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IDENTIFYING THE INFLUENCE OF VARIOUS FACTORS ON THE COMPOSITION OF JUICES AND WINES OBTAINED FROM THE AUTONOMOUS BAYAN SHIREY GRAPE VARIETY

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The object of the study is juice, wine, pulp obtained from the autochthonous Bayan Shirey grape variety. There are a number of studies on the autochthonous Bayan Shirey grape variety, but the influence of extraction methods and tools on the composition and quality of juice samples, as well as the origin of wine, maceration time and treatment with a fining agent on the compositional parameters has not been studied.

A comparative analysis of the physicochemical composition of wine samples prepared using the same technological method from Bayan Shirey grapes of different origin was carried out. The results showed that the acidity of wine samples from the Goygol region, which has a relatively cold climate, was 0.4–0.6 g/dm^3 higher than that of the sample taken from the arid Samukh region with a warm climate, and the highest. The largest amount of extracted extract was in the Samukh sample, then in descending order in the samples Ganja, Shamkir and Goygol. With maceration time, the amount of turbidity-forming compounds and absorbed oxygen in wine samples increases. Therefore, it is more effective to carry out maceration for 1.5–3.0 hours. Processing samples of long maceration with optimal doses of adhesives allowed to minimize the content of suspended particles and the NTU index.

The studies substantiate the correct choice of technological methods, means and modes that minimize oxidation for the preparation of exquisite table and champagne wines. The appearance, composition and quality of the future wine are optimized depending on the growing conditions of the grapes, the reasons for the increase in suspended particles causing oxidation and methods for their elimination.

These studies are important in production for determining the of methods and means on the composition and quality of juice, as well as for studying the origin of wine, maceration time, time and treatment with solvents to change physicochemical composition. The obtained results can be used at factories and wineries

Keywords: autochthonous, maceration, phenolic compounds, suspended particles, absorbed oxygen, lilac, gallic

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1. Introduction

The development of the wine market necessitates increasing the competitiveness of the released product. In the production of wines that meet this demand, the correct selection of grape varieties, as well as processing methods and means (equipment) plays an important role. The bulk of vineyards planted in recent years are grape varieties introduced from Europe. Many of these varieties demonstrate poor resistance to the unfavorable natural factors and stress factors of the new conditions in which they find themselves. In this regard, an additional source of raw materials for wine production can be grape varieties native to local conditions and obtained through selection. These grape varieties are fully adapted to the soil and climatic conditions of the place where they belong, and also have high resistance to diseases and pests common here, as well as frosts. In unfavorable years, when the productivity of introduced grape varieties drops sharply, the harvest is low, and in such a situation, the specific weight and importance of local grape varieties, as well as the product obtained from them, increases in the total volume.

The use of new grape varieties in the production of white natural wines requires their technological adaptation. This requires studying the chemical composition of grapes and the wine material processed from them, selecting varieties that ensure the production of higher quality products, and substantiating the technological elements of grape processing.

The demand for high-quality and noble white natural grape wines is constantly growing. An important requirement for the technology of white table wines is that they be low-oxidized and low-extract. The oxidation of the juice and the extraction of various components from the solid elements of the bunch continue throughout all subsequent stages of winemaking, starting from the crushing of the grapes. The direction of oxidation-reduction processes, in which substances belonging to all groups, including phenolic compounds, nitrogenous substances, organic acids, etc., are involved, depends on the stage of winemaking and is mainly determined by the absorbed oxygen.

The immediate introduction of oxygen into the juice as soon as it is separated causes rapid oxidation of easily oxidizable substances, including phenolic compounds. The degree of crushing of the cherries also affects both oxygen absorption and the rate of fermentation. Therefore, in the production of low-oxidized natural sour wines, the correct selection of the degree of crushing of the cherries and the time of contact of the juice with the crushing is very important.

It cannot be said that sufficient research has been conducted on the above-mentioned issues in the preparation of juices and wines from the autochthonous Bayan Shirey grape variety. Therefore, it is necessary to determine the effect of the extraction method and means on the composition and quality of juice samples from the white autochthonous Bayan Shirey variety. It is extremely relevant to investigate the effect of wine origin, maceration time, and fining agent treatment on its physicochemical composition and quality.

The data of the study, devoted to the composition and quality of juice depending on the method of extraction and equipment, maceration time and treatment with adhesives of the physicochemical composition of juice and wine, are relevant.

2. Literature review and problem statement

The development and application of a rapid PRLC method has determined the phenolic content of winemaking by-products (pomace, seeds, skins and bran). The results confirmed the effectiveness of the method and its suitability for the determination of phenolic compounds in winemaking by-products: Seeds, skins, bran and pomace exhibited a phenolic profile with different amounts and qualities, as well as different antioxidant properties [1]. This study was devoted to the determination of phenolic compounds and antioxidant properties in grape processing residues, but the effect of the extraction method and equipment on the composition of the obtained juices and wines was not considered.

In this study, the effect of different maceration methods on color parameters, phenolic compounds content and antioxidant activity in grape juice was studied. It was found that maceration method affects color parameters and shades. At the same time, it was found that microwave treatment and combined microwave and ultrasound treatment increased the total amount of monomeric anthocyanins, phenols and flavonoids. The results showed that microwave treatment, microwave and ultrasound treatment were more effective for maceration [2]. In these studies, the effect of maceration methods on the color indicators, as well as the amount of phenolic compounds and antioxidant properties, was investigated. However, the changes in the composition of the juice depending on the maceration time, including the amount of suspended matter, were not studied here.

The amount of antioxidant components in grape juice obtained from Italian Riesling and Cabernet Sauvignon varieties during cold maceration processes was monitored. After maceration at intervals of 0; 2; 4; 6; 8; 12 and 24 hours, antioxidant activity (by DPPH test), total flavanols, anthocyanins and hydroxycinnamic acid were assessed by spectrophotometric method. At the same time, total acidity and pH were assessed. The results obtained prove that the amount of the mentioned indicators increases with increasing maceration time in the crush [3]. In these studies, antioxidant activity and the amount of phenolic compounds were determined during maceration in the crushing at intervals of 2 to 24 hours. However, it should be noted that continuous maceration, especially for the Italian Riesling grape variety, is not favorable from the point of view of oxidation.

In this study, the effect of several traditional (cold, enzymatic and thermal) and innovative (ultrasound and microwave) maceration methods on some quality parameters of the juice was studied. The results obtained showed that ultrasound and microwave technology significantly outperform traditional maceration methods in terms of improving color, removing sugar, acid and phenolic compounds [4]. In this study, ultrasound and microwave processing technology were used to improve color. However, it is known that the color enhanced by such effects is not stable and changes and degradation occur in this indicator after a certain period of time.

The effect of the combined effect of heat treatment and pectolytic enzymes of different concentrations on juice yield, color, and separation of sugar, acid and biologically active compounds was studied. Heat and enzymatic treatment, mainly due to the high concentration of enzymes, had a very beneficial effect on the studied grape juice, significantly increasing the yield of biologically active components [5]. The use of the mixed-action enzyme preparation "Vinozim" or "Ultrazim" in the process of fermentation of pomace provides a rational reserve of phenolic substances for Marsala blends, and in the process of infusion of pomace of nitrogenous components and pentose [6]. These studies investigated the effects of heat and enzymatic processing on juice yield, color, flavones, and biologically active compound content. However, the increased content of substances, especially flavones, with thermal processing is not stable for long-term storage.

The effect of ultrasonic maceration on the amount of polyphenols, physicochemical properties and the amount of microorganisms in the juice in both hot and cold conditions was studied in comparison with traditional maceration. Ultrasonic maceration resulted in the separation of polyphenols, including anthocyanins, flavanols, flavan-3-ols, and stelven, in a shorter processing time. The amount of microorganisms in such juice was also significantly lower, which was associated with the antimicrobial effect of the mentioned method [7]. In this study, the effect of ultrasonic maceration on the physicochemical and microbiological composition of the juice was investigated. However, the implementation of this method is technically difficult and requires special equipment and containers. It is known that such processing is effective in a thin layer of liquid. For the method to be effective, there are inherent difficulties in creating such a flow layer in the mash.

The effect of cold maceration carried out for three different periods on the color, volatile content and sensory quality of wine was studied. It was found that the physicochemical parameters were independent of the maceration duration. Increasing the maceration duration resulted in a significant increase in color intensity and a decrease in wine hues. Sensory evaluation showed that long-term maceration not only enhanced the color intensity and floral-fruity aroma of the wine, but also increased its astringency [8]. In this study, the effect of long-term maceration on the organoleptic quality indicators of wine was studied. However, the increase in the amount of oxygen absorbed in the juice and wine during long-term maceration was not taken into account.

The effect of pre-maceration treatments, such as microwave thermomaceration and enzymatic treatment, on the content of phenolic compounds and their oxidation-reduction potential was evaluated. None of the pre-thermal maceration treatments resulted in a lighter or redder juice. On the contrary, such samples were characterized by less redness and more yellow hues [9]. As can be seen, initial thermal maceration was observed with a change in color from red to yellow in red juices. However, it is not known whether this process is valid for white grape varieties.

Semi-structured interviews were conducted with 26 French winemakers from Burgundy and Jura. It was found that winemakers from both regions agreed that there were sensory changes associated with oxidation, but disagreed on what type of oxidation should be considered [10]. Although these studies are important from a theoretical perspective, they remain unsubstantiated from a practical perspective.

The controlled addition of oxygen during alcoholic fermentation (4 mg/l on days 2, 4, 6, 10, 14, 16 and 20) and lees maturation (2 mg/l every 15 days for 3 months) in stainless steel tanks was studied in the production of white wine from almost neutral grapes. Under less reductive conditions, alcoholic fermentation was completed in 27 days, while under more reductive (reductive) conditions an additional week was required. The higher amount of oxygen dissolved in the wine led to an increase in the oxidation-reduction potential from the end of alcoholic fermentation throughout the maturation period, as well as an increase in the resistance of the wine to clouding [11]. This study investigated the effect of oxygen content on alcoholic fermentation. It was noted that high levels of dissolved oxygen in wine had a positive effect on maturation. However, these studies were not at the level of covering all varietal wines with different types and colors.

The latest information on the 3 most common non-microbial defects in wine and recommendations for their prevention are presented. It is noted that non-microbial defects in wine can be reliably prevented based on modern knowledge [12]. In these studies, a theoretical solution to the elimination of non-microbial defects in wine was investigated. However, in this case, a practical solution to the intended problems was not provided.

The aging potential, which plays a crucial role in the complexity of a wine's flavor, is related to its oxidation under the influence of oxygen, temperature, and light, which affects quality. This type of oxidation is non-enzymatic, catalyzed by metal ions, changing color and flavor [13]. In this study, the oxidation processes that occur in wine during the aging period and affect its quality are reflected. However, the factors that affect the composition of juice and wine during the preparation process, especially the effect of absorbed oxygen, were not investigated.

Extracts of unripe grapes are used in food and beverage products to enrich and preserve the product with beneficial compounds, as well as in the diet. The aim of this study is to review the composition and properties of unripe grape products, and their traditional and innovative applications in food and beverage products [14]. This study addresses theoretical issues, focusing on the use of unripe grapes. However, these issues are notable for not being addressed in a practical way.

Phenolic compounds were separated and purified from winemaking residues using a water-based extraction method. The antioxidant activity and total phenolic compounds of the extract were determined, and the antimicrobial efficiency was noted [15]. In this study, phenolic compounds were isolated from the residues and the antioxidant activity of the extracts was determined. However, their further use, benefits, and effects have not been found in practice.

It has found that long-term fermentation leads to a 50% decrease in total soluble solids, a 90% decrease in turbidity, and a decrease in pH. In general, high-pressure processing provides a better preservation of the "freshness" characteristic, as well as the demonstration of higher phytochemicals and antioxidant properties [16]. In this study, the effect of fermentation time on the amount of suspended solids and turbidity was studied. However, the factors affecting the juice extraction and its composition before fermentation were not studied.

Technological methods for making wine from the autochthonous grape varieties Madrasa and Bayan Shirey [17–20], extractants for obtaining rich extracts from the solid parts of the bunch and rational modules for mixing them with solid parts have been given [21]. At the same time, juice, wine, and other products are obtained from fruits and berries, including cherries and rose hips, using different methods [22, 23], investigations have been conducted into the biochemical and physicochemical compositional properties and basic regularities of the processes occurring [24]. However, important issues such as the effect of juice extraction methods and means on its composition and quality have not been resolved in these studies.

To obtain wine samples with different colors from the red Madras grape variety, various technologies were used, including activated carbon and Kolagel Clar preparations [17]. However, these studies did not resolve issues such as the effect of juice extraction methods and means on its composition and quality.

The effect of the must maceration regime on the amount of phenolic compounds and color indices in samples of autochthonous Madras wines was studied [18]. However, these studies did not resolve such important issues as the effect of juice extraction methods and means on its composition and quality.

The role of components included in the berries of the Madras grape variety (skin, seeds, juice) was experimentally determined, and the fundamental effect of maceration under different conditions, as well as yeast used in fermentation, on the composition of wine at different maceration times was experimentally confirmed [19]. These studies did not resolve issues such as the effect of juice extraction methods and means on its composition and quality.

Extractants for obtaining saturated extracts from solid parts of the bunch and rational modules for mixing them with solid parts are given [21]. However, these studies do not address issues such as the influence of juice extraction methods and means on its composition and quality. In particular, the problem of the production of juice and wine, which do not oxidize or are maximally protected from oxidation, has not been completely solved. At the same time, such an important issue as the influence of the origin of wine on its physical and chemical composition has not been studied, and the influence of the time of maceration and processing with glues on the physical and chemical composition of wine has not been studied.

3. The aim and objectives of the study

The aim of the study is to identifying the factors affecting the preparation of juices and wine from the autochthonous Bayan Shirey grape variety and the physicochemical composition of the resulting product.

To achieve this aim, the following objectives are achieved:

– determine the effect of collection methods and tools on the composition and quality of juice samples;

– determine the effect of the origin of wine on its physicochemical composition;

– determine of the effect of maceration time and adhesive substances on the physicochemical composition of wine samples.

4. Materials and methods

The object of research is grape bunches, berries, juice, pulp, juice and wine production technology and tools.

The main idea of the research is to study the effect of the extraction method and the equipment used on the physicochemical composition of the juice in the autochthonous Bayan Shirey grape variety, the physical and chemical composition of the wine's origin, as well as. The purpose of this study is to investigate the effect of maceration time and adhesive substances on the physicochemical composition of wine samples. The application of modern processing methods and analysis methods greatly simplifies the research.

The study used raw materials from vineyards of the Bayan Shirey grape variety cultivated in the Ganja region (Goygol, Ganja, Shamkir and Samukh regions). During the harvest, the grapes are cleaned of diseased and damaged parts, leaves, broken buds, dust, etc. Then the berries are separated from the comb and divided into 5 equal weight parts (each weighing 40 kg). The first part is immediately squeezed and the juice is extracted. The second part is crushed and kept in the crush for 1.5 hours, III – 3.0 hours, IV – 4.5 hours and V – 6.0 hours. Then, the juice obtained by squeezing each sample separately is filled into 3; 5 and 10 l cylinders, ensuring that there is no air gap at the mouth. Then, it is stored in the refrigerator at 1°C for 2–3 days, and during this time, the pure juice separated from the sediment that settles at the bottom of the container is transferred to other containers. The samples obtained are divided into parts for use in research. While a portion of the juice samples taken according to the variants are kept for analysis, the main part is fermented and wine samples are prepared by dividing them into variants in the same way as before.

The grape juice samples, which analyses have been completed, are filled into containers that have been sterilized at 121°C for 15 minutes and immediately placed in a refrigerator at a temperature of +3–4°C in the dark. Wine samples are also filled into flasks, ensuring that they are not left half-full at the top of the container, and stored in a cool place.

The physicochemical and organoleptic characteristics of raw materials, semi-finished products and finished products are determined by common analysis methods available in enochemistry [25–27]. However, modern analysis methods, computer technology and statistical processing of data are used in the study. Statistical analyses were performed using the SPSS18 package [28–30].

Mass concentration of phenolic compounds in wine It is determined by the Folin-Ciocalteu method. The Folin-Ciocalteu reagent, when added to the wine, oxidizes the phenol groups and reduces them to a blue compound. In this case, the intensity of the color is proportional to the concentration of phenolic compounds. The total amount of flavonoids is measured by the intensity of the reaction with sodium nitrite and aluminum chloride solutions by the photocolorimetric method. The emission coefficient is determined at a wavelength of 510 nm. The total amount of flavonoids is determined according to calibration curves and is expressed in mg of catechin per 100 g of initial raw material.

Hunterlab (Model D-9000 Color Difference Meter) analyzer was used to measure the color of wine samples. In Hunter, a-value measures redness and greenness, and b-value measures yellowness and blueness. The L-value measures the degree of light or brightness. The price varies between 100 – full white, 0 – black.

The turbidity of grape juice is measured using a turbidimeter (HACH 2100Q). The turbidity value of grape juice is given as Nephelometric Turbidity Unit (NTU) (1 NTU = mg/dm^3).

5. Results of the study of the influence of various factors on the preparation of juice and wine and the composition of the product

5. 1. Determining the effect of collection methods and tools on the composition and quality of juice samples

Samples prepared in 5 variants during juice extraction from the Bayan Shirey grape variety were studied: without maceration – immediate pressing of the grapes and separation, and with maceration of the juice in the press for 1.5 hours, 3 hours, 4.5 hours, and 6 hours.

The results, which reflect the values of the total extract, are presented in a diagram (Fig. 1).

As can be seen, while the amount of extract obtained in the control (white method) variant was 19.5 g/dm^3, this indicator had different values in the experimental samples. Compared to the control, an increase of 0.2 g/dm^3 was observed during 1.5 hours of maceration, 0.6 g/dm^3 during 3 hours of maceration, 1.2 g/dm^3 during 4.5 hours of maceration, and 2.0 g/dm^3 during 6 hours of maceration. Therefore, it was observed that when the contact time of the juice in the pulp increased, the amount of dry matter extracted from its solid parts also increased.

Similar changes were observed in the amount of phenolic compounds in the extracted extract (Fig. 2).

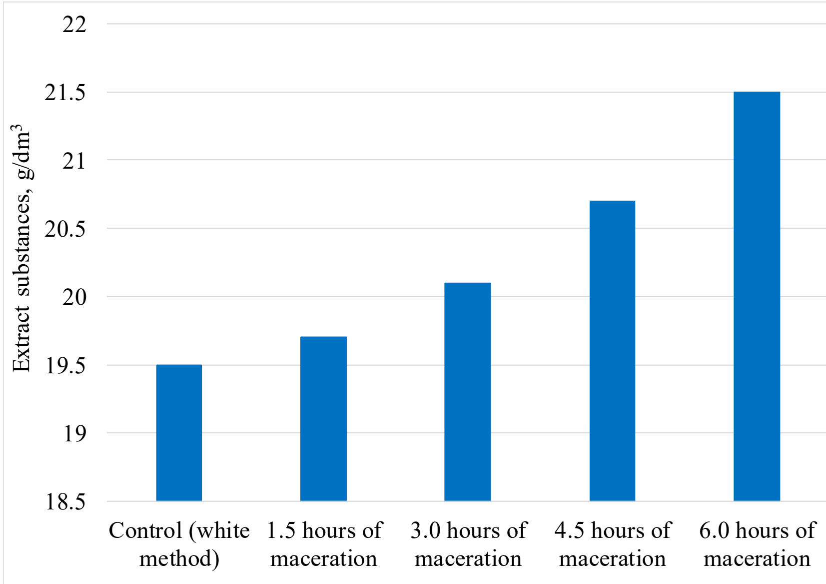

Fig. 1. Amount of total extract in juice samples depending on maceration time

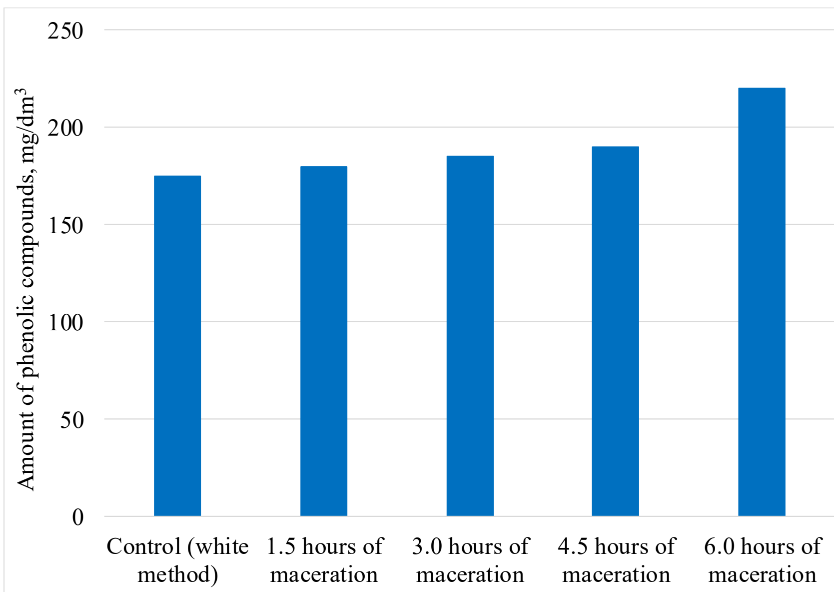

Fig. 2. Variation in the amount of phenolic compounds in the juice depending on the maceration time, $n = 6$, $p < 0.05$

Compared to the immediately squeezed juice sample (control), an increase in the amount of phenolic compounds is observed in the samples obtained by maceration. This shows the highest value in the sample obtained by maceration for 6.0 hours. As can be seen, the amount of phenolic compounds in the control sample was 175 mg/dm^3. During 1.5 hours of maceration of the pulp, this indicator was 181 mg/dm^3, and an increase in the same amount was observed with an increase in the maceration time. A relatively high increase occurred after 4.5 hours of maceration. During 6 hours of maceration, the amount of phenolic compounds was 216 mg/dm^3, which is 41 mg/dm^3 higher than the control variant and 35 mg/dm^3 higher than the maceration time of 1.5 hours.

The study of the effect of juice extraction on the amount of oxygen absorbed is of great interest as it provides information on its oxidation. Therefore, the amount of oxygen absorbed was investigated and the results are presented in the following figure (Fig. 3).

It was found that in the experimental samples, this indicator received higher values compared to the amount of oxygen absorbed in the control variant. As the maceration time increased, this increase became more pronounced. If after 1.5 hours of maceration, there was a 10.7% increase in the amount of oxygen absorbed compared to the control, then after 6 hours of maceration, this amount was approximately 3 times higher. All this gives grounds to say that as the time of contact of the juice with the pulp increases, along with the increase in the amount of dry matter in the composition, an increase in the amount of oxygen absorbed is also observed.

In production conditions, different equipment is used for juice extraction. The most commonly used of these in our conditions are the continuously operating screw BCH-20 press, the screw BPO-20 press and membrane presses. The role of the equipment from which the juice is obtained in its quality is indisputable. However, it is of interest to study the effect of the equipment on the refinement and oxidation of the juice. For this purpose, juices obtained from the processing of the Bayan Shirey grape variety in different equipment were studied at the AZGRANATA juice and wine processing enterprise. Thus, the amount of phenolic compounds and suspensions in juice samples obtained from membrane presses, press, press with I pressure, press with II pressure and press with III pressure was studied (Fig. 4).

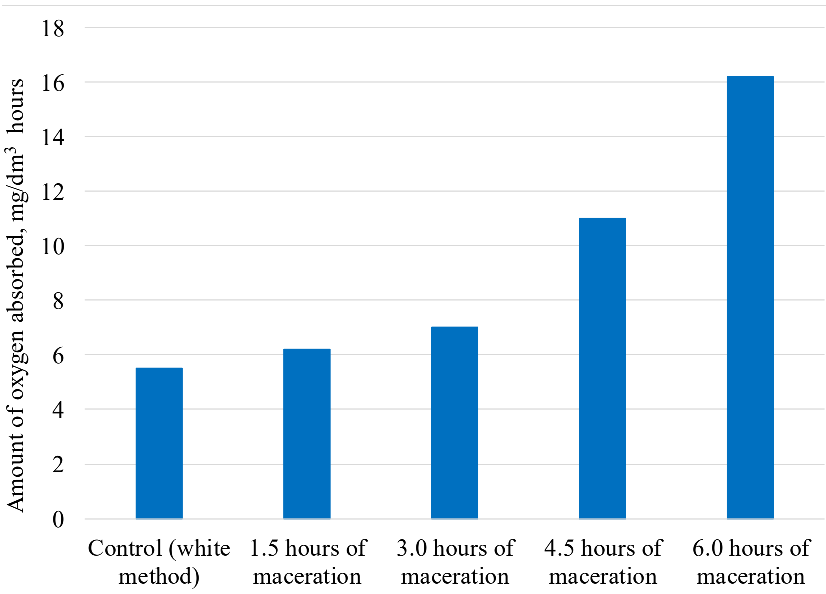

Fig. 3. Change in the amount of oxygen absorbed depending on the maceration time, $n = 6$, $p < 0.05$

As can be seen, depending on the equipment from which the juice was obtained, there is a difference in the amount of phenolic compounds in its composition. Thus, while the amount of phenolic compounds in the juice obtained from membrane presses was 135 mg/dm^3, the same indicator was 170 mg/dm^3 in the juice obtained from the squeezer. With the increase in the compression pressure in the compressor, a proportional increase in the amount of phenolic compounds was also observed. If the amount of phenolic compounds in the juice obtained from the compressor with pressure I was 210 mg/dm^3, in the juice obtained with pressure II it was 280 mg/dm^3 and in the juice obtained with pressure III it was 360 mg/dm^3.

A similar situation was observed in the amount of suspensions in the juice (Fig. 5).

If the content of suspended solids in the juice obtained from membrane presses was 11 g/dm^3, then in the juice obtained from the press, this figure was 19 g/dm^3, and an increase in the amount of phenolic compounds was also observed with an increase in the pressing pressure in the press. If the amount of suspended solids in the juice obtained from the press at pressure I was 35 g/dm^3, then in the juice obtained at pressure II, this figure was 51 g/dm^3, and in the juice obtained at pressure III, 77 g/dm^3. It is known that with an increase in the number of hangers, the probability of oxygen absorption and oxidation by the juice increases. Oxidation leads to a change in the color of grape juice and its darkening. The reason for the darkening of the color is the enzyme polyphenol oxidase, which makes fruit juice darken when exposed to oxygen. This enzyme is very sensitive to free sulfur dioxide, and adding sulfur after crushing the grapes and extracting the juice causes the enzyme to lose activity. At the same time, it also prevents the development of foreign microorganisms during the fermentation process. SO_2, added in very small quantities to the wine formed after fermentation, prevents the oxidation of alcohol and other compounds and changes in their composition.

75–150 mg/dm^3 was carried out for physicochemical and organoleptic parameters (Table 1).

As can be seen, sulfur was found in the samples in free and combined forms. Free SO_2 was in the form of bisulfite, which is considered the main active form in wine. In juice samples, the amount of total sulfite acid varied within the norm, being 81.9–136.1 mg/dm^3, and the amount of free sulfite anhydride was 8.7–27.6 mg/dm^3. When a very small amount of SO_2 is added to the juice, the results are good for the juice and future wine, SO_2 prevents oxidation, affects harmful microflora and facilitates the settling of the juice.

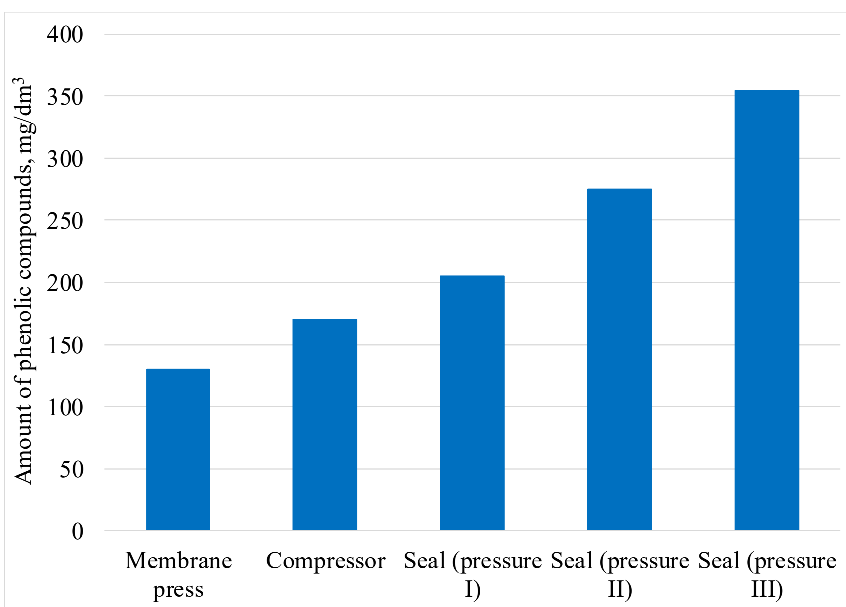

Fig. 4. Effect of juice extraction equipment on the amount of phenolic compounds, $n = 6$, $p < 0.05$

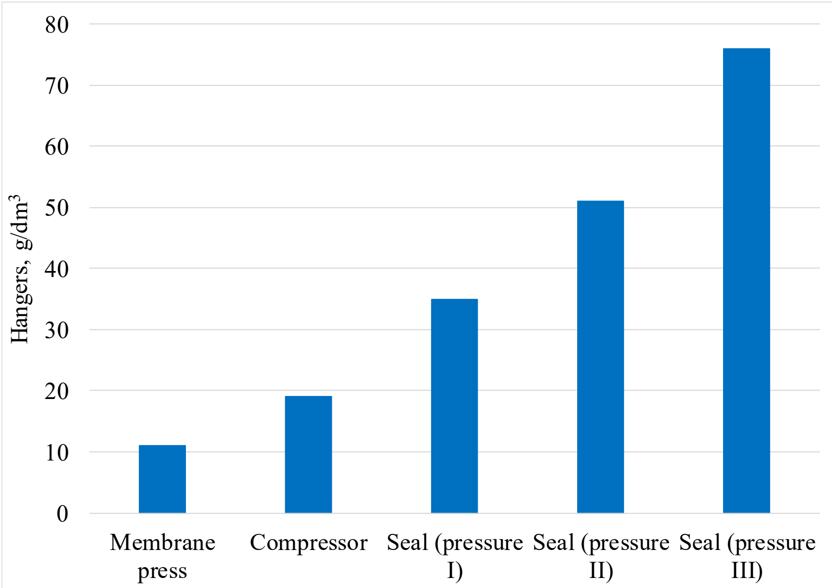

Fig. 5. Effect of juice extraction equipment on the amount of suspended particles, $n = 6$, $p < 0.05$

If to look at the results of the organoleptic analysis, it becomes clear that in the evaluation conducted according to the criteria of transparency, bouquet, taste and harmony, transparency was evaluated between 0–2, bouquet 0–4, taste 0–8 and harmony 0–6 points. It was found that in this case, transparency in the samples was evaluated between 1.75–2.00 points, with an average score of 1.943 points; bouquet was evaluated between 2.87–3.49 points, with an average score of 3.005; taste was evaluated between 5.04–7.06 points and an average score of 6.156 points; harmony was evaluated between 2.68–3.56 points, with an average score of 3.211 points. If to look at the overall tasting score, it is possible to see that the average score for the samples varied between 13.32–15.55, with an average score of 14.315.

Table 1

Physicochemical composition indicators of sulphited juice samples, $n = 6$, $p < 0.05$

Juice samples	Sugar, %	Total SO_2, mg/dm^3	Free SO_2, mg/dm^3	Dry matter, g/dm^3	Titratable acidity, g/dm^3	pH
1	17.7	109.4	18.6	18.4	6.50	3.31
2	19.8	88.3	12.8	20.1	6.27	3.25
3	18.7	110.2	19.9	19.0	6.66	3.30
4	17.3	90.8	14.1	17.5	6.96	3.22
5	17.8	81.9	16.8	18.1	6.35	3.25
6	17.7	121.6	10.7	18.4	6.88	3.20
7	18.5	130.5	23.0	18.8	7.34	3.30
8	19.9	136.1	27.6	20.3	6.81	3.35
9	17.7	133.6	25.7	17.9	6.42	3.20
10	17.4	82.9	8.7	17.7	7.06	3.21

The samples were analyzed by organoleptic method and tasting on a 20-point system with the participation of 9 tasters. The results are presented in the table with the average score (Table 2).

Table 2

Results of organoleptic evaluation, $n = 6$, $p < 0.05$

Options	Tasting prices				Total score
	Transparency 0–2	Bouquet 0–4	Taste 0–8	Harmony 0–6	
1	2.00	2.87	5.62	3.00	13.49
2	2.00	2.99	5.87	3.51	14.37
3	1.85	3.12	5.04	3.31	13.32
4	1.98	2.75	6.00	3.06	13.79
5	2.00	3.49	6.24	3.50	15.23
6	1.95	2.49	6.18	3.43	14.05
7	2.00	3.12	6.87	3.56	15.55
8	1.75	3.36	5.74	2.68	13.53
9	1.90	2.74	6.93	3.18	14.75
10	2.00	3.12	7.06	2.88	15.06
Total	19.43	30.05	61.56	32.11	143.15
Average price	1.943	3.005	6.156	3.211	14.315

5. 2. Determination of the influence of the origin of wine on the physicochemical composition indicators

Wine samples were prepared using the "white method" from the autochthonous Bayan Shirey grape variety of different origins. The prepared samples were sourced from the Goygol, Ganja, Samukh, and Shamkir regions and named according to their origin. The results of the analysis of the physicochemical composition of the samples are given (Table 3).

The alcohol content in the samples fluctuated between 11.8–12.0% vol., and the amount of titratable acids – within 6.4–7.0 g/dm^3. At the same time, a larger amount of titratable acids was observed in Goygol samples (7.0 g/dm^3), and a smaller amount in Samukh samples (6.4 g/dm^3). In descending order of quantity, Goygol's sample is followed by Shamkir (6.9 g/m^3) and Ganja (6.8 g/dm^3) samples. Considering the amount of titratable acids, it can be seen that climatic conditions played a significant role in this change. Thus, wine samples taken from places with a relatively cold climate (especially from the Goygol region) differed in acidity by 0.4–0.6 g/dm^3 higher than a sample taken from the arid Samukh region with a warm climate. If to look at the volume of extracted extract, it is possible to see that there is some consistency with the previous year. The highest amount of extracted extract was in sample Samukh – 19.8 g/dm^3, followed by sample Ganja – 19.6 g/dm^3, sample Shamkir – 19.5 g/dm^3 and sample Goygol – 19.4 g/dm^3.

The content of phenolic acids was determined in wine samples prepared using the same technological method from the Bayan Shirey grape variety cultivated under different conditions (Table 4).

As can be seen, wine samples prepared from Bayan Shirey grape variety grown in different regions differ in terms of the total amount of phenolic acids and the ratio of individual phenolic acids to each other. With the exception of gallic and lilac acids, which differ in the highest amount, the amount of other phenolic acids was significantly lower in comparison. The total amount of acids was highest in the Goygol sample (40.5 mg/dm^3), followed by Ganja (34 mg/dm^3), Samukh (23.6 mg/dm^3) and finally Shamkir (17 mg/dm^3). Let's present the change in the amount of gallic and lilac acids in the samples, depending on their origin, in the form of a diagram (Fig. 6).

Thus, the amount of gallic acid varied by region from 5.6 to 16.5 mg/dm^3, with Goygol region being the first with 16.5 mg/dm^3, followed in descending order by Ganja (16.1 mg/dm^3), Samukh (13.9 mg/dm^3) and finally Shamkir with 5.6 mg/dm^3 (Samak samples were monitored). The second most abundant phenolic acid after gallic acid is lilac acid. The amount of lilac acid varied between 4.8 and 14.2 mg/dm^3 according to the samples. In this case, the decreasing order of the amount was also noticeable, as in the case of gallic acid.

The ratio of gallic acid to lilac acid was taken as an indicator characterizing the quality of phenolic acids. This indicator is higher in Samukh region (3.2 mg/dm^3) and in Goygol and Shamkir regions (1.2 mg/dm^3). The Ganja sample, demonstrating an intermediate position, was notable for its ratio being 1.4.

The quantitative and qualitative composition of flavonoids in wine samples was studied by liquid chromatography using a mass spectrometer (Table 5).

It was found that catechin was the most abundant flavonoid in terms of quantity. Its content in the samples ranged from 5.0 to 5.6 mg/dm^3. If to pay attention to other flavonoids, it was noted that epicatechin (2 mg/dm^3) was higher in the Ganja sample, quercetin 3-glycoside in the Samukh sample (1.7 mg/dm^3), trans resveratrol in the Goygol sample (0.7 mg/dm^3), and kaempferol in the Samukh sample (2.0 mg/dm^3). As for the total amount of flavonoids, it can be said that this indicator attracted attention by having close values in the samples. Thus, this amount in the samples varied between 10.9–11.4 mg/dm^3, with a relatively low indicator observed in the Samukh sample, and a high indicator in the Ganja sample.

Table 3

Physicochemical composition of wine samples depending on their origin, $n = 6$, $p < 0.05$

Wine samples	Composition indicators						
	Alcohol, vol.%	Titratable acidity, g/dm^3	Glycerin, g/dm^3	Extract obtained, g/dm^3	Volatile acids, g/dm^3	Total nitrogen, mg/dm^3	Saturated esters, mg/100 ml
Goygol	11,8	7.0	7.1	19.4	0.27	170	76
Ganja	11,8	6.8	7.2	19.6	0.34	160	71
Samukh	12,0	6.4	7.4	19.8	0.38	210	110
Shamkir	11,9	6.9	7.0	19.5	0.36	190	90

Table 4

The amount of phenolic acids in wine samples obtained from the Bayan Sirey grape variety, $n = 6$, $p < 0.05$

Options	Phenolic acids and mass concentration, mg/dm^3									
	Gallic	Coffee	Lilac	Vanillin	4-hydroxybenzoic	Sinab	Phenol	P-coumaric	Gallic/Lilac	Total
Goygol	16.5	3.3	14.2	0.5	1.8	1.3	1.1	1.8	1.2	40.5
Ganja	16.1	1.3	11.2	0	1.4	1.7	0.3	1.1	1.4	34.6
Samukh	13.9	1.1	4.4	0	0.7	1.1	1.2	1.2	3.2	23.6
Shamkir	5.6	1.3	4.8	0	0.8	1.3	1.8	1.4	1.2	17.0

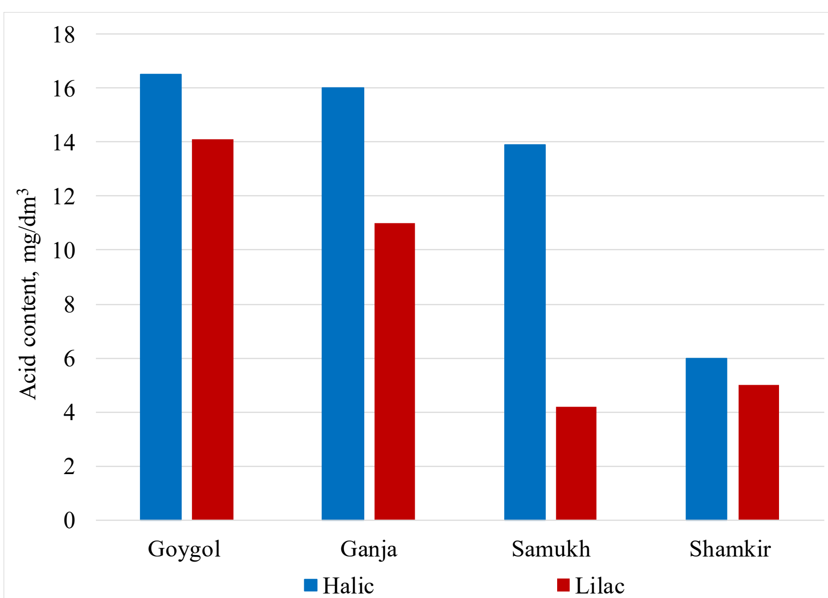

Fig. 6. Variation in the amount of gallic and lilac acids in wine samples depending on their origin, $n = 6$, $p < 0.05$

Table 5

Amount of flavonoids in Bayan Sirey wine samples, $n = 6$, $p < 0.05$

Experience options	Mass fraction of flavonoids, mg/dm 3					
	Catechin	Epicatechin	Quercetin 3-glycoside	Trans-resveratrol	Kimferol	Total
Goygol	5.4	1.9	1.6	0.7	1.7	11.3
Ganja	5.6	2.0	1.4	0.5	1.9	11.4
Samukh	5.0	1.8	1.7	0.4	2.0	10.9
Shamkir	5.3	2.1	1.5	0.6	1.6	11.1

A decrease in the amount of flavonoids was observed during the maturation of wines. Among the flavonoids, trans resveratrol was the least abundant. The amount of resveratrol varied between 0.4–0.7 mg/dm^3 (Fig. 7).

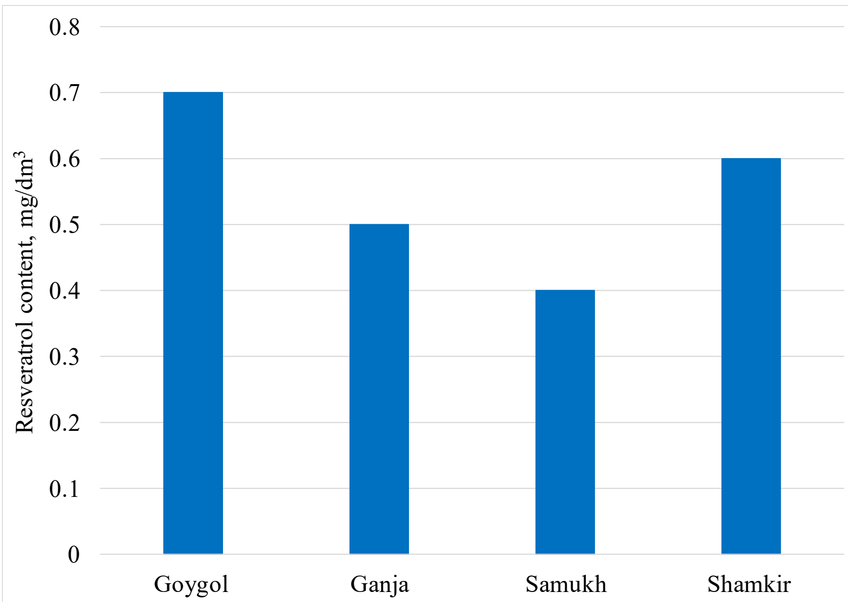

Fig. 7. Variation in resveratrol content in wine samples depending on origin, $n = 6$, $p < 0.05$

As can be seen, relatively high levels of tans resveratrol were observed in wine samples from the Bayan Shirey grape variety grown in the foothills of the Goygol and Shamkir regions, which are distinguished by their colder climate. They were followed by the Ganja and, finally, the Samukh sample.

The amount of cations and anions was studied in wine samples that differed depending on their origin (Table 6).

Table 6

Amount of cations and anions in wine samples depending on origin, $n = 6$, $p < 0.05$

Cation and anions	Concentration of samples, mg/dm^3			
	Goygol	Ganja	Samukh	Shamkir
SO_4^{-2}	23.6	191.5	247.9	273.5
Cl^{-2}	39.5	77.3	22.4	65.8
NO_3^{-2}	6.5	2.4	5.4	3.2
Na^+	203.0	37.1	22.4	31.2
NH_4^+	2.5	2.4	3.8	9.5
K^+	446.5	672.6	732.5	468.9
Ca^{2+}	96.3	81.5	56.8	66.4
Mg^{2+}	41.2	39.0	77.4	62.5

The amount of cations and anions in the studied samples varied within the generally accepted norms. In the samples, the Cl^- anion was higher in the Goygol and Samukh wine samples than in the other two samples. The amount of SO_4^{-2} anion was notable for being higher in the Shamkir and Samukh wine samples than in the other samples. This can be primarily attributed to the soil conditions of those regions and the work carried out during the cultivation in the vineyard. Goygol samples are characterized by an increased content of Na^+ cations, and Samukh samples are characterized by an increased content of K^+ cations.

5. 3. Determination of the effect of maceration time and adhesive substances on the physicochemical composition of wine samples

Wines were prepared from juice samples obtained without maceration and with maceration for different periods. Thus, control samples of wine were prepared without maceration and with maceration (1.5; 3; 4.5 and 6 hours). The analysis of the samples is given below (Table 7).

Table 7

Physicochemical composition indicators of Bayan Sirey wine samples, $n = 6$, $p < 0.05$

Composition indicators	Control	Maceration time, hours			
		1.5	3.0	4.5	6.0
Ethyl alcohol, % vol.	12.1	12.0	12.2	12.3	12.3
Sugars, g/dm^3	2.5	2.4	2.6	2.7	2.2
Titratable acidity, g/dm^3	6.4	6.5	6.5	6.6	6.7
Volatile acidity, g/dm^3	0.31	0.31	0.33	0.34	0.35
Extract obtained, g/dm^3	18,9	19.2	19.4	19.6	19,9
pH	3.35	3.35	3.33	3.30	3.27
Total SO_2, mg/dm^3	75	51	60	62	58
Free SO_2, mg/dm^3	16	18	15	20	17
Wine acids, g, dm^3	2.9	3.0	3.2	3.3	3.3
Apple acids, g, dm^3	2.8	2.9	3.0	3.0	3.1
Milk acids, g, dm^3	0.5	0.4	0.4	0.2	0.2

It was found that with the increase in the maceration time, an increase was observed in the amount of titratable, volatile acids and the extracted extract. If in the control variant the amount of extracted extract was 18.9 g/dm^3, then during 6 hours of maceration this indicator was 19.9 g/dm^3. This can also be attributed to the amount of phenolic compounds. A similar situation was observed in the amount of organic acids. If to look at the qualitative composition of acids, it is possible to see that wine, apple and lactic acids have a predominance and are present here. In terms of quantity, an increase was observed in the amount of wine acid as the maceration time increased, while a decrease occurred in other acids or no sharp change was observed. The effect of increasing maceration time on the amount of compounds likely to cause cloudiness in wine was studied. It was found that as maceration time increased, the amount of polysaccharides, phenolic compounds, and nitrogenous substances in wine samples increased (Table 8).

Table 8

Some compounds likely to cause turbidity and turbidity levels in wine samples, $n = 6$, $p < 0.05$

Experience options	Polysaccharides, mg/dm³	Phenolic compounds, mg/dm³	Nitrogenous substances, mg/dm³	Proteins, mg/dm³	Absorbed oxygen, mg/dm³ hours	Turbidity NTU
Control (white method)	340	175	255	45	5.6	15.4
Crushing maceration:						
1.5	351	181	260	48	6.2	17.0
3.0	365	185	268	53	7.1	17.9
4.5	390	190	271	61	11.3	18.2
6.0	420	216	281	68	15.6	18.6

If the amount of polishes in the white-prepared (control) sample was 340 mg/dm³, this indicator increased with increasing maceration time and reached its highest point at 6 hours of maceration, amounting to 420 mg/dm³. At the same time, the amount of phenolic compounds, nitrogenous substances and the related extract increased with increasing maceration time. If to pay attention to the amount of proteins, it is possible to see that this amount increased with increasing maceration time. If the amount of proteins in the control variant was 45 mg/dm³, it is possible to see that this amount was 68 mg/dm³ during 6 hours of storage. A similar situation was observed in the amount of absorbed oxygen, the amount of absorbed oxygen in the control sample, which was 5.6 mg/dm³ hours, became 15.6 mg/dm³ hours during 6 hours of maceration. It can be seen that samples with a long maceration time, both in terms of the amount of substances (polysaccharides, phenolic compounds, nitrogenous substances, proteins) and other indicators that make up the extracted extract, do not meet the requirements of fine table wines. Taking into account the above, a maceration time of 1.5–3 hours was considered more suitable.

The samples were processed to remove turbidity-causing substances and particles. The added doses of bentonite and gelatin were determined by sample adhesion. It was found that for variants I and II of the experiment, a mixture of 0.6 g of bentonite and 0.7 g of gelatin was sufficient, and for the other variants, a mixture of 0.7 g of bentonite and 0.8 g of gelatin was sufficient. The results of the effect of the combined use of adhesives on the amount of proteins, phenolic compounds and turbidity are given (Table 9).

As can be seen, the amount of proteins before processing with a mixture of bentonite and gelatin was 45 mg/dm³ in the control variant, while the amount of phenolic compounds was 175 mg/dm³, while after processing this amount was 36 mg/dm³ and 153 mg/dm³, respectively. In variant II (with 1.5 hours of maceration), the amount of proteins before processing was 48 mg/dm³, and phenolic compounds were 181 mg/dm³, and after gluing, they decreased to 34 and 147 mg/dm³, respectively. Although a similar situation was observed in other variants, in this case the decrease was more intense. This was manifested in the fourth and mainly in the fifth variants. Thus, the decrease in proteins in these variants was 47.0–57.3%, and the decrease in phenolic compounds was 22.6–28.7%. It was found that while the turbidity before clarification was between 15.4–18.6 NTU (mg/dm³), after clarification this indicator changed between 0.81–1.61 NTU (mg/dm³). Therefore, clarification resulted in the regulation of turbidity-causing compounds and ultimately turbidity, reducing the amount of proteinaceous and phenolic compounds, almost eliminating their possibility of causing turbidity. The repeated decrease in turbidity provided transparency in the samples.

Table 9

Effect of adhesives on the amount of proteins, phenolic compounds and turbidity, $n = 6$, $p < 0.05$

Examples	Turbidity, NTU		Amount of compounds, mg/dm³			
	Before processing	After processing	Proteins		Phenolic compounds	
			Before	Then	Before	Then
I without maceration (Control)	15.4	0.92	45	38	175	153
II 1.5 hours	17.0	0.81	48	34	181	147
III 3.0 hours	17.9	1.61	53	36	185	149
IV 4.5 hours	18.2	0.87	61	35	190	147
V 6 hours	18.6	1.01	68	32	216	154

6. Discussion of the results of studying the effect of various technological methods and tools on the composition of juice and wine samples

The physicochemical composition indicators of juice samples obtained without maceration and with maceration for different periods are comparatively analyzed. With the increase in the maceration period, an increase in the amount of extractive substances and suspensions in the juice was observed. A comparative analysis of juice samples obtained in different equipment was conducted. It was found that membrane presses provide a delicate juice, distinguished by a lower amount of suspensions and rapidly oxidizable substances. In the order of increasing extractivity and suspension substances in the juice samples, the following were obtained: press juices obtained with percolation and I, II, III pressure.

The physicochemical composition indicators of wine samples prepared from raw materials of different origin using the same technological method were studied, and it was found that samples obtained from the same grape variety cultivated in different conditions had different composition indicators. Thus, the sample obtained from the Goygol region with a relatively cold climate had higher acidity, and the sample obtained from the Samukh region with hot arid conditions had relatively higher extractivity. A comparative analysis of the physicochemical composition of wines prepared from juice samples obtained without maceration and with maceration was carried out.

In this study, which studied the effect of different maceration methods on color parameters, the amount of phenolic compounds, and antioxidant activity in grape juice, a comparative analysis of the physicochemical composition of wines prepared from juice samples obtained without maceration and with maceration was conducted. It was determined found that the amount of extractive substances and turbidity increased in macerated samples compared to the sample without maceration, and especially with the increase in maceration time. The results obtained allowed determining the optimal maceration time. The dosage of agglutination was determined, which allowed adjusting the physicochemical composition of samples with higher turbidity compared to the control sample.

The amount of extract in the control (white method) variant was 19.5 g/dm^3, this indicator had different values in the experimental samples. Compared to the control, an increase of 0.2 g/dm^3 was observed during 1.5 hours of maceration, 0.6 g/dm^3 during 3 hours of maceration, 1.2 g/dm^3 during 4.5 hours of maceration, and 2.0 g/dm^3 during 6 hours of maceration. Thus, it was observed that when the contact time of the juice with the pulp increased, the amount of dry matter extracted from its solid parts also increased. A similar situation was observed regarding the amount of phenolic compounds. The amount of absorbed oxygen also increased proportionally to the increase in the amount of dry matter and phenolic compounds penetrating the juice. This can be explained by the increase in the amount of substances, including phenolic compounds, that penetrate the juice from solid particles with the increase in the contact time with the pulp, and ultimately the increase in the amount of dry matter. The fact that phenolic compounds and other dry matter are very prone to oxidation creates the basis for an increase in the amount of oxygen absorbed with an increase in their amount (Fig. 1–3).

Unlike the study [4] that investigated the effect of several traditional (cold, enzymatic and thermal) and innovative (ultrasound and microwave) maceration methods on some quality parameters of juice, this study studies the effect of the type of equipment used on the composition and quantity of juice.

The type of equipment used affects the composition and quantity of juice. While the amount of phenolic compounds in the juice obtained from membrane presses was 135 mg/dm^3, the same indicator was 170 mg/dm^3 in the juice obtained from the squeezer. With the increase in the compression pressure in the compressor, a proportional increase in the amount of phenolic compounds was observed. If the amount of phenolic compounds in the juice obtained from the squeezer with pressure I was 210 mg/dm^3, then in the juice obtained with pressure II it was 280 mg/dm^3 and in the juice obtained with pressure III it was 360 mg/dm^3. The type of equipment did not remain unaffected by the amount of suspended matter in the juice, and with the transition from gentle squeezing to compression based on mechanical effects, physical effects on the crushing also increase, which triggers the passage of more suspended matter consisting of small particles into the juice. The suspended matter content in the juice obtained from membrane presses was 11 g/dm^3, while this indicator was 19 g/dm^3 in the juice obtained from the strainer. An increase in the amount of phenolic compounds was also observed with the increase in the compression pressure in the press. While the amount of suspended matter in the juice obtained from the press with pressure I was 35 g/dm^3, this indicator was 51 g/dm^3 in the juice obtained with pressure II and 77 g/dm^3 in the juice obtained with pressure III (Fig. 4, 5).

Unlike the study [5] that investigated the effect of thermal and enzymatic processing on the quality of grape juice and the yield of biologically active components, this study investigated the effect of moderate amounts of sulfite anhydride on the physicochemical and organoleptic properties of the wine formed after fermentation. As is known, SO_2 added in very small quantities to wine formed after fermentation prevents the oxidation of phenolic compounds, alcohol and other compounds, thereby their composition. The amount of total sulfite acid in juice samples fluctuated within the normal range and ranged from 81.9–136.1 mg/dm^3, and the amount of free sulfite anhydride ranged from 8.7 to 27.6 mg/dm^3 (Table 1). Organoleptic analysis of the samples was carried out on a 20-point scale with the participation of 9 tasters. If to look at the overall tasting assessment, it is possible to see that the points of the samples ranged from 13.32 to 15.55, and the average score was 14.315 (Table 2).

Wine samples were prepared Unlike the study [9], which main objective was to study oenological practices and oxidation in two regions of France, this study examined wine samples made from the Bayan Shirey grape variety, which was procured sourced from the Goygol, Ganja, Samukh, and Shamkir regions, which differed in origin, and were named according to the name of the place. The alcohol content of the samples ranged from 11.8–12.0%, and the amount of titratable acids ranged from 6.4–7.0 g/dm^3. In this case, a higher amount of titratable acids was observed in the Goygol (7.0 g/dm^3) and a lower amount in the Samukh (6.4 g/dm^3) samples. Wine samples obtained from places characterized by a relatively cold climate (especially the Goygol region) were notable for having a higher acidity of 0.4–0.6 g/dm^3 than the sample obtained from the arid Samukh region with a warm climate. If to look at the amount of extracted extract, there is some correspondence here with the previous year (Table 3). In wine samples made from the Bayan Shirey grape variety grown in different regions, the total amount of phenolic acids was highest in Goygol (40.5 mg/dm^3), followed by Ganja (34 mg/dm^3), Samukh (23.6 mg/dm^3) and finally in the Shamkir sample (17 mg/dm^3) (Table 4).

Unlike the study [14], which determined the antioxidant activity, total phenolic compounds content, and antimicrobial efficacy of the extract, the quantitative and qualitative composition of phenolic acids was investigated in this study. It was noted that the amounts of other phenolic acids were significantly lower in comparison, with the exception of gallic and lilac acids, which were distinguished by their highest amounts. Except for the highest amounts of gallic and lilac acids, the amount of other phenolic acids was significantly lower. The ratio of gallic acid to lilac acid was taken as an indicator characterizing the quality of phenolic acids. This indicator is higher in Samukh district (3.2 mg/dm^3) and in Goygol and Shamkir districts (1.2 mg/dm^3). The Ganja sample was distinguished by its intermediate position, with this ratio being 1.4 (Fig. 6). The total amount of flavonoids was noted for its close values across the samples. Thus, this amount varied between 10.9–11.4 mg/dm^3 across the samples, with a relatively low indicator observed in Samukh and a high indicator in Ganja. Other samples occupied an intermediate position (Table 5).

Unlike the work dedicated to the determination of phenolic content in winemaking by-products (pomace, seeds, skins and stems) by the development and application of a rapid PRLC method [1], this study investigated the amount of resveratrol in wine samples. Among the flavonoids, the least abundant was trans resveratrol was the least abundant. The amount of resveratrol varied between 0.4–0.7 mg/dm^3. Relatively high amounts of trans resveratrol were observed in wine samples from the Bayan Shirey grape variety grown in the foothills of the Goygol and Shamkir regions, which are distinguished by their colder climate. They were followed by the Ganja and, finally, the Samukh sample (Fig. 7).

Unlike this study [13], which was devoted to the composition and properties of unripe grape products, including an overview of mineral substances, and their traditional and innovative application in food products and beverages, this study studies the amount of mineral substances in wine samples of the same variety, obtained from different regions. The amount of cations and anions in the studied samples varied within the generally accepted norms.

It was noted that the Cl^- anion exceeded other samples in the Goygol and Samukh wine samples, and the SO_4^{-2} anion exceeded other samples in the Shamkir and Samukh wine samples. This is primarily due to the soil conditions of these regions and the work carried out during the cultivation of vineyards. Among the cations, Na^+ and K^+ are distinguished by a higher content in the Goygol and Samukh samples (Table 6).

Unlike the study [3] in which antioxidant activity (by DPPH assay), total flavanols, anthocyanins, and hydroxycinnamic acid were evaluated during the cold maceration process in juice obtained from Italian Riesling and Cabernet Sauvignon varieties, the effect of maceration time on the compositional parameters of wine samples obtained from Bayan Shirey grape variety was investigated in this study. Compared to the wine sample without maceration (control), an increase in the amount of titratable acids, volatile acids and extracted extract was observed with increasing time in various maceration variants. If the amount of extracted extract in the control variant was 18.9 g/dm^3, then this indicator was 19.9 g/dm^3 after 6 hours of maceration. This can also be applied to the amount of phenolic compounds. A similar situation was observed in the amount of organic acids (Table 7). The effect of increasing the maceration time on the amount of compounds that are likely to cause turbidity in wine was studied. It was found that as the maceration time increased, the amount of polysaccharides, phenolic compounds and nitrogenous substances in wine samples increased. This ultimately led to an increase in the amount of absorbed oxygen and turbidity (8).

Unlike the study [6], which compared the effect of ultrasonic maceration with traditional maceration on the amount of polyphenols, physicochemical properties, and the number of microorganisms in the juice under both hot and cold conditions, this study studies different combinations of colloidal turbidity inhibitors. To prevent the possibility of sample turbidity due to phenolic compounds and proteins and to eliminate the observed turbidity, the samples were glued together with a of bentonite + gelatin mixture. It was found that such treatment leads to a significant decrease in the indicated compounds and turbidity index (Table 9).

The results of the study are of practical importance for wineries engaged in both primary and secondary winemaking. Selection of optimal equipment, mode and time of maceration for obtaining exquisite table and champagne wine materials protected from oxidation in primary winemaking; Secondly, the results of this study can be used in terms of managing the physicochemical processes occurring in the clarification-stabilization processes carried out in winemaking.

In general, the results of the study can be applied in the scientific fields of viticulture and winemaking. The obtained results can be used in scientific research works on winemaking, family farms and winemaking enterprises. It is planned to apply the results of the research in AZGRANATA LLC (Azerbaijan).

The study is suitable for white grape varieties, especially those with a delicate composition such as Bayan Shirey. There is a limitation, especially for red juice and wines with extract, made using the “red method”, as well as for fortified juice and wines.

The drawback of the study is that grape raw materials grown in different conditions do not ripen at the same time, and harvesting is carried out at different times, which requires special research and equipment. Future studies can be expanded to produce juices and wines from fruit and berry raw materials.

7. Conclusion

1. Compared to the white method, the amount of suspended particles in the juice after 1.5 hours of maceration increased by 10.7%, and after 6 hours of maceration by almost 3 times. While the amount of phenolic compounds in the juice obtained from membrane presses was 135 mg/dm^3, the same indicator in the juice obtained from the squeezer was 170 mg/dm^3. A proportional increase in the amount of phenolic compounds was also observed with the increase in the compression pressure in the press. If the amount of phenolic compounds in the juice obtained from the press with pressure I was 210 mg/dm^3, in the juice obtained with pressure II it was 280 mg/dm^3 and in the juice obtained with pressure III it was 360 mg/dm^3.

2. The physicochemical composition indicators of wine samples prepared from the Bayan Shirey grape variety cultivated under different conditions using the same technological method, including the amount of phenolic compounds, were determined. The alcohol content of the samples ranged from 11.8–12.0% by volume, and the amount of titratable acids ranged from 6.4–7.0 g/dm^3. Wine samples from the Bayan Shirey grape variety cultivated in the Goygol region, which is distinguished by its relatively cold climate, were notable for their acidity being 0.4–0.6 g/dm^3 higher than that of the sample from the arid Samukh region with a warm climate. The highest amount of extracted extract was in the Samukh sample, followed by the Ganja, Shamkir and Goygol samples in decreasing order.

3. Samples with a long maceration time do not meet the requirements for vintage table wines in terms of the amount of extract added and other parameters. As the maceration

time increases, the amount of suspended matter and absorbed oxygen increases in the wine, which can cause turbidity. Therefore, it was considered more convenient to carry out maceration for 1.5–3.0 hours. Processing samples obtained with long maceration times with optimal doses of adhesives made it possible to minimize the NTU indicator.

Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

Financing

The study was performed without financial support.

Data availability

Data will be made available on reasonable request.

Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating the current work.

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