

Innovations in Production of Red Grape Liqueur Wines

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Abstract

Orientation of use of new hybrid variety of the grapes possessing complex stability to illnesses and depredators have enough general character which is not providing selection of processing methods and the equipment. Application of the developed universal module allows to solve this problem particulate. The key quality parameters for experimental wines were methanol content, ethanol and higher alcohol content, total esters, acetic aldehyde content, furfural, organic acid content, total phenolic compounds, anthocyanins, which were measured. Thanks to modern chromatographic methods of the analysis qualitative and quantitative composition of volatile aromatic and nonvolatile components of wines liqueur type, received from hybrid variety of grapes is studied.

Keywords: Grape; Chromatography; Electrophoresis; Acid; Alcohol; Volatile Component

Introduction

Production of grape wine with the raised biological value is reached at the expense of decrease in dosages of preservatives, sulfur dioxide and reduction of quantity of agrochemical treatments of grapes [1]. One of the most real conditions of achievement of effect in the yielded direction is building of the protected atmosphere in field conditions and cultivation of hybrid variety of the grapes steady against illnesses [2,3].

Now in the world the significant assortment of the similar variety is saved up, however many wine makers consider complex reception from them wines of high quality, and the reception question blend wines is more often considered. Nevertheless, works on wine production from hybrid variety of grapes are made not only at micro-winemaking level, but also commercially [4,5]. The cause of that offers in directions of use of new variety have recommendatory character, practical absence of well-founded processing methods of processing of grapes, and also the specialized equipment is. In such a situation, the creation and application of a universal module allows to achieve an improvement in the quality of the finished product by eliminating the possibility of its oxidation by air oxygen and optimizing the effect on volatile components. Application of the universal module allows to raise quality of a finished stock at the expense of an exception of possibility of its oxidation by oxygen of air and accordingly influences allocation of volatile components [6]. The appearance of the universal module made of stainless steel, with a working volume of 75 dm³ is shown in figure 1.



Figure 1: Universal module, working volume 75 dm³.

The aim of this study was to estimate influence of processing methods and the universal module used including for making of red wines from hybrid variety of grapes (Rubin Golodriga, Gurzuf Pink and Tavkveri Magarach) on process of fermentation and accumulation of volatile components and organic acids.

Materials and Methods

The grape of varieties Rubin Golodriga, Tavkveri Magarach and Gurzuf Pink were obtained from Taman region (Russia). Only mature grape were included for use in this study. The yeast *Saccharomyces Vini* was used for wine making.

Chemical analyses

Used standard samples: HCl, NaOH (Sigma), gallic acid (Sigma), ethylene-diamine-diacetic acid (Sigma), TEMED (Sigma), dipicolinic acid (Sigma), tartaric acid (Sigma), malic acid (Sigma), succinic acid (Sigma), citric acid (Sigma), lactate lithium (Sigma).

For determination of volatile components of experimental wine used capillary gas chromatography, "Kristall-2000M" with the FID detector (Russia, CHROMATEK); the quartz capillary column FFAP with a polyimide coating, inner diameter of $320 \cdot 10^{-6}$ m, length of 50 m (USA, HP), Clarus-600 with the MS detector (USA, Perkin-Elmer); the quartz capillary column FFAP with a polyimide coating, inner diameter of $320 \cdot 10^{-6}$ m, length of 50 m (USA, HP). For determination of organic acids used systems of capillary electrophoresis CAPEL-105 (Russia, LUMEX) with characteristics: the photometric detector (254 nm); the quartz capillar with a choronomic polyimide coating, inner diameter of $75 \cdot 10^{-6}$ m, effective length of 0,5

m; aqueous thermostatic control. Results treated by means of the software Multichrome for Windows, version 1.5 (Open Company "Ampersand", Moscow).

Sample preparing

For determination of organic acids sample preparing carried out as follows: sample of wine was diluted by water with at 10-50 time, centrifuged 3-5 minutes at $6000-8000 \text{ n}^{-1}$ and subjected to the analysis.

For determination of volatile components sample preparing carried out as follows: during preparation of hallmarks took into consideration presence in experimental wine of a significant amount of nonvolatile compound: applied watering in 4 times. The yielded reception is used to exclude interaction of carbohydrates with extractives under the influence of temperature. Without dilution application in received distillate from wine found the more higher of contents of furfural overestimated several times and others, including nonidentified, components. Total phenolic compounds and anthocyanins were determined by means of a photo colorimetric. In experiments used following technological variants and have received wine with the conforming standards, table 1.

№	Variety of grapes and the applied technology of processing	Content			
		Alcohol, % vol	Carbohydrates, mass %	Anthocyanins, $\text{g} \cdot \text{dm}^{-3}$	Total phenolic compounds, $\text{g} \cdot \text{dm}^{-3}$
1	Gurzuf Pink, mashing spirits - infusion - pressing	16.5	20.0	0.5	2.70
2	Tavkveri Magarach, mashing spirits - infusion - pressing	16.4	20.5	1.3	3.70
3	Tavkveri Magarach, mash heating up to 60°C - infusion - cooling - alcoholizing - pressing	16.4	20.5	1.9	5.80
4	Tavkveri Magarach, alcohol dosing in heated mash heating up to 60°C - infusion - cooling - pressing	16.5	21.0	1.7	4.40
5	Tavkveri Magarach, mash heating up to 60°C - infusion - cooling - alcoholizing - infusion - pressing	16.6	20.5	2.1	5.60
6	Rubin Golodriga, mash heating up to 60°C - infusion - cooling - alcoholizing - infusion - pressing	16.7	20.5	1.5	5.00
7	Rubin Golodriga, mashing spirits - infusion - pressing	16.4	21.5	2.2	4.70

Table 1: Technological indexes of experimental wines, P = 0.95.

Comparison of the data in Table 1 shows that the technology implemented in variants 3,5 providing for mash heating provides the maximum accumulation of anthocyanins and phenolic substances in conditions of using a universal module. Variants 1, 2, 4, 7 do not give the maximum accumulation of phenolic substances, in contrast to variants 3,5,6, but they allow one to obtain a high content of anthocyanins. The most significant differences in the composition are found between the variants 2-5 applied on the grape variety of Tavkveri Magarach. The most essential difference of technological indexes is positioned for 4 variants of the technologies

applied to processing of grapes of a variety of Tavkveri Magarach, thus is shown that existing processing methods provide almost full extraction anthocyanins components and the sums of phenolic compounds from firm parts of a grape bacca as even fastening by alcohol hot mash (55-60°C) does not lead to augmentation of their concentration. The use of the universal module allowed to achieve good indicators on the accumulation of phenolic substances and for the rose grape variety Gurzuf Pink – only 30% less than for the same technology when using red grapes.

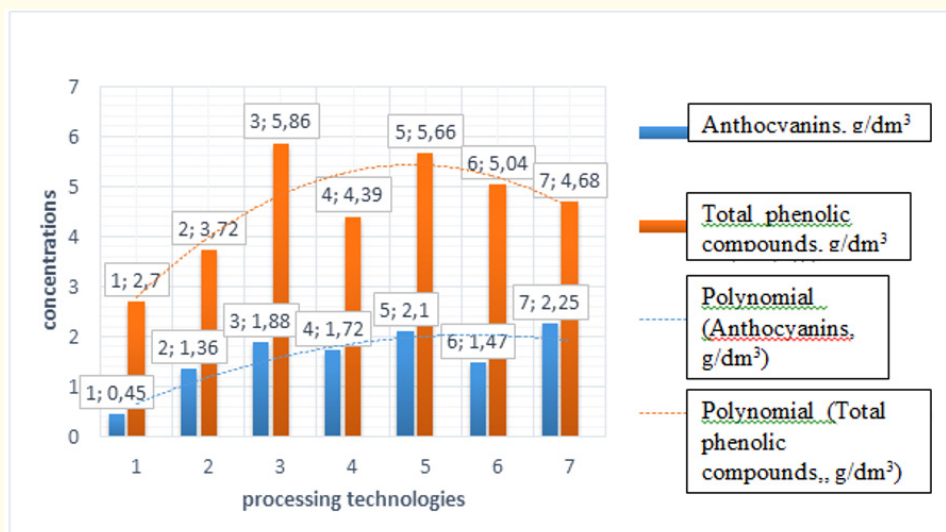


Figure 2: Polynomial dependence of the content of phenolic substances in experimental wines.

The most essential difference of technological indexes is positioned for 4 variants of the technologies applied to processing of grapes of a variety of Tavkveri Magarach, thus is shown that existing processing methods provide almost full extraction anthocyanins components and the sums of phenolic compounds from firm parts of a grape bacca as even fastening by alcohol hot mash (55-60°C) does not lead to augmentation of their concentration.

Now in Russia in production liqueur wines use only ethanol of grape parentage is supposed. For maintenance of high flavoring characteristics of wine grape alcohol should be rectified, corresponding on the quality to grain distilled spirits of the first kind. It is necessary to notice that development rectified grape alcohol is circumscribed enough by grapes resources, therefore the category liqueur grape wines is insignificant on volume basis. Grape wines in which technology use rectified grain alcohol, named the wine drinks.

Results and Discussion

Organoleptic properties of wine are formed at the expense of interacting of aromatic and flavouring characteristics, and aromatic in the core create the components possessing certain pressure of steams at atmospheric pressure. On the other hand, flavouring components effect on the maintenance of volatile matters vapour-phase, their distribution and a relationship that directly influences on organoleptic characteristics of grape wine [7,8]. The saved up experimental material and the analysis of the literary data allows to choose in the capacity of substances which appreciably form organoleptic properties of the wine, following volatile components – acetic aldehyde, the total content of ethers, methanol, total content of higher alcohols, furfural [9,10]. Mass concentration of the

yielded groups of the volatile components, found gas chromatography in experimental samples liqueur wines are shown by a method in table 2.

Attracts attention the fact of the low concentration of acetic aldehyde for all wines at the expense of as much as possible restricted access of oxygen, except the sample № 7; and the maximum quantity of the total content of ethers and methanol for samples № 6-7 that is a characteristic sign of carrying out of partial fermenting of a must. For group of samples № 2-5 the essential difference of concentration of volatile components occurs. So the wine produced on variant (№2) contains concentration of furfural in 2-5 times less than other alternatives, it is less than total higher alcohols in 4 times in comparison with production technology of wine (№3) that can be explained in and magnitude of carrying out partial fermentation in anaerobic conditions. Alternative №5 yields in 1,3 times of more methanol, but thus provides the low maintenance of the total of higher alcohols and acetic aldehyde. Presumably obtained data testifies to directivity of conditions of production engineering of alternative №5 on a hydrolysis of pentose.

For an estimation of a level of production and quality of grape wine the great value has the maintenance of organic acids: tartaric, malic, succinic, citric and lactic acids. Mass concentration of organic acids in experimental wines are shown in table 3.

Data of the table № 3 testify that with alcohol entering in heated mash leads to decrease (on an instance of alternatives of wine № 2-5 of quality of Tavkveri Magarach) to mass concentration of all organic acids – and especially tartaric – 15-25 %. The significant

Nº	Acetic aldehyde	Total ethers	Furfural	Methanol	Total content of higher alcohols
1	21-25	16-20	1-2	140-150	5-7
2	24-30	28-30	5-7	140-150	8-9
3	31-35	30-40	30-35	118-125	40-44
4	29-35	14-20	13-15	110-120	11-13
5	24-30	25-30	11-14	157-165	8-10
6	21-25	67-70	8-10	200-220	25-28
7	45-50	63-70	7-8	280-300	26-30

Table 2: Mass concentration of the basic volatile components, experimental samples liqueur wines, mg•dm⁻³.

Nº	Mass concentration of organic acids					
	Tartaric	Malic	Succinic	Citric	Lactic	Acetic
1	2.22-2.30	3.2-3.40	0.11-0.15	0.34-0.40	0.1	0.072
2	2.14-2.21	1.93-2.11	0.08-0.10	0.22-0.25	1.25	0.063
3	1.83-1.90	2.35-2.48	0.27-0.30	0.27-0.30	1.51	0.081
4	1.56-1.60	2.05-2.10	0.12-0.15	0.14-0.20	1.58	0.075
5	2.11-2.29	2.18-2.28	0.12-0.15	0.21-0.24	0.04	0.067
6	2.54-2.88	1.8-2.0	0.18-0.22	0.50-0.60	0.14	0.048
7	3.43-3.86	1.95-2.21	0.12-0.15	0.40-0.46	0.10	0.066

Table 3: Mass concentration of organic acids, experimental samples of the liqueur wines g•dm⁻³, P = 0.95.

difference in the maintenance of acids is received and for samples № 6-7 which leads to essential decrease in the maintenance of organic acids, was possibly, at the expense of the sped up formation of residue of salts of tartaric acid. Generalisation of summaries of tasting has allowed to note the attained positive results for quality of wine from variety of grapes Gurzuf Pink and Tavkveri Magarach who possessed full color and expressive aroma.

Conclusions

The new approach for production of the liqueur wines of high quality taking into account technological directivity of the new zoned quality is offered and proved. The offered production engineering at the expense of significant restriction of access of oxygen of air and carbonic maceration allows to improve appreciably quality, and the applied universal module for fermenting and alcoholing essentially restricts reaction rate of condensation of acetic aldehyde and emersion of negative resultants of reaction. To carry out experiments have allowed to prove regimes, conditions and receptions for production of the liqueur wines of high quality from variety of a grape of Tavkveri Magarach. To size up production engineering of the liqueur wines on three variety of a grape and to receive the objective analytical and tasting characteristic. The quantitative and qualitative composition of the volatile and nonvolatile components is studied.

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