

DEVELOPMENT AND SENSORY EVALUATION OF PAPAYA PEEL POWDER BASED PRODUCTS

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ABSTRACT

Nowadays, there is a considerable interest in studying the feasibility of using by-products from food processing plants as raw materials for production of value added products. Since these wastes are inexpensive and highly abundant, there is a considerable emphasis on the recovery, recycling and upgrading of wastes. Most of the food waste consists of peels. The focus of this research was to develop papaya peel powder and utilizing it for the development of value added Idli and papdi. Fresh papaya peels were blanched, sun dried and microwave dried and stored in an air tight container. Prepared papaya peel powder was evaluated for moisture (13.63%), ash (5.05%), protein content (11.67%), Vitamin C (81.81 IU), total fibre (32.51%), total carbohydrate (47.33%), beta-carotene (15.46µg) and potassium (516.22mg). Papaya peel powder fortified idli and papdi sample were formulated by incorporating 2.5%, 5% and 7.5% papaya peel powder with all-purpose flour and semolina in the present investigation. Results revealed that 2.5% of idli and 5% of peel powder formulated papdi were found to be most acceptable.

The additions of Papaya peel powder to the products have shown increase in the nutritional content. Both the products show increase in the protein, fibre, fat, zinc, Vitamin C, β-carotene and potassium content. A nutritive value comparison of the most desirable products was done and it was found that both the products incorporated with 5% Papaya peel powder were more nutritious than the other desirable products.

1. INTRODUCTION

Papaya (*carica papaya L.*) is one of the important delicious fruit crop grown in the tropical and subtropical parts of the world. It originated in Mexico and spread to all tropical parts of the world. Papaya (*carica papaya L.*) belongs to the family of caricaceae and was introduced in India in 16th century by Portuguese. It is one of the few plants which produce fruit throughout the year.

In recent years, the role and beneficial effects of many phytonutrients from plant sources such as fruits and vegetables had attracted much attention from food scientists as well as the public. Increasing numbers of studies on residual sources in replacing synthetic antioxidants with the natural ones are due to the augmented recycling interest of the agro-food industry. These are playing an important role in improving the complete utilization of the residual sources. The wastes or by-products from food processing such as

seed and peel of some fruits contain higher source of potential antioxidant activities than that the edible portion (Okonogi et al., 2007).

Papaya peel waste is generated in many countries throughout the year and proper management of this waste product could gain commercial interest in various industries. Since the annual global average production of papaya is about 10.0 million metric tons, it is important to add value to the left over waste materials of papaya fruit which could in turn be commercially beneficial as well as be useful to the environment due to reduction of waste.

The papaya (*Carica papaya*) peel flour could be used as a potential source for functional food ingredients and, in addition, it could be further processed into therapeutic functional food products (Hubat et al., 2017). Therefore, in the present investigation the attempt was made to develop and evaluate the dried ripe papaya peel powder incorporated idli and Papdi and determine its acceptability by sensory evaluation.

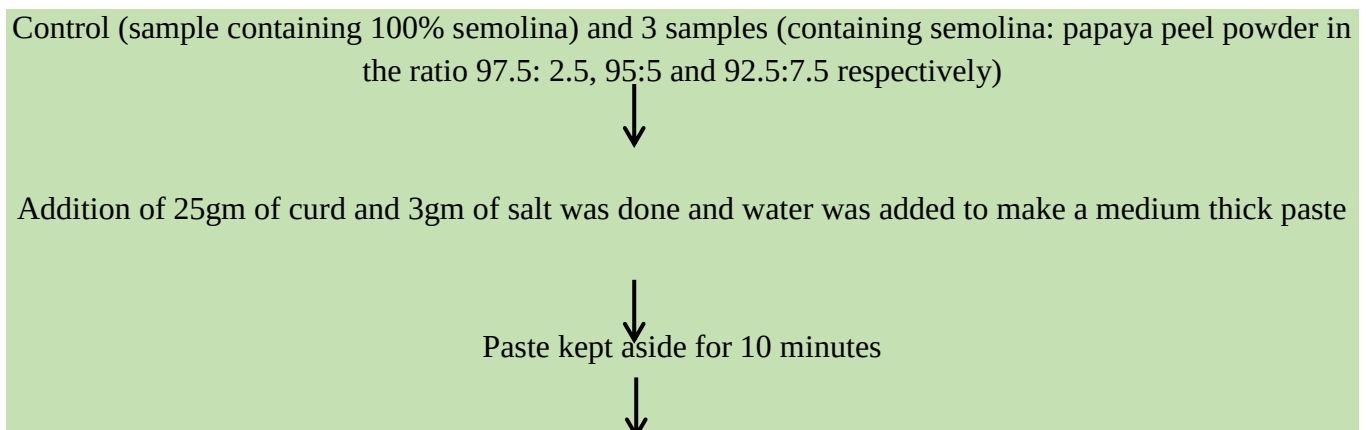
2. MATERIALS AND METHODS

Mature papaya was procured from the local market, washed, peeled and blanched at 100°C for 3-4 minutes. Papaya peel powder was prepared by sun drying blanched papaya peels for 16-18 hours. The sundried peels were dried again in microwave for 30 seconds to remove extra moisture. The powder of the dried peels were made in a mixer grinder and stored in air tight container in refrigerator for further use. Figure 1, figure 2 and figure 3 represents papaya peel powder, prepared samples of idli and papdi respectively. Process description of prepared samples of papaya peel powder based idli and papdi are represented by flow chat 1 and flow chart 2 respectively.



Figure 1: Papaya Peel Powder

Flow chart 1: Process description of prepared samples of Idli



Addition of 3gm Eno to each sample and then the paste is transferred to greased idli mould



Microwave each sample for 4 minutes and idlis are ready



Figure 2: Prepared samples of idli

Flow chart 2: Process description of prepared samples of Papdi

Control (Sample containing 100% all purpose flour) and 3 samples (sample containing all-purpose flour: papaya peel powder in the ratio 97.5 : 2.5, 95:5,

92.5 :7.5 respectively)



Addition of 3gm salt, 1gm carom seeds and 5gm of refined flour to the flour and preparation of tight dough with adequate amount of water.



Dough kept covered and rested for 10 minutes



Balls made from dough and thin chapatti made using rolling pin, then the chapattis were tapped using fork



Cut in small sphere shape and fried at medium flame. Stored in airtight and sanitized container for future use



Figure 3: Prepared samples of papdi

2.1 SENSORY EVALUATION OF DEVELOPED PRODUCTS

Untrained consumers evaluated the developed Papdi and Idli for colour, flavour, taste, texture and overall acceptability using 9 point hedonic scale.

2.2 CALCULATION OF NUTRITIVE VALUE OF THE PRODUCTS

Nutritive values given below are calculated according to the INDIAN FOOD COMPOSITION TABLES (2017) issued by National Institute of Nutrition (NIN), Hyderabad and for the calculations of nutritive value of papaya peel powder the research paper on “Nutritional properties of papaya peel” by Pavithra CS, S Suchiritha Devi, Jessie Suneetha W and Ch. V Durga Rani, 2017 published in the Pharma Innovation journal was referred. The calculations are done by unitary method from the above mentioned tables.

3. RESULT AND DISCUSSION

3.1 Physiochemical and nutritional composition of Papaya peel powder (PPP)

The results of the proximate composition obtained for papaya peel powder are given in table 3.1.1.

Table 3.1.1: Average value of the proximate composition of papaya peel powder

S.no.	Components	Amount
1.	Energy	300 Kcal
2.	Fibre	32.51g
3.	Protein	11.67g
4.	Fat	2.51g
5.	Carbohydrate	47.33g
6.	Vitamin C	81.81mg

7.	β -carotene	15.46 μ g
8.	Zinc	1.97mg
9.	Potassium	516.33mg
10.	Magnesium	19.11mg

The papaya peel powder consists of significant availability of micronutrients and high dietary fibre content.

3.2 Determination of physiochemical and nutritional characteristics of papaya peel powder based idli and papdi of different formulations.

- Control: 100%
- Type 1: 2.5% PPP incorporated products
- Type 2: 5% PPP incorporated products
- Type 3: 7.5% PPP incorporated products

Results are represented in table 3.2.1 and 3.2.2 for idli and table 3.2.3 and 3.2.4 for papdi.

Table 3.2.1 Average value of proximate Composition of macronutrients in Idli incorporated with Papaya Peel Powder

Treatment	Energy (Kcal)	Fibre(g)	Protein (g)	Fat (g)	Carbohydrate (g)
Control	409.8	9.72	12.19	1.86	69.66
Type1(PPI ₁)	408.34	10.23	12.13	1.89	68.78
Type2(PPI ₂)	408.17	10.82	12.2	1.94	68.59
Type3(PPI ₃)	407.33	11.42	12.2	1.98	68.06

Table 3.2.2 Average value of proximate Composition of micronutrients in Idli incorporated with Papaya Peel Powder

Treatment	Vitamin C (mg)	Vitamin A (β -carotene) (μ g)	Zinc (mg)	Potassium (mg)	Magnesium (mg)
Control	0.50	5.01	2.46	312.75	39.96
Type1(PPI ₁)	2.54	5.34	2.469	317.13	39.29
Type2(PPI ₂)	4.58	5.69	2.448	324.35	39

Type3(PPI ₃)	6.62	5.73	2.447	330.15	38.52
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The results show a significant increase in the fibre, Vitamin C and Vitamin A content of the idli incorporated with 5% and 7.5% PPP.

Table 3.2.3 Average value of proximate Composition of macronutrients in papdi incorporated with Papaya Peel Powder

Treatment	Energy (Kcal)	Fibre(g)	Protein (g)	Fat (g)	Carbohydrate (g)
Control	1493.76	2.76	12.72	90.76	75.99
Type1(PPI ₁)	1464.26	3.5	12.75	90.8	75.31
Type2(PPI ₂)	1435.16	4.24	12.78	90.84	74.63
Type3(PPI ₃)	1405.86	4.98	12.81	90.88	73.95

Table 3.2.4 Average value of proximate Composition of micronutrients in papdi incorporated with Papaya Peel Powder

Treatment	Vitamin C (mg)	Vitamin A (β-carotene) (μg)	Zinc (mg)	Potassium (mg)	Magnesium (mg)
Control	0	4.245	1.19	0.34	50.34
Type1(PPI ₁)	2.04	4.575	1.209	13.24	50.09
Type2(PPI ₂)	4.08	4.905	1.238	26.14	49.79
Type3(PPI ₃)	6.12	5.235	1.267	39.04	49.49

The results show a significant increase in the fibre, Vitamin C and Vitamin A and potassium content of the papdi incorporated with 5% and 7.5% PPP than the control sample.

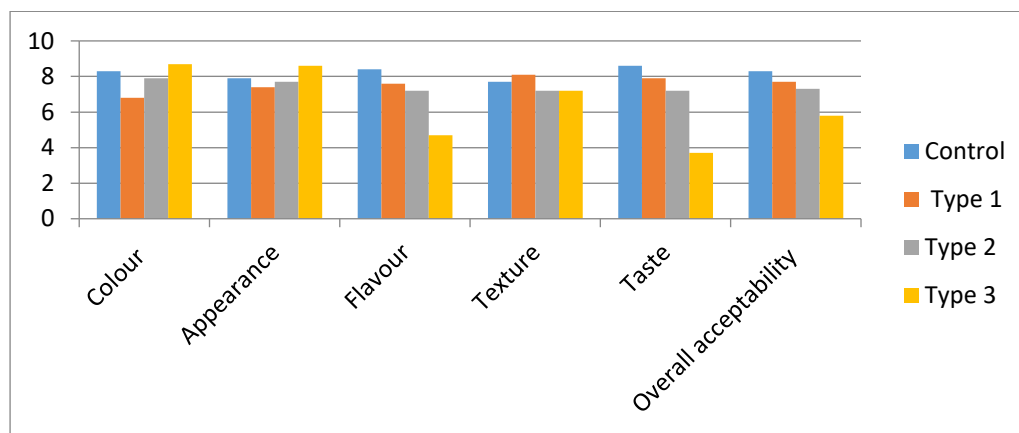
3.3 Evaluation of sensory characteristics of papaya peel powder based idli and papdi.

Sensory and organoleptic characteristics of all the samples are shown in table 3.3.1 and figure 3 for idli and in table 3.3.2 and figure 4 for papdi.

Table 3.3.1 Mean sensory scores of papaya peel powder (PPP) incorporated idli

Treatment	Colour	Appearance	Flavour	Texture	Taste	Overall acceptability
Control	8.3±0.48	7.9±0.87	8.4±0.69	7.7±0.67	8.6±0.51	8.3±0.48
Type1(PPI ₁)	6.8±0.63	7.4±0.51	7.6±0.51	8.1±0.31	7.9±0.73	7.7±0.48
Type2(PPI ₂)	7.9±0.31	7.7±0.48	7.2±0.78	7.2±0.42	7.2±0.78	7.3±0.67
Type3(PPI ₃)	8.7±0.48	8.6±0.51	4.7±0.94	7.2±0.42	3.7±0.82	5.8±1.39

Figure 3. Bar graph showing the acceptability of Idli incorporated with papaya peel powder

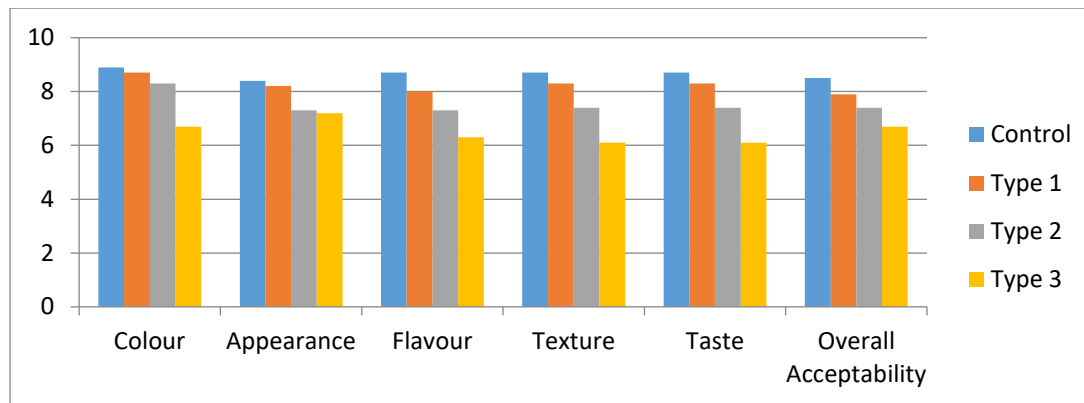


The best colour rating of incorporated idli was seen at Type 3 i.e. 7.5% PPP incorporation (8.7 ± 0.48) and the least was at Type 1 i.e. 2.5% PPP incorporation (6.8 ± 0.63). The flavour and taste of all the types were comparatively lower than the control sample. Out of all the three, Type 1 and Type 2 were acceptable and showed good scores. In terms of taste, flavour and overall acceptability, type 1 show better scores as 7.6 ± 0.51 , 7.9 ± 0.73 and 7.7 ± 0.48 respectively.

It can be concluded that idli prepared by incorporating 2.5% and 5% of papaya peel powder are acceptable in all criteria of sensory evaluation along with control.

Table 3.3.2 Mean sensory scores of papaya peel powder (PPP) incorporated papdi

Treatment	Colour	Appearance	Flavour	Texture	Taste	Overall acceptability
Control	8.9±0.31	8.4±0.51	8.7±0.48	8.0±0.66	8.7±0.48	8.5±0.52
Type1(PPP ₁)	8.7±0.48	8.2±0.42	8.0±0.81	8.1±0.87	8.3±0.67	7.9±0.56
Type2(PPP ₂)	8.3±0.48	7.3±0.48	7.3±0.82	6.9±0.73	7.4±0.69	7.4±0.69
Type3(PPP ₃)	6.7±0.67	7.2±0.63	6.3±0.48	7.3±0.67	6.1±0.56	6.7±0.67

Figure 4 Bar graph showing the acceptability of Papdi incorporated with papaya peel powder

The best colour rating of incorporated papdi was seen at Type 1 i.e. 2.5% PPP incorporation (8.9 ± 0.31) and the least was at Type 3 i.e. 7.5% PPP incorporation (6.7 ± 0.67). The flavour and taste of all the types were comparatively lower than the control sample. Out of all the three PPP incorporated papdi, Type 1 and Type 2 were acceptable and showed good scores. In terms of taste, flavour and overall acceptability, Type 1 show better scores as 8.3 ± 0.67 , 8.0 ± 0.81 and 7.9 ± 0.56 respectively.

It can be concluded that papdi prepared by incorporating 2.5% and 5% of papaya peel powder are acceptable in all criteria of sensory evaluation along with control.

4. Conclusion

By adopting slight changes during processing, the antioxidant and nutritive activity of the final products can be increased and a valuable reserve will be optimally utilised. It is concluded in this study that present study is the initial step towards the utilisation of fruit waste in snacks like idli and papdi preparation. Peels of fruits contains tannins, which are important phytochemicals with a wide range of medicinal properties, including anticancer, antioxidant, anti-inflammatory and antibacterial activities.

Based on the sensory scores it can be concluded that other than control samples the most desirable products of idli and papdi were those having 2.5% and 5% PPP incorporation. Enrichment of idli and papdi with Papaya peel powder enhances their nutritional attributes as an increase in beta carotene, fibre, potassium, vitamin c, protein and zinc are noted in incorporated products.

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