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INFLUENCE OF TANNINS AND MANNOPROTEINS PRODUCTS ON THE IMPROVEMENT OF ORGANOLEPTIC CHARACTERISTICS OF WINES

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Abstract

The aim of the work was to establish an influence of oenological tannins and mannoproteins products on the change of the organoleptic parameters of table dry wines, made from grapes of aromatic and non-aromatic varieties. The materials of the researches were wines that had defects or faults, mainly related with changes in wine aroma and taste. Oenological tannins of various botanical origins and mannoproteins products of a company Martin Vialatte (France) were used in the researches. Wines with these additives were mixed intensively, kept during 3 days at a temperature, not exceeding 12 °C and then determined the sensory characteristics of wine. Control samples were wines without additives. The descriptive method of analysis was used to create aromatic profiles of wines. The effectiveness of tannins and mannoproteins products on the sensory characteristics of wines was established. The intensity of the descriptors that made a positive affect on the aroma and taste of the samples was increasing. If, at the beginning tones of oxidation or bitterness were felt in the wines, then after introduction of the additives, these tones decreased in intensity. A difference of the changes of aromatic characteristics of wines from two groups of grapes with different aromatics was established. The action of additives was spread on the tings of descriptors, enriching the aroma of samples from non-aromatic grape varieties together with eliminating faults of taste. The effect of the additives was light in the aromatic varieties of grape that is due to the strong aroma and expressed taste of the grapes of these varieties. The results of the researches can be used to improve the quality of white wines, and further researches should be focused on the expansion of assortments of wines from other varieties, as a result utilizing tannins and mannoprotein products.

Keywords: white wines, aromatic and non-aromatic varieties, wine faults, mannoproteins products, oenological tannins.

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1. Introduction

The process of wine production and storage may be appearing of foreign colors, smells and tastes that have a negative effect on the organoleptic characteristics of wines. The reasons for such changes may be violation of sanitary and hygienic conditions of the production, excessive contact with oxygen, level of sulfitation, incorrect choice of yeast race and fermentation conditions, errors in the stabilization technology of wines and etc. The defects of wines make them less attractive to the consumers. Their appearance in wines immediately needs elimination because the devel-

opment of the defect can be lead to wine diseases that will be make the wine completely unfit for consumption [1].

Small faults in organoleptics are eliminated by treatment of sorbents or flocculants. Bentonites, activated carbon, gelatine and etc. are widely utilized in winemaking for these purposes. However, these additives can be reducing for the intensity of color, aroma and taste [2].

Tannins and polysaccharide products are new and modern additives that can be utilized to faults elimination, and at the same time don't have a negative impact on the aroma and taste of the wine.

Tannins are natural components of grapes that form the basis of the wine extract. They have antioxidant properties, prevent oxidation of other components of wines, participate in reactions of copigmentation, preserve the color of wines and determine the taste and aroma of wines [3, 4].

The addition of exogenous tannins, so-called "oenological tannins", has a positive effect on the organoleptic characteristics of wines that was noticed by some scientists [5]. Their adding may be carried out at the different stages of wine production: before and after fermentation. These additives are promoting to stabilize the wine color, improving its structure, protecting against oxidation, and reacting with wine proteins by the classical tannin-protein reaction, therefore removing defects of protein origin [6].

The raw materials for the tannins production are the bark of the quebracho tree, oak, chestnut, acacia, gall nuts, seeds and skins of grape, that have different chemical composition and action in relation to the components of wine [7].

Mannoproteins are one of the main polysaccharide groups, presented in wine, that origin from cell walls of the yeast *Saccharomyces cerevisiae*. 32.2 % from the total content of polysaccharide in wines in the average are presented by mannoproteins. These polysaccharides are glucoproteins. They are located on the outer layer of a cell wall of the yeast of *S. cerevisiae* and equal 35…40 % from its content [8].

Mannoproteins are known by several important properties in wines. They have the ability to prevent protein turbidity, and the interaction between mannoproteins and phenolic compounds of wine is of great interest. Some investigations have shown a possible effect on color stability, improving sensory characteristics, namely softening of the taste of wines [9].

It should be noted, that the cost of oenological tannins is 70…230 €/kg and mannoproteins products – 65…85 €/kg, but their recommended doses – 0.1…0.5 g/dal and 1.0…3.0 g/dal, respectively, that do not significantly affect the cost of wines.

Therefore, researches, aimed at studying the effect of tannins and mannoproteins products that are widely utilized in winemaking, to eliminate faults of various chemical origins and improve the organoleptic characteristics of wines, are relevant.

The aim of the work was to establish the influence of oenological tannins and mannoproteins products on the changes of organoleptic parameters of table dry wines from grapes of aromatic and non-aromatic varieties.

2. Materials and Methods

Materials:

– table white varietal and blended winesб made from aromatic grapes (Muscat Ottonel, Muscat White, Johanniter, Traminer) and non-aromatic varieties (Chardonnay, Rkatsiteli) that were producув in the conditions of the different regions of Ukraine. The wines had light faults, mainly due to changes in aroma and taste;

– oenological tannins (characteristics, presented in **Table 1**);

– mannoproteins products (characteristics, presented in **Table 2**).

Tannins and mannoproteins products, presented in **Tables 1, 2** will be promoted to eliminate faults, associated with changes in the organoleptic characteristics of white wines.

The scheme of the wine treatment is presented in the **Table 3**.

Wines with additives were intensively mixed, kept during 3 days at a temperature, not exceeding 12 °C, and then determined the sensory characteristics. Control was samples of wines without additives.

The descriptive method of analysis was used to create aromatic profiles of wines. The rating scale is from 0 to 5, where 0 – don't felt, 1 – barely feeling, 2 – weak feeling, 3 – average feeling, 4 – feeling above average, 5 – intense feeling. Descriptors were selected:

– non-aromatic varieties: apple, honey, flowers, barberry, acacia, pear, oxidation, freshness, intensity of taste, bitterness;

– aromatic varieties: rose, currant leaf, grapefruit, orange, apple, linden, oxidation, freshness, intensity of taste, bitterness.

Table 1

Characteristics of the oenological tannins (company Martin Vialatte, France)

Name of product	Characteristics
Subliwhite	mixture of procyanidin tannins that were selected according to low tartness and antioxidant properties. Used for clarification, stabilization, balance, preservation of color and aroma in white wines
Taniraisin	condensed tannins from the skins of white grapes. Guarantee protection against oxidation and protection of the organoleptic properties of wine
Tannin WB	condensed tannins from the seeds of grape. Protecting against oxidation, improving the organoleptic properties of wine

Table 2

Characteristics of the mannoproteins products (company Martin Vialatte, France)

Name of product	Content and characteristics
Ultima fresh	Yeast monnoproteins and gum arabic. Based on selective mannoproteins, improving aroma, increasing the duration of taste and balancing taste sensations
Ultima soft	Yeast monnoproteins and gum arabic. Based on selective mannoproteins, allowing to balance the feeling of acidity (to reduce its perception in the taste), improving the balance of wine

Table 3

The scheme of the wine treatment by additives

Name of wine	Subliwhite	Taniraisin	Tannin WB	Ultima fresh	Ultima soft
	g/dal				
Non-aromatic varieties					
Chardonnay 1	–	0.25	–	–	1.0
Chardonnay 2	0.12	–	–	–	0.75
Rkatsiteli	–	–	0.25	–	–
Mix of varieties	0.15	–	-	–	0.5
Aromatic varieties					
Muscat Ottonel	0.5	–	–	1.0	–
Muscat White	0.13	–	–	–	0.7
Traminer	–	–	–	1.2	–
Johanniter	0.25	–	–	–	1.0

The results of the sensory analysis were processed statistically separately for each parameter [10]. The calculation of the standard deviation for each unit indicator was determined by the formula:

$$S_{\vec{x}} = \sqrt{\frac{\sum_{i=1}^{n} x_i \left(x_i - \vec{x}\right)^2}{n(n-1)}},$$

where $S_{\vec{x}}$ – average quadratic deviation from the mean score for the intensity of each descriptor; $\vec{x}$ – average score; n – quantity of experiments; x_i – score of an individual expert.

If the score of an individual expert (x_i) differed from the average score ($\vec{x}$) by $2S_{\vec{x}}$, it was not taken into account.

3. Results

The results of the organoleptic analysis showed the effectiveness of the additives on the sensory characteristics of wines. The intensity of descriptors, that made a positive contribution to the aroma and taste of the samples, was increasing (**Fig. 1**). If, at the beginning of the experiment the wines had the tones of oxidation or bitterness, then after addition of the products, these tones decreased in intensity.

The co-treatment by products of condensed tannin (Taniraisin) and mannoproteins (Ultima soft) reduced the oxidation of the samples and enriched the aroma by coconut and greenery tones. Honey tones, that are indicators of the oxidation and not typical for white wines, made from the grape of Chardonnay, disappeared from the aroma.

The treatment by procyanidin tannin (Subliwhite) together with mannoproteins (Ultima soft) contributed to the appearance of fruity-floral notes, particularly of acacia and pear tones.

In general, the treatment by these products gave wines of Chardonnay freshness, fullness of taste and the samples became more harmonious.

The Rkatsiteli samples, where condensed tannin, made from grape seeds, was added, demonstrated an increase in pleasant fruit tones, a decrease in the tone of oxidation and an improvement in the complexity of the wine. As a result of the treatment of blended wine by products of Taniraisin and Ultima soft, tones of apple and honey, unpleasant bitterness disappeared, floral notes and freshness in general increased that had a positive effect on the balance of the sample. Such changes are explained by the fact that mannoproteins quickly react with polyphenols, removing them from the system, thereby reducing bitterness and oxidation appearing. They are able to connect with volatile thiols that give an unpleasant aroma. The tannin action aims on the absorption of oxygen due to its hydroxyl groups. The origin of tannins determines the quantity of these groups and the different ability to antioxidant effect.

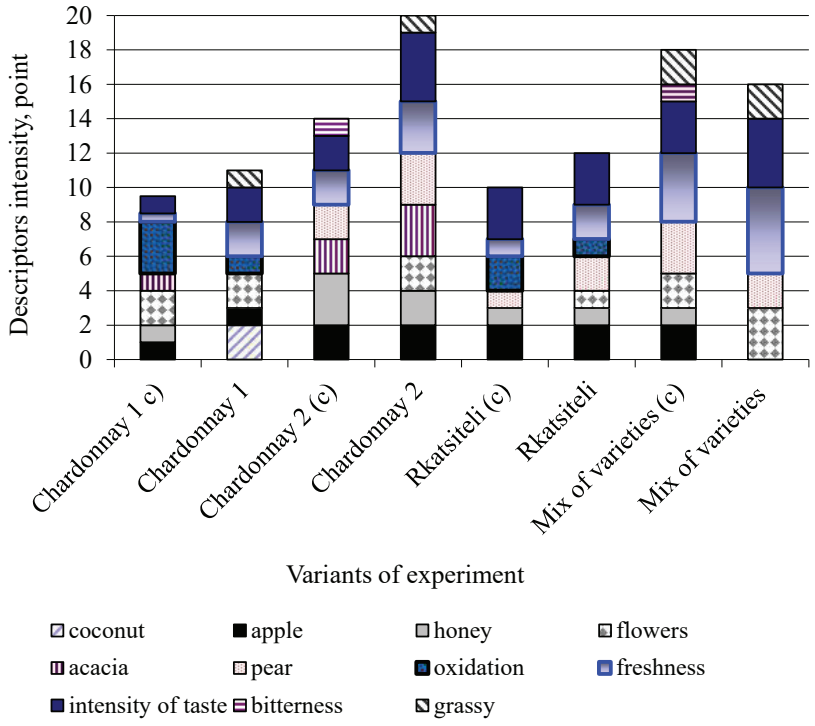

Fig. 1. Influence of the treatment by tannins and mannoproteins products on sensory profiles of wine materials from non-aromatic varieties of grape:
c – control (without treatment by preparations)

The treatment of wines from aromatic grape varieties by products of tannins and mannoproteins in general has improved sensory characteristics of wines. They became fresher. A feeling of

oxidation and bitterness disappeared. Tasters mainly noted a small increase in one descriptor that prevails in the samples of the varietal wine materials.

It should be noted, that Muscat Ottonel wine had an unusual aromatic characteristics – a strong apple note and a linden note. The co-treatment by products of Subliwhite together with Ultima soft did not affect the descriptors of linden and rose, instead the apple tone was reduced by 2 times and there were barely noticeable tones of currant leaf (**Fig. 2**). Changes in taste characteristics were established. Thus, the bitterness decreased in 2 times from 4 to 2 points, and the intensity of taste increased in 1.5 times from 2 to 3 points.

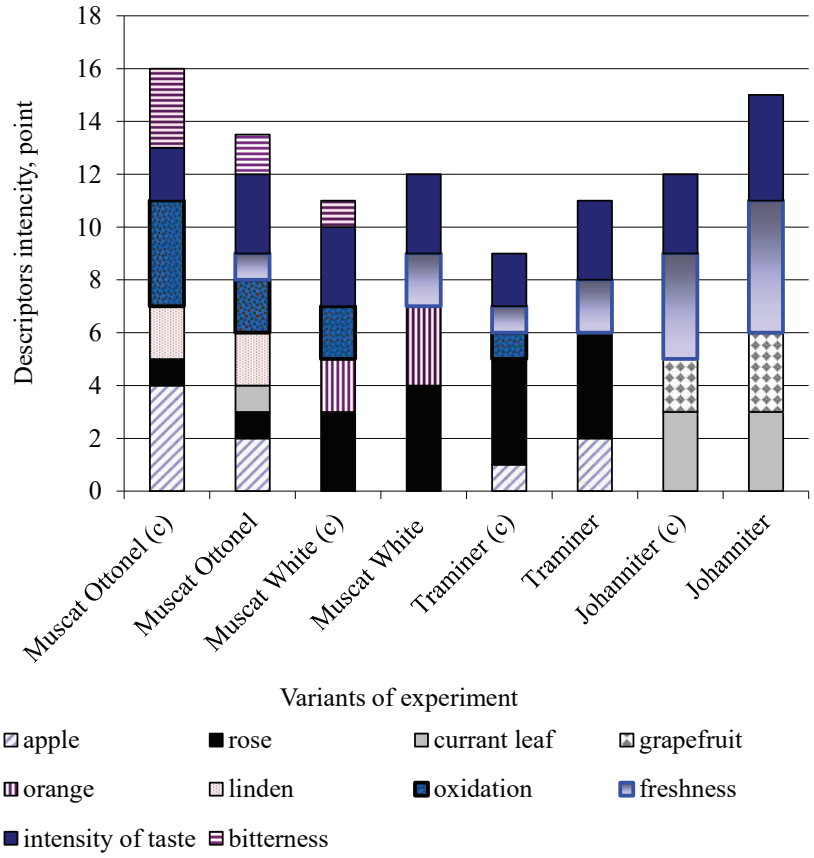

Fig. 2. Influence of the treatment by tannins and mannoproteins products on sensory profiles of wine materials from aromatic varieties of grape: c – control (without treatment by preparations)

Although the overall organoleptic characteristics of the sample improved, the products did not significantly affect the feeling of varietals characteristics.

The co-treatment of wine of white Muscat by Subliwhite and Ultima soft slightly increased the intensity of the tone of the rose and citrus notes. Wines, made from the grape of Traminer, that had a strong tea rose tone, after the treatment by mannoproteins, were slightly enriched by an apple tone and acquired freshness. The intensity of the aroma in Johaniter wine was increased mainly due to grapefruit tones.

Probably, for wines, made from aromatic varieties of grape, where prevail substances that fix one or maximum two descriptors, the effect of the products is weak, because they react to other substances that have much lower content.

The results of researches can be utilized to improve the quality of white wines. The further researches should be focused on the elimination mechanism of faults, caused by oxidation of wine components, from a wider range of varietal wines as a result of the treatment by tannins with different botanical origin and monnoproteins products.

4. Conclusions

The complex action of products of tannins (dosages of 0.12… 0.25 g/dal) and mannoproteins (dosages of 0.5…1.2 g/dal) in the technology of white wines production is improving their structure, harmonizing taste, removing unpleasant tones of bitterness and foreign tastes, increasing the intensity of aroma by 1…2 points (according of the five-point scale) and enriching them by additional tones. In the aromatic grape varieties, the effect of the treatment by the products was lightly noticeable, that is due to the presence of strong aroma and expressed taste of these grape varieties. In general, the utilization of oenological tannins and mannoprotein products has a positive effect on improving the quality of white wines from aromatic and non-aromatic varieties of grape, and their cost and dosages per unit of raw material make them economically attractive for widespread utilization in the winemaking.

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