

IMPROVEMENT OF THE BLENDING TECHNOLOGY OF MEDIUM DRY AND SEMI-SWEET WHITE TABLE WINES

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Introduction. Formulation of the problem

A lot of table wines belong to those with a residual content of sugars. Medium dry and semi-sweet wines are very popular [1-5]. Throughout the world, much attention is paid to the problem of decreasing the thermal load and increasing their quality [5-8]. However, in Ukraine, wines of this group are often of inadequate quality. The winemaking technological regulations prescribe the classical or the blending schemes of making these wines [9-11]. Medium dry and semi-sweet table wines obtained by the classical

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Abstract. One of the most important problems of the modern wine technology is the production of high quality and competitive products. It is commonly known that the quality of a wine largely depends on the yeast race. The main requirement for yeast is completeness of fermentation, which depends on the amount of yeast involved, aeration, initial content of various substances in the must, temperature, pH of the environment. Using imported materials in the specific conditions of national winemaking requires laboratory and industrial research to rationalize the use of local and foreign pure yeast cultures and to accelerate the process of grape must fermentation. So, this study considers how the yeast origin and additional nutrition effect on grape must fermentation and influence the physicochemical and organoleptic characteristics of wine materials obtained from the white grape varieties Aromatny and Zagrei of the generative breeding by the National Scientific Centre *Tairov Viticulture and Winemaking Institute*. Besides, it has been concluded whether using additional nutrition is practical. It has been established that the fermentation process was complete in both the control and the experimental samples. There were no facts of underfermentation. When supplementary nitrogenous nutrition was used, the fermentation activity of yeast increased and the fermentation process ended faster. The dynamics of the total number of cells of the Aromatic and Zagrei varieties was the same during the years 2015–2017 and did not depend on the fermentation scheme. It has been found that the fermentation process does not depend on supplementary nutrition, but the yeast race effects on the physicochemical parameters, namely on the volatile acids content. The results obtained have shown the effect of a yeast race and supplementary nutrition on the organoleptic characteristics of these varieties. In Southern Ukraine, to control the quality characteristics of wine materials, using active dry yeast *Saccharomyces cerevisiae* with a two-stage nutrition complex has a positive effect on the physicochemical parameters of the corresponding grape variety and allows revealing its varietal characteristics.

Keywords: fermentation, white wine materials, yeast, organoleptic characteristics, varietal descriptors.

technology are the best and the healthiest, so they are preferred by connoisseurs all over the world [4-5,12], but their production cost is too high. With the method of stopping the fermentation by cooling the must down quickly, natural grape sugar still remains in the wine. Besides, the method allows retaining, to the highest possible degree, the fine aroma of the grape variety. However, this method is laborious, is limited by the shortness of the primary production period, and low-temperature storage of medium dry and semi-sweet wine materials is energy-consuming. That is why in our country, it is the blending scheme that is normally

used to manufacture table wines with a residual sugar content. However, it does not allow actualising the fullest potential of a wine. So, improving the blending technology and the quality of medium dry and semi-sweet wines is a topical task.

Analysis of recent research and publications

It is well-known that Ukrainian medium dry and semi-sweet wines are produced by blending dry table wine materials and preserved grape must. The technology of making dry wine materials is described in the Technology Guidelines on the Manufacture of ordinary dry table wines. The technology of preparing preserved must is based on one of the five commonly used schemes that involve pasteurising, preserving with increased concentrations of sulphurous anhydride, or concentrating in vacuum evaporators [8]. This technology makes it possible to lower substantially the production cost of medium dry and semi-sweet wines. However, the technology has a serious fault. When grape must concentrated at relatively high temperatures is used as the main sweet component, it can result in a loss of the varietal aroma, undesirable transformation of aromatic compounds, oxidation of phenolic substances, appearance of tones of boiled-down matter, denaturation and breakdown of proteins, appearance of dark-coloured melanoidins, increase in furfural, and lower vitamin R activity. Besides, it is no secret that grapes to be processed into preserved must or vacuum-must are quite often of inadequate quality. So, blending with the use of preserved must obtained by the traditional methods involving heat treatment does not always allow a wine to retain the specific aroma and flavour of the original grape variety. This results in mass production of second-rate wines.

A lot of researches from our country and abroad have worked on reducing the negative effect of the above factors on the quality of manufactured wines.

In particular, scientists from Dagestan State Technical University have suggested the must desulphitation technology based on electrodialysis [7].

As the traditional methods of concentrating must in vacuum evaporators have a number of serious negative aspects (undesirable changes in the chemical composition and colour of the vacuum-must, with prevailing dark amber and brown tints; appearance of the tones of caramel or boiled-down matter), scientists have worked to solve this problem [8]. To prevent the scorching of must, the process conditions have been developed under which the temperature of the wall is about the same as the boiling point, and the boiling point of must is minimum. It was achieved at the maximum values of the heat transfer surface, the duration of the process, and the heat-exchange coefficient. Besides, when the saturated steam was the heating agent, a decrease in its condensation temperature, too, helped create milder evaporation modes. To implement this process in the modes

suggested, the research and engineering firm *Vanda* has developed a small-sized evaporator with a horizontal evaporation chamber, which makes it possible to carry out the process during the progressive rotation of the vapour-liquid flow [patent 1660265 A1 of the RF].

The above-mentioned works were aimed at studying whether and how it was possible to reduce the negative effect the heat treatment of the must has on its quality – and never how to obviate it.

The National Institute of Grapes and Wine *Magarach* studied ways of improving the technology of medium dry and semi-sweet wines made by blending with wine materials that had a residual content of sugars [13,14]. Prior to blending, the level of nitrogenous substances in the underfermented sweet wine materials had been lowered by the method of alternately applying the two types of fermentation, that with free access for air and that without it. Besides, these materials were fermented two times, with interruptions in the fermentation and filtration process [15,16]. Thus, the researchers suggested an alternative way of making medium dry and semi-sweet red table wines, without the traditional use of preserved must. The research is definitely of certain practical interest. However, this technology is rather laborious, and besides, it is developed mainly for red wines.

All these facts make it clear that, to solve the problem of the high production cost and labour input, on the one hand, and of the low quality, on the other hand, it is of practical interest to develop an effective technology of high quality medium dry and semi-sweet wines. Researchers from Kuban State Technological University have shown that the quality of dry table wines made from low-grade grapes can be improved by the freezing method. It was noted that this method allowed obtaining better wine materials with a well-developed full flavour and good aromatic qualities [17]. The effect of cryotechnology, though, was only studied for dry wines.

As high quality table wines (including medium dry and semi-sweet) are always in great demand, and taking into account that in the Ukrainian market, there is no niche for choice wines of this group, it is of practical interest whether wines with residual sugar can be produced by an innovatory technology involving blending with the cryomust of the same grapes that have been used to obtain the main wine material. It will allow preserving, to the greatest possible extent, the valuable aromatic components of wine, increasing its biological and sensory value, and, perhaps, classing them as a separate category of medium dry and semi-sweet wines of special quality.

The purpose and the objectives of the research

So, the main **purpose** of the research is improving the technology of medium dry and semi-sweet wines based on the use of grape must cryoconcentrates.

To achieve the purpose, the following **objectives** were to be completed:

- defining, based on the review of literature, the specific features of the technology of making medium dry and semi-sweet wines by the classical scheme and by blending; analysing different scientists' research in this area; outlining the ways of improving the technology for this type of wines;
- making medium dry (semi-sweet) wines by traditional blending and by blending with cryomust;
- studying the physical and chemical and the sensory parameters of the experimental and the control samples of wine materials;
- analysing the results obtained, evaluating the produced samples technologically, deciding how practical it is to use the suggested technology of making medium dry (semi-sweet) wines.

Research materials and methods

The methods of the experiments included collecting data on how the changes in the chemical composition and in the sensory properties of the system 'grape must → intermediate products (dry wine materials, preserved must) → medium dry wines' depended on the specific technological features of making wines according to the technological scheme (Fig. 1).

The experiments were conducted in 2016–2017 using the facilities and equipment of the LLP *Vyna Zaporizhzhya*. The research was carried out on the basis of the Department of Wine Technology and Oenology in Odessa National Academy of Food Technologies (ONAFТ), and at the National Scientific Centre *Tairov Viticulture and Winemaking Institute*.

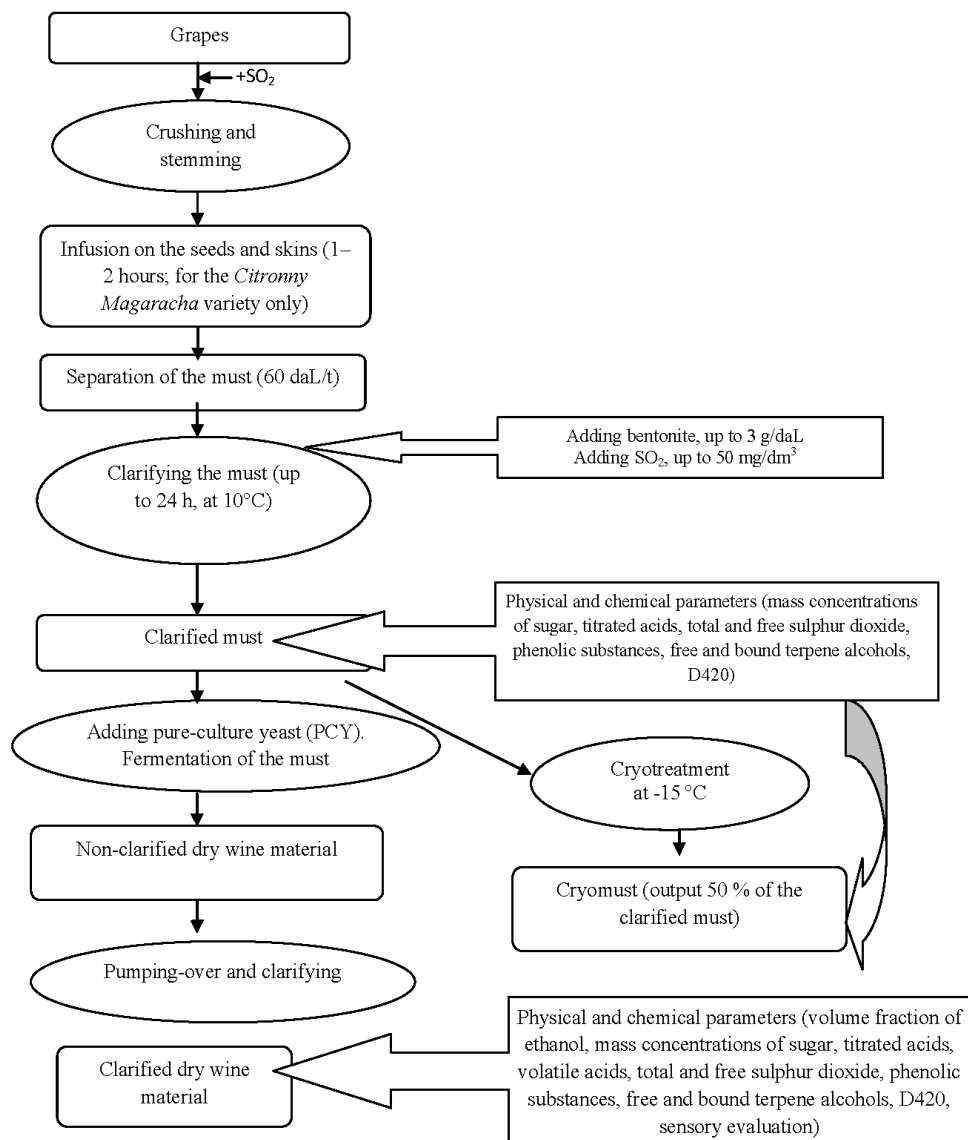


Fig. 1. Diagram of obtaining and analysing must, cryomust, and dry wine materials to produce medium dry (semi-sweet) wines

The materials used and analysed were:

- must of the grape varieties Rkatsiteli and Citronny Magaracha;
- cryomust of the grape varieties Rkatsiteli and Citronny Magaracha;
- vacuum must;
- dry wine materials obtained from the grape varieties Rkatsiteli and Citronny Magaracha;
- medium dry wine materials obtained from the grape varieties Rkatsiteli and Citronny Magaracha by the traditional blending technology and by the innovatory one involving the use of cryomust.

On the stage of processing the grapes, for the samples of the must from the varieties Rkatsiteli and Citronny Magaracha, the physical and chemical characteristics were determined and analysed (the mass concentrations of sugar, titrated acids, total and free sulphur dioxide, pH, phenolic substances, free and bound terpene alcohols, optical density with the wavelength 420 nm). The above parameters were determined by standard methods (State Standard of Ukraine (DSTU) 2366-2009 'Fresh wine grapes. Technical conditions'; State Standard of Ukraine 4112.13-2002 'Determination of total acidity. Control method'; State Standard of Ukraine 4112.25-2002 'Wines and wine materials. Method of determination of sulphur dioxide'; State Standard of Ukraine 4112.24-2002 'Wines and wine materials. Method of determination of pH') and by the wine products identification methods developed in the Research Institute *Magarach* (determining the mass concentrations of phenolic substances, terpene alcohols) [18].

The mass concentration of sugar was not lower than 170 g/dm³ (199–202 g/dm³); the titrated acids content ranged within 6–10 g/dm³ (6.4–7.2 g/dm³). The period between harvesting and processing did not exceed 4 h. The grapes were transported in boxes to the site of processing.

The grapes were stemmed and crushed on a roll crusher. The seeds and skins of the variety Citronny Magaracha were sulphitised in the proportion 60–79 mg/dm³ and pumped over for short maceration. Further on, must was separated on a press. The grapes of the Rkatsiteli variety, stemmed, crushed, and sulphitised, were sent directly to the press.

The preserved must samples to be studied were obtained by cryoacting on the must that had been clarified. The cryoaction temperature was -15°C, and during the process, 50 per cent of the concentrate was taken. The control sample was Rkatsiteli must vacuum-concentrated at a temperature of up to 55°C in a vacuum evaporator in the production environment.

To make must and dry white table wine materials, the best fractions of must were used, not more than 60 daL of 1 ton of grapes. The time of must separation did not exceed 60 min. the must obtained was rested at a temperature of up to 10 °C for not more than 24 hours, with 40 mg/dm³ of sulphurous anhydride and 1–2 g/dm³ of bentonite added. After resting, samples were selected to determine the physical and chemical characteristics of the must.

All the wine materials were prepared according to the Technology Guidelines on the Manufacture of ordinary dry table wines (TI Y 00011050-15.93.12-1:2008). Only disease-free, fresh, undamaged grapes were used to be processed into white wine materials. Spoilt grape bunches, as well as those damaged by diseases and pests were sorted out and precluded from being processed. The grapes processed complied with State Standard of Ukraine 2366:2009.

The experimental samples of medium dry wines were obtained by blending the processed dry wine materials with cryomust. The control samples were wines made by blending the wine materials with vacuum must. The samples of medium dry wines were subjected to physical, chemical, and sensory analysis. The sensory method of determining the wine quality consisted in evaluating the samples by a taste panel on a scale of 1 to 10 [19].

Results of the research and their discussion

The values of the physical and chemical parameters of the clarified must of the samples analysed are shown in Table 1. The mass concentration of total sulphurous acid was 94–103 mg/dm³, of which free acid was 37–41 mg/dm³. The must of Citronny Magaracha was high in phenolic substances (304 mg/dm³), which was by 39.4 per cent higher than the value of the same parameter in Rkatsiteli. This is, obviously, due to the method of resting used in the technological scheme. A similar picture was observed for the content of free and bound forms of terpene compounds.

Table 1 – Physical and chemical parameters of the must (n=3, P<0.95)

Samples	Density, g/cm ³	pH	Mass concentration, g/dm ³			Mass concentration, mg/dm ³					D ₄₂₀
			Sugar	Titrated acids	Volatil e acids	SO ₂ total	SO ₂ free	Phenolic sub-stances	Free terpene alcohols	Bound terpene alcohols	
Rkatsiteli must	1.087 ±0.001	3.11 ±0.03	199 ±3	7.2 ±0.2	–	94 ±7	37± 5	218 ±8	1.75 ±0.6	0.81 ±0.3	0.108 ±0.005
Citronny Magarach a must	1.088 ±0.001	3.15 ±0.02	202 ±4	6.4 ±0.2	–	103 ±6	41 ±6	304 ±10	3.91 ±0.4	1.48 ±0.7	0.119 ±0.006

The content of bound forms of terpene compounds in the Citronny Magaracha must was 1.48 mg/dm³ (0.81 mg/dm³ in Rkatsiteli), and the concentration of free forms was 3.91 mg/dm³, which was more than twice as high as the same parameter in Rkatsiteli.

Then, the clarified must was divided into two portions. One was used to make dry wine materials, the other, to obtain cryomust. To make cryomust, the

clarified must was cryoacted upon at -15°C, so that the cryomust output was about 50 per cent. The control sample of the preserved Rkatsiteli must was obtained by heating in the vacuum evaporator at a temperature of up to 55°C. The values of the physical and chemical parameters of the cryomust and vacuum must are shown in Table 2.

Table 2 – Physical and chemical parameters of the concentrated must (n=3, P<0.95)

Samples	Density g/cm ³	pH	Mass concentration, g/dm ³			Mass concentration, mg/dm ³					D ₄₂₀
			Sugar	Tit-rated acids	Volatile acids	SO ₂ total	SO ₂ free	Phenolic substances	Free terpene alcohols	Bound terpene alcohols	
Rkatsiteli cryomust	1.148 ±0.002	2.81 ±0.03	390 ±5	9.4 ±0.1	–	128 ±4	51±4	406 ±11	3.50 ±0.04	1.50 ±0.02	0.127 ±0.005
Citronny Magaracha cryomust	1.150 ±0.002	2.90 ±0.03	393 ±4	8.1 ±0.2	–	137 ±8	46±4	507 ±9	7.72 ±0.07	2.70 ±0.04	0.133 ±0.004
Vacuum must (control)	1.380 ±0.003	3.00 ±0.03	650 ±6	7.9 ±0.2	–	108 ±6	41±3	380 ±7	2.09 ±0.03	1.68 ±0.06	0.240 ±0.010

Table 2 evidences about the substantial differences established for the values of a number of parameters of the must obtained by freezing, compared to the vacuum must. Thus, the mass concentration of sugar in the Rkatsiteli cryomust was 390 g/dm³, which was substantially lower than that of the vacuum must (650 g/dm³). The titrated acidity of the cryomust samples was 9.4 dm³ for Rkatsiteli. It was, on average, by 19 per cent higher than for the control, which, too, is in full accordance with the increase in the active acidity. The pH for the Rkatsiteli cryoconcentrates was 2.8, whereas in the vacuum must it was 3.0. The cryomust was somewhat high in phenolic substances, their concentration being 406 mg/dm³ (Rkatsiteli), while in the vacuum must, this parameter was only 380 mg/dm³. But the value of optical density of the cryoconcentrate, with the wavelength 420 nm, was 0.127, which is by 47.1 per cent lower than that in the control sample (0.240). This means that in cryoconcentrates, the prevailing forms of phenolic substances are the reduced ones.

The analysis of the physical and chemical parameters of the experimental cryomust samples from different grape varieties has allowed establishing some differences in them. In the cryomust variants from Citronny Magaracha, the active acidity was somewhat low, and the values of the mass concentration of phenolic substances, terpene compounds, and the optical density were higher, compared to those in Rkatsiteli. This can be due to the specific features of a grape variety.

Substantial differences have been found in the values of the mass concentrations of terpene compounds (Fig. 2).

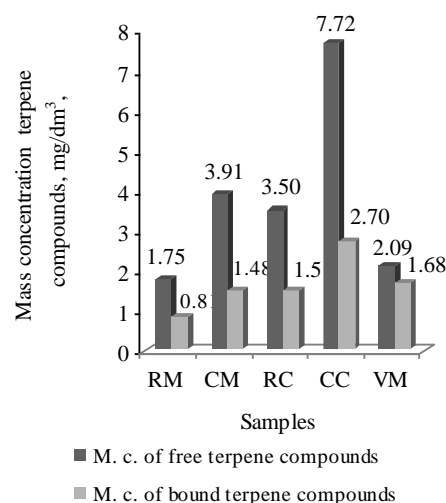


Fig. 2. Mass concentration of free and bound terpene compounds in must, cryomust, and vacuum must

A consistent dependence of this parameter on the technology used is observed. Thus, the mass concentration of free terpene alcohols in the Rkatsiteli cryomust (RC) was 3.5 mg/dm³, while in the vacuum must (VM), it was only 2.09 mg/dm³. It should be noted that using must cryoconcentration not only allows retaining a high concentration of terpene compounds, but also ensures the prevalence of their free forms. This is especially important to preserve the aromatic qualities of a variety. In the experimental cryomust variants, there were 70–74 per cent of the terpene alcohol free forms, with only 55.8 per cent of them in the control sample (vacuum must). This is

obviously due to retaining a major part of the aromatic compounds, which is a result of excluding the heating from the preserved must technology.

Not only the technology, but the grape variety, too, greatly effects on the terpene compounds concentration. As can be seen from Fig. 2, the mass concentration of free (3.91 mg/dm³) and bound (1.48 mg/dm³) terpene forms in the Citronny Magaracha must (CM) were, respectively, by 123.4 and 82.7 per cent higher than the corresponding parameters in the Rkatsiteli must (RM). The same tendency is observed in the Citronny Magaracha and the Rkatsiteli cryomust (CC, RC).

The clarified must to be used in making dry wine materials was racked off and underwent batch fermentation in glass vessels at a temperature below 20°C. The must, while fermented, was systematically monitored. The residual sugar content in the wine materials was not higher than 3 g/dm³. After full fermentation and sufficient clarification, the wine materials were poured in an open way – decanted from the yeast deposits, and then, kept in conditions that prevented their oxidation. The dry wine materials, before being processed into medium dry wines, were analysed physically and chemically.

The data on the chemical composition and physical and chemical properties of the wine materials from the processed grapes are presented in Tables 3, 4.

The conventional physical and chemical parameters of the Rkatsiteli and the Citronny Magaracha dry wine materials (ethanol by volume, mass concentrations of sugar, of titrated and volatile acids, of free and total sulphurous anhydride) were within the range specified by State Standard of Ukraine 48–06.

By studying the additional parameters, we have established that the Citronny Magaracha wine material was somewhat high in the mass concentrations of phenolic substances and terpene alcohols, compared to that of Rkatsiteli. Further on, the dry wine materials were blended with concentrated must (the experimental variants with the cryomust of the corresponding varieties, the control samples with the vacuum must). The obtained medium dry wines Rkatsiteli and Citronny Magaracha were processed and then subjected to physical, chemical, and sensory analysis (Tables 5, 6).

The values of the mass concentrations of sugars, titrated acids, sulphurous anhydride, and volatile acids in the experimental samples were close to those in the control samples.

Table 3 – The main physical and chemical parameters of dry wine materials (n=3, P≤0.95)

Samples	Density, g/cm ³	Alcohol by volume, % vol.	SO ₂ total	SO ₂ free	Mass concentration, g/dm ³		
					Sugar	Titrated acids	Volatile acids
Rkatsiteli wine material	0.098 ±0.002	11.9 ±0.1	101 ±5	28 ±2	1.5 ±0.1	6.8 ±0.1	0.25 ±0.02
Citronny Magaracha wine material	0.098 ±0.001	12.0 ±0.1	91 ±3	25 ±1	2.0 ±0.2	6.1 ±0.1	0.28 ±0.02

Table 4 – Additional physical and chemical parameters of dry wine materials (n=3, P≤0.95)

Samples	pH	Mass concentration, mg/dm ³			D 420
		Phenolic substances	Free terpene alcohols	Bound terpene alcohols	
Rkatsiteli wine material	3.04±0.02	186±6	0.99±0.05	0.71±0.05	0.098 ±0.02
Citronny Magaracha wine material	3.08±0.03	264±8	2.89±0.08	1.14±0.02	0.107 ±0.03

Table 5 – The main physical and chemical parameters of the medium dry wines (n=3, P≤0.95)

Wine samples	Alcohol by volume, % vol.	SO ₂ (total) g/dm ³	SO ₂ (free) g/dm ³	Mass concentration, g/dm ³		
				Sugar	Titrated acids	Volatile acids
Medium dry Rkatsiteli (control)	11.6 ±0.1	88 ±5	33 ±3	15 ±1	6.6 ±0.2	0.26 ±0.02
Medium dry Rkatsiteli (+cryomust)	11.5 ±0.1	92 ±4	29 ±3	15 ±2	6.6 ±0.2	0.25 ±0.03
Medium dry Citronny Magaracha (control)	11.7 ±0.1	91 ±3	25 ±2	15 ±2	6.1 ±0.1	0.30 ±0.01
Medium dry Citronny Magaracha (+cryomust)	11.7 ±0.1	105 ±4	31 ±2	15 ±2	6.2 ±0.1	0.29 ±0.02

Table 6 – Additional physical and chemical parameters of dry wines (n=3, P<0.95)

Wine samples	D420	pH	Mass concentration, mg/dm ³			Taste panel score
			Phenolic substances	Free terpene alcohols	Bound terpene alcohols	
Medium dry Rkatsiteli (control)	0.108 ±0.002	3.01 ±0.01	178 ±4	1.01 ±0.02	0.81 ±0.04	8.3 ±0.3
Medium dry Rkatsiteli (+cryomust)	0.103 ±0.002	2.99 ±0.01	190 ±7	1.21 ±0.05	0.70 ±0.02	8.6 ±0.1
Medium dry Citronny Magaracha (control)	0.112 ±0.003	3.03 ±0.02	264 ±6	2.89 ±0.02	1.14 ±0.05	8.4 ±0.2
Medium dry Citronny Magaracha (+cryomust)	0.109 ±0.001	3.05 ±0.01	275 ±9	3.24 ±0.05	1.21 ±0.04	8.9 ±0.2

Comparative analysis of the additional physical and chemical parameters of the experimental samples (with cryomust used) and of the control ones (with vacuum must used) of the ready-to-consume medium dry wines has allowed establishing certain tendencies. The mass concentration of phenolic substances, with cryomust used, tended to increase, on average, by 6.7 per cent (Rkatsiteli) and 10.5 per cent (Citronny Magaracha), being for these wines 190 and 275 mg/dm³, respectively.

A consistent increase in the terpene compounds concentration (responsible for the varietal aroma) was established when analysing the cryomust in comparison with the vacuum must, and this increase can also be observed in the ready-to-consume medium dry wines. In the experimental Rkatsiteli sample, the concentration of free forms of terpene compounds was 1.21 mg/dm³, which was 20 per cent higher than that in the control sample. The same tendency has been noted in the experimental Citronny Magaracha sample, where this parameter was 3.24 mg/dm³, by 35.6 per cent higher than in the control sample.

The results obtained for the physical and chemical composition of the medium dry wine samples analysed are in good agreement with the tasting assessment of the medium dry wines obtained. Both the experimental cryomust-based variants were notably superior to the control samples by their sensory characteristics. The

Rkatsiteli wine had a bouquet with noticeable complex floral and fruity tones and well-balanced, harmonious flavour, so it was graded 8.6 (with 8.3 for the control). The Citronny Magaracha wine had a full, well-balanced flavour, with bright muscadine and floral shades and notes of honey. It received the top grade of 8.9 points (with only 8.4 for the control sample).

Conclusions

1. It has been shown that the existing technologies of medium dry and semi-sweet wines are not perfect. Some scientists have worked on improving the technological process by lowering the boiling temperature of vacuum must, using electrodialysis, etc. On the basis of a review of literature, we have suggested must obtained by freezing as a sweet component.

2. Physical, chemical, and sensory analysis have been carried out for the intermediate wine materials and the ready-to-consume medium dry white table wines Rkatsiteli and Citronny Magaracha made by traditional blending and by the suggested blending method using cryomust. The results of the analysis indicate that it is practical to use cryotechnology, because it allows obtaining more aromatic medium dry (semi-sweet) wines, with more complex and fuller flavours.

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УДОСКОНАЛЕННЯ КУПАЖНОЇ ТЕХНОЛОГІЇ БІЛИХ СТОЛОВИХ НАПІВСУХИХ ТА НАПІВСОЛОДКИХ ВИН

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Анотація. Наведено короткий літературний огляд існуючих технологій столових напівсухих і напівсолодких вин, окреслено основні проблеми виробництва вин цього типу і шляхи їх вирішення вітчизняними і зарубіжними виноробами. Відомо, що класична схема отримання напівсухих і напівсолодких вин, що дозволяє максимально зберегти ароматику сорту і отримувати якісні вина, в Україні не застосовується у зв'язку з технічною складністю і дорожнечю технології. Купажна схема є економічно більш ефективною, але не дозволяє в повній мірі зберегти тонкі ароматичні нюанси сорту. Тому в статті вивчено можливість отримання напівсухих і напівсолодких вин з використанням суслу, яке було концентровано виморожуванням. Показано, що дана технологія дозволить зберегти цінні речовини аромату сорту, і створить передумови для виробництва найбільш якісних вин цього типу. Для проведення дослідження проаналізовано зразки освітленого суслу сортів Ркацителі і Цитронний Магарача, суслу, яке було консервовано виморожуванням, вакуум-суслу, сухих виноматеріалів, а також отриманих з них столових напівсухих білих вин. У суслі та винах вивчено ряд основних фізико-хімічних показників (масові концентрації цукру, титрованих кислот, загального і вільного діоксиду сірки), а також додаткові показники (величина рН, масові концентрації фенольних речовин, вільних і зв'язаних терпенових спиртів, оптична щільність при довжині хвилі 420 нм). У виноматеріалах і винах також визначено масову концентрацію летких кислот і органолептичні показники. У результаті проведених досліджень встановлено, що напівсухі вина, які були отримані з використанням криотехнології, характеризувались збільшенням концентрації вільних терпенових сполук з 1,01 мг/дм³ до 1,21 мг/дм³ для Ркацителі та з 2,89 мг/дм³ до 3,24 мг/дм³ для Цитронного Магарача та істотним поліпшенням якості букета і аромату. Таким чином, застосування купажної технології виробництва столових напівсухих (напівсолодких) вин з використанням криосуслу дозволяє максимально зберегти яскравий виразний сортовий аромат і отримувати найбільш якісні вина цього типу.

Ключові слова: напівсухі вина, напівсолодкі вина, купажна схема, сусло, криосусло, виноматеріали, виморожування, якість.

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