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IMPROVEMENT OF THE TECHNOLOGICAL MODES OF PRODUCING DRY WHITE TABLE WINES

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Introduction. Formulation of the problem

In the last decades, a number of scientists have noted an important role of pre-fermentation maceration of pomace for white wine formation at the first stage of winemaking [1-5]. In the technology of white table wines, today's enterprises strive to minimise unwanted oxidative processes and to obtain high-quality must, as suspension-free as possible. This is achieved by a soft technological mode of grape processing and by separating must from pomace immediately after grapes are crushed. These conditions are vital to manufacture high-quality white table wine materials and wines, fine

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Abstract. By using the classical technology of making dry white wines, which does not involve maceration of the pomace, we can produce standard table wines, light and delicate. This minimises such an objectionable factor as saturation of the wine with extra nitrogenous and phenolic substances and oxidative enzymes. On the other hand, this scheme gives a specific varietal aroma no chance to reveal itself more expressively. The paper overviews briefly the scientific works considering the modes of pomace maceration before fermentation and the use of enzyme preparations in the technology of white table wines. The physicochemical and sensory characteristics of wine materials from Rkatsiteli grapes grown in the south of the Mykolaiv Region have been analysed. This analysis has proved that standard white table wine materials can be obtained both by the traditional method (the so called 'white' method) and with the use of short-term maceration of the pomace. Macerating the pomace resulted in obtaining fuller, richer wine materials with a bright aroma and good body. It has been shown that to obtain bright and not too blunt wine materials, the most essential parameter of the maceration process is its low temperature. A pectolytic enzyme preparation used during maceration increased, to some extent, the mass concentration of phenolic substances, the reduced extract, the optical density, and the concentration of terpene alcohols. Besides, it allowed fuller revealing a wine's aromatic profile. The research has resulted in establishing that there is regularity in how the concentration of terpene alcohols changes with different temperature conditions of steeping the pomace. It has been shown that the maximum concentration of terpenes responsible for the varietal aroma is best retained in wine materials when the maceration temperature is 5°C. A rise in the pomace maceration temperature to 20°C led to a decrease in the concentration of labile terpene alcohols, so it should be avoided in producing quality wines. Studying different maceration modes has allowed recommending a certain method to manufacture full-bodied, well-structured white table wines with a pronounced varietal aroma. This method involves adding the enzyme preparation Depectil CLARIFICATION to the pomace and macerating it for 12 hours at 5°C.

Keywords: dry white table wines, maceration, cryomaceration, enzymes, wine materials, quality, terpenic compounds.

and delicate, like Verdicchio, Chardonnay, Pinot grigio, Pinot blanc, and others [2]. Along with these, there is another style of dry white table wines that can be described as flavoury, full-bodied, of a richer and more aromatic bouquet, like New World wines. It is clear that their technology should allow must to come into contact with pomace, because all aromatic substances of a grape berry are concentrated in its skin and in the layers next to it.

It is a well-known fact that during pomace maceration, oxidative and hydrolytic enzymatic processes can greatly affect the quality of the wine-to-be [6]. A technologist always blocks the activity of

oxidative processes, but the hydrolytic ones (degradation of pectin substances, sucrose inversion, hydrolysis of proteins and high-molecular-weight polypeptides) are definitely positive at the wine clarification stage. The activity of endogenous enzymatic catalysis is not always effective enough, that is why winemakers quite widely practice using pectolytic enzyme preparations. They make it possible to increase the yield of free-run, facilitate pomace pressing, and accelerate must clarification and the further processing and filtering of the wine materials [7,8]. Besides, one can suppose that decomposition of pectic substances releases not only galacturonic acids and methoxy groups, but other compounds, too, including those responsible for aroma formation. In this case, pectolytic enzyme preparations could be an additional tool to produce extra-aromatic dry white table varietals. However, there are practitioners of winemaking who have a different opinion. They believe there are no reasons why use exogenous enzymatic catalysis in first-stage winemaking: if the technological process is properly directed, they say, endogenous enzymes of grapes perfectly do their job, so adding extra enzymes is but an unnecessary auxiliary technique. Thus, this research is topical, as it is aimed at choosing the scientifically grounded optimum technology of obtaining varietal materials for white table wines.

Analysis of recent research and publications

Dry white table wine can be made in a number of ways. In France, to produce the lightest, low-extraction, fine, unoxidised wine materials (for champagne), they press entire grape clusters. By this method, the phenolic, nitric, aromatic, and other substances from the solid parts of a grape berry are prevented, to the greatest possible extent, from passing into the must. However, the classical grape processing method (the 'white' method) is far more frequently used to produce varietal table wine materials and wines.

In some cases, to obtain fuller-bodied wines with a well-developed aroma, it can be practical to use short-term pomace maceration. First of all, this holds true for high-aroma grape cultivars, such as Muscat, Roter Traminer, Sauvignon, and others. However, this method can also be applicable to create interesting wines from other, less aromatic grape cultivars.

A lot of scientists have studied how different maceration conditions effect on the wine material quality during grape processing [9-17].

N. Taran, M. Taran, I. Ponomaryova, et al. [9] studied how different maceration and fermentation modes effected on the content of aromatic compounds in wines from Muscat cultivars. The researchers showed that in the course of grape processing, free and bound aromatic compounds were hydrolysable and could transform due to various factors (temperature, time of maceration, pH, maceration medium structure,

etc.). Thus, changes in the maceration parameters greatly affected the aroma of the wine materials obtained. The research findings showed that an increase in the maceration time to 8 hours resulted in a larger amount of terpenic compounds (4.3mg/dm³), but longer maceration (up to 12 hours) decreased their level (4.3mg/dm³). The maximum concentration registered by the researchers was at 18-20°C, and the minimum at 10-12°C. At a high maceration temperature, though, they observed high accumulation of aldehydes (up to 48.0mg/dm³), which adversely affected the quality of the finished products.

The scientists noted that treating the pomace with pectolytic enzyme preparations had a pronounced effect on the content of terpenic compounds [9,10]. When applied during maceration at the optimum 14-16°C, the enzyme increased the content of terpenic compounds up to 4.2mg/dm³, compared with the control. However, it increased the aldehyde concentration, too (up to 30.0mg/dm³), which was due to the intensified hydrolysis of terpenic compounds [9].

Recently, the leading European scientists have paid much attention to revealing the full potential of white wines from non-aromatic cultivars by means of pomace maceration [11-17]. Thus, as part of the programme FFABR 2017, with support from the Italian Ministry of Education, University, and Research (MIUR), the Italian oenologists researched an interesting method of cryomacerating pomace of Chardonnay grapes. The scientists' latest developments in this area are directed at the maximum preservation of the aromatic composition of grapes. To this end, the authors suggest an innovatory system bringing liquid CO₂ into direct contact with pomace. In their research, they analysed how different cryomaceration temperatures (10°C, 8°C, 6°C, 4°C) changed the physicochemical composition and sensory rating of wine materials. It was established that the cryomaceration temperature as low as 6°C is the optimum to increase the polyphenol concentration and to improve the sensory qualities of wine materials [5, 11].

Gomez-Miguez et al. analysed 9 variants of white wines made after the pomace was macerated for 2, 4, 6, 8, 12, 18, and 24 hours at 5°C, 10°C, and 20°C. The researchers showed that maceration for 12 hours and more allowed obtaining typical white table wines only when low temperatures of steeping were used [13]. According to Bavčar's findings, using maceration in the technology of white table wines from Malvasia grapes is inferior, by the general impression, to the classical 'white' technology [14]. However, all researchers observed enhanced varietal aroma in case of maceration [14-16]. So, the choice of a particular way of preparing wine materials should be based on a scientifically grounded approach and experiments with certain cultivars in a certain terroir.

Thus, many scientists focus on studying different modes of pre-fermentation short-term pomace maceration

and the effect of pectolytic enzyme preparations on the quality of varietal wine materials from different cultivars in the soils and climates of Moldova, Italy, and other winemaking regions. All the above makes it clear that the scientifically-grounded choice of the optimum technology for varietal white table wine materials is a key factor determining the quality of the finished product.

The **purpose** of this research is to study whether different technological modes based on adding pectolytic enzyme preparations and short-term pomace maceration are practical when producing materials for white table Rkatsiteli wines in the terroir of the Odessa Region. To achieve the purpose, the following **objectives** should be accomplished:

- to prepare wine materials for white table varietals by the standard 'white' technological scheme and with short-term pomace maceration in the must;

- to obtain experimental samples of wine materials with the use of exogenous and endogenous enzymatic catalysis when macerating the pomace;

- to study the physicochemical and sensory parameters of the experimental and control samples of the wine materials;

- to analyse and summarise the findings, and use them as a basis to recommend the optimum technological conditions for manufacture of high-quality white table varietals.

Research materials and methods

The experimental research involved studying and analysing the physicochemical composition and sensory properties of dry white table wine materials produced by different technological schemes according to the research design (Fig. 1).

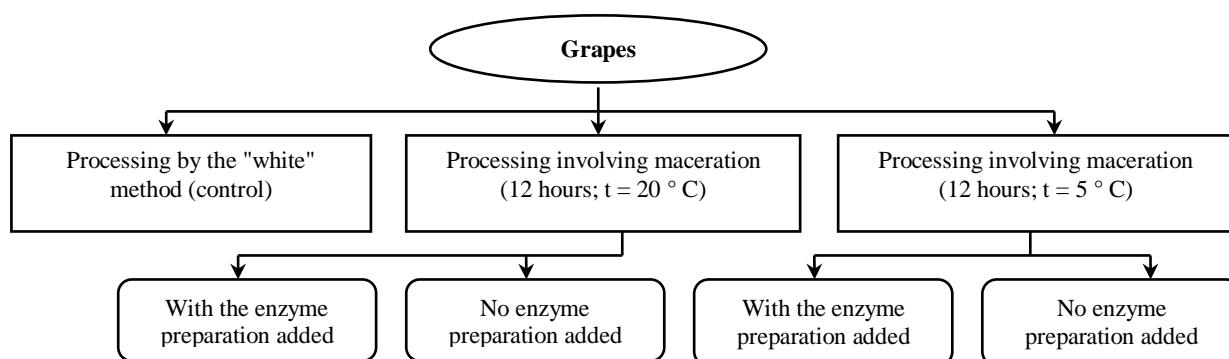


Fig. 1. General research design

The grape cultivar used in the experiment was Rkatsiteli harvested in 2018 in the agricultural production co-operative Lymansky. The grapes were hand-picked, placed in wooden boxes, and transported. At the Department of Wine Technology and Sensory Analysis (Odessa National Academy of Food Technologies), the grapes were checked for quality and processed. The mass concentration of sugar in the grapes was 197 g/dm³, that of titratable acids was 6.7 g/dm³.

The control variants of dry white Rkatsiteli materials were prepared according to the Technology Guidelines on the Manufacture of ordinary dry table wine materials, with no preliminary pomace maceration (Sample 1). Under microvinification conditions at the Department of Wine Technology and Sensory Analysis (ONAFТ), the grapes were crushed and stemmed on a hand-operated roll crusher. At the very moment of crushing, 50mg/dm³ of sulphurous anhydride was added to the grapes, and the pomace obtained was immediately pressed in a hand-operated basket-type vertical press with a 50-litre basket. Then, the must was passed for clarification and fermentation in glass vessels. The experimental variants were the samples produced with 12-hour pre-fermentation pomace maceration at 20°C (Sample 2) and 5°C (Sample 4). Besides, it was studied whether it was practical to use pectolytic

enzyme preparations in the tested samples at the maceration stage. To check this, under each steeping mode, the pomace after crushing was divided into two portions. The enzyme preparation was added to one of the portions (Sample 3 at the maceration temperature 20°C, and Sample 5 at 5°C), and was not added to the other portion (Sample 2 at the maceration temperature 20°C, and Sample 4 at 5°C). After maceration, the pomace was pressed in a hand-operated basket-type vertical press in order to separate the free-run must and press fractions. In the control and test samples, the free-run and the first press fraction were isolated (in the amount 60 dal per 1 tonne of grapes) and sent to be clarified. The static clarification of the must was carried out in glass containers, by adding bentonite in the amount 3g/dal must. The process lasted 24 hours at the temperature up to 20°C.

After clarification, the must was decanted off the lees, and a pure yeast starter was added to it (2–3g/dal must). The fermentation went on at a temperature of up to 20°C. In all the experimental variants, fermentation was carried out with the use of yeast for white wines Enartisferm ES-181.

On completion of fermentation, the wine materials being clear enough, they were decanted off the lees, with adding 25 mg/dm³ of sulphurous anhydride (first

decantation) and placed for storage. A month later, the wine materials were decanted off the lees again (second decantation) and rested. After that, their physicochemical composition and sensory properties were studied.

The enzyme preparations used in the samples analysed were the liquid pectolytic enzyme Depectil CLARIFICATION (France), with the endo and exo polygalacturonase activity 58000 nkat/g, pectin-methyl-esterase activity 12000nkat/g, and pectinolyase activity 1700nkat/g, taken in the amount 0.015ml per 1 l of the pomace.

Ethanol by volume was analysed using the areometric method according to DSTU (State Standard of Ukraine) 4112.1-2002. The mass concentration of sugar was measured by direct titration (DSTU 4112.5-2002), that of titratable acids was determined titrimetrically (DSTU 4112.13-2002), that of volatile acids by titrating the distillate of the wine materials (DSTU 4112.14-2002), that of free and total SO₂ titrimetrically (DSTU 4112.25-2002), that of reduced extract by pycnometry (DSTU 4112.4-2002), that of heavy metals by colourimetry (DSTU 4112.30-2003). The additional parameters were analysed according to [17]: the mass concentration of phenolic substances (the method of colourimetry based on oxidising wine's phenolic substances with the Folin-Ciocalteu reagent), the optical characteristics (optical density, intensity and tone of colour – by photoelectrocolorimetry), and the mass concentration of terpene alcohols (method based on distillation and further colourimetric determination of the concentration of terpene alcohols by the reaction of interaction with vinylin).

Results of the research and their discussion

Table 1 presents the values of the physicochemical parameters of the Rkatsiteli wine materials prepared without maceration (control) and with short-term pomace maceration (test samples) at 20°C and 5°C respectively. Besides, the table contains the values of

the main parameters of the test samples with the pectolytic enzyme preparation Depectil CLARIFICATION added.

As seen from Table 1, the values of all the main physicochemical parameters of the wine materials were within the limits prescribed by the effective DSTU 4806:2007 “Wines. General specifications.” Their ethanol by volume was 11.7%, the mass concentration of residual sugar did not exceed 3g/dm³. The MC of titratable acids was 6.2–6.4g/dm³, of volatile acids 0.33–0.40g/dm³. The MC of heavy metals in all the samples did not exceed 3mg/dm³, and of total sulphuric anhydride was no higher than 151mg/dm³. In all the experimental variants, pomace maceration led to an increase in the mass concentration of reduced extract from 16.9g/dm³ to 17.8–18.5g/dm³.

The mass concentration of total phenolic substances, the optical characteristics, and the mass concentrations of terpenic compounds in free and bound forms have been analysed, too (Fig. 2-4).

The use of maceration resulted in accumulation of phenolic substances in white wine materials from 277mg/dm³ in the control to 367–461mg/dm³ in the experimental variants (Fig. 2). A factor for the maximum increase of this parameter (by 34.6–66.4%) was the increased temperature of the steeping (20°C). The low temperature of maceration (5°C) levelled the excessive increase in the concentration of phenolic substances (which in this case only increased by 32.5–46.2%). The Italian scientists conducted similar research, but obtained different results for the dynamics of concentration of phenols. According to them, when the cryomaceration temperature was lowered from 10°C to 6°C, this caused some rise in the concentration of total phenolics [11]. This discrepancy between the Italian authors' findings and our data on the phenolic concentration must be due to the difference in the very technology of cooling: the Italian refrigerator allowed the pomace to come into direct contact with liquid CO₂.

Table 1 – Physicochemical parameters of the wine materials (n=3, P≤0.95)

Sample	Mass concentration (MC) of ethanol, %	MC of sugar, g/dm ³	MC of titratable acids, g/dm ³	MC of volatile acids, g/dm ³	MC of SO ₂ , mg/dm ³		MC of reduced extract, mg/dm ³	MC of heavy metals, mg/dm ³
					free	total		
No maceration (control)	11.7±0.1	2.4±0.2	6.4±0.1	0.33±0.02	16±0.9	135±3	16,9±0.2	2±0.2
Pomace maceration (t=20°C)	11.7±0.1	2.1±0.1	6.3±0.1	0.39±0.04	12±1.4	151±4	18,2±0.3	2±0.3
Pomace maceration (t=20°C) + enzyme	11.7±0.1	1.8±0.3	6.2±0.1	0.40±0.03	15±1.5	126±4	18.5±0.3	3±0.2
Pomace maceration (t=5°C)	11.7±0.1	2.0±0.2	6.3±0.1	0.37±0.03	11±0,8	121±5	17.8±0.2	3±0.2
Pomace maceration (t=5°C) + enzyme	11.7±0.1	1.6±0.2	6.3±0.1	0.39±0.02	18±1.0	118±6	17.9±0.3	3±0.3

Obviously, under these conditions, the cells of the crushed grapes were subjected to extra stress from low temperatures, some of their structure was destroyed, and this intensified the course of diffusion. A pronounced, delicate, well-developed bouquet and the highest quality of wine materials were observed in the variants with the low maceration temperature 6°C [11].

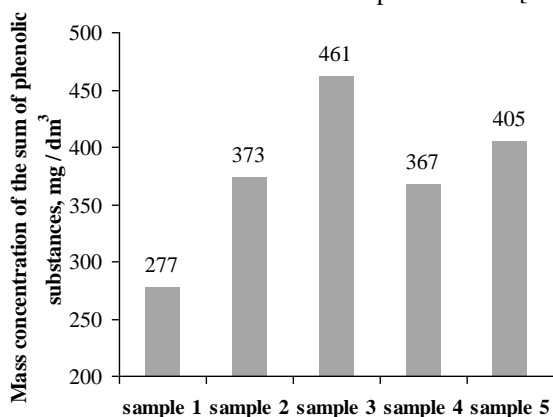


Fig. 2. Mass concentration of total phenolic substances in the wine materials

In this research, the pomace was cooled down at a similar temperature of 5–6°C in a cooling chamber.

Using enzymes, too, had an effect on the accumulation of phenolics. It was 25.6% when the maceration temperature was 20°C, and 10.5% at the maceration temperature 5°C. This can be due, on the one hand, to the physical slowdown in diffusion at low temperatures, and on the other hand, to some deceleration in the enzymatic processes of destroying the cellular structure of a grape berry.

Another important qualitative characteristic of white table wine materials is the optical density. The value of the optical density D_{420} at the wavelength 420nm can characterise, in conditional units, how much the yellow and brown tones contribute to the colour of the samples. In all the variants, the increase in the optical density of the wine materials was largely due to pomace maceration, especially when no cooling was used (Fig. 3). It increased the total value of optical density by 1.6–2.2 times. Cooling the materials down during maceration substantially reduced the objectionable tendency for a change in their colour. That is why the optical density of all the samples macerated at 5°C did not exceed 0.119.

Enzyme preparations, too, intensify, to some extent, the yellow and brown tones in the colour of wine materials. With enzyme preparations used, the average value of this parameter increased by 6.3–11.0%.

Mass concentrations of free terpene alcohols (Fig. 4), which are largely responsible for the varietal aromatic descriptors, tend to increase when the pomace is macerated.

The increase in the concentration of free terpene alcohols (by 64.0–172.7%) was the most pronounced when enzyme preparations were used. This correlates

quite accurately with N. Taran's and other researchers' findings [9–10].

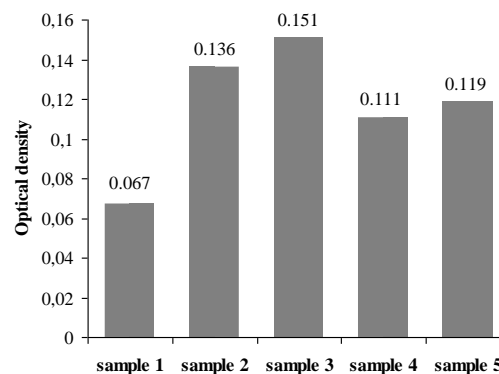


Fig. 3. Values of the optical density in the wine materials (in conditional units)

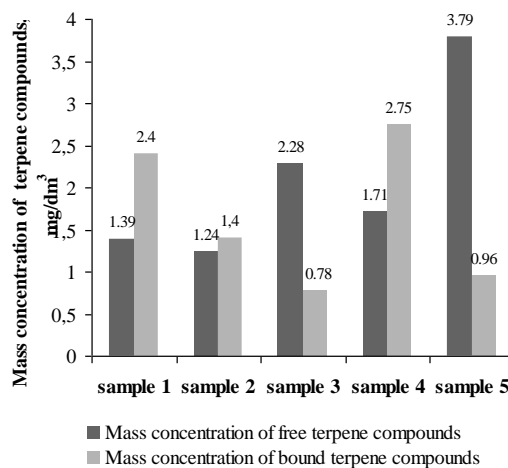


Fig. 4. Total mass concentration of free and bound terpene alcohols

However, unlike it was with phenolic substances, not only did the rise in the maceration temperature from 5°C to 20°C lead to no higher concentration of free terpene alcohols, but, on the contrary, it significantly reduced this parameter from 1.71–3.79mg/dm³ to 1.24–2.28mg/dm³. This may be due to partial oxidative degradation of terpenic compounds when the temperature rises. The same tendency was observed for bound-form terpene alcohols: their mass concentration decreased from 0.96–2.75mg/dm³ to 0.78–1.4mg/dm³.

The sensory analysis has allowed establishing that all the samples tested can be characterised as typical of white table wine materials. It has been noted that all the wine materials are clear, their colour ranges from light straw to straw yellow, they have a pure varietal aroma, and a fresh, well-balanced flavour. Using maceration generally resulted in a richer flavour of the wine materials, with a pronounced bright aroma where fruit tones prevailed. The most interesting samples are those obtained by cryomaceration at 5–6°C: they have a pronounced complex aroma of ripe fruit and the highest sensory rating (7.95–7.98 points). This fully agrees with

the earlier findings by Daniele Naviglio et al [11]. Also, using the enzyme preparation contributed, in a way, to the development of the complex aroma and the palate fullness. The sample rated highest (7.98 points) was made with the use of cryomaceration after introducing the pectolytic enzyme preparation Depectil CLARIFICATION into the pomace.

Conclusion

On analysing the physicochemical and sensory parameters of wine materials from Rkatsiteli grapes grown in the Odessa Region, it has been found that standard white table wine materials can be produced both by the traditional 'white' method and by using short-term pomace maceration. The latter resulted in fuller and richer wine materials, with a bright aroma and good body. However, without cooling, blunter samples are likely to be obtained.

On analysing the extra effect of the enzyme preparation Depectil CLARIFICATION on the quality of the wine materials during maceration, it has been established that their phenolic concentration increases, on average, by 10.3–23.6%, reduced extract by 0.6–1.0%, optical density by 7.2–11.0%, and concentration of terpenic compounds by 6.5–15.9%.

Besides, the preparation promoted the development of the aromatic profile of the samples.

The regularities have been studied in how the concentrations of terpene alcohols change with the technology. In all the experimental variants (except for the one where the pomace was macerated at 20°C), when maceration was used, the mass concentration of free terpenic compounds was 1.71–3.79mg/dm³, which is by 23.0–172.7% higher than it was in the control (1.39mg/dm³). The fact that pomace maceration at 20°C reduced this parameter from 1.39mg/dm³ (in the control) to 1.24mg/dm³ can be explained by decomposition of some part of terpenic compounds when the maceration temperature rose.

On studying different pomace maceration modes, a method has been found recommendable for manufacturing full-bodied, well-structured white table wines with a pronounced varietal aroma. This method involves adding the enzyme preparation Depectil CLARIFICATION to the pomace and macerating it for 12 hours at 5°C. The recommended conditions of grape processing increase the concentration of phenolics in wine materials by 32.5%, that of terpenic compounds by 17.7%, and result in a higher optical density value D₄₂₀ (however, the latter never exceeds 0.111). The colour of the wine material is described as "light straw."

References:

1. Sholts-Kulikov EP. Vinodeliepo-novomu. Simferopol: Tavrida. 2009.
2. Klark O. Polnoe rukovodstvo dlya znatokov i ne tolko. M: Izd-voEsmo. 2004.
3. Marais J. Effect of different wine-making techniques on the composition and quality of Pinotage wine. I. Low-temperature skin contact prior to fermentation. *S. Afr. J. Enol. Vitic.* 2003;24(2):70-75. <https://doi.org/10.21548/24-2-2642>.
4. Piombino P, Genovese A, Gambuti A, La Morte SA, Lisanti MT, Moio L. Effects of off-vine bunches shading and cryo-maceration on free and glycosylatedflavours of Malvasiadelle Lipari wine. *Food science and technology.* 2010;45(2):234-244. <https://doi.org/10.1111/j.1365-2621.2009.02126.x>
5. Carillo M, Formato A, Fabiani A, Scaglione G, Pucillo GP. An inertizing and cooling process for grapes cryo-maceration. *Electron. J. Biotechnology.* 2011;14(6):8-8. <https://doi.org/10.2225/vol14-issue6-fulltext-10>.
6. Ageeva NM, Avanesyants RV. Vliyanie fermentnyih preparatov novogo pokoleniya na biopolimeryi vina. *Plodovodstvo i vinogradarstvo Yuga Rossii.* 2017;46(4):129-140.
7. Čapounová D, Drdák M. Comparison of Commercial Pectin Enzyme Preparation Applicable in Wine Technology. *Czech Journal Food Science and Technology.* 2002;20(4):131-134. <https://doi.org/10.17221/3523-CJFS>.
8. Godabrelidze AA, Kalatozishvili EI, Mudzhiri LA. Sovershenstvovanie tehnologii proizvodstva vin putem primeneniya fermentnyih materialov. *Georgian English News.* 2005;(4):203-204.
9. Taran NG, Ponomareva IN, Taran MN, Luka VI. Izuchenie optimalnyih rezhimov protsessa matsratsii pri pererabotke vinograda sorta Muskatbelyiy. *Vinogradarstvo I vinodelie.* 2013;4:266-269.
10. Taran NG, Ponomareva IN, Soldatenko EV, Trotskiy IN. Vliyanie obrabotki susla fermentnyim preparatom na fiziko-himicheskiy sostav i penistyie svoystva vinomaterialov dlya igrystyih vin. *Magarach. Vinogradarstvo i vinodelie.* 2011;2:34-36.
11. Naviglio D, Formato A, Scaglione G, Montesano D, Pellegrino A, Villecco F. Study of the Grape Cryo-Maceration Process at Different Temperatures. *Foods.* 2018;7(7):107. <https://doi.org/10.3390/foods7070107>.
12. Formato A, Gallo M, Ianniello D, Montesano D, Naviglio D. Supercritical fluid extraction of α - and β -acids from hops compared to cyclically pressurized solid-liquid extraction. *J. Supercrit. Fluid.* 2013;84:113-120. <https://doi.org/10.1016/j.supflu.2013.09.021>.
13. Gómez-Míguez MJ, González-Miret ML, Hernanz D, Fernández MÁ, Vicario IM, Heredia FJ. Effects of prefermentative skin contact conditions on colour and phenolic content of white wines. *Food English.* 2007;78(1):238-245. <https://doi.org/10.1016/j.foodeng.2005.09.021>.
14. Bavčar D, BašaČesnik H, Čuš F, Košmerl T. The influence of skin contact during alcoholic fermentation on the aroma composition of RibollaGialla and Malvasia Istriana Vitisvinifera (L.) grape wines. *Int. J. Food Science and Technology.* 2011;46(9):1801-1808. <https://doi.org/10.1111/j.1365-2621.2011.02679.x>.
15. Peinado RA, Moreno J, Bueno JE, Moreno JA, Mauricio JC. Comparative study of aromatic compounds in two young white wines subjected to pre-fermentative cryo-maceration. *Food Chemistry.* 2004;84(4):585-590. [https://doi.org/10.1016/S0308-8146\(03\)00282-6](https://doi.org/10.1016/S0308-8146(03)00282-6).
16. Parenti A, Spugnoli P, Calamai L, Ferrari S, Gori C. Effects of cold maceration on red wine quality from Tuscan Sangiovese grape. *Eur Food Res Technol.* 2004;218:360-366. <https://doi.org/10.1007/s00217-003-0866-1>.
17. Gerzhikova VG. Metody tehnohimicheskogo kontrolya v vinodelii. Simferopol: Tavrida. 2009.

УДОСКОНАЛЕННЯ ТЕХНОЛОГІЧНИХ РЕЖИМІВ ВИРОБНИЦТВА
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Анотація. Класична схема білих столових вин, яка не передбачає мацерації м'язги, дозволяє отримувати типові тонкі й легкі столові вина. При цьому, з одного боку, зводяться до мінімуму небажані фактори додаткового насичення вина азотистими, фенольними речовинами і окиснювальними ферментами, але з іншого боку, не реалізується потенційна можливість розкриття більш виразного сортового аромату. У статті наведено короткий огляд наукових робіт, спрямований на дослідження режимів мацерації м'язги до бродіння і застосування ферментних препаратів в технології білих столових вин. Аналіз фізико-хімічних і органолептичних показників виноматеріалів із сорту винограду Ркацителі в умовах півдня Миколаївської області дозволив констатувати можливість отримання типових білих столових виноматеріалів як класичним способом по-білому, так і з використанням короткочасної мацерації м'язги. Мацерація м'язги сприяла отриманню більш повних, насичених виноматеріалів з яскравою ароматикою і хорошим «тілом». При цьому показано, що найважливішою умовою отримання яскравих виноматеріалів без надмірної грубості є низька температура мацерації. Застосування ферментативного пектолітичного препарату при мацерації сприяло деякому зростанню масової концентрації фенольних речовин, приведеного екстракту, величини оптичної густини, концентрації терпенових спиртів і повнішому розкриттю ароматичного профілю вина. У результаті проведених досліджень встановлено закономірність динаміки зміни концентрації терпенових спиртів у залежності від температурних режимів настоювання м'язги. Показано, що температура мацерації 5°C в найбільшій мірі сприяє збереженню у виноматеріалах максимальної концентрації терпенів, які відповідають за формування сортового аромату. Підвищення температури мацерації м'язги до 20°C сприяло зниженню концентрації лабільних терпенових спиртів і не є бажаним для отримання якісних вин. Вивчення різних режимів мацерації м'язги дозволило виділити кращий і рекомендувати для виробництва повнотілих білих столових вин з хорошою структурою і виразним сортовим ароматом спосіб, який передбачає внесення в м'язгу ферментного препарату «Депектіл кларіфікейшн» та її мацерацію протягом 12 годин при температурі 5°C.

Ключові слова: білі столові сухі вина, мацерація, кріомацерація, ферменти, виноматеріали, якість, терпенові сполуки.

Список літератури:

1. Шольц-Куликов Е. П. Виноделие по-новому. Симферополь: Таврида. 2009. 320 с.
2. Кларк О. Полное руководство для знатоков и не только. М: Изд-во Эсмо. 2004. 144 с.
3. Marais J. Effect of different wine-making techniques on the composition and quality of Pinotage wine. I. Low-temperature skin contact prior to fermentation // South African Journal of Enology & Viticulture. 2003. № 24 (2). С.70-75. <https://doi.org/10.21548/24-2-2642>.
4. Effects of off-vine bunches shading and cryo-maceration on free and glycosylated flavours of Malvasiadelles Lipari wine / Piombino P. et al // Int. J. Food. Sci. Technol. 2010. Vol. 45, Issue 2. С.234-244. <https://doi.org/10.1111/j.1365-2621.2009.02126.x>.
5. An inertizing and cooling process for grapes cryo-maceration/ Carillo M. et al // Electron. J. Biotechnol. 2011. Vol. 14, Issue 6. P.8-8. <https://doi.org/10.2225/vol14-issue6-fulltext-10>
6. Агеева Н.М., Аванесьянц Р.В. Влияние ферментных препаратов нового поколения на биополимеры вина // Плодоводство и виноградарство Юга России 2017. № 46 (4), С.129-140.
7. Čapounová D., Drdák M. Comparison of Commercial Pectin Enzyme Preparation Applicable in Wine Technology // Czech. J. Food Sci. 2002. Vol. 20, Issue 4. P.131-134. <https://doi.org/10.17221/3523-CJFS>
8. Годабрелидзе А. А., Калатошвили Е. И., Муджири Л. А. Совершенствование технологии производства вин путем применения ферментных материалов // GEN: Georg. Eng. News. 2005. №4. С. 203-204.
9. Изучение оптимальных режимов процесса мацерации при переработке винограда сорта Мускат белый / Таран Н.Г. и др. // Виноградарство и виноделие. 2013. № 4. С.266-269.
10. Влияние обработки сула ферментным препаратом на физико-химический состав и пенные свойства виноматериалов для игристых вин / Таран Н.Г. и др. // Магарач. Виноградарство и виноделие. 2011. №2. С.34-36.
11. Study of the Grape Cryo-Maceration Process at Different Temperatures / Naviglio D. et al // Foods. 2018. Vol.7, Issue 7. P. 107. <https://doi.org/10.3390/foods7070107>.
12. Supercritical fluid extraction of α - and β -acids from hops compared to cyclically pressurized solid-liquid extraction / Formato A. et al // J. Supercrit. Fluid. 2013. Vol.84. P.113-120. <https://doi.org/10.1016/j.supflu.2013.09.021>.
13. Effects of prefermentative skin contact conditions on colour and phenolic content of white wines/ Gómez-Míguez M.J. et al // J. Food Eng. 2007. Vol.78, Issue 1. P.238-245. <https://doi.org/10.1016/j.jfoodeng.2005.09.021>.
14. The influence of skin contact during alcoholic fermentation on the aroma composition of Ribolla Gialla and Malvasia Istriana Vitisvinifera (L.) grape wines / Bavčar D. et al // Int. J. Food Sci. Technol. 2011. Vol.46, Issue 9. P.1801-1808. <https://doi.org/10.1111/j.1365-2621.2011.02679.x>
15. Comparative study of aromatic compounds in two young white wines subjected to pre-fermentative cryo-maceration / Peinado R.A. et al // Food Chem. 2004. Vol.84, Issue 4. P.585-590. [https://doi.org/10.1016/S0308-8146\(03\)00282-6](https://doi.org/10.1016/S0308-8146(03)00282-6).
16. Effects of cold maceration on red wine quality from Tuscan Sangiovese grape / Parenti A. et al // Eur. Food Res. Technol. 2004. Vol. 218. P.360-366. <https://doi.org/10.1007/s00217-003-0866-1>.
17. Гержикова В.Г. Методы теххимического контроля в виноделии. Симферополь: Таврида. 2009. 304 с.

НОТАТКИ