

Some Processing Methods of Jak Fruit and Characteristics of Processed Products

L.R. Sathasivam, G. Ravindran and S. Ekanayake

Department of Food Science & Technology,
Faculty of Agriculture,
University of Peradeniya.

ABSTRACT. *Pulp from two local varieties of jak fruit, namely waraka and wela, were processed into cordial, jam, osmotically dehydrated preserves and sugar syrup preserves, and the sensory and physico-chemical characteristics of the processed products were studied. Based on sensory evaluation, both varieties are suitable for processing into cordial, jam and medium syrup preserves. For osmotically dehydrated preserves, only waraka was found suitable due to its firm pulp.*

INTRODUCTION

Jak (*Artocarpus heterophyllus*) is a popular fruit crop in Sri Lanka. Jak fruit is one of the largest borne by any tree and weighs, on an average, eight to twenty kilograms. Under normal conditions, a tree may bear 150–250 fruits per year. The sweet, golden, fleshy pulp, which fills the massive jak fruit, has an aromatic and agreeable taste and is usually consumed fresh.

Large quantities of jak fruits are available as seasonal surpluses during certain months of the year and they go unutilized. The use of these surpluses may be extended if suitable processing methods could be developed for the preservation of jak fruits. Jak fruit has the potential of being processed in to several products including jam, cordial, osmotically dehydrated preserves and sugar syrup preserves. But published data on processing of jak fruit is scanty. Jak fruit pulp could be preserved successfully by canning them in syrup in the presence of citric acid (Siddappa, 1951). The possible preparation of a beverage concentrate has also been reported (Anon, 1954).

Full exploitation of the market for jack fruit products can be realized if a proper understanding of the processing and the characteristics of products is available. Accordingly, the present study

was to evaluate different processing methods of jak fruit and the characteristics of the final products.

MATERIALS AND METHODS

Materials

Fruits from two local varieties of jak, namely *waraka* (firm pulp) and *wela* (soft pulp), were obtained from market outlets in Kandy.

The randomly selected fruits were fully ripe and were free from cracks and bruises. The fruits were cut and the pulp was separated. The seed and the thin covering (ovary wall or carpel) was then removed by slitting the pulp.

Preparation of cordial

Cut pieces of the pulp were softened by heating slowly in about half their weight of water. While heating, the pulp was stirred continuously and mashed into a fine pulp. The pulp was then passed through a fine sieve to remove all large pieces.

A sugar syrup was prepared (60° Brix) by dissolving 1.5 Kg/Kg of sugar in water and heating for 15 minutes. The ingredients (citric acid, sugar syrup and fine pulp) were then blended and strained through muslin cloth. Potassium metabisulphite was added at the rate of 200 ppm. The resultant cordial was bottled in sterilized bottles and stored at room temperature.

Preparation of jam

The fine pulp was prepared as described under the preparation of cordial. Sugar and pulp (1:1 ratio, by weight) and citric acid (0.2g/100g pulp) were mixed thoroughly. The mixture was cooked slowly at 105.5 C for 15 minutes until the sheet test was satisfactory. The hot product was filled into the sterile containers and stored at room temperature.

Preparation of osmotic - dehydrated preserves

Fresh pulp was washed in ample quantity of water. About 550g of sugar, 450g of water and 0.5% citric acid were mixed and the mixture was heated at 105 C until 55^o brix was reached. Fresh pulp was then added and the mixture was boiled for three minutes. Pulp was allowed to soak in the syrup for 18h. After 18h pulp was removed and washed in running water and dried in an oven at 60 C for 24h. The product was packed in polyethylene bags and stored at room temperature for subsequent analysis.

Preparation of sugar syrup preserves

Fresh pulp was washed in ample quantity of water. Sugar syrups were prepared at three different concentrations, namely as heavy (50% sugar), medium (40% sugar) and light (33% sugar) as described previously. Fresh pulp was placed into the glass bottles and boiling sugar syrups were poured to cover the pulp, leaving only 1/2 cm head-space. The filled bottles were exhausted to drive out air from the fruit tissues and to prevent discolouration. The bottles were sealed and further heated in water until the centre of the bottle recorded a temperature of 80-82 C for 10 min.

Sensory evaluation

A consumer type panel, which consisted of university staff and students was used in this study. Representative samples of the products were served to the panelists. Thirty grams of solid products and 25 ml of the beverage were saved at room temperature. Sensory characteristics of the products were evaluated by a twelve member panel who scored coded samples for colour, taste, flavor, appearance and general acceptability on a nine point hedonic scale with 9, representing "like extremely" and 1, "dislike extremely". The results were statistically analyzed using the friedman's non-parametric test (Snedecor and Cochran, 1977). Wilcoxon-signed test statistics were also computed to evaluate significant differences between treatment means.

Physico-chemical characteristics of the products

Moisture and ash contents of the processed products were determined by AOAC (1975) procedures. Total soluble solids were measured in terms of brix value by refractometer. pH was determined using a pH meter (Model 10, Corning, USA).

Titration acidity was measured as citric acid (AOAC, 1975). Pectin was estimated as percent calcium pectate by the procedure of Ranganna (1979). Reducing sugar contents were determined using Lane and Eynon method (AACC, 1976).

RESULTS AND DISCUSSION

The results of the present study demonstrate that seasonal surpluses of jak fruit pulp can be successfully processed into various products. Based on sensory evaluation, both *wela* and *waraka* varieties were found to be suitable for cordial preparation (Table 1). But there was a tendency for preference towards *wela*.

This is probably due to the lack of a strong flavour in *wela* pulp. The taste panel also consistently preferred the taste of cordial from *wela* and this appears to be related to the slight sour taste of *wela* pulp.

The values for sensory evaluation parameters of jam prepared from *waraka* and *wela* were not significantly different. However, the mean scores for all parameters tended to favour *waraka* jam. *Waraka* pulp was also found to be more suitable for processing into osmotically dehydrated products (Table 1), probably because of the firm nature of the pulp.

Among the different types of sugar syrups tested, medium syrup gave the product which received the highest overall acceptability (Table 2); the light syrup product ranked a close second.

The physico-chemical characteristics of fresh pulp and the processed products prepared from *waraka* and *wela* varieties are presented in Table 3. The variety of fruit pulp has no effect on brix value, pH, titration acidity, pectin content and sugar content of any of the products.

Table 1. Sensory evaluation scores of processed jak fruit products*.

Product	Variety of Jak fruit	Sensory Characteristics				General Acceptability
		Appearance	Colour	Taste	Flavour	
Cordial	<u>Waraka</u>	7.17	7.16	6.25	6.58	7.00
	<u>Wela</u>	7.58	7.33	7.16	7.00	7.46
Jam	<u>Waraka</u>	7.83	6.91	6.90	6.16	6.25
	<u>Wela</u>	6.42	6.00	6.50	5.60	5.68
Osmotic dehydrated product	<u>Waraka</u>	8.36 ^a	8.00 ^a	7.73 ^a	7.36 ^a	7.90 ^a
	<u>Wela</u>	5.55 ^b	5.00 ^b	3.64 ^b	5.00 ^b	4.00 ^b

* All means are average of 12 scores.

a, b means followed by the same letter within a column are not significantly different ($P > 0.05$).

Table 2. Sensory evaluation scores of sugar syrup preserves of jak fruit pulp*.

Type of sugar syrup	Sensory Characteristics				
	Appearance	Colour	Taste	Flavour	General Acceptability
Heavy	3.92 ^a	3.50 ^a	4.75 ^a	4.40 ^a	4.50 ^a
Medium	6.75 ^b	7.67 ^b	6.75 ^b	6.50 ^b	7.50 ^b
Light	7.00 ^b	7.00 ^b	6.08 ^b	6.25 ^b	7.17 ^b

* All means are average of 12 scores.

a, b means followed by the same letter within a column are not significantly different ($P > 0.05$).

Table 3. Physico-chemical characteristics of processed jak fruit products.

Products	Variety	Moisture %	Brix value	pH	Titrateable acidity %	Pectines Calcium	Reducing Sugar pectate
Fresh Pulp	<u>Waraka</u>	73.1	23 ⁰	5.0	0.30	1.7	16.71
	<u>Wela</u>	71.8	20 ⁰	4.7	0.33	1.5	15.24
Cordial	<u>Waraka</u>	-	24 ⁰	2.7	0.60	0.3	17.56
	<u>Wela</u>	-	22 ⁰	2.9	0.60	0.3	16.69
Jam	<u>Waraka</u>	34.7	68 ⁰	3.7	0.45	0.6	25.83
	<u>Wela</u>	30.8	65 ⁰	3.6	0.41	0.6	21.63
Osmotic Dehydrated Preserves	<u>Waraka</u>	6.9	34 ⁰	4.5	0.06	1.4	20.04
	<u>Wela</u>	8.5	32 ⁰	3.9	0.06	1.4	19.27
Sugar Syrup Preserves	Heavy	55.5	28 ⁰	3.0	0.07	0.4	16.84
	Medium	56.2	24 ⁰	2.9	0.30	0.3	15.87
	Light	64.0	23 ⁰	2.9	0.32	0.3	13.74

Among the sugar syrup preserves, the moisture content and titrateable acidity decreased with increasing sugar concentrations, whereas the brix value and reducing sugar content increased. The concentration of sugar syrup had no notable effect on pH. Retention of pectin was found to be higher in heavy sugar syrup preserves.

In conclusion, it can be stated that jak fruit pulp can be successfully used for jam and cordial preparations. In jam preparation jak fruit pulp holds a definite advantage over other fruits in that no addition of pectin is necessary. The pectin content of pulp is more than adequate to prepare an acceptable jam product. Both *waraka* and *wela* are equally useful for such processing. However, because of the firmer pulp, *waraka* is more suitable for osmotic-dehydrated product and sugar syrup preserves.

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