

1. INTRODUCTION

The freezing and drying preservation of fruits is one of the growing food industries in Egypt in the last decade. Frozen and dried products find an extending market for the local consumption and for export.

Drying fruits is an established in Egypt while freezing banana and Egyptian apple fruits is a promising new trend as an intermediate product for many food processing.

The most serious problem in the freezing and drying preservation of fruits is the activity of the oxidative enzymes, which results in quality and nutritional deterioration of the food product during the frozen and dried storage.

The term chemicals (citric acid and sodium metabisulphite) and thermal (water and steam blanching) treatments were originally used to designate those heat treatment operation in the processing of foods for frozen and dried storage which prevent deterioration changes that occur in foods.

Prevention of browning in the apple and banana slices is difficult to achieve because of rapidity of the enzymatic oxidation of phenolic substrates (**Annese *et al.*, 1997** and **Kim *et al.*, 1993**). A common approach to preventing of the enzymatic browning is the use of antibrowning agents that act primarily on enzymes or reacts with substrates and/or products of enzymatic catalysis, so that the pigment formation is inhibited (**McEvily *et al.*, 1992**). The prevalent use of sulfites as inhibitors of enzymatic browning in foods has been restricted by the Food and

Drug Administration (**Anon, 1987**) due to allergic reactions produced some times in individuals with respiratory ailments. Some natural agents can be effective replacements for sulfur dioxide (SO₂), at the same time satisfying the consumer demand for fewer chemicals in food products. The use of alternative anti-browning agents from natural products is however extremely limited. Some of the leafy vegetables, such as cabbage and celery, contain ascorbic acid and sulfur dioxide (SO₂) (**Heinze, 1970**). Pineapple and lemon juices have been reported to prevent discoloration of cut surfaces of fruits and vegetables (**Bennion, 1990 and Patricia et al., 1993**). Steam blanching is widely used in the industry of fruit and vegetable products. It helps to inactivate the polyphenoloxidase (PPO) activity responsible for flavour alteration and tissue softening (**Ponne et al., 1994**).

Pre-drying treatments, and subsequent drying and rehydration induce many changes in the structure and composition of plant tissue (**Lewicki, 1998**) that result in impaired reconstitution properties. Rehydration can be then considered as a measure of the injuries to the material caused by drying and treatments preceding dehydration. The porous structure of dried fruits and vegetables can affect both the transport properties and quality characteristics. Air-drying gives a smaller pore size of apple than freeze-drying, owing to the structure collapse during the air-drying process (**Karathanos et al., 1996**). Loss of water and segregation of components occur during drying, resulting in rigidity of the cell walls. The outer layers of dried material become rigid and acquire considerable mechanical strength (**Lewicki et al., 1997**). **Sagar et al. (1998)**

reported that the dried mango slices could be stored at low and room temperatures without losing their color, flavor and texture.

Most recent reviews have concentrated on the mechanism of action of the enzymes and particularly on the function of some conditions in them.

Therefore the present work was designed to study the kinetic of the oxidative enzymes with different conditions. Also, the scope of the investigation was concentrated on the following main aspects:

- 1- Study the effect of the conventional thermal (water and steam blanching) and chemicals (ascorbic acid, citric acid and sodium meta-bisulphite) pretreatments on the oxidative enzyme activity of the apple and banana slices.
- 2- Study the effect of natural vegetable extracts pre-treatments on the oxidative enzyme activity of the apple and banana slices.
- 3- Evaluate the potential of natural vegetables extract (NVE) from cabbage, Taro pulp and peel) for inhibition of enzymatic browning as oxidative enzymes activity (PPO, POD and CAT) in fresh apple and banana slices by dried rings and frozen pulp, as compared with the effectiveness of thermal and chemical pre-treatments.
- 4- Study the changes in chemical characteristics, browning, pigments, color, vitamin C, microbial counts and sensory properties after drying and after freezing,

- 5- Study the effect of pretreatments, freezing and storage at -18°C on the oxidative enzyme activity, microbiology and quality characteristics of banana and apple puree.
- 6- Study the effect of pretreatments, drying and storage at room temperature (20-30°C) on the oxidative enzyme activity, microbiology and quality characteristics of banana and apple rings.