International Scholars Journals

African Journal of Wood Science and Forestry ISSN 2375-0979 Vol. 8 (8), pp. 001-004, August, 2020. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Effect of steam blanching on quality of custard apple pulp

K. J. Kamble and S. B. Soni

College of Agricultural Engineering, M. A. U. Parbhani - 431402, Maharashtra - India.

Accepted 11 February, 2020

The study on the organoleptic evaluation of custard apple pulp stored up to 70 days was carried out in the Department of Agricultural Process Engineering, C. A. E. T., and M. A. U. Parbhani in the year 2005 - 2006. Statistical analysis and sensory evaluation of the data was carried out and it was observed that effect of storage of custard apple pulp at - 4 and - 18°C temperature up to 70 days on scores for sensorial quality of pulp viz appearance, color, flavor, taste, texture and overall acceptability increases from 7.25 - 8.20, 7.3 - 8.0, 6.0 to 7.25, 6.0 - 7.25, 6.25 - 7.0, and 6.30 - 7.5, respectively. The application of heat facilitates molecule damage of constituents of pulp by denaturation of protein, evaporation of volatile constituents and gelatinization of starchy material. This may lead to the changes in sensorial characteristics of the pulp like increased viscosity loss of flavor and taste and change in color.

Key words: HDPE - high density polyethylene, COH - carbohydrates, PPO - polyphenoloxidase, TSS - total soluble solids.

INTRODUCTION

Numbers of dryland fruits are still to be exploited to its maximum extent. The custard apple (*Annona squamosa L.*) is one of them with 20,497 MT production from 4,990 ha of area in Maharashtra (Sontakke 2003). It is exported in large quantity from India to UAE, Saudi Arabia, Bangladesh and Kuwait (Chadha 1995). The fruit consists of moisture 73.5%, COH 23.9%, proteins 1.6%, fats 0.3%, minerals 0.9%, vitamin A and C (Gopalan et al., 1991). It yields about 40% pulp having TSS 26.4°C brix, pH 5.5 and tannins 0.5% (Nanjundaswamy and Mahadeviah, 1990). Fruit skin is rich in phenols and causes rapid browning and strong off flavor during storage and processing. Ancorine is an alkaloid extracted from custard apple, which has insecticidal properties. The custard apple seeds contain 25.5% oil used in soap and paint industries. The seed cake can be used as manure. The peak period of availability of custard apple fruits is October and November. Being climatic and highly perishable fruit custard apple cannot be stored for long period. Cold storage is not promising. Hard fruits become chilled at 15.5° C or below although ripe fruits can be kept for 6 weeks at 4.4°C. The skin becomes brown and unattractive and as a result it loses market value Therefore the ripe fruit is to be sold in local market only.

The major constraints in custard apple processing are; the appearance, the bitterness develops gradually due to limonin after extraction of pulp and the enzymatic browning reaction catalyzes by polyphenoloxidase (PPO). Control of enzymatic browning during processing and storage is important to preserve the quality of fruit pulp. Heating of pulp in open pan beyond 55°C impairs pulp flavour considerably and often results in developing bitterness and unpleasant repulsive off flavor in the pulp (Sastry. 1961). Hence it specifies the need to study the effect of steam blanching on polyphenoloxidase (PPO) activity and quality of custard apple pulp stored at different storage conditions.

MATERIALS AND METHODS

Fully matured but ripe fruits of uniform size and shape were selected and graded. The pulp was extracted by scooping and kept in sterilized stainless steel container. The skin and seeds were separated and weights were recorded. The pulp obtained after various heat treatments was analyzed for chemical composition and sensory evaluation by following standard methods.

*Corresponding author. E-mail: aaskk@rediffmail.com. Tel: 09273455142, 02452223230.

Blanching treatments

Temperature: 59, 64, 75, 80, 81, 82, 83, 84, 85, 90, 92°C.
Pressure: 0.20, 0.25, 0.40, 0.50, 0.51, 0.53, 0.55, 0.56, 0.60, 0.70, 0.80 kg/cm^2.
Time: 1, 2, 3, 4 and 5 min

Treatments

T_1 - Steam heating at 83°C for 2 min pulp (with seed) + citric acid (4.87g) to maintain acidity 0.5% + packing in HDPE pouches.
T_2 - Steam heating at 83°C for 2 min pulp (without seed) +citric acid (4.87g) to maintain acidity 0.5% + packaging in HDPE pouches.
T_3 - Seed separation by scooping method + maintain ascorbic acid 2000 ppm + citric acid 4.87 g to maintain acidity 0.5% and packaging in HDPE pouches.
Storage condition: C_1 = -18°C, C_2 = - 4°C.
Storage period: 0, 10, 25, 40, 55 and 70 days.
Chemical parameters: Moisture, TSS, acidity, colour, ascorbic acid, pH.
Sensory parameters: Appearance, colour, flavour, taste, texture, and overall acceptability.

PPO enzyme was determined by using a colorimetric method based on the increase in absorbance at 420 mm. One unit of PPO enzyme was defined as the amount of enzyme extract causing a change in absorbance of 0.001 /min. Colour measurement was carried out with slight modifications in the method described by Lee and Smith (1979). Observations on chemical composition of pulp subjected to different blanching treatments were recorded from 15 - 70 days of storage. The pulp was analyzed for color, acidity, pH, ascorbic acid, moisture content and TSS at 0, 10, 25, 40, 55 and 70 days of storage.

The organoleptic evaluation of pulp was done as per the nine point Hedonic scale (Amerine et. al., 1965). The average score for different character viz. color, texture, flavor, taste appearance of overall acceptability was recorded. The experiment was planned using completely randomized block design (CRBD) with three replications each and mean values of chemical composition and organoleptic scores have been reported. The data obtained in the present investigation was analyzed for the statistical significance according to the procedure given by Panse and Sukhatme (1967).

Blanching

Heating the pulp in open pan causes bitterness when temperature goes beyond 55°C. Therefore it is necessary to inactivate the enzyme by blanching. Blanching was done in an autoclave. (32 cm diameter and 78 cm height). To facilitate the blanching in autoclave a stainless steel rack was designed. In this experiment evenly, ripened, sound custard apples were selected and peeled manually. The pulp was extracted by scooping method. The pulp was heated in autoclave at 59, 64, 75, 80, 81, 82, 83, 84, 85, 90 and 92°C for 1, 2, 3, 4 and 5 min. Experiment was conducted for the pulp with and without seed. Five containers of (15 cm diameter and 4 cm depth) were selected for blanching. Pulp 300 g was filled in each container table. Reading at an interval of 1 min was taken from 1 to 5 min for blanching. Each treatment was conducted for three replications. It was observed from the experiment that if custard apple pulp blanched at 83°C for 2 min then PPO activity inhibited 100 %. Taking this temperature as a standard for blanching the experiment and kept in autoclave for blanching. Pressure was recorded from pressure gauge and temperature was determined by using steam was conducted with different treatments, stored and results were analyzed and interpreted.

RESULTS AND DISCUSSION

The custard apple pulp subjected to treatments T_1C_1, T_1C_2, T2C1, T_2C_2, T $_3C_1$, and T_3C_2 and was evaluated for sensorial properties by semi - trained panel. The effect of blanching and storage of custard apple pulp up to 70 days was observed, analyzed and interpreted. The average score for color of custard apple pulp obtained by different treatment ranges from 7.25 - 7.75 Table 1. No significant change in sensory evaluation of color of custard apple pulp is observed after storage up to 70 days. Dhumal et al. (1997) has also reported mean color score of 6.8 - 7.8 for custard apple pulp.

The average mean score for appearance of custard apple pulp obtained by different blanching treatment ranges from 6.91 - 7.73 Table 2. There is no significant change in appearance of custard apple pulp. Dhumal et al. (1997) has reported mean score of 6.8 - 7.8 for custard apple pulp. The mean score for taste of custard apple pulp obtained by different blanching treatment ranges from 5.81 to 6.36 Table 3. The maximum score 6.9 for the pulp stored at T_3C_1 treatment for 10 days was observed and minimum for the pulp stored at T_2C_2 and T_3C_2. There is no development of bitter compounds after heating at up to 83^0C temperature and storage up to 70 days. Dhumal et al. (1997) has also reported the mean taste score of 7.2 to 8.8 for custard apple pulp.

The average mean score for texture of the custard apple pulp obtained by different blanching treatment ranges from 6.12 - 6.5 (Table 4). The variation in the score for texture of the pulp may be due to blanching treatment. The texture of the pulp stored at T_3C_1 treatment and T_3C_2 scored maximum. Brown et al. (1988) has also reported the mean score of 5.1 out of 10 for texture of custard apple pulp. The mean score of flavor of custard apple pulp obtained by different blanching treatment Table 5 ranges from 5.95 to 6.5. The variation in the score for flavor of pulp may be due to varying heat treatment.

The pulp stored at T_3C_2 for 10 days scored relatively less than at T_3C_1 treatment. This difference may be due to loss of some volatile flavor components during storage because of temperature difference. Brown et al. (1988) has also reported mean score 7.3 out of 10 for flavor of custard apple pulp. The mean score for overall acceptability of custard apple pulp by different blanching treatment ranges from 6.56 - 6.76 Table 6. The overall acceptability scores of pulp of T_1C_2 scored relatively less than T $_3C_1$ and more at T $_3C_2$ treatment. Overall acceptability depends on color, taste, texture, flavor; appearance.

SUMMARY AND CONCLUSION

The data was analyzed and the following conclusions were drawn. Effect of storage of custard apple pulp at - 4 and -18°C temperature up to 70 days on colour of pulp increases from 0.082 - 0.119. Increase in colour depends

Table 1. Effect of blanching on color of custard apple pulp stored for 70 days.

Treatment	Storage period (days) / Color score					
	0	10	25	40	55	70
T_1C_1	7.75	7.70	7.80	7.80	7.73	7.73
T_1C_2	7.75	7.25	*	*	*	*
T_2C_1	7.30	7.35	7.35	7.20	7.15	7.15
T_2C_2	7.30	7.25	*	*	*	*
T_3C_1	8.00	8.00	8.10	8.00	8.00	7.90
T_3C_2	8.00	6.00	*	*	*	*
Mean	7.68	7.25	7.75	7.66	7.62	7.59

* indicate that sample is spoiled.

Table 2. Effect of blanching on appearance of custard apple pulp stored for 70 days.

Treatment	Storage period (in days) / appearance score					
	0	10	25	40	55	70
T_1C_1	7.75	7.25	7.75	7.75	7.72	7.72
T_1C_2	7.75	6.50	*	*	*	*
T_2C_1	7.25	7.25	7.20	7.20	7.15	7.15
T_2C_2	7.25	6.50	*	*	*	*
T_3C_1	8.20	8.00	8.10	8.10	8.10	8.00
T_3C_2	8.20	6.00	*	*	*	*
Mean	7.73	6.91	7.68	7.71	7.65	762

* Indicate the sample is spoiled.

Table 3. Effect of blanching on taste of custard apple pulp stored for 70 days.

Treatment	Storage period (in days) /Taste score					
	0	10	25	40	55	70
T_1C_1	6.30	6.35	6.30	6.25	6.20	6.25
T_1C_2	6.30	5.52	*	*	*	*
T_2C_1	6.00	6.10	6.00	6.00	5.90	5.90
T_2C_2	6.00	5.00	*	*	*	*
T_3C_1	6.75	6.90	6.80	6.80	6.70	6.00
T_3C_2	6.75	5.00	*	*	*	*
Mean	6.35	5.81	6.36	6.35	6.26	6.05

* Indicate that sample is spoiled.

Table 4. Effect of blanching of texture on custard apple pulp stored for 70 days.

	Storage period (in days) / Texture score					
Treatment	0	10	25	40	55	70
T_1C_1	6.25	6.30	6.20	6.20	6.15	6.15
T_1C_2	6.25	6.00	*	*	*	*
T_2C_1	6.25	6.20	6.20	6.10	6.00	6.00
T_2C_2	6.25	5.75	*	*	*	*
T_3C_1	7.00	7.00	6.90	6.90	6.75	6.70
T_3C_2	7.00	5.50	*	*	*	*
Mean	6.50	6.12	6.43	6.40	6.30	6.28

* Indicate that sample is spoiled.

Table 5. Effect of blanching on flavor of custard apple pulp stored for 70 days.

Treatment	Storage period (in days) / Flavor score					
	0	10	25	40	55	70
T1C1	6.25	6.25	6.25	6.15	6.07	6.15
T1C2	6.25	5.52	*	*	*	*
T2C1	6.00	6.00	6.15	5.95	6.00	5.90
T2C2	6.00	5.25	*	*	*	*
T3C1	7.25	7.20	7.25	7.20	7.15	7.10
T3C2	7.25	5.50	*	*	*	*
Mean	6.50	5.95	6.55	6.43	6.40	6.38

* Indicate that sample is spoiled.

Table 6. Effect of blanching on overall acceptability of custard apple pulp stored for 70 days.

Treatment	Storage period (in days)					
	0	10	25	40	55	70
T1C1	6.50	6.52	6.50	6.25	6.15	6.15
T1C2	6.50	5.50	*	*	*	*
T2C1	6.30	6.30	6.25	6.25	6.25	6.20
T2C2	6.30	6.30	*	*	*	*
T3C1	7.50	7.50	7.50	7.25	7.35	7.20
T3C2	7.50	7.50	*	*	*	*
Mean	6.76	6.60	6.56	6.58	6.58	6.57

* indicate that sample is spoiled.

on enzymatic browning facilitated by oxidation of phenolic substrates in presence of *in vivo* PPO leading to change in colour of end products. No significant change appears at -18°C (C_1) against remarkable change at refrigerated -4°C storage condition (C_2). This may be the cumulative effect of residual activity of PPO and reduced oxidation inhibition potential coupled with degradation of ascorbic acid. The storage conditions C_1 inhibited the rate of degradation of ascorbic acid to protect its potency as anti oxidant. The change in color exhibited a range 0.119 – 0.398 for T_3. Effect of storage of custard apple pulp at – 4 and –18° C temperature up to 70 days on scores for sensorial quality of pulp viz appearance, color, flavor, taste, texture and overall acceptability increases from 7.25 - 8.20, 7.3 - 8.0, 6.0 - 7.25, 6.0 - 7.25, 6.25 - 7.0, and 6.30 - 7.5, respectively. The superiority in quality was associated with non-degradation of heat liable constituents of the pulp in the absence of heat treatment. The application of heat facilitates molecule damage of constituents (nutrients) of pulp by denaturation of protein, evaporation of volatile constituents, and gelatinization of starchy material. This may lead to the changes in sensorial characteristics of the pulp like increased viscosity loss of flavor and taste and change in color.

REFERENCES

Amerine NA, Pangborn RM, Roessier BB (1965). Principles of sensory evaluation of foods. Academic Press, New York. pp. 350-376.

Brown BL, Wang LS, George AP, Nissen RJ (1988). Comparative studies on the post harvest physiology of fruits from different species of Annona (custard apple). J. Hort. Sci. 63(3): 521-528.

Chadha KL (1995). Export of fresh fruits and nuts from India J. Appl. Hort. 1(2): 1-18.

Dhumal NS, Adsule RN, Kotecha PM (1997). Method of extraction, chemical composition and organoleptic properties of custard apple pulp. Beverage and Food World. 24(1): 27-28.

Goplan C, Ramasastri BV, Balasubramanyam SC (1991). Nutritive value of Indian Foods. National Institute of Nutrition, Hyderabad. Pp. 55-72.

Lee CY, Smith NL (1979). Blanching effect on polyphenoloxidase activity in table beets. J. Food. Sci. 44(1): 82-83; 86.

Nanjundaswamy AM, Mahadeviah M (1990). Fruit processing in adv. Horti. Fruit crops. p. 4.

Panse VS, Sukhatme PV (1967). Statistical methods for agricultural workers. Indian Council of Agricultural Research, New Delhi. pp. 70-72.

Sastry LVL, Bhatia BS, Girdharilal (1960). Preservation of custard apple pulp. Food Sci. 26: 244.

Sontakke MB (2003). Importance of rainfall fruit crops. Winter school on advances in production and management of rain fed fruit crops. p. 1-3.