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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

INVESTIGATION OF WAYS OF IMPROVING THE TECHNOLOGY OF PINK WINES

Specialty: **3309.01- Food technology**

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GENERAL DESCRIPTION OF THE RESEARCH

Relevance and degree of completion of the topic. For sale in a number of countries, especially in France, which is considered the cra-dle of wine, pink wines surpassed white wines and took second place after red. They attribute this to the fact that pink wines have quality in-dicators inherent in both white and red. They are distinguished by the fact that they, on the one hand, are light enough, with little extract, and on the other hand, have valuable components, including phenolic compounds, such as red wines. The growing demand for pink wines is due to their attractive appearance, pleasant fresh taste, the taste and pro-nounced aroma of fresh grapes, and especially the ability to reconcile with any dish. Despite the fact that there are no world-famous red wines and world-famous white wines, there are no pink wines that fall into the high category. This is due to the fact that this type of wine is difficult to prepare, and its processing requires subs-tantial labor costs. In addition, it should be noted that not always the best raw materials are allocated for this type of wines. For pink wines, sometimes not fully ripe, poorly colored grape raw materials are used. That is why regions where red grape varieties do not ripen well (as well as years) are specialized for the production of pink wines. Some grape varieties with a weakly expressed aroma and an unpleasant tanning taste are mainly aimed at the production of pink wines. Finally, it is given for this type of wines when the grape raw materials are defective, infected with molds and heavily contaminated.

One of the reasons for the limited production of pink wines, as mentioned, is due to the difficulty of their production process. Pink wines differ from red wines by being more similar to white wines in terms of their general characteristics. This difference is due to the dif-ference in the duration of maceration applied to the crush during their production. The only criterion used in the recognition of pink wines is the color. The duration of maceration, temperature and sulfi-tation, which implies contact of the solid parts of the wine with the juice, affect the solubility of phenolic compounds in pink wines and hence the color. Therefore, the production of high-quality pink wines may be possible through proper coordination of these factors. In this

regard, many studies have been conducted. Of these researchers, Minguez and Hernández, Jiménez-De-Maguirriain, Pérez-Magariño, Sànchez-Mo-reno,Tamborra, Diaz, Murat,A.A.Lisoves,M.V.Bilko and others. However, these studies did not cover the grape variety of our country and the processing technology to be applied in accordance with local conditions. In particular, our aboriginal grape varieties, whose color substances are in the Shell and which can be considered valuable for this purpose, have not been investigated in Madrasa and Khindogny, the potential of these varieties has not been revealed in connection with the mentioned issue, the period of contact of the juice and the processes occurring during the storage of wine have not been As can be seen, the field is facing a scientific problem that requires its solution.

Purpose and objectives of the study. The purpose of the study is to investigate the ways of improving the technology of pink wines by using grape varieties cultivated in local conditions.

To achieve the goal, the following tasks are intended to be solved:

- research and evaluation of grape varieties;
- investigation of influence of preparation method on composition and quality of pink wine samples;
- to the quality of pink wine samples are yeast race, phenolic compounds, grape varieties, etc. effects;
- investigation of quality influence of storage conditions and duration of pink table wines;
-assessment of hardware and economic efficiency of technology.

Research methods. As the object of research, products from Aboriginal and introduced grape varieties, juice, crushed, wine material, production and processing technology, cultivation process and hardware were taken. Pink wine samples are made by different technological methods from Madrasa and Khindogni grape varieties cultivated in different areas. Maceration of pus for periods from 3 to 24 hours and analysis of the composition indicators every three hours is carried out. In the preparation of wine, not only one variety is used, but also sepaj and kupaj methods are used. Storage of wine samples up to 12 months and analysis of physico-chemical

composition indicators ac-cording to the main indicators every three months is carried out. Physico-chemical and organoleptic indicators of raw materials, semi-finished products and finished products are determined by the methods of general analysis available in the chemistry of wine. Anthocyanins are carried out using high-efficiency Liquid Chromatography (YSMX), gas chromatography of perfume compounds, phenolic compounds Foline-Chokelteu, statistical processing of data using computer hardware and Statistica 6.0 SPSS Statistics 17.0 package software

Main provisions to be submitted for defense:

- experimental solutions of the constituent properties and use of grape varieties for the production of pink wines;
- changing features of the composition and quality of the product depending on the sort, processing method and cultivation conditions;
- scientific substantiation of composition indicators, including change dynamics of anthocyanins depending on zonality, maceration time of crush and optimum ratio of leukoanthocians to anthocyanins in studied varieties;
- to the quality and safety of wine samples may contain yeast race, SO_2, toxins, etc.experimental ways of solving the effect of;
- scientific justification of the change regularity of the amount of co-lored and colorless phenol compounds depending on maceration time;
- components in wine production by the method of sepaj and kupaj and ways to solve their optimal proportions;
- storage of different wine samples under different conditions for 12 months and scientific justification of the processes occurring in this time;
- development of technology and hardware for the production of high-quality pink wines using cold maceration and storage.

Scientific novelty of the research. Sugar-acid potential of raw materials, phenol maturation, anthocyanin composition, flavoring com-pounds, etc. the indicators of selection and evaluation of varieties have been studied and justified. For the first time regime parameters of grape maceration were developed in Aboriginal Madrasa and Khin-dogni grape varieties cultivated in different

conditions. The optimum ratio of leukoanthosians to anthocians ensuring the production of high-quality wines by varieties was determined, and the storage regime en-suring the occurrence of transformations accompanied by less losses in wine samples was developed. The production of Sepaj, kupaj and also one-of-a-kind pink wines, components and their optimal proportions are scientifically substantiated. By limiting oxidation and fer-mentation of apple-lactic acid by the effect of cold maceration and storage, the technology and hardware-technological scheme for its imple-mentation have been developed that ensure the preservation of acidity and freshness characteristic of pink wines.

Theoretical and practical significance of the study. Determination of maceration time of crush in madrasa and Khindogny Aboriginal grape varieties cultivated in different areas, continuation of maceration, as well as phenol compounds, flavoring substances, etc. Depending on the period of storage of wine material. determination of changes in important composition indicators, investigation of factors affecting quality and safety of wine, experimental justification of selection and quantity ratios of components in sepaj and kupaj are of theoretical importance for research in winemaking and fermentation technology, especially in the production of table wines.

Determination of the optimum ratio of leukoanthocians to anthocians in local pink wine samples obtained in different varieties and different conditions, successful testing of the technology and hardware-technological scheme to implement, which ensures the preservation of acidity and freshness typical for pink wines by using maceration and storage in cold conditions are of practical importance for the winemaking industry.

Approbation and application of works. The main provisions of the dissertation are in scientific-practical conferences of academic staff, doctoral students and masters of the faculty of Agrotechnology of Azerbaijan State Agrarian University (Ganja, 2018-2021), in the XIII international scientific-technical conference on “Technique and technology of food production” at Mogilev State Food University (Mogilev, 2020), in the All-Russian online conference with internati-

onal participation at the, IV Republican scientific-practical online conference on “Development perspectives of food and textile industry in Azerbaijan and future tasks” held at Azerbaijan State University of Economics (Baku, 2020), Republic online scientific conference on “New directions of development of agrarian economy and protection of Environment” held at Western Caspian University (Baku, 2021), Kiev State University at the 87th International Scientific-practical online Conference of young scientists, post-graduate students and students (Kiev, 2021), at the international online scientific conference on “Main prob-lems of University rating issues” dedicated to the 98th anniversary of national leader Heydar Aliyev at Azerbaijan University of Technology (Ganja, 2021).

The technology enabling the production of quality pink wine has been developed and applied in “Az-Granata” OJSC within the advanced hardware-technological scheme. The use of advanced technology allows the production of 1,000 pink wine with an economic efficiency of 602 manats.

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, conclusions, a list of used literature and appendices in 158 numbers. There are 8 pictures, 72 tables and 2 appendices here. Introduction in the con-ten of the dissertation is 7 pages, the first chapter is 27 pages, 56294 pages, the second chapter is 17 pages, 25332 pages, the third chapter is 48 pages, 77574 pages, the fourth chapter is 26 pages, 41658 pages, results are 3 pages, 4402 pages, recommendations to production is 1 page, 959 pages and the list of 158 books used is 18 pages, 31174 The volume of the dissertation consists of 154 pages of computer writing, and the total volume is 254557 characters (excluding the list of used literature and appendices and 223383 characters.

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", the influence of grape variety characteristics on the quality of pink wines, factors influencing the formation of flavor in grape-juice and wine, the place of cultural yeast in the for-mation of the quality of pink wines, different technological schemes of production of pink wines and conclusions on the literature review, determination of the purpose and objectives of the work are reflected.

The importance of a number of substances contained in it, including the amount of phenolic compounds, was emphasized by the fact that raw materials for pink wines have a fundamental role. Since pink wines are prone to oxidation, it is recommended that phenol compounds, especially leukoanthosians, be controlled and the amount of the latter should not exceed 30 mg/dm^3.

The pink wines, which are close to red wines, have been sufficiently colored, are obtained by continuous storage or fermentation of crushed pink and red grape varieties. Pink wines, which are close to white wines, are obtained from white processing of red varieties. Pink sour wines can not be named only according to the place of production. These are varieties of pink, white and red grape varieties, sepaj and kupaj wines. Apparently, local conditions for the production of pink wines, varieties of grapes, the composition of grapes, phenolic compo-unds, etc. has a fundamental effect. In our conditions, the lack of research into these issues has a slowing down effect on the improvement of the technology of pink wines.

The selection of grape varieties for the production of pink wines, the development of a more optimal and progressive technology for the production of wine materials and wines are quite relevant in our country.

Second chapter is entitled It is called “Object and methods of re-search". Here, first, the research materials, then the structural scheme of the study and the stages of the implementation of the work are ref-lected in sequence. The variety of Madrasah and Khandogny

→ is selectively harvested → separated from diseased and damaged parts → separated from the comb and crushed berries → macerated for diffe-rent periods of time during crushing → squeezed and separated from the pulp → fermented to the end →separated from the sediment by transfer with the addition of SO_2 and stored in containers filled with mouth. Bayanshire sort → is assembled by selective method → is separated from sick and damaged parts and is used for sepage. Physico-chemical, microbiological and sensory analysis methods widely used in enochemistry were used in the process of implementation of experimental works. Double-pumped, double wave height and diode array detector, Agilent-1100 brand HPLC were used to detect anthocyanins. Gas chromatograph "Agilent 6890N" and mass spectro-meter "Agilent 5975VL MSD" are used for the determination of flavoring substances. To determine the turbidity, the Por-tativ turbidimeter H193414 brand of the company "HANNA" is used. Statistical processing of data is carried out using computer technology and the program Statistica 6.0 package SPSS Statistics 17.0.

Third chapter under the title «Research results, its analysis and discussion are called". Determination of carbohydrate and phenol ripening of grape varieties used here, composition and quality of grape juice, change of composition of pink wine samples depending on year and zonality, study of flavoring compounds in pink wine samples, influence of maceration period on composition and quality of pink wine samples, study of role of yeast, different methods of pink wine production were investigated. During our researches high mass concentration of sugars was characteristic during ripening of grape varieties. Thus, it was found that this index in varieties ranged from 188-220 g/dm^{3}and the mass density of titrating acid fluctuated between 6.0-7.0 g/dm^3. In this regard, the sugar-acid index on the varieties was between 3.05-3.14. Technical ripeness indicator in Madrasa grape variety was 221, Khindogny-207, Bayanshira-212 and Merlo-230 g/dm^3. These indicators were at the level of the recommended regulatory requirements for the preparation of pink wines. During the study of color, it was found out that as an indicator of phenol maturation in the seed, the color has brown-green, brown-

gray and brown color regardless of the variety. The color of the seed often reflects its hardness, bitterness and astringency. The amount of tannins from grape seed reached to Phenol maturity is 4 points lower than grapes that did not reach that maturity. But other indicators include potential quantity of anthocyanins (1090 mg /dm^3), quantity of extracted anthocyanins (601 mg/dm^3), technological reserve of phenolic compounds (2160 mg/dm^3), technological reserve of colorants (385 mg/dm^3), etc. it is noticeable that the indicators are significantly higher than those on immature grapes.

In total, 23 fragrance substances were found in juice samples from Madrasa grape variety grown in different areas. 6 of them are acids, 4 are higher alcohols, 4 are six-carbon compounds, 3 are carbomilli compounds, 5 are volatile phenols and 1 are lactone compounds. The total amount of fragrance was 1226.2 mg/dm^3 in Goygol, 1050.81 mg/dm in ganja and 881.5 mg/dm^3 in Samukh.

The share of ethyl alcohol in volume fluctuated between 11,0-12,2 h in samples of pink wines from Madrasah grape grown at different heights of ganja region (table 1).

Table 1.Influence of zonality on the composition of wine materials

Ingredients	Wine materials		
	Goygol	Ganja	Samukh
Spirt, h %	11,0	11,5	12,2
Titrating acidity. g/l	6,6	6,4	6,0
pH	3,31	3,42	3,27
Volatile acids, q / l	0,25	0,36	0,38
Reducing sugars q / l	0,03	0,02	0,05
Total phenolic compounds mg / l	56,42	76,21	67,76
Color density (OS_{420}+ OS_{520}+ OS_{620})	1,031	1,28	1,136
Color tone (OS_{420} %/ OS_{520} %)	1,26	1,12	1,04
OS_{420} %	46,9	41,0	39,58
OS_{520} %	35,56	36,15	38,01
OS_{620} %	16,8	21,7	22,34
Dry ingredients, q/l	15,3	15,9	16,2
İndependent SO_2 mg/l	8,0	6,0	11,4
Total SO_2 mg/l	56	49	62

The amount of titrating acids was 6.6 g/l, 6.4 g/l and 6.0 g/l in sequence in Goygol, Ganja and Samukh areas; pH respectively was 3.31, 3.42 and 3.27. It is known that the acidity fundamentally affects the taste and color of the wine, giving it freshness. The amount of dry

matter was 15.3 g/l in Goygol, 15.9 g/l in Ganja and 16.2 g/l in Samukh. The amount of flavoring compounds receives different prices at the stages of juice and wine preparation. There is an increase in some indicators and a decrease in others (table 2).

Table 2. Total amount of flavoring agents in pink wine samples

Compounds, mcg/dm3	Goygol	Ganja	Samukh
Acids	14503,2	13609,5	11980,5
Higher acids	62291,2	62995,4	61336,6
Ethyl esters of fatty acids	5622,5	5341,5	5296,4
Acetals of higher alcohols	5096,3	4982,4	5360,5
6 carbon compounds	276,8	261,3	269,6
Volatile phenols	646,4	492,5	536,3
Lactones	876,9	846,2	794,7
Carbon compounds	146,4	142,5	140,3
Common combinations	90,9597	88,6393	85,6849

Apparently, the total amount of flavors was 90.9 mg/dm3 in the wine material obtained from the Goygol district, 88.6 mg/dm3 in Ganja and 85.6 mg/dm^3 in Samukh. Samples of rose wines from Madrasa and Khindogni grape varieties with an aging of 3, 6, 12, 18, 24 hours were examined. It turned out that the dry matter content in wine materials made by aging for 3 hours in pressing was lower, and when stored for 12 hours -the highest. At the same time, the total amount of phenolic compounds in the first case was 0.66, and with 24-hour storage-1.01 g/l. With a change in color density between 1,075-1,502, an increase was observed as the shelf life increased. A similar situation occurred with the color tone, that is, mainly with an increase.

The number of anthocyanins also showed a change depending on the technology used (table 3). Apparently, during the maceration period from 3 to 24 hours, the content of anthocyanins varied from 57.22 to 91.35 mg/dm^3. At the same time, it is noticeable that there is one law between an increase in maceration time and an increase in the number of anthocyanins-compliance. The lowest amount of anthocyanins was in the control variant, 43.86 mg/dm^3, and then 61.22 mg/dm^3 with a 3-hour observation of maseration. When considering the samples, the anthocyanin content in the sample obtained with 3-hour maseration was minimal, and with 6-and 12-our maseration-optimal, and finally, with 18-and 24-hour maseration-

maximum, that is, 86.02-91.35 mg/dm^3. A similar situation was found in wine samples made from the Khindogni grape variety.

Table 3. Anthocyanin content (mg/dm^3) in rose wine samples from the Madrasah variety

Combinations	Control (by the white method)	Storage time in crushing, hour				
		3	6	12	18	24
Delphinidin-3-glucoside	0,36	1.60	3.16	5.01	5.95	6.46
Cyanidin-3-glucoside	1,38	2.02	2.46	2.95	3.16	3.22
Petunidine-3-glucoside	0,47	1.07	2.21	3.03	8.67	7.15
Cyanidin-3-glucoside	8,51	10.32	10.15	11.56	11.96	12.07
Malvidin-3-glucoside	31,98	38.22	42.86	48.95	53.46	57.09
Delphinidin-3-glucoside-acetate	0,00	0.45	0.67	0.71	0.73	0.74
Cyanidin-3-glucoside-acetate	0,00	0.38	0.35	0.41	0.41	0.43
Petunidin-3-glucoside-acetate	0,00	0.32	0.45	0.49	0.47	0.51
Cyanidin-3-glucoside-acetate	0,15	0.17	0.19	0.16	0.14	0.18
Malvidin-3-glucoside-acetate	0,79	0.94	1.27	1.35	1.41	1.53
Delphinidin-3-glycoside-P-Coumarate	0,00	0.22	0.23	0.21	0.21	0.21
Petunidin-3-glycoside-P-coumarate	0,00	0.27	0.29	0.31	0.32	0.35
Cyanidin-3-glycoside-p-coumarate	0,00	0.16	0.14	0.13	0.13	0.15
Malvidin-3-glycoside-P-coumarate	0,22	1.08	0.39	0.77	1.16	1.26
Total	43,86	57.22	64.82	76.04	86.02	91.35

A representative of lactones from aromatic compounds was found in the studied samples. Among the lactones, the most noticeable in terms of quantity was γ-butyrlactone. Its amount ranged between 621-686 micrograms/dm^3 on the samples. Approximately 80% of the total amount of lactones is accounted for only by this lactone. Of the carbonyl compounds, 3-hydroxy-2-butanone (acetoin) is represented in an amount of 61.8-7.8 μq/dm^3, which is about 55% of the total. Of the carbonyl compounds, the smallest was 3-hydroxy-4-phenol-2-butanone, which was found in the range of 5.9-9.2 μq/dm^3. Samples of rose wine were made using different yeast strains produced by different companies. It turned out that the compounds released by a number of natural flavors and belonging to different classes were distributed to varying degrees among the samples. A total of 31 aromatic compounds, including 10 esters, 6 higher alcohols, 8 carboxylic acids, 2 volatile acids, 2 phenols, 1 aldehyde, 1 alcohol and 1 terpene, in a sample fermented with 1 Anchor Alchemy strain; A total of 36 compounds, including 11 esters, 7 higher alcohols, 8 carboxylic acids, 3 volatile acids,3 phenols, 1 aldehyde, 1 alcohol and 2 ter-pene compounds with Anchor NT 50; a total of 29 compounds,

inclu-ding 9 esters, 6 higher alcohols, 8 carboxylic compounds, 2 volatile acids, 1 phenol, 1 aldehyde, 1 alcohol and 1 terpene, with Oenoferm Freddo; 10 esters, 7 higher alcohols, 8 terpene compounds in fermen-tation natural yeast; 33 compounds were found, including carboxylic acid, 3 volatile acids, 2 phenols, 1 aldehyde, 1 alcohol and 1 terpene. In terms of the quantity and quality of perfume compounds, Anchor NT 50 varieties and specimens fermented with natural yeast turned out to be richer.

From the sepals of Madrasah and Bayanshir varieties (80:20; 60 : 40; 40:60; 20:80) in the samples of pink wines from which they were made, the color shades varied between 0.67-0.98 and the color density was 0.02-4.25. With an increase in the proportion of white gra-pes in the sepals, a decrease in color density was observed. The largest amo-unt of dry matter was found in the third sample, namely in the 40:60 sepage (23.2 g/l). In other samples, this indicator ranged from 19.2-21.4 g/l, being close to each other. From the results of the organoleptic analysis of wine samples, it can be seen that the average score of the tasting evaluation in the second, i.e., the 60:40 sample, was 7.90, which is 0.05-0.35 points more than in other samples. A study was conducted to find out the effect of fermentation of white juice in red wine on the quality of pink wines. A sample of wine was made from the madrasah by the “white method" and a compara-tive analysis was carried out with two other variants (table 4)

Table 4.Effect of fermentation of white juice in red juice on the amount of volatile phenols

volatile phenols	Method and quantity, μq/dm^3		
	Madrasah by the white method	Bayanshir juice + freshly squeezed Madrasah juice	Bayanshir juice + sourdough in fermented Madrasah
2-methoxy-4 vinylphenol	168,7	187,4	224,6
2,6-dimethoxyphenol	3,6	7,8	12,8
4-vinylphenol	107,9	112,7	118,5
Vanilla	8,1	16,4	19,3
Acetovanilone	46,4	58,9	68,7
Zingeron	6,5	28,5	22,4
Propiovanillon	45,6	111,4	109,3
Homovanil Alcohol	21,4	32,3	71,1
Total	408,2	555,4	646,7

Apparently, volatile phenols were found in 8 names in wine samples. Among them was 2-methoxy-4-vinylphenol, and then 4-vinylphenol, which was distinguished by a higher content. But when comparing wine samples, we find that the largest amount of volatile phenols is contained in the third sample, that is, in white juice fermented in a fermented stone.

Fourth chapter named It is called "Generalization of research results and improvement of the production technology of rose wines". Based on the research conducted here, an improved hardware and technological scheme for the production of rose wines was developed. In accordance with this scheme (fig.1), grapes are fed into the hopper-receiver-feeder-1, and from there into the crusher-crusher-2. First, the comb is separated from the comb and the edge of the tape is made-3. Then the crushed kernels are pumped by a crushing pump-4 into a sulfitator-5 through pumping CO_2 at the rate of 50-75 mg/dm^3 into a maserator-6. In the generator-6, crushing is maintained for 3-6 hours, then in an ultrasonic chamber-8 +4- it is cooled to 5^0C, and at this temperature the membrane is fed to the press-9. In this case, the goal is to prevent oxidation. Juice separated from crushing, subjected to cold compression, is pumped by a pump-10 from the refrigerator-11 into sedimentation tanks-12, which serve to precipitate juice and are equipped with cooling jackets. It is best to use the first 50-60 decaliters of the compression fraction. The resulting juice is passed through a vacuum perlite filter-13 and washed and fed into the ignition battery-14. These tanks are equipped with jackets that serve to regulate the temperature at +14-16^{0}C. A 3% pure yeast solution is injected into the material and fermented from a yeast dispenser-15. After the fermentation is completed, the wine material is pumped by the pump-10 into the tank-13 for a standing equalizer by passing through a vacuum perlite filter-16. The distilled wine material is taken with a pump-10 and passed through the refrigerator-11, directing the thermos to the tanks-12 for storing wine material at a temperature of +14-18^{0}C. Here the wine is sent for further technological operations or for bottling.

The cooling of the wine material after fermentation is carried out in order to limit malolactic fermentation. Because malolactic fermen-

tation can lead to a loss of acidity and freshness, which is a typical feature of rose wines. To do this, the wine is aged at a temperature of +17-18^{0}C, separated from the sediment and stored at a temperature of +12-14^{0}C. One of the main features of this technological scheme is that it is possible to simultaneously make rose wines by the blending method. In this case, the crushing obtained by the crushing pump-4 is fed from the sulfitizer-5 to the shredder-heater-7 through a three-collector valve with sulfitization-7. Here the crushing is heated to a temperature of 40-45^{0}C, and then through a three-shaft crane is transferred to the diaphragm compressor-9. The first fraction obtained by crushing is obtained from juice, the juice is cooled in a tubular-tubular refri-gerator at a temperature of -11-20-25^{0}C. The rest of the process conti-nues in the same order as above, until the blend. In this case, the grinding obtained by the crushing pump-4 is fed directly into the mem-brane crimper-9, and immediately, by compressing (in the white way), the resulting juice is transferred to subsequent operations. Both wine materials purchased in this way are separately fed into the blend-17 through a three-column crane. Here, after blending, the thermos is transferred to tanks-18 for storage at a temperature of 16-18^{0}C. What we mentioned provides the second scheme implemented here.

Young wine materials after separation from yeast and rinsing, if necessary, are treated with yellow blood salt and trilon-B, filtered and stored at a temperature of 16-18^{0}C with protection against oxidation. In the second case, the ratio between the obtained white method and the obtained red method is 80:20 or 90:10. This operation can be performed in the form of a mixture of wine materials obtained from the red variety by the white method and thermovinification, or a white variety with a red variety.

The proposed hardware and technological scheme has successfully passed production tests at the Az-Granata juice and wine processing enterprise and provided economic efficiency of 602 manats per 1000 dal of finished products.

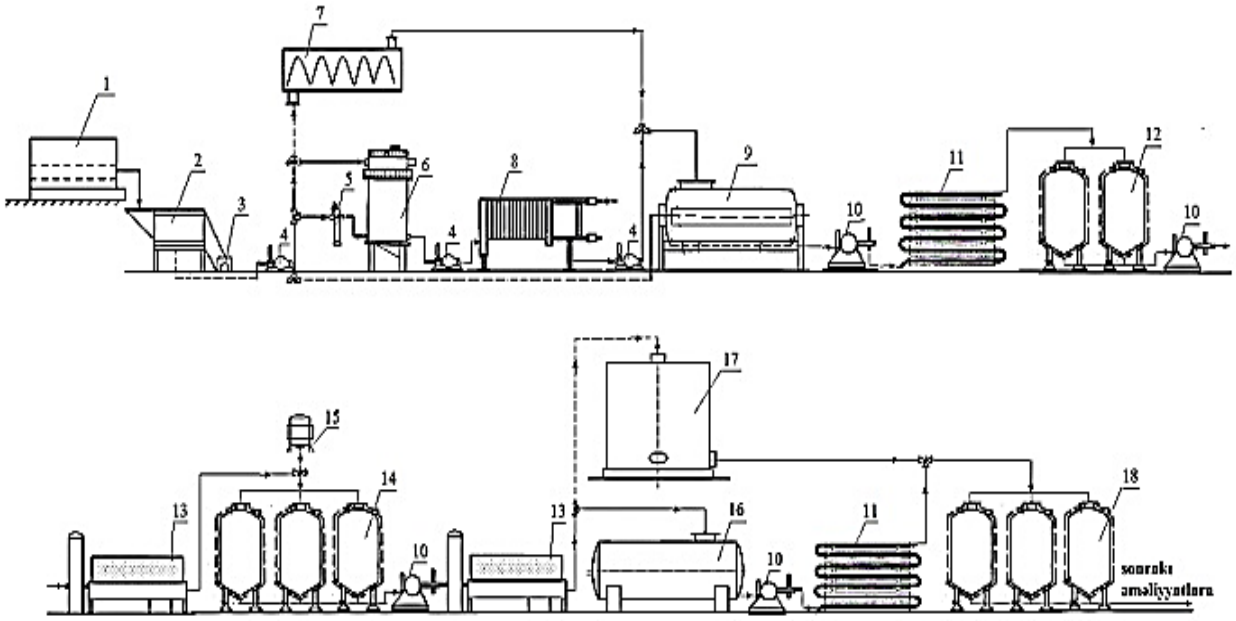

Figure 1. Hardware and technological scheme of the production of pink wines:

1-receiver-hopper for feeding; 2-shaft comb-crusher; 3-comb tape; 4-crushing pump; 5-sulfitator; 6-crusher storage tank; 7-crushing heater; 8-ultrasonic heater; 9-membrane press; 10-juice pump; 11-tube-tubular type heat exchanger; 12-sedimentation tanks; 13-vacuum-perlite 14-ignition battery; 15-yeast dispenser; 16-ecalization tank; 17- blend; 18-thermos wine storage tanks at a temperature of +12-+140C.

A change in the amount of aromatic acids was observed depending on the method of obtaining rose wine samples (table 5). Apparent-ly, all the wine samples contained aromatic acids, although in different amounts. Although five representatives of aromatic acids were found in the samples, the highest of them was kaftaric acid, characterized by a high content (6.3-41.9 mg/dm^3), and the lowest was n-coumaric acid (0.4-2.3 mg/dm^3.)

Table 5. Mass fraction of aromatic acids in rose wine samples, mq/dm^3

The practice options	Gallic acid	Jasmine acid	Succinic acid	Kautar acid	n-kumar acid	Sis rasveratro l	Total
The white method	1,5	1,0	6,3	3,0	0,4	0,0	12,2
Crush + FP	6,2	4,0	29,5	7,8	1,5	0,3	49,3
Trenolin rot 3 hours	4,5	2,7	25,8	22,0	1,7	0,0	56,7
Soak the brine for 3 hours at a temperature of 40-450C	2,6	4,1	29,5	8,6	1,1	0,2	47,1
3 hours maceration in brine	5,0	3,4	41,9	9,4	2,3	0,4	62,4

Along with aromatic acids, rasveratrol was found in some samples. The amount of rasveratrol ranged from 0.2-0.4 mg/dm3 on the samples and was not completely in the two samples.

When distilling wines by maceration of carbon dioxide from the distillate, not only the extraction of phenolic substances is important, but also its preservation in all technological cycles. An even more important point in this case is the preservation of the flavor inherent in the variety. It turned out that these properties are also affected by the temperature of maceration.

As you know, rose wines are sold in less time, as they are resistant to long-term storage. And in this regard, it is not a coincidence with the branded varieties of pink wines. Considering that wines of this type are sold for one year, studying the changes occurring in wine samples during this period is very important. Considering that an attic is a basement in which samples are stored, and after implementation it often remains in room conditions, it has a place to study the processes occurring in both conditions. The analyses were carried out by sampling every 3 months from samples

of rose wine stored for a year at different temperatures. Despite the fact that the initial content of total phenolic compounds in the samples of madrasa wine, regardless of the conditions in which they were placed for storage, was the same, its decrease during 12 months when stored in basement conditions was 25%, and in room conditions-29%.When storing madrasahs in basement conditions, changes in the amount of anthocyanins were observed by month (table 6).

Table 6. Total amount of anthocyanin monomers in wine samples (mg/l)

Kind of wine	Control (without storage)	In the basement (at a temperature of 8-11^{0}C)				
		3 ay	6 ay	9 ay	12 ay	%
Madrasah	63,9	86,3	71,8	64,5	59,4	7,0
Khindogny	74,5	71,8	71,9	75,1	70,5	5,3
In room conditions (at a temperature of 18-20^{0}C)						
Madrasah	63,9	62,5	59,9	56,4	53,0	17,0
Khindogny	74,5	68,3	65,9	62,3	60,6	18,6

In samples stored in room conditions (18-20^{0}C), there was a decrease in the total number of monomeric anthocyanins by months. This decrease was noted by 17.0% in the sample of madrasa wine and 18.6% in Khindogny. If we approach the conditions of the basement in comparison with the room conditions, we can see that in the second case, the loss of anthocyanins in the Madrasah is 2.4, and in the Khindogny 3.5 times more.

Results

1. The mass density of sugars in the studied grape varieties ranged from 188-220 g/dm^3, the mass density of titrated acids ranged from 6.0-7.0 g/dm^3. The sugar-acid index for the varieties was 3.05-3.14, the indicator of technical ripeness was 221 for the grape variety "Madrasah", 207 for the variety " Khindogny ", 212 for "Bayanshir" and 230 for the variety "Merlot".

2. With the exception of the tannin content in grape seeds that have reached phenolic maturity, other indicators, including the potential content of anthocyanins, the technological reserve of phenolic compounds and coloring substances, the mass density of sugars, the antioxidant index of berries were higher than those that

have not reached maturity. Therefore, the use of unripe grapes for pink wines was not considered appropriate.

3. An increase in the number of anthocyanins was observed as the time of zinc maseration increased, in samples taken with 18- and 24-hour maseration, this indicator was maximum. As for the qualitative composition, 14 representatives of anthocyanins were identified in the wine samples. According to the composition and organoleptic properties, samples made with 3 and 6-hour maceration were selected, with higher indicators.

4. Various variants of separation of grape product from varieties of madrasah and Bayanshir have been investigated, as well as schemes of fermentation of Bayanshir juice in fresh and fermented juice of madrasah, the best technological scheme of fermentation of separation (60:40) and white juice in red juice has been experimentally substantiated.

5. The conditions of CO_2 maseration (the degree of clay grinding, the temperature of maserization, etc.) does not affect the amount and content of phenolic compounds. Carbon dioxide nitrogen maceration positively affected the formation of aromatic substances, in this case the content of isoamyl alcohol, ethyl esters of fatty acids and cereal alcohols was noticeably higher than in other samples. This has a positive effect on the aromatic complex and organoleptics of the wine.

6. The ratio of leucoanthocyanins to anthocyanins and the intensity of coloring has been experimentally established, which is an important indicator of the color quality of pink wines. This ranged between 1.81-2.50 and 0.33-0.47 in madrasa wine samples, respectively; 1.87-2.16 and 0.40-0.52 in Khindogny. The percentage of yellow, red and blue colors was 46.9%, 35.56% and 16.8%, respectively, in Goygol; 41.0%, 36.15% and 21.7% in Ganja; 39.58%, 38.01% and 22.34% in Samukh.

7. Representatives of aromatic grain alcohols 11, esters 15, volatile acids 10, volatile phenols 8, lactones 7 and other compounds belonging to the group were found in wine samples. The total amount of flavors in the madrasa wine sample was 90.9 mg/dm^3 in Goygol district, 88.6 mg/dm^3 in Ganja and 85.6 mg/dm^3 in Samukh. One of

the 3 representatives of higher alcohols, represented in higher quantities, was 2-phenylethyl alcohol, which has the aroma of a rose.

8. 12 months of storage were marked by changes in the total composition of wine samples, including a decrease in phenolic compounds of 25% in cellar conditions and 29% in room conditions. With the exception of cyanidin-3-glycoside, the number of other anthocyanins decreased by months, malvidin-3-glycoside increased during the first 6 months, and in recent months there was a decrease. And in room conditions, with the exception of cyanidin-3-glycoside, the decrease in other anthocyanins is noticeable from the first months of main-tenance.

9. The amount of anthocyanin monomers decreased by 7.0% in the Madrasa wine sample and by 5.3% in Khindogny within 12 months. A comparative analysis of samples stored in basement and room conditions showed that the losses of anthocyanins were 2.4 times greater than in the first, in the second case in the Madrasah and 3.5 times in the Khindogny. During the organoleptic analysis, it turned out that the samples stored in basement conditions are estimated at 0.13-0.97 points higher than analogues.

10. The technology and hardware-technological scheme of its implementation have been developed, which allows producing rose wines in one variety, as well as by separation and blending. Here, by maceration and the use of cold during storage, the acidity and freshness characteristic of rose wines are preserved. The proposed hardware and technological scheme has successfully passed production tests at the Az-Granata juice and wine processing enterprise and provided economic efficiency of 602 manats per 1000 dal of finished products.

Recommendatıons for producers

- technical and optimal technological parameters of the phenolic ripeness of the grape harvest for pink wines;
- determination of optimal parameters of crushed stone maderization (marking duration, temperature, degree of clay grinding, etc.);
- parameters of the optimal ratio of leucoanthocyanins to anthocyanins for high-quality pink wines from native grape varieties of Madrasah and Khindogny;

- introduction of more accessible methods and technologies of wine production and storage;
- the use of optimal quantitative proportions that ensure the production of high-quality wine from one variety, as well as the methods of separation and blending;
- the introduction of technology that allows you to maintain a more optimal composition of wine in the processing and storage processes:
- chemistry of processes occurring in wine samples, depending on the variety, growing conditions and technology;
- technology and hardware that ensure the preservation of acidity and freshness in rose wine samples.

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

1. Farzaliev, E.B. Imanova, K.F. The role of fortified wild-growing raw materials in medicine. // Abstracts of the scientific and practical conference azgiu-Baku, 2008. - pp.395-396.

2. Imanova, K.F. Fataliev, H.K. Research of the origin of pink wines. //Azerbaijan Agrarian Science.-2019. No.3.- pp.126-130.

3. Tagiev, A.T., Imanova, K.F., Fataliev, H.K. Investigation of the possibilities of obtaining sherry wine material from matras grapes // Equipment and technology of food production.Materials of the XI International Scientific and Technical Conference, -Mogilev MGUP - April 23-24, 2020. volume 1, pp. 91-93.

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6. Imanova, K.F. Studying the effect of the duration of the infusion on the pulp on the quality of pink wines. // All-Russian online conference with international participation "Modern Biotech-

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