ANALYSIS OF THE MECHANISM OF FORCED OXIDATION OF GRAPE SEED OIL

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Lipid oxidation is one of the major causes of decreased nutritional value of foods, limiting their shelf life. This phenomenon leads to changes in the nutritional and organoleptic quality of the oils. Consumption of metabolites of oxidative degradation of lipids is the cause of oxidative stress of the human body and, respectively, causes multiple morbid conditions for human health. In food, the oxidation of lipids is a process consisting of a series of stages, being influenced by the chemical structure of unsaturated fatty acids, their physical state (liquid or solid), the presence of inorganic oxidants (ions of some metals: Fe^{2+}, Cu^{2+}, Co^{2+}, Mn^{2+}) or organic (haemoglobin, myoglobin), the pre-existence of free radicals, the existence of lipases, the quantity and quality of substances with antioxidant role in food, the way of food processing, the way of packaging and the conditions of food storage. Stopping or inhibiting the lipid self-oxidation process is of practical importance for various industrial applications, especially for the food industry. One of the most rational methods of inhibiting lipid self-oxidation is the use of affordable, relatively inexpensive natural antioxidants that do not affect the health of potential consumers. In order to select antioxidants potentially useful for inhibiting the oxidative process, it was necessary to study and understand the mechanism and kinetics of the lipid self-oxidation process, the influence of various factors on the process kinetics, both in the absence and presence of antioxidants.

Grape seed oil, a local product ("Golden Tear") was used as a substrate. A study was performed on the process of forced oxidation of oil in the presence of hydrogen peroxide and Cu (II) ions. The action of some antioxidants on the oxidation process was researched: α-tocopherol, n-octyl gallate, L-ascorbic acid 6-palmitate and matcha extract (green tea). The oil samples with the addition of different concentrations of H_2O_2 and Cu^{2+} were placed in airtight containers. Periodically, for 800 hours, samples were extracted to determine the peroxide index and the content of conjugated dienes and trienes.

Following the forced oxidation of the researched oils, products of the oxidation reaction (HPLC method) were identified: hexanal, octanal and hydroxinonadienal. It was found that the most intense dynamics is attested in the first 12 hours of exposure to prooxidant conditions. Optimal concentrations of oxidizing agents to accelerate the oxidation process – hydrogen peroxide (10^{-3} M) and Cu^{2+} ions (10^{-3} M) were established. The inhibitory action was demonstrated by the application of the antioxidants α-tocopherol, L-ascorbic acid 6-palmitate, n-octyl gallate, macha extract. The effective action of L-ascorbic acid 6-palmitate and n-octyl gallate has been established. Less effective have been established to be α-tocopherol and matcha extract.

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