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Physical and Chemical Methods Involved in Enzymatic Browning

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Short Communication

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ABOUT THE STUDY

Browning is the process by which food turns brown as a result of chemical reactions within it. Browning is a chemical reaction that occurs in food chemistry and is an intriguing research topic in the fields of health, nutrition, and food technology. Though there are numerous ways for food to change chemically over time, browning in particular is divided into two categories: enzymatic versus non-enzymatic browning processes. Browning has numerous significant implications for the food industry in terms of nutrition, technology, and economic cost. Researchers are particularly interested in browning control and the various methods that can be used to maximise this inhibition and, ultimately, extend food shelf life.

Enzymatic browning

One of the most important reactions that occurs in most fruits and vegetables, as well as seafood, is enzymatic browning. These processes have an impact on the taste, color, and monetary value of such foods. In general, it is a chemical reaction involving Poly Phenol Oxidase (PPO), catechol oxidase, and other enzymes that results in the formation of melanin's and benzoquinone from natural phenols. Enzymatic browning necessitates the presence of oxygen. It starts with polyphenol oxidase converting phenols into quinines, which are highly electrophilic and thus vulnerable to nucleophilic attack from other proteins [1]. These quinines are then polymerized through a series of reactions, resulting in the formation of brown pigments on the food's surface. The amount of active polyphenol oxidases present in the food determines the rate of enzymatic browning. As a result, the majority of research into methods of preventing enzymatic browning has focused on inhibiting polyphenol oxidase activity. However, not all browning of food has a negative impact.

Control of enzymatic browning

Enzymatic browning control has always been a challenge for the food industry. To prevent or slow down enzymatic browning of foods, a variety of approaches are used, each aimed at targeting specific steps of the chemical reaction.

The various types of enzymatic browning control can be divided into two broad categories: physical and chemical. Generally, multiple methods are employed. The use of sulphites has been reconsidered due to the potential hazards associated with their activity [2]. Much research has been conducted to determine the precise types of control processes that occur when the enzymatic process is encountered. Aside from prevention, browning control also includes measures to recover the color of the food after it has browned. In winemaking, for example, ion exchange filtration or ultrafiltration can be used to remove brown color sediments from the solution.

Physical methods

Heat treatment

Heat treatment of food, such as blanching or roasting, de-nitrates enzymes and destroys the reactants that cause browning. Blanching is used in winemaking, tea processing, storing nuts and bacon, and preparing vegetables for freezing preservation, among other things. Meat is frequently partially browned on high heat before being incorporated into a larger preparation that will be cooked at a lower temperature, resulting in less browning.

Cold treatment

The most common methods of storing food and preventing decay are refrigeration and freezing. Browning enzyme activity decreases at low temperatures. As a result, refrigeration helps to preserve the appearance, color, and flavor of fresh vegetables and fruits. Fruit and vegetable distribution and retailing also make use of refrigeration [3].

Irradiation

Another method for extending food shelf life is to irradiate it with UV-C, gamma rays, x-rays, and electron beams. Ionizing radiation reduces the viability of microorganisms that cause food spoilage and causes the maturation and sprouting of preserving vegetables and fruits to be delayed.

Chemical methods

Acidification

Browning enzymes, like all enzymes, are active at a specific pH range. To maintain a desired pH in food products, acidifying agents and acidity regulators are widely used as food additives. As anti-browning agents, acidulates such as citric acid, ascorbic acid, and glutathione are used. Many of these agents have additional anti-browning properties, such as complexation and antioxidant activity [4].

Antioxidants

Many antioxidants are used as food additives in the food industry. These compounds react with oxygen and prevent the browning process from starting. They also inhibit melanin formation by interfering with intermediate products of the following reactions. Antioxidants that have been studied for their anti-browning properties include ascorbic acid, N-acetylcysteine, L-cysteine, 4-hexylresorcinol, erythorbic acid, cysteine hydrochloride, and glutathione.

CONCLUSION

Enzymatic browning alters the color, flavor, and nutritional value of foods, resulting in significant economic loss when they are not sold to consumers on time. It is estimated that enzymatic browning wastes more than half of all produce. The rise in human population and the resulting depletion of natural resources has prompted many biochemists and food technicians to develop new or improved methods to preserve food for longer periods of time by inhibiting the browning reaction. This effectively extends the shelf life of foods, thereby addressing this aspect of the waste problem. Understanding the properties of the enzymes and substrates involved in the reaction, in particular, understanding the properties of the enzymes and substrates involved in the reaction, may certainly help technologists control certain stages of the mechanism and ultimately apply that knowledge to inhibit browning.

REFERENCES

1. Ranjan A, et al. A Modern Ampelography: A Genetic Basis for Leaf Shape and Venation Patterning in Grape. Plant Physiol. 2014; 164:259-272.
2. Charlotte P, et al. Photosynthesis, Transpiratin, and Water Use Efficiency of Mature Grape Leaves Infected with Uncinula necator (Powdery Mildew). Physiology and Biochemistry. 1983; 72:232-236.
3. Loughner R L, et al. InXuence of leaf trichomes on predatory mite (Typhlodromus pyri) abundance in grape varieties. Exp Appl Acarol. 2008; 45:111–122.
4. Estrada M C, et al. Nondestructive Methods to Estimate Leaf Area in Vitis vinifera L. Ann Bot. 2000; 35:696-698.