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Improvement Of Winemaking Technology on The Basis of The Study of Antioxidant Activities

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Annotation: On a global scale, in the perspective of the development of the wine industry, it is planned to increase the production of aged vintage dry and high-quality fortified wines that meet modern market requirements. The main directions of development of the national economy of Uzbekistan provide for the expansion of the range and improvement of the quality of food products, including wine-making.

The action strategy for the further development of the Republic of Uzbekistan defines the tasks for "further modernization and diversification of industry by transferring it to a qualitatively new level, aimed at advancing the development of high-tech manufacturing industries, primarily for the production of finished products with high added value based on the deep processing of local raw materials"[1].

Key words: Oxygen, antioxidant protection, superoxide dismutase and peroxidase, therosinase.

Introductions. Oxidants are present in must and wine. Oxidation processes play a decisive role, both in typing and in the maturation and aging of wines. The regulation of oxygen content through the technological methods of winemaking will help to develop a set of measures, methods and means to improve existing technologies, taking into account the role of oxygen in winemaking, as well as individual stages and stages of production. Therefore, the study of the content of oxidants and the system of antioxidant protection is an urgent scientific and technical task, which makes it possible to clarify the technological regimes for the production of various types of improved quality wines, as well as competitive and environmentally friendly natural drinks by studying, modeling and optimizing complex oxidative processes in winemaking technology.

"Antioxidant activity of products and the system of antioxidant protection in winemaking" studied the system of AOP products of primary winemaking, the system of antioxidant protection and antioxidant activity of secondary winemaking.

If in white grape must the activity of catalase was noted only during its fermentation, then during the processing of red grapes, an increase in catalase activity is observed with crushing 0.421 μmol/min.dm3, then with pressing 0.82 μmol/min/dm3 and maximum with fermentation 2.02 μmol /min/dm3. The activity of the enzyme catalase, both in quantitative terms and in terms of technological methods where its activity is manifested, prevails in the processing of red grapes. And the processing of red grapes showed peroxidase activity: during runoff, the increase in activity was 3.9 μmol/min/dm3 and during sedimentation - 2.6 μmol/min/dm3.

From the results of the analyzes it follows that the red must is not sufficiently protected from oxidative stress.

Determination of antioxidant activity during technological processing of various wines.

When fining white wines, the antioxidant activity (AOA) decreases by 0.12 times (see Fig. 1), increases by 3.3 times during cold treatment, and 3 times during heat treatment, i.e. in white wines, AOA is

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determined not only by the content of phenolic components, but also due to the maturation and stabilization processes that take place during thermal processing. The maximum degree of antioxidant protection in white wines is observed during fining.

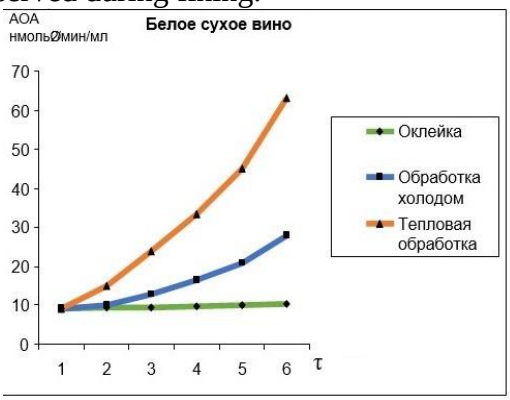


Fig.1 AOA of dry white wine.

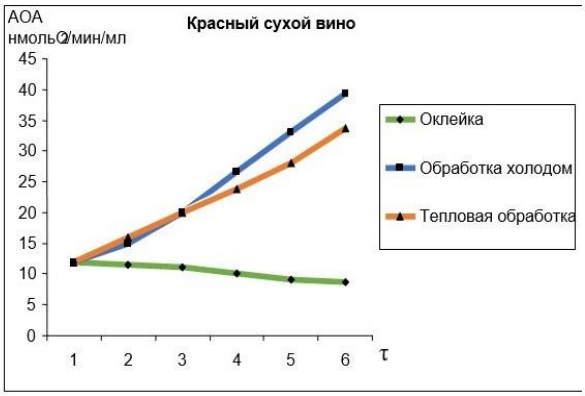


Fig.2. AOA dry red wine

In red wines (Fig. 2), AOA increases with all types of processing.

It increases when treated with bentonite - by 1.1, when treated with cold - by 3, and when treated with heat - by 6.8 times.

The heat treatment of red wines gives a maximum of AOA, and its quantitative value is twice as high as in whites, which once again confirms the high biological activity of red wines.

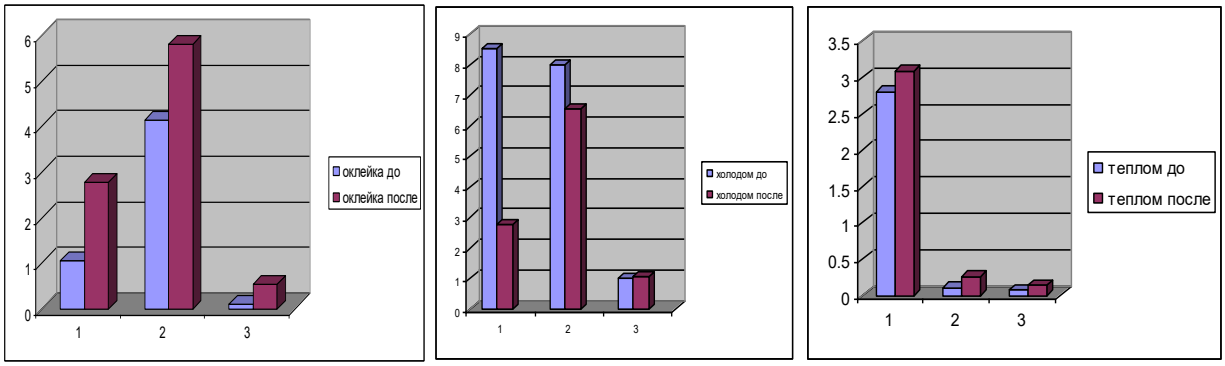
Compared with dry wines, the original fortified wine has a greater antioxidant activity.

Therefore, this technological method must be carried out when preparing an oxidized type of wine, which is the studied sample of fortified wine (Port wine).

Thus, in dry white wines, it was noted that oxidation occurs due to non-phenolic components; in red wines, oxidation occurs mainly due to the phenolic complex; in fortified wines, oxidation is less intense, but has a phenolic and non-phenolic character.

The presence of oxygen during technological processing increases in all wine samples (Table 3). That is, the concentration of the component that causes oxidation is constantly present and increasing, not excluding the risk of oxidative stress. Cold treatment of fortified wine brings it closer to the oxygen saturation concentration, which makes it possible to recommend it as an “oxidative stress” enhancer, which is necessary in the preparation of special types of wines.

Antioxidant protection of dry red wines. Red wines are characterized by a rich complex phenolic complex and have a high antioxidant activity, determined by the high content of phenolic and coloring substances.



a) b) c)

1 – SOD, conventional units, 2-catalase, μmol/min/dm3, 3-gluthione peroxidase, μmol/min/dm3.

Fig.8. Oxidative enzymes of the antioxidant defense system of dry red wine during technological processing (a, b, c).

Low-temperature treatment reduces the activity of catalase (Fig. 8b), but its value is approximately ten times higher than during heat treatment.

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Glutathione peroxidase activity increases in all samples, and it is maximal after wine fining and minimal (0.059 µmol/min/dm3) during heat treatment, which confirms the existing hypothesis that heat treatment accelerates wine maturation. And this technique is recommended to accelerate the maturation and typification of wines.

Technological methods adopted in winemaking in the production of multi-colored wines (white and red) inadequately affect the activity of antioxidant defense enzymes. Thus, catalase activity was maximum (8.12 µmol/min/dm3) in dry red wine after fining it with bentonite. The minimum activity (0.22 µmol/min/dm3) was noted in dry white wine after cold treatment. The increase in the activity of the catalase enzyme was the largest (2.2 µmol/min/dm3) in dry red wine treated with fining agents. Minimal inactivation of catalase was noted in dry red wine treated with heat, a jump in catalase activity (4.28 µmol/min/dm3) was observed when fining dry white wine, which indicates the presence of peroxidation.

Peroxidase had the highest activity among other samples in dry red wine after cold treatment, and the lowest activity appeared in dry white wine after cold treatment. The fining of dry red wine gave the greatest increase in the activity of the peroxidase enzyme (0.438 µmol/min/dm3). The decrease in peroxidase activity is significant (0.673 µmol/min/dm3) in dry white wines treated with heat. In other words, white wines that have undergone heat treatment are not at risk of oxidative damage.

Conclusion. The results of analyzes of dry white wines showed (Fig. 4) an equal increase in tyrosinase activity during heat treatment and fining, which indicates the oxidation of phenolic substances. Cold treatment reduces tyrosinase activity. That is, during cold treatment of dry white wine, oxidation of the phenolic complex is not observed. But cold treatment is mandatory for wines of this type and it is carried out in order to stabilize the wines against crystalline haze.

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