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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

STUDY OF THE INFLUENCE OF PROCESSING METHODS ON THE QUALITY OF JUICES AND WINES

Specialty: **3309.01- Technology of food products**

Field of science: **Technical sciences**

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Ganja-2025

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GENERAL DESCRIPTION OF THE RESEARCH

The justification and development level of the topic. Winemaking is a chain process that reflects numerous technological operations, accompanied by complex physico-chemical and microbiological processes. In the initial processing of grapes' crushing, pressing, keeping in crush or filtering, rinsing, as well as alcohol and malo-lactic acid fermentations, filtering and other operations performed are reflected in the composition of juices and wines to one or another degree. At the same time, the technological operations carried out during the primary and secondary processing of winemaking, as well as external substances for different reasons, can directly affect the quality and safety of wine.

On the other hand, the intensification of raw material processing is considered characteristic for modern winemaking. For this reason, wines are enriched with protein and polyphenol substances. Such a situation leads to the misbalance of the colloid system, the occurrence of turbidity during the heating and cooling of the wine material.

In order to protect grapes and grape products from diseases, pests and weeds a number of chemicals called pesticides are used. Despite the fact that the problems caused by chemical control methods are known and alternative control methods are preferred, pesticides are still applied in high quantities. Pesticide residues are mainly transferred from grapes to wine by water and dissolved substances in water-alcohol mixture, and in some cases, the level of these residues is in the amount that may cause danger to human health.

By removing many unwanted substances clarifier ingredients are used to make the wine clear and stable. At this time, it is also important to control the effect of rinses on the amount of useful substances such as p-tyrosyl found in wine.

Improving the quality of wines, protecting them, ensuring their crystal clear state as the main commodity indicator, and increasing their guaranteed shelf life are among the actions must be taken. In such a case, it is important to study the effect of the technological

operations during the winemaking period, as well as the methods that provide transparency on the composition and quality of wines.

On Related to all the mentioned issues numerous studies have been conducted in the near and far abroad and efforts have been made to effectively solve the problem with minimum loss. In this regards to this, we can mention Z.N. Kishkovski, Ribero-Gayon, N.A. Mekhuzla, V.A. Zaguroyko, N.V. Gnilomedova, N.M. Aqeeva, N.G. Taran, V.A. Vinogradov and others studies.

However, those studies were mainly devoted to the issues of turbidity removal and stabilization of wines, but were not at the level of covering issues related to quality indicators.

Especially in our country, there was no studies done on the elimination of pesticide residues and the investigation of the amount of p-tyrosyl from wine safety point of view. It is obvious that there is a scientific problem facing the field that needs to be solved.

The objection and tasks of research. The aim is to study the effect of processing methods on juices' and wines' quality.

Solution of the following tasks is envisaged for the research:

- selection of raw materials to be processed, preparation and research of juice and wine materials;
- study of the effect of processing methods of juice samples quality;
- studying the influence of fining, filtering, cooling and other technological methods on product quality;
- study of environmentally friendly wine production;
- research hardware support, production testing and economic evaluation.

Methods of research. As research object, grapes, juice, pulp, wine, production and processing technology and hardware were used. Juice and wine samples made by different technological methods are subjected to different technological processes and the transformations that occur at this time are deeply studied. At the same time, the changes in composition with the individual and combined use of rinses with different composition and mechanism of action are studied.

Physico-chemical and organoleptic indicators of raw materials, semi-manufactured products and manufactured products are determined by the most modern and traditional analysis methods available in wine chemistry. P-tyrosyl content and pesticide residues are determined by High Performance Liquid Chromatography (HPLC), fragrance compounds by gas chromatography, and phenolic compounds by the Folin-Chokelteu method.

Main provisions defended:

- changes in compositional indicators of the shell, seed and leaf part according to the growth state and stages of maturity, and experimental solutions for determining ripeness;

- experimental ways of solving the effects of "keeping in the crush", "injecting enzyme preparations into the crush", "cold processing of the crush" and other technological methods on the composition and quality of wine;

- experimental substantiation of the change of composition indicators after separate stages of the process of obtaining wine from juice, namely fermentation, rinsing, filtering and filling;

- scientific substantiation of the effect of different filtration methods and ultrafiltration on the quantity and species composition of microorganisms, as well as on the physico-chemical properties of wines;

- the effect of processing with adhesives on the compositional indicators of juices and wines, especially on phenolic compounds and color indicators, and experimental justification of the changes occurring at this time;

- the purification of pesticide residues from wines and the development of technology and hardware to preserve the compounds that give it functionality, especially p-tyrosyl.

Scientific innovation of the research. The growth of individual components of grape skin, the dynamics of changes in sugar and acidity, as well as the sugar-acid index at stages of skin maturity, were experimentally substantiated. For the first time, the effect of individual and combined application of various adhesives on the physico-chemical composition of juices and wines, especially on phenolic compounds and color indicators, was determined. It is

justified that the composition and quality of the wine obtained by cold processing and storage conditions of compressed and etc. have different values, and the optimal regime parameters ensuring high quality have been determined. The effect of the operations performed on the stages of wine preparation (rinsing, filtering, filling) on the composition and quality was determined.

For the first time, it was determined in locally produced wine samples pesticide residues and p-tyrosyl substance, which has a strong antioxidant property, and the factors affecting their amount. Technology and hardware have been developed to remove pesticide residues and at the same time preserve the substances that give functionality to wine, especially p-tyrosyl.

Theoretical and practical significance of research. The problems of obtaining wine material from juice and the processing of wine material into wine, as well as rinsing, filtering, filling, as well as the effect of individual and combined adhesive substances on individual indicators of composition, are of theoretical importance for research in winemaking and fermentation production technology, especially in wine production.

Preparation of juices and wines by "keeping compressed" at different temperatures and periods; treatment with cold, enzyme preparations, various filtering methods, etc. improving the quality of the final product with its application, as well as the development and testing of technology and hardware that allows preservation of p-tyrosyl in the composition by removing pesticide residues, is of practical importance.

A-probation and application of work. The main provisions of the dissertation were presented at the scientific-practical conferences in the Faculty of Agrotechnology of the Azerbaijan State Agrarian University, with presence of professor-teachers, PhD students and masters (Ganja, 2019-2022), at the Azerbaijan State University of Economics (UNEC) "Development prospects of food and light industry in our republic and the upcoming tasks" (Baku, 2020), at the All-Russia online conference with international participation on "Modern biotechnology: current questions, innovation and achievements" held at Kemerovo University (Kemerovo,

2020), "Modern Nature and Economy" at Ganja State University It was reported at the international scientific conference (Ganja, 2021) on the topic of "Actual problems of science", At the Republican online scientific conference on "New directions of agricultural development and environmental protection" at Western Caspian University (Baku, 2021), on "Mulda's scientific achievements - part of the problems of humanity's problems in the XXI century" held online at Kyiv State University, young scientists, graduate students and students At the 87th International scientific-practical online conference (Kyiv, 2021), at the International online scientific-practical conference dedicated to the 98th birth anniversary of the national leader Heydar Aliyev at the Azerbaijan University of Technology (UTECA) "The main problems of university rating issues" (Ganja, 2021) , at the IV International scientific-practical conference of young students and specialists held at the Lugansk State Agrarian University on the topic "Young students in agrarian science" (Lugansk, 2021), at the International scientific-practical conference on the topic "Innovation technologies of food and feed" at the Donsk State Agrarian University (Donsk, 2021) at the International scientific-practical conference held at the Belarusian State Agrarian and Technical University on the topic "Processing and management of quality of agricultural production" (Minsk, 2023).

Name of the organization where the dissertation work was performed. The study was carried out at the Department of Food Products Engineering and Expertise of the Azerbaijan State Agrarian University.

Total volume of the dissertation with a characters indicating the volume of the structural sections of the dissertation separately. Dissertation consists of an introduction, four chapters, conclusions, a list of 169 references and appendices. There are 49 figures, 51 tables and 2 appendices. In the content of the dissertation, the introduction is 7 pages with 14405 characters, the first chapter is 27 pages with 57755 characters, the second chapter is 20 pages with 25176 characters, the third chapter is 26 pages with 35923 characters, the fourth chapter is 56 pages with 68168 characters, the results are 3 pages with 4058 characters,

recommendations for production 1 page and 673 characters and 169 used bibliography consists of 21 pages and 35728 characters. The volume of the dissertation consists of 167 pages of computer writing, total volume of which is 244,750 characters (209,014 characters excluding the list of used literature and appendices).

CONTENT OF WORK

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

The first chapter is called "Analytical summary", where the assessment of factors affecting quality, including grape variety and initial processing characteristics, fermentation conditions, applied technological operations, as well as risk factors, contamination of juices and wines with pesticides, organic wine production, the purpose of the work and duties are reflected. It is known that among the factors affecting the quality of wine are soil, climate, agrotechnical care, geographical structure of the area and wine production technology have a fundamental role. While the amount of tannin increases continuously with the increase in fermentation time in smashed.

İt cannot be attributed to the amount of anthocyanins. The increase in the amount of anthocyanins occurs in the first 4-5 days of fermentation, but then a decrease is observed. Distillation is one of the operations used since ancient times to improve the quality of wine production. It is the processing carried out to separate the proteins, tannins, metal compounds, some color substances and pectin substances from the environment and make the wine transparent, which can cause turbidity if certain clarifiers are added to the wine. In wine technology the most commonly used fining substances are casein, gelatin, bentonite, activated carbon, polyvinylpolypyrrolidone and kieselsol. After rinsing, the wine is filtered. This operation is important for obtaining stable transparency and stable wine. Some pesticides commonly used in horticulture can leach into wine. Chromatography studies were conducted to

determine insecticides and fungicides in grapes, juice and wine. It has been known that some pesticide residues are combined with suspended solids and precipitated and separated by yeast sedimentation.

Number of physico-chemical processes take place as a result of receiving the juice, rinsing it and settling it, filtering it and turning it into wine by fermentation and further processing. It is noteworthy that these processes are not studied enough. At the same time, turbidity occurs in wine for various reasons, and its elimination is of particular importance. The turbidities encountered are grouped into biological, biochemical and physico-chemical depending on the causes that cause it. Distillation is the process of separating tannins, proteins, metal compounds, some color and pectin substances that create turbidity from the environment by adding certain substances to the wine and clarifying the wine. After experimenting investigation of the changes in composition created an interest.For the reasons mentioned above, the study of how the applied processing methods and processing affect the composition and quality is of scientific and practical importance. Although research has been conducted in this direction, it has not been at a level that provides a complete solution to the problem. As you can see, there is a scientific issue in front of the science that needs to find solution.

Second chapter is called "Materials and methods of research". First, the research material and its characteristics are given here, and then the methodology of experimental research is given. In the methodological part, research scheme, research methods and analysis methods are reflected in sequence. Grape varieties grown in the region, juice, wine, auxiliary materials, technology and technological tools are taken as objects of research. Bentonite, gelatin kieselsol, tannin, enzyme preparations, etc. are used as auxiliary materials.

Juice and wine materials prepared from Bayanshira, Madrasa, Rkasiteli and Merlo grape varieties were used for distillation. From the rinseable substances, polyvinylpolypyrrolidone (EVER), potassium caseinate (CASEO SPEED "Pure potassium caseinate", EVER), gelatin (collagen, solid gelatin, EVER), albumin (egg albumin, EVER), activated carbon (Everdec D100) bleaching

activated carbon", EVER) is used. Rinseable substances were used for 40 ml wine samples. Each eluent was selected in 3 concentrations for p-tyrosyl: low, medium and high. While 5, 15 and 30 g/hl were used for polyvinylpolypyrrolidone, doses of 10, 25 and 40 g/hl were used for activated carbon, gelatin, casein and albumin. The rinseable substances were prepared as a water suspension at 20 g/liter. An appropriate volume of these solutions was added to each sample to obtain the desired consistency. In many cases, it was observed that the rinse agents did not give the necessary effect separately, so their joint combinations were also considered. Research have allowed us to determine the dosage of each rinse in those combinations. The determination of color in the samples was carried out with Hunterlab (model/D-9000 color Difference Meter). Hunter's a value represents redness and greenness, b value represents yellowness and blueness, and l value represents the degree of clarity. At this time, 100 varies between pure white and 0 black, and the measurement of color (a and b) gives the determination of colors (a+ red, 0 gray-green; b+ yellow, 0 gray, -blue).

During the research, were used methods adopted in enochemistry which is general, modern and modified improved analysis.

Third chapter is titled as "The effect of juice extraction from raw materials and applied processing on quality indicators". Research of raw materials and received juice, the effect of rinsing schemes on the composition of juice samples, the effect of adhesives on phenolic compounds and color indicators, as well as changes in composition and quality during cold processing were included here. The effect of rinsing the juice samples obtained from Madrasa and Merlo grape varieties on the brix index was determined by using rinsing agents in different variants (Figure 1).

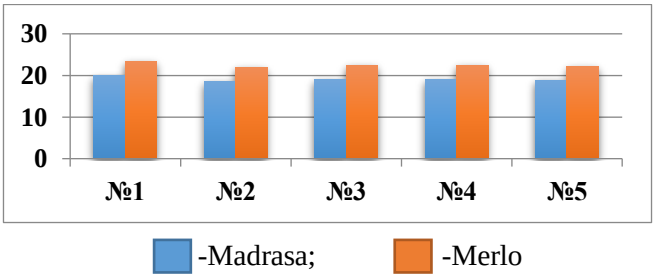

Figure 1. Brix index in juice samples.

As it is seen, the brix index of the samples varied between 19.90 and 23.40% in the untreated control sample. Looking at both samples of juice, it is known that the variation pattern of the brix indicator was similar for the variants. Thus, the greatest decrease was observed in the second option. Although the tartaric acid first increased during the cold treatment of the samples, it decreased later. The increase is due to the thickening of the solution (the liquid part of the wine is enriched with tartaric acid), which occurs due to the decrease in water, and the decrease can be associated with the precipitation of tartrates and bitartrates, usually with the formation of potassium and partially calcium salts.

Fourth chapter is called "Investigation of the effect of processing methods on the composition and quality of wine". Here, changes in the composition of wine samples depending on the preparation method, the effect of filtration methods on the microflora and compositional indicators of the wine, the effect of sticky substances on the antioxidant property, the effect of technological operations on the phenolic compounds and color indicators of the stages of winemaking, the study of the effect of traditional methods on organic wine production, and the cleaning of pesticide residues Issues such as hardware technological scheme of quality wine production, economic efficiency report were investigated.Influence of “keeping compressed” regime, in other words, the temperature and duration of storage, on the composition and quality of the obtained wine was studied. It was found that the highest amount of phenolic compounds was 4200 mg/dm3 observed during 144 hours at room

conditions (at 20^0C) and 96 hours at cellar conditions (10^0C) in crushing (Figure 2).

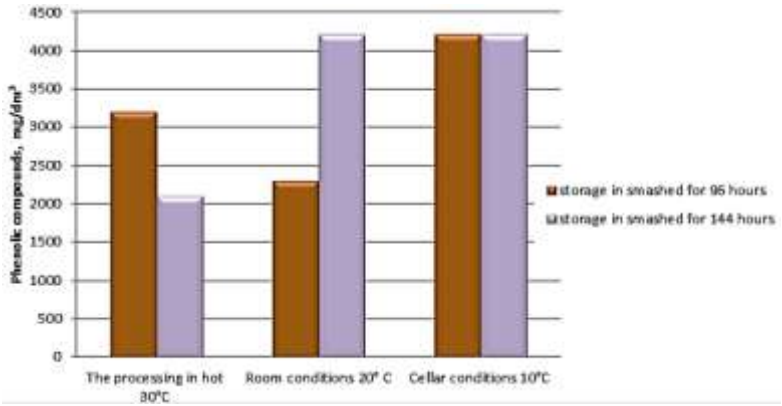

Figure 2. The effect of "keeping compressed" conditions and duration on the amount of phenolic compounds in wine.

Smallest amount of phenolic compounds was found in the samples stored for 144 hours at 30^0C and this amount was 2100 mg/dm3. As seen, the amount of phenolic compounds obtained different values during fermentation depending on the temperature. Color density (RS) of the samples was 13 in samples kept in crushing for 144 hours with hot processing, and 6.8 in samples kept in crushing in cellar conditions for 96 hours. Number of yeast colonies was 1450 per 1 ml in the control sample of the white wine sample that did not pass the filtration stages, and 1735 in the red wine. After rinsing, this indicator was 460 in white wine and 611 in red wine. Kizelgur filtering resulted in a three-fold reduction of these indicators, the number of yeasts in the white wine sample decreased to 155 per milliliter, and to 285 in the red wine sample.

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sample decreased to 155 per milliliter, and to 285 in the red wine sample.

As a result of staged filtration, the amount of bacteria in sour wine samples tended to decrease. According to control samples, 290 bacteria were detected in red wine and 11 in white wine. After rinsing, this amount decreased to 9 in white wine and 235 in red wine. If we look at the different stages of filtration, we can say that the strongest effect on the number of bacteria is observed at 1μm filtration. So, in this case, the number of colonies in white wine decreased to 6, and in red wine to 30. When looking at the samples that underwent all rinsing operations, 4 colonies were found in 1 ml of white wine sample, and 3 colonies in 1 ml of red wine. This amount was within the permitted limit for bottled wine.

Amount of total phenolic compounds obtained different values at different processing stages of the wine. While its amount in juice was g390 mg/dm3, it increased many times in wine and reached 1630 mg/dm3 after fermentation. Decrease was observed in further processing, i.e. rinsing, filtering and filling. Bentonite, activated carbon, casein, polyvinyl, polypyrrolidone and kieselsol occupy a special place among the rinsing agents.

Activated charcoal is more suitable for removing phenolic compounds, color pigments and malodorous substances in winemaking. Substances that are highly soluble in water are not adsorbed by activated carbon. Table 1 shows the effects of rinsing using different doses of activated carbon on the amount of pesticides.

As can be seen, compared to the control, there is a sharp decrease in pesticide residues in the samples treated with activated carbon. When using activated carbon at a dose of 150 mg/dm³, the residue of imazalil was 8.9 mg/dm³, nuarimol 1.35 mg/dm³, tetradifon 0.09 mg/dm³, vincozalin 0.05 mg/dm³ and penconazole 0.02 mg/dm³. while α-fudosulfan was not found. When using a dose of 300 mg/dm³, only imazalil was 0.35 mg/dm³ and nuarinol was 0.03 mg/dm³, and no other pesticides were encountered. No pesticide residues were found in the subsequent increasing doses of activated carbon (450 and 600 mg/dm³). It was found that a dose of 450 mg/dm³ of activated carbon is sufficient to completely remove

pesticide residues from wine samples. Recent research have shown that p-tyrosyl, another phenolic compound in wine, has an important role in human health. It was found that treatment with activated carbon has a more intensive effect on the amount of p-tyrosyl than other extracts (figure3).

Table 1. Activated charcoal effect on pesticide quantity on residues in wine

Samples	Pesticides, mg/dm³					
	İmazilil	Nuarimol	Tetradifon	Vincozolin	Pencondzole	α-fudosülfan
1.Control	155,31	148,51	145,56	125,31	128,55	135,44
2. Activated carbon (150 mg/dm³)	8,96	1,35	0,09	0,05	0,02	0,00
3. Activated carbon (300 mg/dm³)	0,35	0,03	0,00	0,00	0,00	0,00
4. Activated carbon (450 mg/dm³)	0,00	0,00	0,00	0,00	0,00	0,00
5. Activated carbon (600 mg/dm³)	0,00	0,00	0,00	0,00	0,00	0,00

As can be seen, compared to the control, there is a sharp decrease in pesticide residues in the samples treated with activated carbon. When using activated carbon at a dose of 150 mg/dm³, the residue of imazalil was 8.9 mg/dm³, nuarimol 1.35 mg/dm³, tetra-difon 0.09 mg/dm³, vincozalin 0.05 mg/dm³ and penconazole 0.02 mg/dm³. while α-fudosulfan was not found. When using a dose of 300 mg/dm³, only imazalil was 0.35 mg/dm³ and nuarinol was 0.03 mg/dm³, and no other pesticides were encountered. No pesticide residues were found in the subsequent increasing doses of activated carbon (450 and 600 mg/dm³). It was found that a dose of 450 mg/dm³ of activated carbon is sufficient to completely remove pesticide residues from wine samples. Recent research have shown that p-tyrosyl, another phenolic compound in wine, has an important role in human health. It was found that treatment with activated carbon has a more intensive effect on the amount of p-tyrosyl than other extracts (figure3).

At the highest dose of activated charcoal, the amount of p-tyrosyl showed a decrease of about 3 mg/dm3 compared to the control. While the amount of p-tyrosyl was 0.29 mg/dm3 in Rkasiteli white wine samples, it was 1.28 mg/dm3 in Madrasah wine sample and 1.69 mg/dm3 in Khindogni.

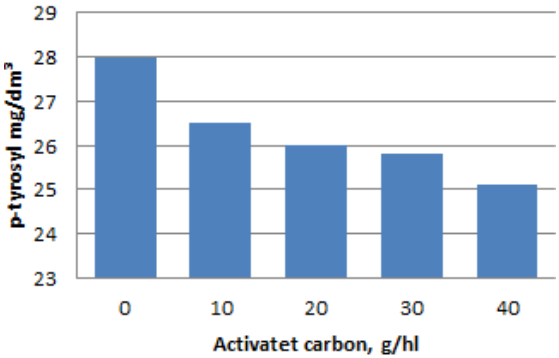

Image 3. Effect of activated carbon on p-tyrosyl content.

Based on experimental studies and existing guidelines, a hardware-technological scheme has been developed that ensures the production of high-quality wine. According to the proposed equipment-technological l scheme, grapes entering the receiving-feeding hopper-1 are transferred to the crusher-comber-2 through an auger. Collected crushed stone is transferred by the crushed stone pump-3 to the sealer-4 and from there to the compressor-5. The juice fractions from the filter and the press are fed together or the press fraction separately to the cooler-reservoir-7 with a pump-6. A moderate amount of SO_2 is injected into that reservoir from the ingredient doser-8 (Image 4.). It takes 18-24 hours to drain the juice by keeping it still. Such long-term quiescent storage involves the use of high doses of sophistic anhydride, which ultimately adversely affects the quality of grape juice and white table wines. Therefore, we conducted the process at a temperature close to 10℃ in order to reduce the dose of SO_2 during the rest of the juice. Although cold application in quiescent storage reduces the amount of SO_2, it does not always provide a good quality rinse. On the other hand, not all

plants have the necessary cooling facilities. However, in such a short-term treatment, it was possible to obtain juice free from large hangers.

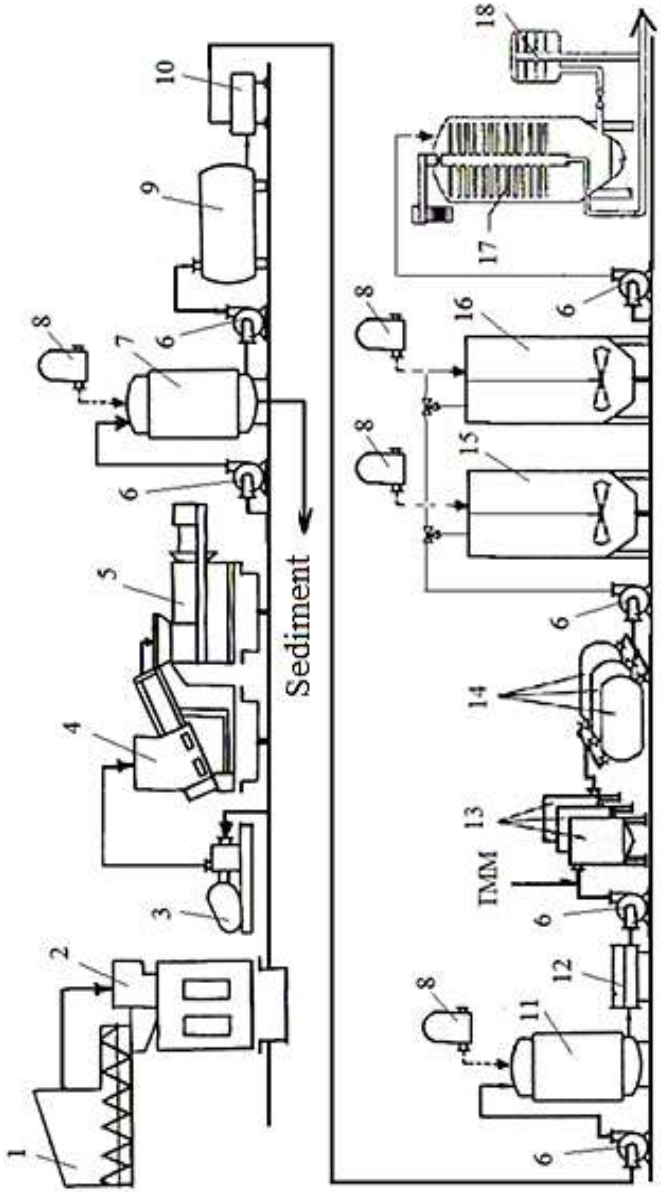

Figure 4. The technological machine scheme of dilution of juice and wine and purification out of pesticide residues:

1-receiving and feeding bunker; 2-crushing comb-splitter; 3-grape crusher pump; 4-filtrater; 5- grape presser; 6-juice pumps; 7-The jacketed wine tanks for cleaning the juice out of the rude components. 8-ingredient dispenser, 9-collector reservoir, 10-heater, 11-the reservoir for fermentation, 12-ultrarefrigerator, 13-the intallation for fermenting of juice, 14-processed containers for final fermentation, 15-the reservoirs for removing the 16 pesticides 17- Smudge filter.

The cleaned juice for short-term from large hangers is taken by pump-6 and delivered to the collecting reservoir-9. The juice is transferred to a heater -10 from there and undergoes preheating up to 45-50℃ and transferred to reservoir -11 for fermentation through pump -6. Enzyme preparations are added on top of them through ingredient doser-8. Then it is fermented for 6 hours at that temperature. The slightly diluted juice is cooled up to temperature of -12 18-20℃ in an ultra-cooler and transferred to the fermenter -13. Then the wine material is transferred to processed reservuors -14 for final fermentation. The fully fermented wine material is transferred to reservoirs-15, 16 depending on the type of added ingredient.

The optimum dosage of ingredients used for the sedimentation of juice and wine is determined by experimental pocess under laboratory conditions. used solutions are prepared in special reservoirs with a mixer and they are added to juice and wine with constant stirring. in this step, after sedimentation of the pesticide residues, the juice is transferred to the filter -17 to achieve complete purification. There are horizontal grid plates here on which diatomite or kizeigur is applied. Then the filtering operation begins. Separated solid particles are retained in the filter element together with adhesives form a porous sediment of the same size.

The sediment gradually becomes thicker and when it reaches a certain size, filtration is stopped. in order to minimize the losses, the obtained sediment is directed to the filter-18 for this purpose.

As a result, having reduce the losses, uninterrupted process is ensured. During the organoleptic evaluation of control and experimental wine materials, the samples are notable for their clean taste and slightly high acidity. Along with that, sour wine obtained from pasteurized juice was fuller and more pleasant having prepare by fermenting material in the smashed. the darkened wine materials were slightly differed and the general aspect was sharpness (alcohol) and lack of fullness.

As we see, the processing of juice by one or another method affects the chemical composition of the obtained wine materials.

The technological machinery scheme has been worked out for diluting the juice and removing the pesticide residues. The proposed

technological apparatus scheme has been successfully tested in the Az-Granata juice and wine processing plant. The economic benefit of the research was 1236.9 manats.

Results

1.The growth of grape components was uneven during ripening, more growth of the grape pulp compared to grape skin and rather no change of the seed mass was observed after the beginning of ripening.

Only equal to 2/3 of the medium sugar norm up to 20% of grapes considered to harvest had processed unpire grape. It was considered necessary to be late to harvest in order to get the growing of such kind of grapes.

2.The mass of 100 grapes in madrasa grape variety was 63 gr in the green stage, 79 gr in half-ripe and 109 gr in full-ripe position? And the similar regularity was observed for other varieties. Though during the stage of green grape the main part of the noticeable high acidity consists of the apple cider vinegar the amount of wine acid resulted with 2-3 times higher than apple cider vinegar.

3.The storage in smashed, cooling, processing with enzyme preparations and other processing methods; the providing operations on purpose of improving the quality of juice and wine, as well as the clarification and stabilization, also filtration, fining and other technological process ultimately have seriously impact to invert sugar, ash, general combination anthocyanin and other indicators.

4.During fining there were changes L, a and b color values compared with controls. There were changes during finning in L, a and b color values compared with control. There was a decrement in the assessment of L, and the increase in a and b. There was growth with percentage in practice variant in 625μm wavelength.

The decrease was observed in color density, polymetric color and it`s level.

5.The amount and species compound of microorganisms in white and red sour wine have changed in course of dilution and production process.

The decrement was different in various filtration stage, for that reason the ultrafiltration caused some changes in content, as well as

in alcohol vibrated acid, free and a mean decrement in amount of general SO_2, but some increase was characteristic in amount of volatile acid. As a result, the taste was soft and harmonious.

6.The turbidity in unprocessed samples was 70-79, but in processed one it was between 0,61-1,50. In this case the amount of protein was 42-47 mg/dm^3 in the first stage and in the second stage the decrease of 33-36 mg/dm^3 was observed in the amount of phenol combination.

7.Various adhesives to the wine content, specially during the study of the effect on pesticide residues, it was known that, compared in comparison with the control the serious decrease in pesticide residues in samples working with the active coal is observed. In course of activated coal used at a dose of 150 mg/dm^3 the residue of imazalil was 8,9 mg/dm^3, tetradifon 0,09 mg/dm^{3}and penconazole 0.02 mg/dm^3, but α-endosulfan wasn`t found at all. A dose of 450 mg/dm^{3}of activated coal was sufficient to remove the pesticide residues totally.

8.Compared with Rkasiteli white wine, the amount of p-tirozol was higher in the samples of Madrasa and Khindogni wine. The amount of p-tirozol in various wine samples made by fermentation in smashed was 24,8-34,5, but mainly the amount was eager to decrease during storage the samples for 2,5 months in sediment wine yeast.

9.The effect of adhesive substances to various amount of P-tirozol was accurate. The dose of 5, 15 and 30 hl for Polyvinyl polypirrolidone; and 10, 25 and 40 q/hl had taken for activated coal, gelatin, casein and albumin. It was known that the process by activated coal had a more intensive effect to the amount of P-tirozol, the most decrement had observed having 3/mq/dm^3.

10.The technological machinery scheme has been worked out for diluting the juice and removing the pesticide residues. The proposed technological-apparatus scheme has been provided more efficient juice diluting and removing the pesticide residues. the machinery technological scheme has been tested at production expermentation at the Az-Granata juice and wine processing enterprise with an economic efficiency of 1236.9 manats.

Recommendation for production

- Optimum technological parameters of grape harvest according to the mass of grape components.
- The regularity of changes in sugar and acid content on various ripening stages.
- The effect of processing methods and technological work to the content of juice and wine
- The effect of processing on the content of the microflora of wine, amount and type of individual microorganisms
- The production of organic wine based on traditional methods of removing pesticide residues from wine.
- The factors influencing to the amount of p-tyrosol and functional wine production with their management.
- Technology providing the production of ecologically clean products and and its equipment

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

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The defense of the dissertation will be held on «**20**» ***june*** 2025, at ***10^{00}*** at the meeting of the Dissertation council BED 4.29 of Supreme Attestation Commission under the President of the Republic of Azerbaijan operating at Azerbaijan State Agrarian University.

Address: Az 2000, Republic of Azerbaijan, Ganja city, Ataturk avenue, 450.

Dissertation is accessible at the library of Azerbaijan State Agrarian University.

Electronic versions of the dissertation and its abstract are available on the official website of the Azerbaijan State Agrarian University.

Abstract was sent to the required addresses on «**20**» ***may*** 2025.

Signed for printing: 16.05.2025
Paper format: (210x297) 1\4
Volume: 34758 characters
Number of hard copies: 30