5. SUMMARY AND CONCLUSIONS

Fruits are rich with antioxidants that help in lowering incidence of degenerative diseases such as cancer, arthritis, arteriosclerosis, heart disease, inflammation, brain dysfunction and acceleration of the ageing process. The freezing and drying preservation of fruits is one of the growing food industries in Egypt in the last decade. We selected Egyptian apple and banana to use experimental in this research. We used some treatments such as:

1. Thermal treatments:

* Blanching on degree 100ºC (1, 2 and 5 min.)
* Steaming on degree 100ºC (1, 2 and 5 min.)

2. Chemical treatments

* Ascorbic acid (0.5, 1 and 2%)
* Citric acid (0.5, 1 and 2%)
* Sodium metabisulfite ($Na_2S_2O_5$) (0.05, 0.1 and 0.2%)

3. Natural extract treatments:

* White cabbage extract(5, 10, 15, 20 and 25%)
* Taro pulp extract (5, 10, 15, 20 and 25%)
* Taro peel extract (5, 10, 15, 20 and 25%)

The optimum temperature for activity of banana and apple of PPO, POD and CAT enzyme activity was 40°C. The enzyme activity decreased with increasing temperature and time showing less activity at 70°C. The maximum activity was 0.2 M catechol,

O-phynelenediamine and sodium perborate with increasing the concentration a corresponding decline in activity was noticed. The results mentioned above concerning the effect of pH, temperature and substrate concentration derived from the study of crud enzyme combination of isoenzymes and interaction with nonenzymatic proteins. High degree of inactivation has been achieved in the first 2 min until 5min of water and steam blanching treatment. The best concentration of ascorbic acid was 2.0% to effect in improving it final acceptability and to make inhibition of PPO activity in various fruit slices, especially for banana and apple. Also, the best concentration of CA 2.0% or inhibition of PPO in banana and apple. However, it could be noticed that addition of $Na_2S_2O_5$at 0.2% in the soaking solution took place as the inhibition of PPO increased.

Generally, the result showed that the CA, $Na_2S_2O_5$ and steam blanching heated samples were not found any browning after 8weeks storage at -18°C for all banana pulp compared with AA, water blanching and untreated samples. The apple slices pretreated with $Na_2S_2O_5$, steam and water have also the highest reduction of Yeast & Molds and bacteria followed by CA, but it pretreated with AA and untreated samples were the lowest reduction of yeast & molds and bacteria after 4 months stored at 25^oC. The low pH of apple products restricts the growth of a wide variety of microorganisms. Only yeast, molds and lactic acid bacteria are capable of prolific growth in apple products. Significant organisms present in processed apple products fall into three categories-spoilage organisms, pathogenic organisms and fermentation organisms. Growth of yeast, mold and bacteria

may lead to production of off-flavors and unacceptable filamentous structures in processed apple products. The percent of inhibition (%) of PPO, POD and CAT was high in 15% of taro pulp and peel treated apple slices (78.60-77.77%) versus 76.95% in 15% in cabbage treated slices. Which means that the taro extracts treated slices was higher than the cabbage extract treated slices and untreated apple slices.

CONCLUSIONS

There are numerous compounds capable of reducing the enzymatic browning; therefore the use of natural anti-browning agents is still stimulated to meet the demands for production of healthy fruit products having high quality. As far as the authors are aware this is the 1st theses dealing with to studying and evaluating the efficiency of natural extracts from the cabbage and taro pulp and peel to inhibit the enzymatic browning (PPO, POD and CAT) in banana slices and pulp and apple slices and pulp. On the other, hand the natural extracts from the cabbage and taro pulp and peel showed comparable results with thermal and chemical pre-treatments, so the use of these natural extracts is more economical. Generally natural extract pre-treatments, especially cabbage, taro pulp and taro peel extract may be effective inhibitors of PPO, POD and CAT catalyzed browning. While cabbage extract itself was not as effective as steam blanching or chemicals in inhibiting browning in dried banana and apple rings and pulp, it still may be useful where use of steam blanching or chemicals are to be avoided. These data suggested that in addition to producing dried banana and apple

rings by inhibiting browning and microbial growth without imparting objectionable color and flavor, these treatments (cabbage, taro pulp and taro peel extracts) incorporating the anti-browning compounds also maintained higher pigments levels, retained color stable (white and red peel), higher galactomanan content in taro pulp (Ferro sugar) which separate between substrate and enzymes, had no browning and had no deterioration in sugar levels indicative of better maintenance of quality after drying of banana and apple slices and pulp. Also, this technique is important to prevent of decrease in market value and the concomitant economic losses. Furthermore from a technological point of view, it would be conceivable to use these natural anti-browning in processed fruits provided that their safety is assessed and their commercial feasibility is demonstrated.

RECOMMENDATIONS

Nutritional and technological studies of the present work revealed the following recommendation:

1- The new trend in the world is eat the prepared fruit slices and pulp because its safety and acceptable to consumer.

2- The most fruits that have high ratio of the enzymatic browning (PPO, POD and CAT) should be treated with safety cold treatments to inhibit the enzymes without any efficient on sensory properties in fruits for consumer.

3- Natural extracts from the cabbage and taro pulp and peel can use to inhibit the enzymatic browning in fruit products to

prevent enzymatic browning and the changes in organoliptic properties in fruit products.

4- Use of Natural extracts pretreatment to increase the shelf life of fruit that have short season without any efficient on the organoliptic properties of fruit.

5- Fruit have high nutritional value such as vitamins, minerals and fibers so must be use fresh without any thermal treatment. Also, the heat treatments can get fruit slices with off-flavor and cooked test.