Studying the Activity of Tyrazinase, Included in the System of Antioxidant Protection of Wines

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ABSTRACT

On a global scale, 140 countries produce more than 250 million hectoliters of wine with a total vineyard area of 7.6 million hectares. Spain, China, France rank first, Uzbekistan thirteenth in the world in terms of vineyard area, cultivated on 73 thousand hectares, of which 10 thousand hectares are considered wine grape varieties.

Keywords: Oxidized wines, antioxidants, antioxidant defense systems, reactive oxygen species, enzymes, superoxide dismutase, catalase, peroxidase, tyrazinase, technology, heat treatment.

Introduction

Today, the attention of industry leaders around the world is focused on expanding the cultivation of wine grapes; for the production of high-quality wine products rich in antioxidants. The prospects for the development of the industry are focused on the production of competitive vintage table and fortified wines that are resistant to various types of turbidity and meet modern market requirements. The current situation requires modern solutions to the problems of improving technologies and its individual stages. So in Uzbekistan, scientific developments are being carried out on issues. According to peptide antioxidants, protecting wines from antioxidants is the oxidative processes of wine, the theoretical basis for the preparation of oxidized wines such as Sherry and the improvement of new device technologies. 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 the rapid 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»

The improvement of existing technologies and its individual stages and stages can be realized through the technological methods of winemaking with controlled oxygen content. Therefore, the study of the content of oxidants and si The main processes that occur during fermentation are the extraction of polyphenols, the production of alcohol (8-15%), the extraction of color pigments - anthocyanins [1], the production of carbon dioxide (CO_2), the release of energy, the formation aromatic compounds such as esters, polyhydric alcohols, fatty acids. The difference between the production of white and red wines is that in the manufacture of red wine, fermentation occurs with the skin (on the pulp), while in the manufacture of white wines, only the juice ferments. If at the same time fermentation is undesirable, the temperature is lowered to 12 0C. The reason for stopping alcoholic fermentation can be high sugar concentration, low nitrogen content, a decrease in thiamine, excessive clarification of the wort, pesticides and lack of oxygen [2]. Maceration - the process associated with the insistence of the must on the pulp, differs in time for white and red wine. Infusion of white must on the pulp is carried out before fermentation, for red wine this process is carried out during and after fermentation. The duration of maceration for white wine does not exceed one day, for red wine it can be 1-2 weeks or more. The main accumulation of anthocyanins in wine during maceration occurs within 7 days. Short maceration [3] has the following advantages:

- fast and complete diffusion of pigments, tannin complexes and certain polysaccharides;
- stabilization of wine polyphenols and aromatic compounds.

Cold maceration prior to fermentation (-50C ÷ +50C) for 48 hours for red wine improves the characterization of the wine, both in terms of chemical analysis and taste characteristics. [4]. Unlike maceration, which is carried out after the fermentation process, carbon dioxide maceration [5] before fermentation in an atmosphere of carbon dioxide can be used to produce red wine. After fermentation and maceration, the wine (red) is separated from the sediment and solid components (skins, stems, seeds). Samotek is the wine of the highest quality, while the rest is pressed one or more times, as a result, the pressed wine is richer in pigments and tannins [6].

Analysis and results

The difference between the production process of red and white wine lies in the processing of the components of the grapes (juice, seeds, skins and stems) as well as in the clarification processes before, during and after fermentation. The skins provide red wine with coloring and tannic acid, so fermentation takes place before pressing. Stopping fermentation is carried out in various ways, among which: sulfitation (sulfur dioxide), heat treatment (heat or cold), maintaining low temperatures during fermentation to accumulate CO2. [7] In the manufacture of strong, dessert and liqueur wines, alcohol and other ingredients are added to grape must during fermentation or to blending in secondary winemaking. Fortified oxidized wines include wines such as port, Madeira, sherry. The system of antioxidant protection is an urgent scientific and technical problem.

- low-temperature treatment increases antioxidant activity while reducing all other indicators;
- during heat treatment, an increase in AO, tyrosinase and catalase activity is observed;
- fining of dry red wine is characterized by a minimal increase in antioxidant activity, a decrease in tyrosinase activity with the activation of all other AOP components;
- cold treatment increases antioxidant activity, while reducing all other indicators of the process under study;
- heat treatment is accompanied by a maximum increase in antioxidant activity with an extreme decrease in tyrosinase activity, with a simultaneous increase in the activity of all studied AOP components, but the minimum oxygen concentration;
- during cold treatment, the antioxidant activity of fortified wines remains unchanged, tyrosinase activity and the activity of catalase and peroxidase increase, but the activity of SOD decreases; oxygen index - limiting, somewhat lower than when treated with gluing agents and heat treatment (8.2 versus 8.4);
- fortified wine treated with heat does not change its antioxidant activity, while tyrosinase activity decreases with maximum SOD activity and a slight increase in catalase and peroxidase.

- fortified wine treated with heat does not change its antioxidant activity, while tyrosinase activity decreases with maximum SOD activity and a slight increase in catalase and peroxidase. The results of analyzes to determine the activity of the tyrosinase enzyme in dry white wines subjected to processing in secondary winemaking showed that at an initially sufficiently high tyrosinase activity (about 17 nmol/min/ml), an equal increase in tyrosinase activity was observed during heat treatment and fining, which indicates oxidation of mainly phenolic substances.

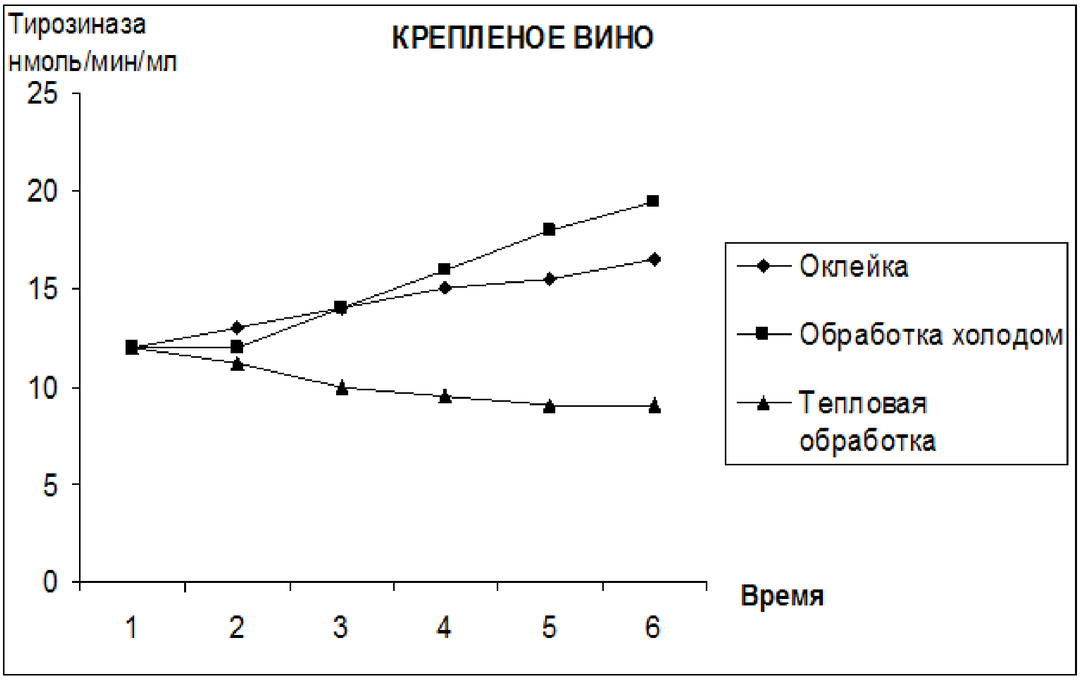

Fig. 1. Relationship between antioxidant activity and tyrazinase activity in white wines

The results of this study indicate that the relationship between antioxidant activity and tyrazinase activity in white wines (regardless of their strength) is not observed.

Let us turn to the antioxidant activity of wine materials from the perspective of the activity of the tyrosinase enzyme. The main components of antioxidant activity are phenolic substances, and tyrosinase is an enzyme that catalyzes their oxidation. As we can see, the decrease in antioxidant activity in dry white wine is accompanied by the activation of tyrosinase. This means that gluing reduces the content of phenolic substances, which, apparently, have been oxidized by tyrosine. In red wines, there is a correlation between antioxidant activity and tyrosinase activity. In these wines, substances of a phenolic nature are oxidized at all technological stages. They are also the main components of their antioxidant activity.

Tyrosinase is an enzyme that mainly catalyzes the oxidation of phenolic antioxidants and determines the high activity of antioxidant activity [8], which is characterized by substances of a phenolic nature. Studies by American scientists on the study of the total antioxidant activity and the concentration of phenolic compounds in wines showed that there was not always a correlation between the total content of polyphenolic compounds and the dynamics of the organic potential in samples of their technological processing. Plant polyphenols are divided into condensed and hydrolysable, contained in red grapes and wines in fairly large quantities. Tyrosinase monooxygenase catalyzes the oxidation of phenols to form orthodiphenols and the subsequent oxidation of phenols to orthoquinones. Moreover, the oxidizing agent in both reactions is molecular oxygen [9]. Tyrosinase causes high antioxidant activity, which is characterized by substances of a phenolic nature. Tyrosinase monooxygenase catalyzes the oxidation of phenols with the formation of orthodiphenols and the subsequent oxidation of phenols to orthoquinones. Moreover, the oxidizing agent in both reactions is molecular oxygen [10]

Conclusion

The improvement of existing technologies and its individual stages and stages can be realized through the technological methods of winemaking with controlled oxygen content. Therefore, the study of the content of oxidants and si The main processes that occur during fermentation are the extraction of polyphenols, the production of alcohol (8-15%)

References

1. Bradshaw, M. P., Scollary, G. R. & Prenzler, P. D., 2001. Ascorbic acid-induced browning of (+)-catechin in a model wine system. J. Agric. Food Chem. 49, 934- 939.
2. Методы контроля. Химические факторы. Руководство по методам контроля качества и безопасности биологочески активных добавок к пище. Руководство Р 4.1.1672-03.М: Федеральный центр госсанэпиднадзора Минздрава Росии, 2004
3. Теоретиечское обоснование и совершенствование технологии красных вин путем регулирования состава фенольных веществ физико-химическими и биохимическими приёмами». Дисс. д.т.н. 2010г. Маркосов Владимир Аромович.
4. David R. Kearns. Physical and chemical properties of singlet molecular oxygen. Chemical Reviews, 1971, 71(4), 395—427. DOI:10.1021/cr60272a004en:Singlet oxygen ja:一pl:Tlen singletowy/
5. Шольц-Куликов Е.П. / Виноделие по-новому // под ред. Г.Г. Валуйко. – Симферополь: Таврида, 2009. – С.320.
6. Sacchi, K. L., L. F. Bisson, et al. (2005). "A review of the effect of winemaking techniques on phenolic extraction in red wines." Am. J. Enol. Vitic. 56(3): 197-206.
7. Zuraldo, Donald J,P. Icewine : extreme winemaking .Kanada. 2007,192p
8. 8. Мехузла Н.Н., Щербаков С.С. Разработка способа производства природно-полусладких вин. // Хранение и переработка сельхозсырья. - 2009 - №7 - С. 9-12
9. 9. Zimman, W. Joslin, M. Lyon, J. Meier, and A. Waterhouse. "Maceration variables affecting phenolic composition in commercial-scale Cabernet Sauvignon wimemaking trials". Am. J. Enol. Vitic. 53:2, 93-98. 2002.
10. Шольц-Куликов Е.П., Геок В.Н. Технология красного полусладкого вина на основе недобродов. // Виноградарство и виноделие. - 2005 - №6 - С. 32-33.
11. M. Castellari, L. Matricardi, G. Arfelli, S. Galassi, A. Amati Level of single bioactive phenolics in red wine as a function of the oxygen supplied during storage. Food Chemistry 69 (2000) 61-67.