the studied varieties in the production of Cahors wines. The indicator of technical ripeness (TG) ranges from 196-280 for varieties.

As you know, one of the important indicators that reflect the quality of raw materials is the sugar-acid potential, in other words, the glucosidometric indicator. In the studied varieties, GAD varied between 3.0-5.7. Madrasah (4.9), Cabernet Sauvignon (5.0) and Shirvanshah (5.7) were high, while Hadogni (3.0) and Merlot (3.1) were low.

According to some researchers, the ratio of glucose to fructose is one of the main indicators that reflect the maturity of grapes (fig. 1).

The ratio of glucose to fructose in the studied grape varieties was close to one (1.01-1.08). At the time, researchers showed that at the stage of technological maturity, this indicator ranges from 0.7-1.5. Let's not be mistaken, let's say that among the polyphenols contained in grapes, there is no second compound that has the same strong anti-oxidant properties as rasveratrol. Rasveratrol (trans-3,4[1],5-trihydro-xylbene) is a phenolic compound belonging to the stilbene group, created to strengthen the mechanism of plant resistance to stress and environmental hazards during evolution. Although it is found in a number of foods, it is found in large quantities in red grapes and wines.

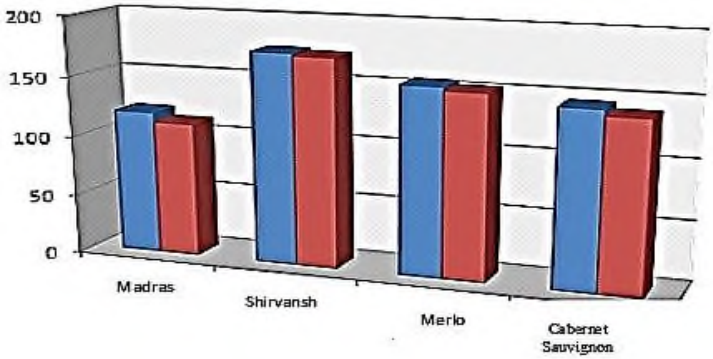

Figure 1. Yield ripeness of grape varieties for Cahors wine material:

- glucose; - fructose

The results of our research on the content of rasveratrol in the components of the gel are presented. The results are due to the wet mass (fig. 2). In the bark of the studied red varieties in 2017 and in Shirvanshahs, a higher content of teratrol was observed over the years. In general, the amount of tsvetrol in the bark varied over the years and varieties in a very wide range (0.75-8.25 mg/kg).

The content of rastratrol in the seeds was significantly lower than in the peel, ranging between 0.31-5.7 mg/kg by year and variety.

According to the varieties and years in the squeeze, latinda did not contain rasveratrol or was very insignificant (maximum 0.25 mg/kg).

The fermentation process in a medium containing carbon dioxide also affected the composition parameters. The time of carbon dioxide maceration has its effect on the amount of phenolic compounds, although not on other indicators. If during 12 hours of maserationthe content of phenolic compounds was 1700 mg/dm^3, and colour substances-410 mg/dm^3, then for 36 hours of maseration these indicators were 2150 mg/dm^3 and 510 mg/dm^3, respectively.

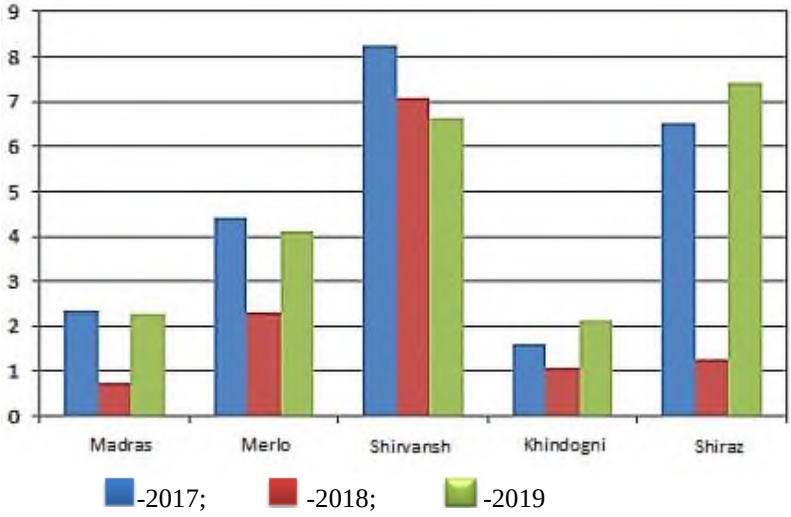

Figure 2. Rasveratrol content in grape skins, mg/kg.

Based on numerous studies, the alloy was heated in 3 modes: 55^{0}C, 65^{0}C and 75^{0}C. To clarify the effect of the heating mode on the composition, the crushing was stored in an additional inactive crushing while it was heated. 3 variants (65^{0}C) had a more optimal composition in terms of the amount and organoleptic qualities of phenolic and nitrogenous compounds. During the organoleptic analysis, this variant was evaluated by 0.2 points higher than the control one. Heating at higher temperatures led to a decrease in organoleptic qualities, this variant received 0.1 points lower than the control one. Hot processing for 4 hours was observed with a sharp caramelizing tone in the taste and was rated 0.2 points lower than the previous version.

The second option, which received a higher rating in terms of quality, was a sample that was subjected to hot treatment for 3 hours.

In the alcohol content, grape and wheat alcohol of the same density were used. It turned out that samples of dessert wines made using rectified wheat alcohol were rated at a higher score, followed by grape spirits in a sequence of reduced density.

In the aroma and taste of the samples darkened with grape alcohol, cognac tone, aldehyde and grain alcohols were noted. Due to the content of methyl alcohol in wine materials diluted with grape alcohol, deviations from the norms were sometimes noted, and, in particular, in samples using insufficiently purified grape alcohol, some deterioration in organoleptic qualities was observed.

The method of conducting the alcohol content also did not bypass the composition and quality. Thus, the content of phenolcarboxylic acids in the Cahor wines obtained by alcoholic fermentation differed from that in other methods by 15-24 mg/dm^3 higher (table 1).

Table 1.

Effect of alcohol formation on the amount of phenolic carboxylic acids

Hardness of phenol-carboxylic acids, mg/dm^3	Spirit lamp method		
	Alcoholization of all pomace material	Method of alcohol treatment of sour material	Method of distilling sour juice (control)
Ascorbic acid	9	7	5
Chlorogenic acid	4	3	0
Nicotinic acid	2	0	2
Orotic acid	26	17	21
Caffeic acid	6	5	6
Gallic acid	7	0	5
Protocatexic acid	6	4	6
Total amount of phenolic carboxylic acids:	60	36	45

It turned out that castor wines obtained by alcoholization provide not only the separation of phenol-carboxylic acids, but also their storage at all technological stages of the winemaking process.

In order to study the extraction of wine, wine samples made using such methods as the white method, maceration, red method, Kak-

heti's method, thermovinification, enzymatic catalysis, were subjected to physico-chemical and organoleptic analysis. It was found that in contact with solid parts and using methods that intensify the process, the extractivity in wine samples increases, including the content of polyphenols. Despite the high extractivity, the material obtained by mowing with a comb lags behind its analogues in organoleptic parameters.

During the analysis of the amino acid composition of the samples according to the prepared variants, 17 amino acids were found in all the samples. The wine samples obtained by heating and alcohol crushing had a richer amino acid composition. When looking at the qualitative composition of amino acids, it becomes clear that all representatives of essential amino acids were represented in the samples, with the exception of tryptophan. The option of alcoholic fermentation of the starter culture in terms of the total number of amino acids lagged behind the option of only heating the starter culture, but the option of alcoholic fermentation of the starter culture in terms of the number of essential amino acids attracted attention because it surpassed all its analogues.

Fermented scallop and clove extracts are prepared using various extracts. At the same time, grape alcohol was used with cognac alcohol and on its basis, the extractants water+alcohol, juice+alcohol, juice+water (1:1) + alcohol, sour wine+alcohol, sour wine+water (1:1) + alcohol with different consistency were prepared. With the addition of these extracts, extracts of various compositions were obtained from fermented scallops or tubers. The physico-chemical and organoleptic analyses carried out allow us to conclude that for this purpose it is necessary to use alcoholic sour wine, as well as a water-alcohol mixture. The extracts obtained using alcohol-containing acidic wine differed from their analogues in their rich content of polyphenols and were evaluated by organoleptic analysis at 7.75 and 7.85 points.

It turned out that the samples of Cahors made by crushing alcohol differed in their aromatic composition from other samples with a richer composition, bouquet and aroma inherent in the grown Cahors. At the same time, the content of aromatic substances was 318.59 mg

/dm^3, 308.02 mg/dm^3 when fermented in brine, 261.41 mg/dm^3 when heated in brine, 206.92 mg/dm^3 during 24-hour storage in brine and differed significantly above the control variant (133.42 mg/dm^3) obtained by the white method.

Fourth chapter named "Improvement of the hardware and technological scheme of production based on the results of research". According to the hardware and technological scheme (fig.3), developed on the basis of experimental studies, grapes with a crushing pump -2, entering the hopper-1 with a screw feed, are transferred to the crushing and pumping hopper-3. Here the comb is separated and sent for fermentation. The crushing is fed by a pump-3 to a system of tanks of the rotary type -4 or by a heater-5 and from there to these tanks-4.

In the heater-5, the crushing is heated to a temperature of 35-40^{0}C, and cyclically all the crushing is brought to this temperature. From the dispenser-6 in hot form with the addition of CO_2 and an enzyme preparation at the rate of 75-100 mg/l. Under the action of enzymes, the extracted material is transferred by a crushing pump-7 to maserates-8 with a stirrer. Here, with a dispenser-6, add a 2-3% solution of yeast and stir the crumbs. After fermentation of sugar in the required amount, alcohol is added here from the dispenser-after 6 intervals.

When mixed in this way, the crushed stone is subjected to intensive maceration, then the crushed stone is fed from there by the pump -7 to the leaker-9 and to the sealer-10. If necessary, the juice of the first fraction obtained from the blender can be used to prepare more refined wines. The juice fractions taken from the agitator and compressor are fed by the pump-11 to the blending tank-12. If the wine material is not sufficiently extractive, then a wine-alcohol extract obtained from a dispenser-6 fermented scallops and a bucket-is introduced into it. To bring it to the required condition, alcohol and solid juice are added from the dispenser-6, if necessary. The material after blending is well mixed, put at rest and pumped through the pump-11 into metal tanks-13 or oak barrels-14, inside of which oak boards are laid. The grown wine material is passed through a filter-15 and sent for further operations.

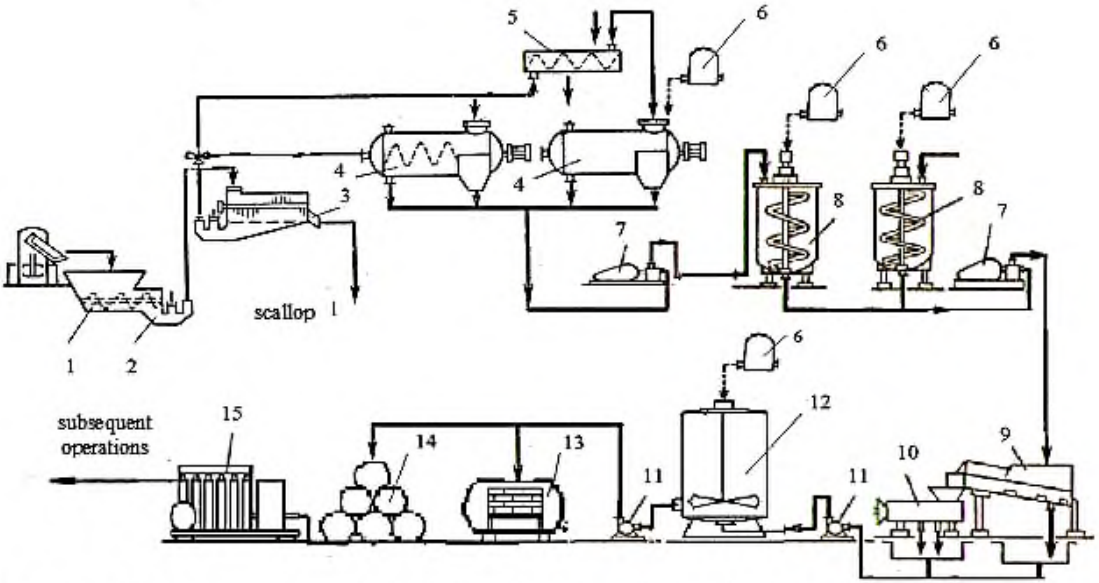

Figure 3. Improved hardware and technological scheme for the production of Cahors wines

1-screw feed hopper; 2-squeeze hopper; 3-squeeze pump hopper; 4-squeeze fermentation tanks; 5-squeeze heater; 6-ingredient dispenser; 7-squeeze pumps; 8-mixer; 9-mixer; 10-compressor; 11-juice pumps; 12-blending tank; 13-metal tank with oak board inside; 14-oak barrels; 15-filter

Varietal fermentation with intermittent alcoholism-I (control); fermentation of the extract with enzyme preparations-II; Examples prepared for variants IV (advanced technology) were studied – heating of pulp, widely used in the production of Cahors-III and fermentation of pulp with dynamic maceration after heating to 35-40^{0}C with the addition of SO_2 and FP (table 2).

Table 2.

Physical and chemical composition and organoleptic characteristics of Cahors samples

num	Composition indicators	Variants			
		Control I	II	III	IV
1	The proportion of ethyl alcohol in the volume, %	16,2	16,2	161	16,3
2	Mass density of sugars, g/dm^3	230	231	230	230
3	Mass density of titrated acids, g/dm^3	6,5	4,6	4,8	4,7
4	Mass density of tartaric acid, g/dm^3	2,7	2,6	2,7	2,6
5	Mass density of malic acid, g/dm^3	1,0	0,1	0,2	0,2
6	Mass density of volatile acids, g/dm3	0,41	0,22	0,20	0,25
7	Mass density of phenolic compounds, mg/dm3	2740	3430	3520	3590
8	Mass density of anthocyanins, mg /dm3	430	525	570	660
9	pH	3,2	3,4	3,5	3,4
10	Mass density of glycerol, g / dm3	5,6	7,0	6,8	6,8
	Tasting characteristics and price, point	prunes in the aroma; inharmonious acidity, rough – 7,60	in the aroma, prunes are black in color, warming a plum tone; the taste is buttery – 7,90	the aroma has a complex chocolate, warming plum tone; the taste is buttery – 7,85	the aroma has a tone of refined roasted plums, black currants; the taste is buttery, rich – 7,95

The chemical parameters of wine materials differed in the content of titrated and organic acids, the numerical value of pH, phenol, coloring substances, glycerol, and organoleptic parameters were also adequately changed. In the wine sample prepared according to option II, the content of anthocyanins was 525 mg/dm^3, that is, 95 mg/dm^3 more than the control one and was estimated at 7.80 points. The experimental sample taken according to variant III was superior to the previous variant both in composition (especially in the number of total phenolic compounds and anthocyanins) and in organoleptic qualities. But this example also attracted attention for its lack of completeness. Based on the composition (the amount of anthocyanins is 660 mg/dm^3) and the results of the tasting, it can be noted that the IV variant fully reflects the quality inherent in Cahors. In other experimental samples, complete completeness was not observed, although a soft harmonious taste was noticeable, expressed by a complex aroma of Cahors. In the control version, a sharp, inharmonious acidity is known, while the fat content and softness inherent in Cahors wines were not observed.

The amount of vitamins in the samples obtained using the improved technology showed an increase. This indicates that the control sample did not show sufficient penetration of these substances into the clay and solid parts of the solution. Moderate hot masering with the addition of SO_2 and PHP served to eliminate the gaps present in this particular regard. This is because after this maceration, with interruptions, alcohol causes vomiting. At the same time, in this case, a clearer contact and moderation with the solid parts is provided compared to the control. All this turns the wine obtained by the new technology into a rich product in composition.

It can be seen from the studies that the influence of technological methods on the subsequent amount of anthocyanins and the intensity of color also depended on the variety. The decrease in color intensity was more noticeable in madrasa and Cabernet Sauvignon than in Merlot. The high content of anthocyanins in the third variant suggests that these wines require longer aging and thus high quality. (table 3).

Table 3. Color change in Cahors wine samples during cultivation

Method of making wine	Indicators	Merlo		Madrasa		Cabernet Sauvignon	
		Preliminary	After 1 year	Preliminary	After 1 year	Preliminary	After 1 year
Fermentation in the pomace	Color intensity	1,25	1,01	1,09	0,80	1,16	0,69
	Anthocyanins, mg/dm^3	580	390	460	330	474	315
Hot processing and fermentation in the squeeze	Color intensity	1,71	1,02	1,45	0,57	1,34	0,51
	Anthocyanins, mg/dm^3	570	235	405	63	552	86
Example of practice (improved technology)	Color intensity	1,88	0,86	1,58	0,60	1,74	0,81
	Anthocyanins mg/dm^3	660	130	620	110	660	120

The reduction of anthocyanins occurs, firstly, due to the fact that part of it polymerizes and provides the formation of the taste and aroma inherent in Cahors, and secondly, by combining with monomeric phenols in the selection process, dimers, trimers, etc. are formed. this is due to the formation. Monomeric flavonoids are usually found in the form of quercetin and its glucoside rutin. In addition, (+) - catechin, (–) - epicatechin, and (-) epicatechingallate were also found in wine samples (table 4).

Table 4

Dynamics of some phenolic compounds (mg/dm^3) during storage and cultivation)

Components, mg/dm^3	crushing in the squeeze (control)		Example of practice	
	Preliminary sh/m	After 1 year	Preliminary sh/m	After 1 year
Quercetin	6,7	9,1	7,0	13,2
Routine	2,0	2,4	2,3	2,8
(+) Catechin	3,6	17,3	6,7	24,5
(-) Epi catechin	24,1	28,2	25,7	31,5
(-) Epi catechingallate	9,2	11,4	`6,4	13,2

Apparently, the increase in the number of monomethylflavonoids occurred during one year of reproduction. It is noticeable that this increase is more intense in the experimental version.

Analysis of the amount of rasveratrol after processing operations in Cahor samples made from different varieties showed that by the end there are weak trends towards a decrease in comparison with the initial state. In the hadogny variety, the reduction to the blend was more noticeable than in other variants. And after the blending, despite the Madrasa, there was some stabilization in Khadogna in terms of the number of divorces. It is noticeable that the local grape variety "Shirvanshah" in the amount of rasveratrol surpasses even the variety "Cabernet Sauvignon". Other varieties are noticeably behind them.

The method of producing Cahors wines affected its physical and chemical properties, including buffer capacity, electrical conductivity,viscosity, and pH. It turned out that with the help of electrophysical properties, it is possible to control the completeness and extractivity of wines. This factor is of particular importance for the wines of Cahors.

The finished samples of Cahors are stabilized according to a complex processing scheme according to the scheme ”Yellow blood salt+bentonite+cold". After cold treatment at a temperature of minus 6-7^{0}C, the samples were filtered and placed at rest, and in cases where the necessary result was not obtained, the samples were processed hot and re-filtered. As a result, complete washing was achieved without additional treatment.

After the stabilization treatment, the samples were analyzed according to the 100-point system of the International Organization for Viticulture and Wine. At this time, the experimental samples of wine were rated 5-12 points higher than the control ones.

Results

1. The mass density of sugars varied between 197-265 g/dm^3 in the studied varieties, in this respect, the first was the Shirvanshah variety (265 g/dm^3), and the last was the Hadogni variety (197 g/dm^3). The sugar-acid potential is high in the Shirvanshah grape varieties (5.7), Cabernet Sauvignon (5.0) and Madrasa (4.9); relatively low in

the Merlot grape varieties (3.1) and Khadogni (3.0), the glucose-to-fructose ratio was about one (1.01-1.08).

2.The spectra of the juice, as well as extracts and hydrolysates of the bark were determined using chromatograms at different wavelengths (280; 520 Nm) and solvents of different compositions. The anthocyanidins delphinidin, cyanidin, peonidin, and malvidin were found in the bark hydrolysates; the content of tsvetrol by year and variety was 0.75-8.25 mg/kg in the bark, 0.31-5.7 mg/kg in the seeds, and 0.01 - 0.25 mg/kg in the late age.

3. In the fermentation and subsequent processing processes, there was a decrease in the content of phenol-nitrogen components, the intensity of color and the cation-anion composition, and in the samples obtained from grapes subjected to heat treatment, this process, as it turned out, was even more intensified. In total, phenol-carbon acids showed an increase in the technological method of "alcohol crushing" by about 2.5 times compared to the"white method".

4. In other variants of the "white method", which involves contact with solid parts, wine samples were characterized by a higher content of extractive substances, including phenolic compounds and nitrogenous components. Common phenolic compounds and its monomeric form were more burdensome in the “alcohol crumb” variant, polymer phenols were more burdensome in the “heating crumb” variant, and anthocyanins were more burdensome in the “combing crumb" variant.

5. The optimal operating parameters of hot processing of crushed stone are determined. 65^0C samples of wine prepared by hot processing for 3 hours differed in composition and quality, with organoleptic analysis they were estimated at 0.8 points higher than the control ones and 0.2-0.6 points higher than other analogues. Just as lower temperatures did not give the desired effect, high temperatures led to a sharp fading of the tone in the taste and deterioration of organoleptic qualities.

6. The amount of intermediates in the Cahor samples obtained by crushing alcohol was 185 mg/dm^3 more than in the sample obtained by the white method (control), and 57 mg/dm^3 more than in the sample obtained by heating crushing. When considering the qualitative

composition of amino acids, it turned out that all the essential amino acids were present in the samples, with the exception of tryptophan, and in this respect, the variant of alcoholic fermentation of the bone differed from all its analogues by an advantage.

7. Wine samples obtained by the "white method" had a higher electrical conductivity and buffer capacity, and samples obtained by distilling wort had a higher pH and viscosity. It was noted that the electrical conductivity decreases with increasing completeness and extractivity of wine samples. At the same time, an increase in viscosity was observed in the sequence of increasing extractivity and completeness. This makes electrophysical quality control possible.

8. The optimal parameters of heat-enzymatic maceration fermentation of wort and alcohol distillery with intervals, allowing to intensify the extraction of substances from the solid parts of the wort, have been developed. Phenolic compounds and biologically active substances (vitamin composition), as well as antioxidant capacity were significantly increased in the wine obtained by this method, which was evaluated in the course of organoleptic analysis at 97 points, significantly surpassing analogues.

9. Anthocyanins after storage and dilution, as well as blending and stabilization operations, a decrease in the color intensity and the amount of resveratrol, monomeric phenolic compounds (quercetin, catechin, etc.), and an increase in the amount of aromatic substances occurred. These changes, in particular, the increase observed in the dynamics of fragrances, close to 115 mg/dm^3, provided the formation of the aroma and bouquet characteristic of Cahors.

10. According to the results of the study, an improved hardware and technological scheme for the production of Cahors was developed and 3 thousand bottles passed production tests with an economic efficiency of 10,507.31 manats with an annual production volume.

Recommendatıons for producers

-production technology and the use of its hardware, which provides for thermofermentative maceration fermentation and alcoholization at intervals for the production of highly extractive Cahors and dark wines;

- the use of reasonable technological parameters that ensure high quality and economic effect in the production of dark wine materials and Cahors wines.

The main provisions of the dissertation are reflected in the following published articles:

1. Imamguluyeva, M.M. Research of some technological methods of obtaining dessert wine material of the Cahor type // Azerbaijan Agrarian Science, - 2017, No. 1. - pp. 121-124.

2. Imamguluyeva, M.M. Fataliyev H.K. Research of aromatic compounds in Cahors-Lad wines. // Scientific works of ASAU, - 2018, No. 1. - pp.54-57.

3. Imamkuliyeva, M.M. Fataliyev, H.K. Investigation of the influence of the cooking method on the composition of the Cahor wine material // Azerbaijan Agrarian Science, -2018, No.1.-pp.84-87.

4. Imamkulieva M.M. Fataliyev H.K. Research on the antioxidant activity of Cahor wines // Ganja State University, International Scientific Conference "Actual problems of modern Natural and Economic Sciences", - 2018, Part I., pp. 362-363.

5. Imamguluyeva, M.M. Fataliyev, H.K. Investigation of mechanical properties of grapes used for making wine type wine // the Azerbaijani agricultural science,-2019, No. 1. – pp. 132-136.

6. Imamguluyeva, M.M. Study of physico-chemical properties of grapes and wine //- Ganja: Ganja branch of the National Academy of Sciences of Azerbaijan, a collection of news stories, - 2019, № 1(75). - pp.216-221.

7. Fataliyev, H.K., Imamkulyeva, M.M., Jafarov, K.T. Study of the production of wine type wine by the method "Kurdamir" in Azerbaijan. // Beer and drinks, non-alcoholic and alcoholic, juices, wine, alcohol. - 2019, No. 4. - pp. 36-40.

8. Imamguluyeva M.M., Jafarova K.T., Alieva G.R. Research of some factors determining the quality of strong wines // Technique and technology of food production. Holding the Riyadh International scientific - technical conference on April 23-24, 2020. - pp. 90-91.

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11. Gafarova, K.T. Imamguluyeva, M.M. Mamedov A.R. Stabilization of heat-treated dark wine // proceedings of the IV Republican scientific-practical conference on the theme” prospects for the development of light and food industry in our country and the challenges ahead", Baku - 08 Dec 2020 - pp 149-150.

12. Mammadova, M.S., Imamguluyeva, M.M., Qadimova N.S., Ismailov M.T., Heydarov E.E. Musaev T.M // Study of resource saving technologies in the processing of grapes. Advances in Applied Science Research, iMedPub Journal, - 2020, vol.11, №.3:2.

13. Imamguluyeva, M.M., Fataliyev, H.K.,.Investigation of the process of hot processing of crushed stone for Cahors // Republican scientific conference on the topic "Directions of development of agricultural farms and environmental protection", Baku: - January 30, 2021. - pp. 607-609.

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