



## RESEARCH ARTICLE

### FORMULATION AND STANDARDIZATION OF PALM FRUIT INCORPORATED PRODUCTS

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#### ABSTRACT

Palmyra palm tree belongs to the 'Palme' family. It is a tall and swaying tree well known as 'Borassus flabellifer'. The word Borassus was derived from a Greek word and it means the leathery covering of the fruit and flabellifer means fan bearer. Palm fruits were collected from Ramanathapuram district. The fruits were washed with tap water and then allowed to ripen for 2-3 days if necessary. The products like squash and juice were prepared using fruit powder at 1g, 2g and 3g level of incorporation. Each ingredient was weighed using a weighing scale before preparation. Portion size, duration of preparation was noted in each case. The sensory evaluation was carried out by a panel of twenty members using five point hedonic rating scales. Iron content of the raw palm fruit was high about 24mg whereas in boiled and roasted palm fruit it was 10mg and 9.5mg respectively. Fiber content of raw palm fruit was high about 4.8g when compared to boiled palm fruit (1g) and roasted palm fruit (1.5g). In general it is seen that dietary fibre content is modified by different methods of processing. The microbial load of raw, boiled and roasted palm fruit squash and juice for different storage periods indicates that on the first day bacteria, fungi and yeast were absent. On the final day bacteria were present in juice. Hence the shelf life of palm squash was less than 15days. Cake incorporated with 1g of palm fruit powder revealed that low amount of carbohydrate was present in boiled palm fruit cake. Protein content is high in roasted palm cake.

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## INTRODUCTION

Palmyra palms are economically useful and widely cultivated in tropical regions. All the parts of this trees are useful for various purposes. The edible food products obtained from this tree are sap for juice, palm jaggery, edible mesocarp, unripe endosperm and palm tuber. The seeds are planted and made to germinate and the fleshy stems are boiled and eaten. It is very fibrous and nutritious, known as 'Panai Kizhangu'. The ripe fibrous outer layer of the palm fruits are also boiled or heated in fire and eaten. The tender fruit inside hard shell called 'Nungu fruit'. When the tree is cut we get an edible cake from which the leave grow out. This is called 'Pananchoru' (TNAU, Coimbatore, 2008) Palm fruit yields palm oil, palmitic oleic rich in semisolid fat and the fat soluble minor components, vitamin E, carotenoids and phytosterols. A recent innovation has led to the recovery and concentration of water soluble antioxidants from palm oil milling waste characterized by its high content of phenolic acids and flavonoids. These natural ingredients pose both challenges and opportunities for

the food and Nutraceutical industries (Sundram et al., 2003). Palm fruit is found to have protein, fat, carbohydrate, calories, fibre, calcium, iron, ascorbic acid, riboflavin, vitamin E, thiamin, niacin and water. The edible palm products have generally found to be high in nutrient quality and since people have been conscious of more eco friendly and naturally available food products, which has resulted in the food processing industry to look back into the traditional cuisine, as they are still the main staple diet for most of the population.

The investigator interested in palm fruit processing. It is properly processed and stored can be used in formulation of instant mixes. It will play a valuable role in diet of the common man, incorporation will enhance the nutritional quality of food products. The study was under taken with the following objectives:

- To develop powder out of Palmyra palm fruit (raw, roasted and boiled)
- To find out the nutrient content of palm fruit and palm fruit powder
- To assess the shelf life of the developed powder
- To develop products out of palm fruit and palm fruit powder

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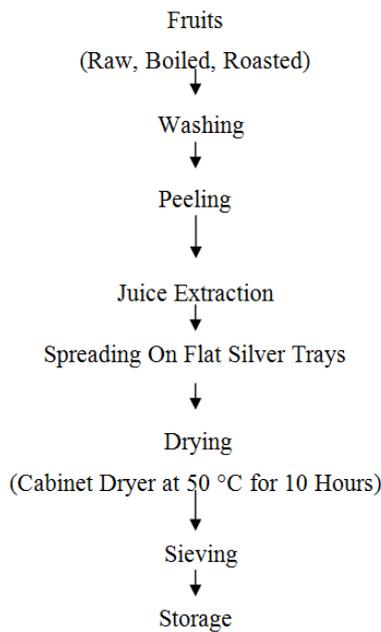
- To assess the consumer acceptability of the developed products

## MATERIALS AND METHODS

### Collection of palm fruits

Palm fruits were collected from Ramanathapuram district. The fruits were washed with tap water and then allowed to ripen for 2-3 days if necessary. Palm fruits can be eaten raw, boiled or roasted. Hence the fruits were taken in raw form, some fruits were boiled in water at 100°C and some fruits were roasted using coal.

### Preparation of palm fruit powder



### Formulation of palm fruit products

Products like squash and juice were prepared using fruit powder at 1g, 2g and 3g level of incorporation. Each ingredient was weighed using a weighing scale before preparation. Portion size, duration of preparation was noted in each case. The sensory evaluation was carried out by a panel of twenty members using five point hedonic rating scales. Overall acceptability of the prepared recipes was assessed using the attributes like appearance, colour, flavor, texture and taste using the score card. The carbohydrate, protein, fat, fibre, -β carotene and vitamin C of fresh fruit pulp and fruit powder were analyzed using standard procedure. The microbes present in the pulp, powder and products were analyzed on initial day and final day of the storage period of 0-15 days as per standard procedure. Microbial analysis followed by the serial dilution method.

## RESULTS AND DISCUSSION

Figure 1 shows that roasted palm fruit had a highest amount of carbohydrate about 78g followed by palm fruit with 74.4g and raw palm fruit with 75g. Protein content of roasted palm fruit

was high about 12g followed by boiled palm fruit with 10.95g and raw palm fruit with 6g. Beni seed soup had higher protein content than both the raw and boiled beniseed which decreased with increase in cooking time. Estimated fat content of raw palm fruit was high about 5.5 g when compared to boiled palm fruit 3.5g and roasted palm fruit 4g. β carotene of raw palm fruit was high about 900µg followed by roasted palm fruit with 600 µg and boiled palm fruit with 490 µg. Iron content of the raw palm fruit was high about 24mg whereas in boiled and roasted palm fruit it was 10mg and 9.5mg respectively. Fiber content of raw palm fruit was high about 4.8g when compared to boiled palm fruit (1g) and roasted palm fruit (1.5g). In general it is seen that dietary fibre content is modified by different methods of processing. Vitamin C was high about 5mg in raw palm fruit. The boiled and roasted palm fruit contains 4.65mg and 3mg respectively. It includes fibrous outer layer so fiber content is high. Iron present in the fruit is 38.24mg, this high iron content probably due to the soil. The roasted palm fruit squash. Highest mean score of about 18.5 was obtained by the squash with 25g pulp. Squash with 50g of pulp got 16 with respect to appearance, taste, texture, colour and flavor. Squash with 25g pulp was highly acceptable than 50g in raw, boiled and roasted palm fruit products.

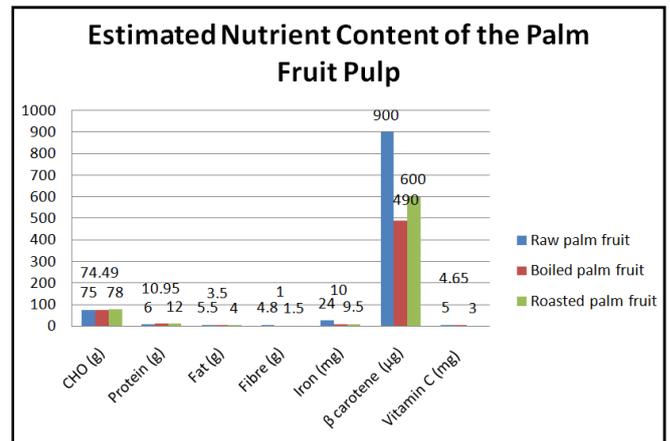


Figure 1.

Table 1. Ingredients used in developed products

S.no.	Product	Ingredients
1	Squash	Palm fruit pulp, sugar, citric acid, preservatives
2	Juice	Palm fruit pulp, barley, sugar, citric acid, preservatives
3	Cookies/ cake	Palm fruit powder, Maida, butter, sugar, egg, baking powder.

Table 2. Overall Acceptability of Palm Fruit Squash

S.No.	Palm fruit squash with 25g of pulp	Overall score	Highest acceptability
1	R.P.F.P	17.5	
2	B.P.F.P	16.8	18.5
3	Ro.P.F.P	18.5	

R.P.F.P – Raw palm fruit powder, B.P.F.P- Boiled palm fruit powder, Ro.P.F.P – Roasted palm fruit powder

Table 2. observed that squash with roasted palm fruit pulp had highest acceptability with the mean score of 18.5 followed by

raw palm fruit pulp 17.5 and boiled palm fruit pulp with 16.8. Roasted palm fruit squash is highly acceptable. Figure 3 indicates that raw palm fruit juice with 25g of pulp got mean score of about 13.8 for appearance, taste, texture, colour and flavor. Juice with 10g got highest mean score of about 16. Boiled palm fruit juice with 10g of pulp got mean score of about 14.7 for appearance, taste, texture, colour and flavor and juice with 25g of fruit pulp got lowest mean score of about 9.9.

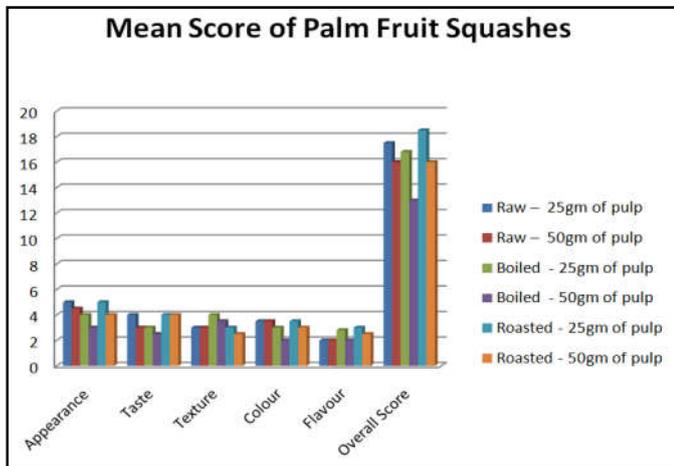


Figure 2.

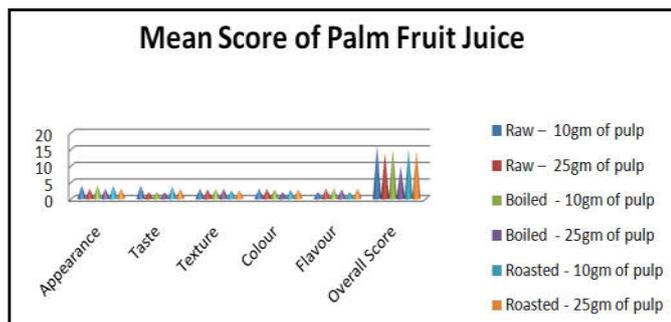


Figure 3.

The roasted palm fruit juice which was prepared using 25g of pulp got mean score of about 14.4 for appearance, taste, texture, colour and flavor. Juice with 10g got mean score of about 14.9. Juice with 10g was highly acceptable than 25g in raw, boiled and roasted palm fruit juice products.

Table 3. Overall Acceptability of Palm Fruit juice

S.No.	Palm fruit squash with 10g of pulp	Overall score	Highest acceptability
1	R.P.F.	16	16
2	B.P.F.P	14.7	
3	Ro.P.F.P	14.9	

Table 4. Overall Acceptability of Palm Fruit Cake

Product	Level of incorporation (1gm)	Overall score	Highest acceptability
Palm fruit powder incorporated cakes	R.P.F.Pd.C	17.2	18.5
	B.P.F.Pd.C	16.3	
	Ro.P.F. Pd.C	18.5	

Table 3 observed that juice with raw palm fruit pulp had highest acceptability with the mean score of 16 followed by roasted palm fruit pulp with 14.9 and boiled palm fruit pulp

with 14.7. Raw palm fruit squash was highly acceptable. The flesh pericarp of palm fruit contains about 49 percent of palm oil. It contains liquid fraction about 75 percent known as olein and a solid fraction stearin. The physical characteristics of palm olein differ significantly from palm oil, (Ravidranath, 2001). From Table 4 it is observed that roasted palm fruit powder incorporated cakes had highest acceptability with the mean score of 18.5 followed by raw palm fruit powder incorporated cake with mean score of 17.2 and boiled palm fruit powder incorporated cake with mean score of 16.3

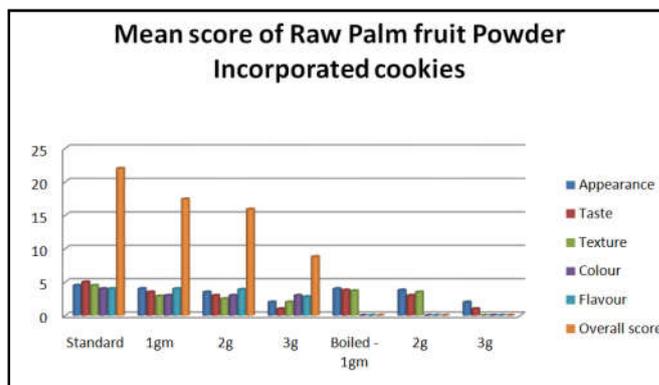


Figure 4.

Fig. 4 it is observed that roasted palm fruit powder incorporated cookies with 1gm got highest mean score of about 20 for appearance, color, taste, texture, and flavor. With respect to 1gm, level of incorporation mean score of 19.7 was obtained and 3gm incorporated cookies got only 17.3

**Microbial load of palm fruit powder incorporated cakes/cookies**

Table 5.

Developed products	Duration	Products	Microbes		
			Bacteria	Yeast	Fungi
Cookies	0 days	R.P.F.Co B.P.F.Co Ro.P.F.Co	Nil	Nil	Nil
	3 days	R.P.F.Co B.P.F.Co	+	Nil	Nil
		Ro.P.F.Co			
Cake	0 days	R.P.F.Co B.P.F.Co Ro.P.F.Co	Nil	Nil	Nil
	3 days	R.P.F.Co B.P.F.Co	+	+	Nil
		Ro.P.F.Co			

The Table 5 shows the microbial count of raw, boiled and roasted palm fruit powder incorporated cookies for different storage periods. On the first day bacteria, yeast and fungi were nil. On the final day there was no presence of fungi and yeast but bacteria was present. The microbial count of raw, boiled and roasted palm fruit powder incorporated cakes for different storage periods. Bacteria, yeast and fungi were absent on the first day. On the final day fungi were absent and yeast but bacteria was present.

**Summary**

Carbohydrate content was high in roasted palm fruit squash 21.48g and protein was high in boiled palm fruit (4.2g). The fat

content of both raw and roasted palm fruit squash was 0.7g. The fibre content was high in raw palm squash. High amount of  $\beta$  carotene and vitamin C was present in raw palm fruit squash about 163 $\mu$ g and 0.90mg respectively. The carbohydrate and protein were high in roasted palm fruit juice. The fat content of both raw and roasted palm fruit juice was same. The fibre content was high in raw palm juice. The microbial load of raw, boiled and roasted palm fruit squash and juice for different storage periods indicates that on the first day bacteria, fungi and yeast were absent. On the final day bacteria were present in juice. Hence the shelf life of palm squash was less than 15days. Incorporation of 3g of powder was not acceptable for any product. But 1g level of incorporation was highly acceptable. Cookies with roasted palm fruit powder had highest acceptability with the mean score of 20. Roasted palm fruit powder incorporated cakes had highest acceptability with the mean score of 18.5. Low amount of carbohydrate was present in raw palm fruit cookies. The Protein, fat and fibre content were high in raw palm cookies

### Conclusion

Cake incorporated with 1g of palm fruit powder revealed that low amount of carbohydrate was present in boiled palm fruit cake. Protein content is high in roasted palm cake.

The fat and fibre content is high in raw palm cake. The  $\beta$  carotene and vitamin C was high in boiled palm fruit cake. The count of raw, boiled and roasted palm fruit powder incorporated cookies and cake for different storage periods revealed that on the first day bacteria, yeast, fungi were absent. On the final day fungi and yeast were absent but bacteria were present in cookies. On the final day bacteria and yeast were present in cake. Hence the shelf life of palm cookies and cake was less than 3days.

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