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Research Article

Effect of Antioxidants on Quality of Minimally Processed Jackfruit (*Artocarpus heterophyllus* L.) Bulbs

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ABSTRACT

An experiment was carried out in the Quality control and PHT laboratory of the Department of Horticulture, AAU, Jorhat during 2014-2015 to study the effect of antioxidants on quality of minimally processed jackfruit (Artocarpus heterophyllus L.) bulbs. Jackfruit bulbs were minimally processed using variables such as ascorbic acid, citric aid, calcium chloride at different concentration @ 0.02%, 0.02% and 1% respectively in different treatment combinations. There was a significant difference among the antioxidant treatment on physico-chemical properties and sensory quality of jackfruit bulbs. Among the treatments TA_7 (ascorbic acid+ citric acid+ calcium chloride) recorded lowest sugar, enzyme activity, pH and highest TSS, total carotenoid and acidity. TA_7 exhibited the highest score in colour, flavour, taste, texture and overall acceptability and the lowest microbial count.

Keywords: *Antioxidants, Bulbs, Jackfruit, Minimally processed.*

INTRODUCTION

Jackfruit (*Artocarpus heterophyllus*) is one of the most remunerative and important fruit crop of India. Consumers like jackfruit for its edible, delicious and attractive golden-yellow-coloured ripe bulbs. Due to low yield of edible portion, transportation and marketing of jackfruit is difficult. Development of suitable processing protocols for pitted and pre-cut bulbs could overcome the problems associated with pre-cutting such as flavour loss, tissue softening, cut surface browning and post harvest decay (Narasimham, 1990). It is here that the concept of minimal processing has emerged to satisfy demand of high quality products (Sudheer & Indira, 2007).

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Jackfruit as such is a bulky fruit and optimization of minimal processing technique for its value addition as minimally processed bulbs could be highly advantageous in making the commodity convenient for handling and transport. So it is desirable to develop suitable processing and storage protocols for the minimally processed jackfruit bulb.

MATERIALS AND METHODS

The experiment was carried out during 2014-2015 in the quality control and PHT laboratory of the Department of Horticulture, Assam Agricultural University, Jorhat.

Sample preparation:

Jackfruits were collected at brownish yellow skin colour of optimum ripening and without any microbial infection or mechanical fissures, from Experimental Farm, Department Of Horticulture, Assam Agricultural University, Jorhat. The fruit were cleaned to remove foreign matters and washed with 2% chlorinated water. Jackfruits were cut with sterilized knife under laminar air flow and the bulbs were extracted. The extracted jackfruit bulbs were sprayed with different antioxidant i.e., Ascorbic Acid (AA), Citric Acid (CA) and Calcium Chloride ($CaCl_2$) at different concentration @ 0.02%, 0.02% and 1% respectively and stored at room temperature.

Description of treatments:

The following antioxidants were tested for finding out the best antioxidant treatment for short term preservation of jackfruit bulbs. The treatments were as follows:

Control (T_0), Ascorbic acid 0.02% (T_1), Citric acid 0.02% (T_2), $CaCl_2$ 1.0% (T_3), Ascorbic acid 0.02% + Citric acid 0.02% (T_4), Ascorbic acid 0.02% + $CaCl_2$ 1.0% (T_5), Citric acid 0.02% + $CaCl_2$ 1.0% (T_6), Ascorbic acid 0.02% + Citric acid 0.02% + $CaCl_2$ 1.0% (T_7).

After treatment of bulbs with different antioxidants, data on chemical and organoleptic changes and microbial growth was recorded accordingly.

RESULTS AND DISCUSSION

Data on physico-biochemical properties of jackfruit bulbs after antioxidant treatments are furnished in Table 1. The pH values in the minimally processed jackfruit bulbs subjected to T_7 was showed lowest and highest was observed in T_0. The lowest reducing sugar and total sugar was observed in T_7 and highest was observed in T_0. The highest ascorbic acid was observed in T_1 and the lowest was observed in T_0. The highest total carotenoid was observed in T_7 and the lowest was observed in T_0. Highest TSS and acidity was observed in T_7 and the lowest was observed in T_0. The lowest polygalacturonase activity was observed in T_7 and the highest was observed in T_0 but there was no significance difference of specific activity among the treatments. Amongst different antioxidants used with different concentration and in various combinations, the spraying of solution containing 0.02 per cent ascorbic acid, 0.02 per cent citric acid and 1 per cent calcium chloride have been found to be most effective. This in agreement with many previous findings which reports the use of citric acid, ascorbic acid and calcium chloride at minimum level alone or in combination, to be beneficial in reducing browning reaction, stress induced metabolism, improving and maintaining firmness and organoleptic quality of various produce with extended shelf life (Soliva-Fortuny et al., 2002; & Martinez-Ferrer et al., 2002). Uses of ascorbic acid have versatile action like it acts as a competitive polyphenoloxidase inhibitor, it chelates copper ion, reduces *o*-quinones, therefore used as enzymatic browning inhibitor (Lozano-de-Gonzales et al., 1993). Citric acid is mostly used as acidifier in combination with other anti-browning agents to control browning. Calcium chloride has been widely used as preservative and firming agents in fresh-cut commodities (Martin-Diana et al., 2007).

Data presented on Table 2 represents changes in sensory quality of Jackfruit bulbs after treated with antioxidants. The colour quality declined irrespective of treatment across the storage. The highest colour score was recorded in T_7 and the lowest was recorded in T_0. The flavour score was highest in T_7 and lowest was recorded in T_0. The highest texture score was found in T_7 and the

lowest was observed in T_0. Taste score was highest in T_7 and the lowest in T_0. T_7 showed the highest overall acceptability while T_0 showed the lowest. This might be due to the properties of ascorbic acid and citric acid in better retention of colour, appearance and flavour while the better sensory score for texture could be influence by $CaCl_2$. Similar beneficial effect was also reported for Chinese cabbage, Pineapple and Jackfruit (Ediriweera et al., 2012; & Saxena et al., 2012). Minimum softening of apple slices for sometimes, by addition of $CaCl_2$ to an acidic dipping solution have been suggested by Ponting et al. 1971.

Microbial count (Table 3) of bulbs revealed that there was no post treatment and pre-treatment microbial infection except in T_0 which exhibited a microbial count after 72 hours of incubation. In all the treatments except in case of control, lesser microbial infection was observed in treatment solution containing ascorbic acid, citric acid and $CaCl_2$. This could be due to the antimicrobial effect of ascorbic acid as well as the chloride ion from $CaCl_2$ which acts toxic to microbes, thereby inhibiting their growth (Hui et al., 2006).

Table 1: Effect of antioxidants on chemical composition of jackfruit bulbs

Treatment	Reducing sugar (%)	Total sugar (%)	Ascorbic acid (mg $100g^{-1}$)	Total carotenoid (µg g^{-1})	Total soluble sugar (°B)	Acidity (%)	pH	Polygalacturonase	
								Enzyme activity	Specific activity
Initial	5.75	15.28	26.21	3.84	19.40	0.39	5.10	1.28	0.35
T_0	8.87	19.97	17.32	1.54	19.09	0.25	5.59	3.91	1.99
T_1	8.18	17.19	32.44	3.01	19.42	0.51	5.44	3.67	0.50
T_2	8.54	17.29	22.22	2.70	20.03	0.54	5.22	3.84	0.55
T_3	6.97	16.91	20.48	2.83	21.20	0.48	5.05	3.57	0.55
T_4	7.64	18.40	21.47	2.45	21.40	0.64	4.67	3.31	0.54
T_5	6.73	16.18	28.16	1.86	20.42	0.64	4.81	3.33	0.54
T_6	7.86	18.93	19.63	2.55	20.27	0.62	4.84	3.33	0.53
T_7	6.51	15.44	29.92	3.22	22.80	0.69	4.43	2.51	0.44
S.Ed±	0.076	0.088	0.319	0.069	0.153	0.021	0.071	0.059	0.748
$CD_{0.05}$	0.162	0.186	0.676	0.145	0.324	0.046	0.151	0.127	NS

*observations are taken on 1st day after treatment

T_0= Control, T_1= 0.02% AA, T_2= 0.02% CA, T_3= 1% $CaCl_2$, T_4= 0.02% AA+0.02% CA, T_5= 0.02% AA+1% $CaCl_2$, T_6= 0.02% CA+1% $CaCl_2$, T_7= 0.02% AA+0.02% CA+1% $CaCl_2$
NS= Non-significant

Table 2: Effect of antioxidants on the sensory quality of jackfruit bulbs*

Treatments	Colour	Flavour	Taste	Texture	Overall Acceptability
T_0	1.67	2.67	1.67	1.20	1.80
T_1	4.33	3.90	4.67	6.50	4.85
T_2	4.67	5.60	5.70	6.40	5.59
T_3	5.00	6.47	5.67	6.30	5.86
T_4	6.67	6.77	6.37	7.23	6.76
T_5	6.33	7.83	6.70	7.20	7.02
T_6	7.00	7.13	6.57	7.40	7.02
T_7	8.33	8.00	8.50	7.80	8.16
S.Ed±	0.577	0.420	0.290	0.181	0.204
$CD_{0.05}$	1.224	0.890	0.614	0.384	0.432

*observations are taken on 1st day after treatment

T_0= Control, T_1= 0.02% AA, T_2= 0.02% CA, T_3= 1% $CaCl_2$, T_4= 0.02% AA+0.02% CA, T_5= 0.02% AA+1% $CaCl_2$, T_6= 0.02% CA+1% $CaCl_2$, T_7= 0.02% AA+0.02% CA+1% $CaCl_2$

Table 3: Effect of antioxidants on presence and severity of microbes on jackfruit bulbs*

Treatments	Presence of microbes		Identification of microbes	Severity (log cfu ml^{-1})
	Pre-treatment	Post-treatment		
T_0	No	YES	A.spp, T.spp	5.80
T_1	No	No	-	-
T_2	No	No	-	-
T_3	No	No	-	-
T_4	No	No	-	-
T_5	No	No	-	-
T_6	No	No	-	-
T_7	No	No	-	-

*observations are taken on 1st day after treatment

T_0= Control, T_1= 0.02% AA, T_2= 0.02% CA, T_3= 1% $CaCl_2$, T_4= 0.02% AA+0.02% CA, T_5= 0.02% AA+1% $CaCl_2$, T_6= 0.02% CA+1% $CaCl_2$, T_7= 0.02% AA+0.02% CA+1% $CaCl_2$
A.spp= *Aspergillus spp*, T.spp= *Trichoderma spp*

CONCLUSION

Jackfruit bulbs sprayed with combine solution of 0.02 per cent ascorbic acid, 0.02 per cent citric acid and 1 per cent calcium chloride was found to be the best treatment in retaining sensory and physico-chemical properties of the bulbs.

REFERENCES

Narasimham, P. (1990). Breadfruit and jackfruit. In: Nagy, S., Shaw, P. E., & Wardowski, W. F. (Eds.), Fruits of tropic and subtropical origin: composition, properties and uses. Florida Science Source Inc., Florida. pp. 193-259.

Sudheer, K. P., & Indira, V. (2007). Minimal processing of fruits and vegetables. *Postharvest technology of horticultural crops*. *New India Publishing Agency*. pp. 183-203.

Amerine, M. A., Pangborn, R. M., & Roessler, E. B. (1965). Principles of sensory evaluation of food. *In*: *Food Sc. and Techno. Monographs*: 338-339

Seeley, H. W., & Vandemark, P. J. (1970). Microbes in action: A laboratory manual of microbiology. D. P. Tarapo Revale Sons and Company Ltd. Bombay. pp. 86-95.

Soliva-Fortuny, R. C., Grigelmo, M. N., Hernando, J., Llichi, M. A., & Martin-Belloso, O. (2002). Effect of minimal processing on the textural properties of fresh-cutr pears. *J. Sci. Food Agri*. *82*, 1682-1688.

Martinez-Ferrer, M., Harper, C., & Perez-Munoz & Chaparro, M. (2002). Modified atmosphere packaging of minimally processed mango and pineapple fruits. *J. Food Sci. 67*, 3365-3371.

Lozano-de-Gonzalez, P. G., Barrett, D. M., Wrolstad, R. E., & Durst, R. W. (1993). Enzymatic browning inhibited in fresh and dried apple rings by pineapple juice. *J. Food Sci*. *58*(2), 399-403.

Martin-Diana, A. B., Rico, D., Frias, J. M., Barat, J. M., Henehan, G. T. M., & Barry-Ryan, C. (2007). Calcium for extending the shelf life of fresh whole and minimally processed fruits and vegetables: A review. *Trends Food Sci. Technol*. *18*, 210-218.

Saxena, A., Bawa, A. S., & Raju, P. S. (2012). Degradation kinetics of color and total carotenoids in jackfruit bulb slioces during hot air drying. *Food Biopro. Technol*. *5*, 672-679.

Ediriweera, S., & Abeywickrama, & Latifah, M. (2012). Effect of chemical pretretamnets of the quality of minimally processed pineapple stored in polystyrene packages. *Ceylon J. Sci*. *41*, 151-155.

Ponting, J. D., Jackson, R., & Watters, G. (1971). Refrigerated apple slices:effect of pH, sulfites and calcium on texture. *J. Food Sci*. *36*, 349.

Hui, Y. H., Barta, J., Cano, M. P., Gusek, T., Sidhu, J. S., & Sinha, K. S. (2006). *Handbook of fruits and fruit processing*. Blackwell publishers, USA, pp. 115-124.