Studies on the quality of minimally processed jakfruit

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Abstract

Minimal processing technologies should provide sufficient shelf life to foods to allow for their distribution and to meet consumer demands for convenient and fresh like quality. This study was conducted at Postharvest Technology Group, Industrial Technology Institute, Colombo to determine the quality and shelf life of minimally processed jakfruit, packed in polythene bags (150 g/bag) and stored at 6 °C for a week. Experiments were carried out to evaluate the microbial quality, sensory quality and respiration rates of blanched (50-55 °C for 1 min) and control jakfruit samples. Microbial changes were assessed through the Total Plate count, Yeast & Mould count, Staphylococcus count and Coliform count. The Coliforms were not found in the blanched product. Total Plate count and Yeast & Mould count showed significant differences among blanched and control samples and lower count was observed in the blanched product. Analysis of the cooked product showed the absence or very low count of all microbial contaminations. Variation of tissue color, firmness and Total soluble solid were studied in uncooked product during the week. Results showed that the blanched product has higher firmness value. Sensory evaluation indicated that there were no significant differences between control and blanched product. It can be concluded that minimally processed, blanched (50-55 °C for 1 min) jakfruit packed in polythene bags (150 g/bag) and stored at 6 °C for a week is in satisfactory condition for fresh market.

Keywords: Minimal processing, microbial count, shelf life, sensory evaluation, blanching

Introduction

The jak (*Artocarpus heterophyllus*) is a tropical evergreen tree belonging to the family Moraceae. In recent years, researches have proved that with preservation methods, jakfruit can be developed in to an alternative source of food to meet the needs of the growing population. Minimally processed fruits retain their flavor, aroma, and nutrition better than conventionally processed fruit. However, they are generally more perishable and vulnerable than the original raw materials due to the injury stress during preparation that greatly increase tissue respiration and lead to deterioration through various biochemical pathways. Moreover, minimal processing may increase microbial spoilage of the product through fruit tissues. Increased respiration, microbial and enzymatic activities are the main reasons for reducing shelf life. Therefore, the objectives of this study were to determine microbiological and sensory quality of minimally processed jakfruit stored at 6 °C for one week.

Methodology

At the laboratory, whole jakfruits were brushed and washed by using teepol and tap water. Then fruits were stored in cold room at 13.5 °C until the time of operation. At the time of operation, fruits were dipped in 200 ppm chlorinated water for 10 min. Outer skin of fruits was removed and whole seeds were removed and remaining fruit was cut lengthwise into cooking size pieces. They were pretreated by blanching in 50-55 °C water for 1 min. Control samples were prepared by dipping in boiled and cold water. The pieces were drained from the dipping solution and air-dried for 10 min using a fan. The dried pieces were quickly packed in polythene bags (150 g/packet). They were labeled and stored in refrigerator at 6 °C for a week.

All aseptic measures should be taken during the experiment. Samples were taken (1, 3, 5 and 7 d of storage) and analyzed for microbiological quality (SLS 516, 2003), physico-chemical changes and sensory quality.

Microbiological analysis - Plate counts (TPC, Y & M, Coliform and *Staphylococcus*) of uncooked and cooked samples were analyzed.

Analysis of physico-chemical changes - Color, firmness and TSS were analyzed in uncooked samples of both control and blanched. Data were analyzed using GLM and mean separation by DMRT at CI of 95 %.

Sensory analysis - Subjective measurements (color, texture and freshness) of uncooked samples and cooked samples were made by sensory panel. Each parameter was compared for treatment effects according to Friedman non-parametric test using Minitab.

Results and Discussion

Microbiological Analysis

Plate Count (TPC): Initially stored blanching sample showed a lower TPC. Then it was increased onday 3 and gradually decreased until day 7. However, control sample showed slight increment on day 7 (Fig. 1). During minimal processing, jakfruits were subjected to several physical changes, which increased cut damage surfaces and availability of cell nutrients. TPC was increased on day 3 because nutrients are easily available to microbes. Limited storage nutrients and competition among microbes resulted to decrease TPC. Slight increment may be due to favorable growth condition occurred in control sample, when it reached 7 d of storage. Lowest TPC was observed on cooked product.

Yeast & Mould (Y & M) count: When blanching, jakfruit pieces were subjected to 50-55 °C and most of Y & M may be destroyed. Thus, lower count could be seen in blanched samples (Fig. 2). Storage period at 6 °C had no significant effect on Y & M count. Slight increase in counts was observed due to availability of nutrients and acclimatization. There was a very little count on cooked sample compared to the uncooked one. Y & M may be easily destroyed when subjected to 100 °C during cooking.

Coliform count and *E. coli*: The presence of coliforms in control sample was significantly higher compared to blanch samples. Coliform count at 6 °C storage clearly indicated that there was a significant increase from day 1 to 3 (Fig. 3). Afterward, coliforms were not found and only a color change was observed. It was revealed that the minimum and maximum tolerant temperatures of pathogenic strains of *E. coli* were 6.5 and 49.4 °C respectively. Therefore, 6 °C storage condition could be successfully suppressed the growth of pathogenic strains of *E. coli* and the product could be recommended as safe for consumption.

***Staphylococcus* count:** Blanching (50-55 °C) did not show significant effect on *S. aureus* according to experimental results because temperature could not adversely affect on growth of the organism. Stored temperature (6 °C) did not show significant difference on the count of *S. aureus*. No organisms were found after cooking at 100 °C (Fig. 4) since it was not favorable for growth of *S. aureus*.

Analysis of Physico-Chemical parameters

Color: There was a significant reduction of hue angle at 1-3 d. Until day 5, blanched sample showed higher browning (Fig. 5) than control. However, slight decrease could be seen in blanched sample after 5 days. Thus, blanching had not much effect for the control of browning.

Firmness: Blanched sample showed higher firmness value than control samples (Fig. 6). Mild heat treatments may be feasible and have been used to retain firmness during storage (Grony, 1997). Storing the product at lower temperatures decreased the rate of respiration, which lowered the overall metabolism and rate of deterioration. Thus, there was no significant reduction of firmness when jakfruit stored at 6 °C.

TSS: Blanching had not much effect for the control of TSS. Upward trend (Fig. 7) could be attributed to the hydrolysis of starch to sugar during fruit ripening (Lizada et al., 1990). Fruit softening during ripening was recognized to the solubilization of pectic substances in the cell wall and middle lamella. Increased levels of water-soluble pectins were observed in advance of ripening.

Sensory analysis of minimally processed jakfruit

Blanching did not significantly affect all sensory quality parameters of MPJ (before cooking) during storage at 6 °C for a week. Although the difference was not significant, the blanching sample obtained higher sensory quality scores than control. Same observation could be seen in cooked sample (Fig. 8).

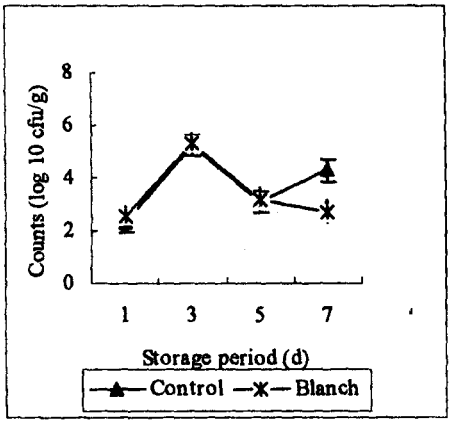

Fig. 1: Changes in the TPC of MPJ in storage at 6 °C

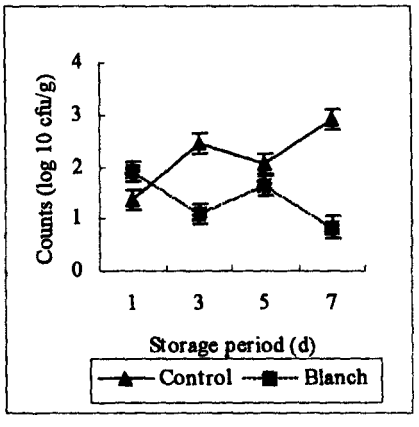

Fig. 2: Changes in the Y & M count at 6 °C

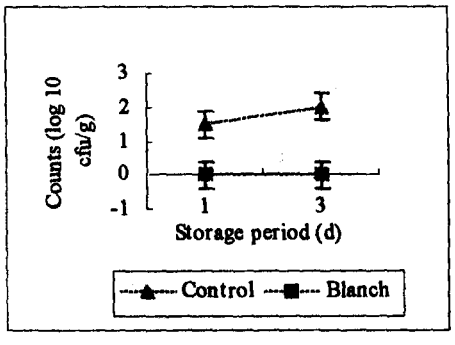

Fig. 3: Changes in the Coliform count of MPJ at 6 °C

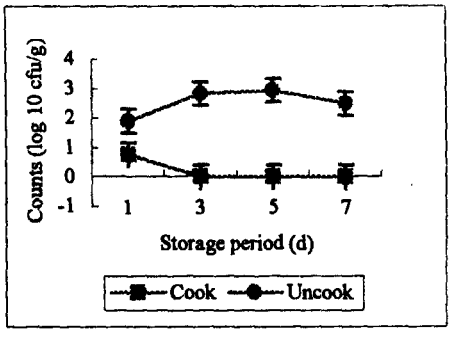

Fig. 4: Changes in the *Staphylococcus* count of MPJ at 6 °C

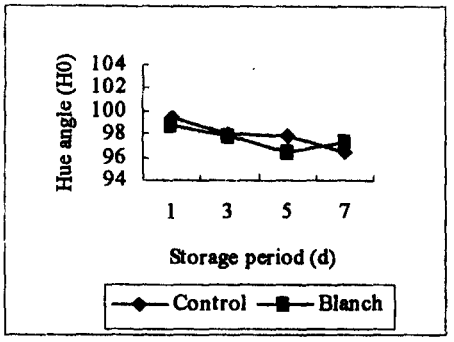

Fig. 5: Variation in hue angle of MPJ at 6 °C

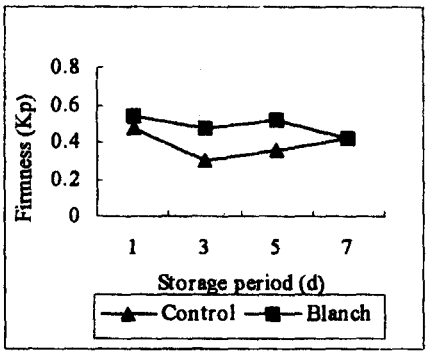

Fig. 6: Variation in firmness of MPJ at 6 °C

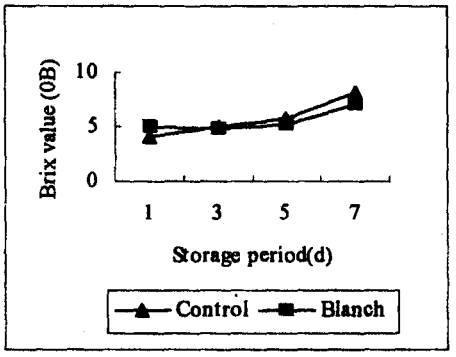

Fig. 7: Variation in TSS of MPJ at 6 °C

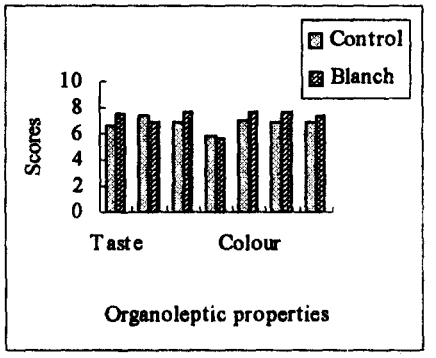

Fig. 8: Changes in the organoleptic properties of MPJ (after cooking) at 6 °C

Conclusion

The microbial quality was a satisfactory level even after 7 d of storage as compared to the maximum permissible limits for minimally processed food consumption. Sensory quality was also in acceptable level. Therefore, minimally processed, blanched (50-55 °C for 1 min) jakfruit packed in polythene bags (150 g/bag) and stored at 6 °C for a week was in satisfactory condition for the fresh market.

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