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VALUE ADDITION TO WAX APPLE (*Syzygium samarangense*) AND LOVI (*Flacourtia incremis*) BY OSMO-AIR DEHYDRATION

C.K.D. WELLALA
Fruit Crops Research and Development Centre, Kananwila, Horana.

INTRODUCTION

Wax apple and lovi are minor fruit crops, commonly found throughout the country. They have high bearing potential and the fruits are found in excess during the season. As for many other minor fruit crops, the demand for wax apple and lovi is less due to low popularity and unawareness of their utility. As a result, a bulk of production is wasted every year. Therefore, it is necessary to develop technologies to minimize the wastage and promote the utilization of these fruit crops. Osmo-air dehydration is a technology of fruit preservation, in which, 50% moisture is removed by osmosis (Bongirwar, 1997) followed by air-drying for further removal of moisture. Sucrose is the most common osmotic agent for fruits (Rahman, 1992). This study was carried out to optimize processing variables for osmo-air dehydration of wax apple and lovi and to develop a product as a ready to eat snack.

MATERIALS AND METHODS

Fruits

Well-ripen seedless wax apple and lovi fruit from the Fruit Crops Research and Development Centre (FCRDC), Horana were used in this study.

Preparation of osmo-air dehytrated wax apple

Each fruit of wax apple was washed thoroughly and cut longitudinally into sixteen pieces and transferred immediately into a solution containing 1% calcium chloride, 1% citric acid and 250 ppm potassium metabisulfite (KMS) and kept for 15 minutes. Sucrose syrups of at the concentration of 50, 60 and 70 ^{o}Brix were prepared with the addition of 0.1g citric acid/100 ml at boiling. The fruit pieces were steam blanched for 3 minutes and dipped in each of three concentration levels of sucrose syrups at the rario of 1:1 and 1:2 of fruit mass to sucrose syrup (kg/l) using sample size of 200 g fruit pieces. They were kept at ambient temperature for 12 hours for osmosis. Then the fruit pieces were taken out and rinsed quickly with clean water and air-dried in seperate trays at 70°C until it acquired a desired texture (cryspiness) and colour.

Preparation of osmo-air dehytrated lovi

Well-ripen lovi fruits were washed, cut longitudinally into eight pieces and transferred to a solution containing 1% calcium chloride, 0.05% citric acid and 250 ppm KMS and kept for 15 minutes. Then the fruit pieces were taken out and steam blanched for 3 minutes. Sucrose syrups of 60, 65 and 70 °Brix were prepared. Lovi fruit pieces were subjected to single (12 hr), two successive (12 hr × 2) and three successive (12 hr × 3) immersions in each of 3 concentration levels of sucrose syrup at fruit:syrup of 1:1 using sample size of 200 g of fruit pieces for each. After osmosis, the fruit pieces were rinsed with clean water and air-dried at 70°C until it acquired the desired texture or crispiness.

Analytical methods

The fresh fruits, the fruit pieces at equilibrium with sucrose syrup and the final products were analysed in triplicate for titratable acidity and moisture content according to standard methods of AOAC (1995). The Total Soluble Solids (TSS) content was determined in triplicate using a hand held refractometer (Atago H80). The data was subjected to analysis of varience (ANOVA) in a Complete Randomised Design (CRD).

The dehydrated products were tested for colour, taste and overall acceptability by using a consumer panel consisting of thirty untrained panelists and a seven-point Hedonic scale (1- extreamly dislike, 7-extreamly like) in order to access the acceptability as a snack. Sensory ratings of each attribute was subjecteted to analysis of varience (ANOVA) to determine whether significant differences in mean degree of liking scores exist among samples. Data was analysed using the SAS package and mean differences were determined by the Duncan Multiple Range Test (DMRT) at p=0.05.

RESULTS AND DISCUSSION

Weight loss

Immersion of wax apple fruit pieces in different sucrose concentrations showed that the weight loss from fruit pieces was significantly higher at 70 followed by 60 and 50 °Brix (Table 1). However, the weight loss of wax apple was not significant when the ratio of fruit mass to sucrose syrup was increased from 1:1 to 1:2 at each of 70, 60 and 50 °Brix at p=0.05 (Fig. 1).

Table 1. Weight loss (%) during osmosis and air dehydration, TSS (°Brix) content at equilibrium and after air dehydration and Total Titratable Acidity (TAA) and moisture content (%) after dehydration, of wax apple.

TSS of sucrose syrup, °Brix	*Weight loss (%)*		*TSS, °Brix*		*Total Titratable Acidity (TTA), in final snack*	*Moisture content, after dehydration, (%)*
	During osmosis	*During air drying*	*Wax apple pieces at equilibrium*	*Wax apple snack*		
70	41.8a	47.4c	42.5a	78.0a	0.44a	9.56a
60	35.1b	55.5b	34.5b	69.0b	0.40a	11.95b
50	27.2c	63.6a	30.0c	64.5b	0.43a	12.74b

Data are presented as a mean of triplicate.
Mean in each column followed by the same letter are not significantly different (P< 0.05).

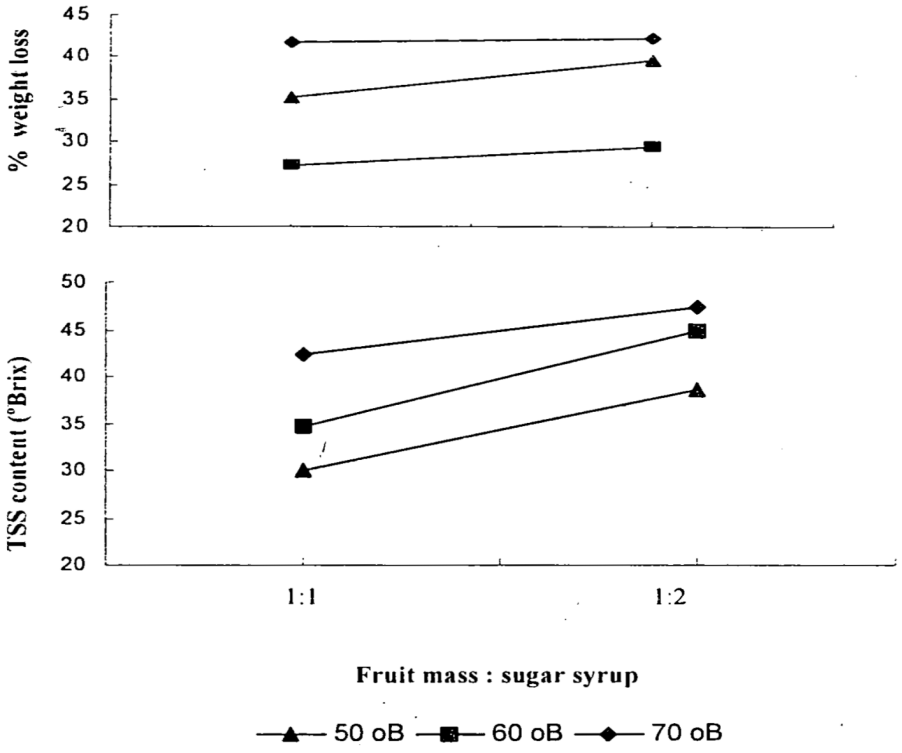

Figure 1. The percentage weight loss and TSS content (°Brix) of wax apple pieces during osmosis at two different fruit mass to sucrose syrup ratios and three different sucrose concentrations.

Lovi fruit pieces kept at 70 °Brix had significantly higher weight loss followed by 65 and 60 °Brix and the moisture was removed at a higher rate innitially and gradually decreased and reached to a constant level after the second immersion(Fig. 2). Therefore, immersing in a third sugar syrup was not necessary and was cost effective in terms of sucrose utility.

Total Soluble Solid (TSS) content

The Total Soluble Solid (TSS) contents of ripe fresh wax apple and lovi are about 6.5 and 10 °Brix. Increase in TSS content during osmosis is probably due to the absorption of sugar from sugar syrup by the fruit pieces (Nanjundaswamy *et al.*, 1978 and Rahman, 1992). The TSS content of wax apple snack was significantly higher at 70 followed by 60 and 50 °Brix (Table 1). Acidity of fresh wax apple was very much low and therefore, 1g citric acid /100ml syrup was added to impart a little sour taste and to balance the high sweet taste of the wax apple snack. At low concentrations acidity is also beneficial for improving colour and preventing browning reactions (Ponting *et al.*, 1966).

The TSS content of lovi fruit pieces was higher at 70 followed by 65 and 60 °Brix both at equilibrium and after air-dehydration (Fig. 2). The acidity of lovi was gradually reduced with the increase of the number of immersions (Fig. 2) and reached a constant level after the 2nd immersion.

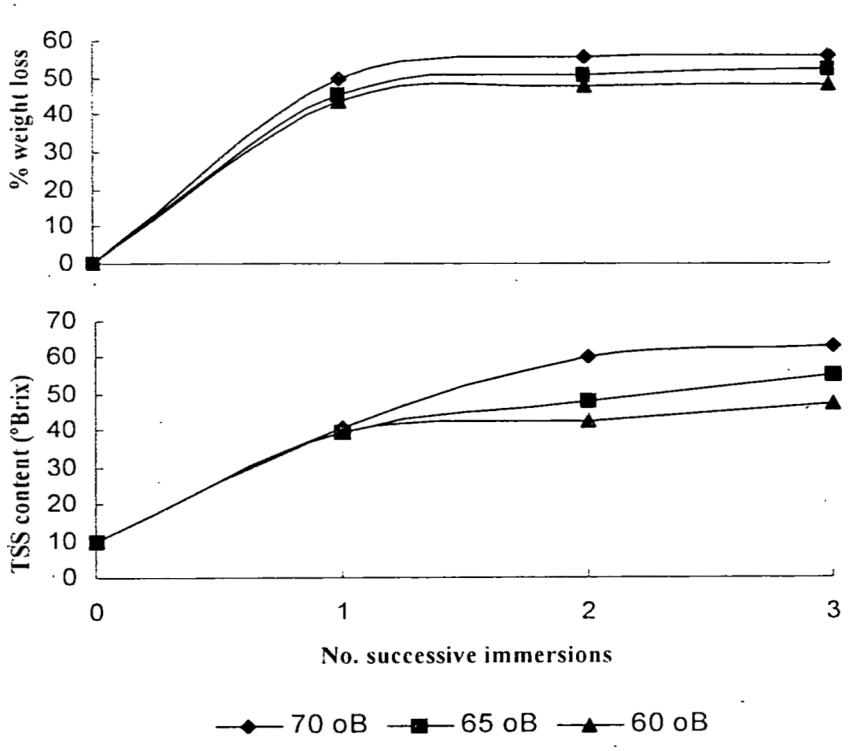

Figure 2. The percentage weight loss and TSS (°Brix) content during osmosis of lovi fruit pieces at three different sucrose concentrations and three successive immersions.

Total Soluble Solid (TSS) content

Air drying of osmotically dehyrated fruit pieces at 70 °C reduced the moisture content to a lower level and the TSS content to a higher

level (Table 2). The wax apple and lovi snacks made of 70 °Brix had a low moisture content of 9.56±0.3 and 6.56±0.6 and higher TSS contents of 78.0±2.5 and 80.5±2 respectively, showing it's potential of having a long shelf life.

Table 2. Weight loss (%) during air dehydration, TSS content (°Brix) and Total Titratable Acidity (TAA) after air dehydration of lovi at three different sucrose concentrations and successive immersions.

No. of successive immersions	*TSS content of innitial sucrose syrup (°B)*	*Weight loss of fruit pieces (%) during air dehydration*	*TSS, °Brix of lovi snack, after air dehydration*	*TAA, in lovi snack*
Single immersion	70	38.80a	68.5a	3.5a
	65	39.73a	55.5b	3.6a
	60	39.87a	52.5b	3.9a
Two successive immersions	70	35.20a	80.5a	1.8b
	65	37.77a	72.5b	2.1b
	60	39.04a	65.5c	2.3b
Three successive immersions	70	35.77a	81a	1.1b
	65	36.90a	78.5a	1.3b
	60	37.01a	70.5b	1.3b

Data are presented as a mean of triplicate.
Mean in each column followed by the same letter are not significantly different ($P < 0.05$).

Sensory evaluation

The estimated means for colour, taste and overall acceptability of the wax apple snack at 70 °Brix were 'like very much', corresponding to 6 of the 7 point Hedonic scale. The lovi snacks were dark reddish, ressembling the colour of well-ripen lovi fruits and the colour was not different among treatments. But the taste and the oveall acceptability were 6 (like very much) when subjected to two successive immersions (12 hr × 2) at 70 °Brix.

CONCLUSIONS

Value addition to wax apple and lovi is possible by using osmo-air dehydration as a preserving technique. The product subjected to 70 °Brix at 1:1 of fruit mass to sucrose syrup (kg/l) resulted in 41.8% and 47.4% of moisture removal from wax apple pieces during osmosis and air dehydration respectively. Two successive immersions of lovi fruit pieces in 70 °Brix sucrose solution at 1:1 of fruit mass:sucrose syrup (kg/l) removed 55.8% and and 35.20 % moisture during osmosis and air dehydration respectively. Air-dehydrated wax apple and lovi snacks had 9.56 and 6.56 % moisture contents and 78.0 and 80.5 % TSS respectively. Both were also prefered organoleptically at 70 °Brix. Sucrose syrup solution can be used sevaral times with the adjustment of the °Brix.

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REFERENCES

AOAC, 1995. Official methods of analysis, Vol. 2. Association of Official Analytical Chemist Inc. Virginia. Pp 69-81.

Bongirwar, D.R. 1997. Application of osmotic dehydration for preservation of fruits. Indian Food Packer 51(1): 18-21.

Nanjundaswary, A.M., G.R. Setty, C. Balachandran, S. Saroja and K.B.S.M. Reddy. 1978. Studies on development of new categories of dehydrated products from indegenous fruits. Indian food Packer 32(1): 91-99.

Ponting, J.D., G.G.Waters, R.R. Forry, R. Jackson and W.L. Stanley. 1966. Osmotic dehydartion of fruits. Food Technology 20:125.

Rahman, M.S. 1992. Osmotic dehydration kinetics of foods. Indian Food Industry 11(5): 20-24.