

BIOCHEMICAL PROCESSES IN THE PRODUCTION OF TABLE WINES

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When the berries are crushed, the fermentation processes in the grape must are intensified. Oxidative processes especially intensify during this period. First, as a result of enzymatic oxidation of polyphenols in grape juice, molecular oxygen under the action of o-diphenyl oxidase produces quinones, which degrade easily oxidizing substances in must and are again reduced to polyphenols. Secondary oxidation processes occurring during this period cause oxidation of ascorbic and dioxyfumaric acids, amino acids, oxyacids and other substances based on the catalytic action of quinones. Acid oxidation is accelerated by the simultaneous action of ascorbate oxidase and dioxyfumaric acid oxidase present in the wort. After complete oxidation of acids, the accumulation of quinones can proceed quite intensively. Later, as they thicken, they are able to form condensed oxidation products that give the wort a brown-brown color and reduce its quality. Enzymatic transformations of oxyacids and amino acids lead to the formation of new organic acids – malic, citric, glycolic, succinic, fumaric and amino acids – and only their partial oxidation with the release of CO₂. After hydrogen peroxide appears as a result of the action of flavoprotein and other oxidizing enzymes, oxidation of polyphenols can also occur under the influence of peroxidase. With the formation of peroxide, catalase is also activated, which protects the cell from the harmful effects of an excess amount of peroxide. Peroxidase oxidizes wort polyphenols into straw-yellow colored products. This way of oxidation takes place both during the crushing of grapes, and in the mash during pressing, and in the wort during its settling.

The intensity of oxidizing processes in the wort during its settling depends on the degree of crushing of the grapes. The more finely chopped the berries are, the better the extraction of substances from hard tissues (for example, phenolic compounds) with wort takes place, while favorable conditions are created for the passage of primary and secondary oxidation processes. Enzymatic processes that occur at the initial stage of wine formation include hydrolytic processes. Thus, in must, due to the presence of β -fructofuranosidase, sucrose inversion occurs immediately after crushing the grapes. Pectolytic enzymes cause the breakdown of protopectin, and subsequently pectin, with the release of methyl alcohol and the formation of galacturonic acids. Since the activity of grape pectinases is low, pectolytic enzyme preparations are used to accelerate the hydrolysis of pectin substances in mash and must. This allows you to increase the speed and juice yield, reduce the viscosity of the juice, facilitate the process of filtering and clarifying the wort. On the other hand, as a result of the destruction of protopectin and the change in the viscosity of the wort, favorable conditions are created for a more complete transition of substances contained in the dense cells of the skin and berries, which affect the aroma, taste and color of the wine. Knowledge of the chemistry of enzymatic processes allows you to correctly create winemaking technology depending on the type – to inhibit or activate these processes. In the production of wine, various processes are used that prevent oxidation. (introduction of sulfuric anhydride into the wort during settling, which has an antiseptic and antioxidant effect; treatment of the wort with bentonite in order to remove proteins, including oxidizing enzymes, while the wort almost completely stops absorbing oxygen). In some cases, on the contrary, oxidizing processes during grape processing play a positive role. Thus, during the production of Kakheti wines, the wort is not separated from the pulp and part of the combs, and fermentation takes place together with solid particles containing active oxidizing enzymes. As a result of the increased content of polyphenols and intensive passage of a number of oxidation processes, such wines differ from other types of wines in color (they have the color of infused tea) and a characteristic tart taste.