



Formulation of osmo - dehydrated cashew apple (*Anacardium occidentale* L.)

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ABSTRACT

Osmo-dehydrated cashew apples could be developed by osmotic treatment of 10 mm thick slices of blanched cashew apples in 60° brix honey at 50° C for 24 hours followed by drying at 50° C till 15-20% moisture. The product could be stored for six months in vacuum pack with nitrogen in laminated pouch without affecting major chemical quality parameters.

Key words: Cashew apple, Honey, Osmo-dehydration.

INTRODUCTION

Osmotic dehydration (OD) is a food preservation technique with low energy and capital requirement compared to other conventional methods and results in good quality final product in terms of colour, texture and flavour. It involves partial removal of water from fruits and vegetables by immersing in aqueous solutions of high osmotic pressure such as sugar and salts. Cashew apple (*Anacardium occidentale* L.) is the succulent peduncle of the cashew fruit containing about 82-85% juice, 10-12% sugar, minerals and high level of vitamin C. The perishable cashew apple generates high amount waste residues and the wastage rate exceeds about 90% of production in India. Economic and efficient methods for handling and processing could help facing this problem through processing and transformation into good quality attractive products with extended shelf life. The problems limiting the acceptability of cashew apple are its astringency, seasonability, poor storability and lack of awareness regarding information on appropriate processing technology. Osmotic dehydration is considered as an answer to these problems, where high quality ready-to-eat products with good shelf life can be produced. Several production factors such as sample size, nature and duration of osmotic treatment etc. affect the efficiency of osmotic dehydration. Hence an experiment was undertaken in the Department of Processing Technology, College of Agriculture, Vellayani, Trivandrum, Kerala to study the effect of osmotic solutions and sample size on osmo-dehydration thereby formulating good quality osmo-dehydrated cashew apple.

MATERIALS AND METHODS

Mature ripe, good quality and firm cashew apples of variety Dhana were collected from Cashew Research Station, Madakkathara under Kerala Agricultural University and used for the study. Cashew apples were cleaned and sliced into different thickness viz., 10mm & 20mm and

blanched by dipping in boiling water containing 375ppm SO₂ for 30 seconds for removal of astringency. The astringent free samples were subjected to osmotic treatments by immersing in two different osmotic agents viz., sucrose and honey at 60° brix at 50° C for 24 hours. After osmotic treatment, the samples were removed from the solutions, excess syrup drained, samples washed with water and dried in hot air oven at a temperature of 50° C for 5-10 hours by spreading evenly on perforated aluminium trays till it attains 15-20% moisture.

Observations on kinetics of osmo- dehydration such as Percent Solid Gain (SG), Per cent Water Loss (WL) and Per cent Weight Reduction (WR) were recorded using the following formulae (Singh *et al.*, 2008).

$$\text{Percent Solid Gain (SG)} = \frac{m - m_0}{M_0}$$

$$\text{Percent Water Loss (WL)} = \frac{(M_0 - m_0) - (M - m) \times 100}{M_0}$$

$$\text{Percent Weight Reduction (WR)} = (M_0 - M) \times 100$$

M₀ = Initial mass of fresh fruit prior to OD (g)

M = Mass of sample after time 't' of OD (g)

m = Dry mass of fruit after time 't' of OD (g)

m₀ = Dry mass of fresh fruit prior to OD (g)

Chemical quality parameters viz., Total soluble solids (TSS), Titratable acidity, Ascorbic acid, Tannin content, carotenoids of the osmo- dehydrated products were recorded (Sadasivam and Manickam, 1992). The samples were rehydrated by immersing in water and rehydration factors viz., rehydration ratio, rehydration coefficient and percent water content were calculated (Srivastava and Sanjeevkumar, 2007). The prepared product was packaged in laminated pouches filled with nitrogen and stored under ambient condition for a period of six months. Sensory

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evaluation of the osmo- dehydrated sample was carried out by 25 semi-trained panelists using a 9 point hedonic scale (ISI, 1971) considering the quality attributes like appearance, flavour, colour, taste, texture and overall acceptability.

The experiment was replicated three times for statistical purposes and analysis of variance was used to evaluate the significant differences of the data at $p < 0.05$.

RESULTS AND DISCUSSION

The parameters like sample size and osmotic solutions had significantly affected the kinetics of osmotic dehydration in cashew apple (Table 1). 10mm thick samples dehydrated using honey had maximum solid gain (22.75%), which was at par with 20 mm samples in sucrose (20.65%). Per cent water loss was maximum (25.39) in 10mm thick samples dehydrated using honey and it was on par with all other samples except 10 mm samples dehydrated using sucrose. 20 mm samples dried in sucrose and 10 mm samples dehydrated using honey had maximum weight reduction with 6.72 and 6.42 respectively.

The Chemical quality parameters of the osmo – dehydrated cashew apples viz., acidity, TSS, vitamin C, tannin and carotenoid content varied significantly with varying sample size and osmotic solutions (Table 2). 10mm

thick samples soaked in honey had maximum TSS (23.92), which was at par with 10 mm samples dehydrated using sucrose (22.38). As the thickness was increased, the TSS content decreased. 10mm thick samples soaked in honey had maximum vitamin C (279.58 mg/100g) which was followed by 10 mm samples dehydrated using sucrose (246.75 mg/100g). Acidity, tannin and carotene content were same for all the osmo-dehydrated cashew apples. Rehydration factors can be used as quality characteristics of any dehydrated product (Velic *et al.* 2004). Rehydration efficiency parameters viz., rehydration ratio and rehydration coefficient were influenced by osmotic solutions and sample size (Table 3.). 10mm thick samples had highest rehydration ratio (1.75). Rehydration coefficient was highest (0.92) for 20 mm samples dehydrated using honey, which was at par with 10 mm samples in honey (0.91). Though the percent water content was same for all the treatments, it was least in 10 mm samples soaked in honey (54.63).

Without appropriate sensory analysis there is a high risk of market failure. Sensory analysis is frequently considered as a requirement before product launch (Arazi and Kilcast, 2001). Sensory analysis of the developed products revealed that the 10mm thick osmo dehydrated cashew apples in honey had highest score for appearance (9.14), flavor (9.79), colour (9.67) taste (9.6) texture (9.64) and overall acceptability (9.63) compared to other osmosed products (Table 4.)

Packaging and storage are the two most important quality control factors of any processed food products, hence influencing its storage stability and shelf life. When the prepared osmo-dehydrated product was subjected to a storage study by packaging in laminated pouches filled with nitrogen under ambient condition for a period of six months, the majority of chemical quality parameters were not affected during the storage period (Table 5.).

Table 1: Effect of osmotic solution and sample size on kinetics of osmotic dehydration.

Treatments	% Solid Gain (SG)	% Water Loss (WL)	%Weight Reduction (WR)
10 mm samples in sucrose	18.74	16.57	3.32
10 mm samples in honey	22.75	25.39	6.42
20 mm samples in sucrose	20.65	23.09	6.72
20 mm samples in honey	19.52	19.69	3.64
CD	2.83	5.77	1.66

Table 2: Effect of osmotic solution and sample size on chemical quality parameters

Treatments	Acidity(%)	TSS(°brix)	Vit.C (mg/100g)	Tannin(%)	Carotenoids
10 mm samples in sucrose	0.72	22.38	246.75	0.19	0.19
10 mm samples in honey	0.55	23.92	279.58	0.05	0.22
20 mm samples in sucrose	0.32	10.90	209.92	0.09	0.15
20 mm samples in honey	0.27	14.58	230.17	0.05	0.29
CD	NS	2.56	1.73	NS	NS

Table 3: Effect of osmotic solution and sample size on rehydration efficiency

Treatments	Rehydration ratio	Rehydration coefficient	Percent water content
10 mm samples in sucrose	1.11	0.62	61.10
10 mm samples in honey	1.75	0.91	54.63
20 mm samples in sucrose	1.27	0.82	57.14
20 mm samples in honey	1.09	0.92	64.53
CD	0.13	0.07	NS

Though the parameters viz., acidity, vitamin C, and carotenoid content were decreased and tannin content increased during storage, it was not significantly different. But the TSS content had decreased from 20.66 during first month to 16.36 after sixth month of storage. Based on physical, chemical and sensory analysis the superior treatment which gave maximum quality was selected for finalization of protocol development of osmo dehydrated cashew apple.

Table 4: Sensory scores of the osmo-dehydrated products

Treatments	Appearance	Flavour	Colour	Taste	Texture	Overall acceptability
10 mm samples in sucrose	7.81	8.01	9.4	9.3	7.10	7.1
10 mm samples in honey	9.14	9.79	9.67	9.6	9.64	9.63
20 mm samples in sucrose	6.90	9.23	8.8	8.2	7.50	7.1
20 mm samples in honey	9.03	7.07	7.78	6.85	8.67	7.18

Table 5: Effect of storage on chemical quality parameters

Month after storage	Acidity(%)	TSS(°brix)	Vit.C (mg/100g)	Tannin(%)	Carotenoids
One	0.50	20.66	262.50	0.04	0.27
Three	0.45	16.81	255.13	0.07	0.21
Six	0.45	16.36	252.19	0.11	0.16
CD	NS	2.21	NS	NS	NS

CONCLUSION

Osmotic dehydrated cashew apple is a novel value added product developed from the commonly waste pseudo-fruit of Kerala, cashew apple. Currently available technology for the development of value added cashew apple products utilizes sugar as the raw material, where as sugar has been completely replaced with honey in preparation of this product, hence having medicinal property with no side effect

of sugar. This is a 'ready to eat' high quality snack food with extended shelf life, preserving natural qualities of cashew apple. By developing this value added products, it is possible to make the seasonal fruit available to the consumers throughout the year.

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