



## **Development and Evaluation of Papaya Peel Powder and Paste Incorporated Chapathis**

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### **Authors' contributions**

Author CSP has carried out the proposed research work as part of Post graduate thesis and performed the statistical analysis. Author SSD has over seen the carrying of this work. Author WJS has designed the research work and wrote the first draft of manuscript. Author CVDR helped in literature search for writing the manuscript and thesis. All authors read and approved the final manuscript.

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### **ABSTRACT**

Consumption of natural bioactive compounds and dietary fibre offers health benefits and protection against lifestyle diseases. Papaya peel which is discarded waste contributes to environmental pollution, but it can be a good source of minerals, fibre and phenolic compounds with antimicrobial antioxidant and cardio-protective properties. In the present study, chapathis were incorporated with 5.0, 10.0 and 15.0% of blanched papaya peel paste and powder. Sensory and physical parameters of chapathis were evaluated using 9 point hedonic scale. The chapathis with 15% blanched papaya peel paste, and 10% papaya peel powder were the most accepted.

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**Keywords:** Papaya peel; sensory evaluation; bioactive compounds.

## 1. INTRODUCTION

In recent years, the global trend is towards the use of natural substances as a source of antioxidant and functional ingredients. Efficient utilisation of food wastes which are unconventional food sources for human consumption increase the nutritional security [1]. The rising costs and decreased availability of raw materials together with environmental pollution necessitates recovery, recycling and upgrading of food wastes as high value-added foods [2].

*Carica papaya* belonged to the family of Caricaceae and was used as medication against a variety of diseases from times immemorial in Ayurveda. India is the world's largest producer of papaya and this is one of the easiest fruits to find in this country [3].

Fruit processing results in large amounts of waste as peels and seeds accounting to approximately 20-25% of fruit weight. It is known that by-products are important sources of minerals, fibre and phenolic compounds that have a wide range of pharmacological activities [4]. The unleavened flatbread called chapathi is of Indian origin made using wheat flour [5]. The mango peel incorporated into biscuits showed an increase in nutraceutical properties (phytochemicals, flavonoids, polyphenols, carotenoids and dietary fibre) of the biscuits [6]. Papaya fruit and peel possess hydrogen peroxide and hydroxyl radical scavenging activity [7].

The present study was undertaken to develop chapathis with the objective to utilise the bioactive compounds present in papaya fruit peel and determine its acceptability by sensory evaluation.

## 2. MATERIALS AND METHODS

Mature papaya was procured from the local market, washed, peeled and the peel was blanched for 3-4 min [8]. The blanched peel was cooled, ground to a fine paste, stored in a sterilised container and kept under refrigeration till further use. Papaya peel powder was prepared using blanched papaya peel by drying at 55° C for 16-18 hours. The dried samples were powdered, sieved and stored in airtight container till further use. Chapathis were

prepared as reported by [5]. A semi-trained panel consisting of 15 personnel from Post Graduate & Research Centre, PJTS Agricultural University evaluated the developed chapathis using 9 points hedonic scale for colour, flavour, taste, chewability, foldability and overall acceptability [9].

## 3. RESULTS AND DISCUSSION

### 3.1 Blanched Papaya Peel Powder Incorporated Chapathis (PPC)

Whole wheat flour was incorporated with papaya peel powder (PPP) at 5, 10 and 15% and labelled as PPC<sub>1</sub>, PPC<sub>2</sub> and PPC<sub>3</sub>. The control chapathis and incorporated chapathis were subjected to sensory evaluation and results were given in Table 1.

The results showed that colour varied from 7.33 to 8.20. The best colour rating was for PPP at 10% incorporation (8.20 ± 0.195) and the least for 5% PPP incorporation (7.33 ± 0.126). The sensory scores for flavour ranged from 6.87 to 7.73, taste 7.00 to 7.46, chewability 6.80 to 7.80, foldability 6.93 to 7.60 and overall acceptability from 7.07 to 7.80. The chewability and foldability of chapathis after incorporation of PPP was comparatively lower than the control sample. The results of taste and foldability showed no significant difference (p<0.05) among the chapathis. The chapathi with 10% PPP incorporation showed the best score for colour (8.20 ± 0.195), flavour (7.73 ± 0.187), taste (7.46 ± 0.192) and overall acceptability (7.80 ± 0.175) in comparison to other chapathis.

### 3.2 Blanched Papaya Peel Paste Incorporated Chapathis (PSP)

Whole wheat flour was incorporated with papaya peel powder (PSP) at 5, 10 and 15% and labelled as PSC<sub>1</sub>, PSC<sub>2</sub> and PSC<sub>3</sub>. The developed and control chapathis were subjected to sensory evaluation using 9-point hedonic scale and results tabulated as given in Table 2.

The sensory evaluation of PSP chapathis for colour, flavour, taste, chewability, foldability and overall acceptability ranged from 7.07 to 8.27, 6.8 to 7.66, 6.86 to 7.46, 6.93 to 7.93 and 6.86 to 7.67, respectively and overall acceptability was between 7.13 to 7.73. The results of the taste

**Table 1. Mean sensory scores of PPC**

Chapathis	Colour	Flavour	Taste	Chewability	Foldability	Overall acceptability
Control	8.00 <sup>bc</sup> ±0.11	7.66 <sup>b</sup> ±0.23	7.27 <sup>ab</sup> ±0.25	7.80 <sup>c</sup> ±0.28	7.60 <sup>b</sup> ±0.19	7.67 <sup>ab</sup> ±0.15
PPC <sub>1</sub>	7.33 <sup>a</sup> ±0.13	6.87 <sup>a</sup> ±0.13	7.00 <sup>abc</sup> ±0.26	6.80 <sup>a</sup> ±0.20	6.93 <sup>bcd</sup> ±0.20	7.13 <sup>bc</sup> ±0.17
PPC <sub>2</sub>	8.20 <sup>c</sup> ±0.20	7.73 <sup>c</sup> ±0.19	7.46 <sup>a</sup> ±0.19	7.40 <sup>ab</sup> ±0.21	7.53 <sup>ab</sup> ±0.22	7.80 <sup>c</sup> ±0.18
PPC <sub>3</sub>	7.67 <sup>ab</sup> ±0.19	6.93 <sup>a</sup> ±0.21	7.20 <sup>abc</sup> ±0.20	6.93 <sup>bc</sup> ±0.21	7.13 <sup>abc</sup> ±0.11	7.07 <sup>a</sup> ±0.21
Mean	7.8	7.30	7.23	7.23	7.30	7.42
CD	0.45	0.54	0.65	0.56	0.56	0.52
SE of mean	0.09	0.10	0.11	0.12	0.10	0.11
CV (%)	7.90	10.10	12.22	10.47	10.44	9.46

Note: Values are expressed as mean ± standard deviation of three determinations.  
 Means within the same column followed by a common letter do not significantly differ at p≤0.05  
 Control: 100% wheat flour  
 PPC<sub>1</sub>: 95% Wheat flour + 5% PPP incorporation  
 PPC<sub>2</sub>: 90% Wheat flour + 10% PPP incorporation  
 PPC<sub>3</sub>: 85% Wheat flour + 15% PPP incorporation

**Table 2. Mean sensory scores of PSC**

Chapathis	Colour	Flavour	Taste	Chewability	Foldability	Overall acceptability
Control	8.0 <sup>bc</sup> ±0.10	7.66 <sup>c</sup> ±0.23	7.27 <sup>ab</sup> ±0.25	7.80 <sup>b</sup> ±0.28	7.60 <sup>c</sup> ±0.19	7.67 <sup>b</sup> ±0.15
PSC <sub>1</sub>	7.07 <sup>a</sup> ±0.59	6.80 <sup>a</sup> ±0.15	6.86 <sup>abc</sup> ±0.25	7.07 <sup>a</sup> ±0.21	7.00 <sup>ab</sup> ±0.14	7.13 <sup>a</sup> ±0.14
PSC <sub>2</sub>	7.60 <sup>b</sup> ±0.63	7.20 <sup>ab</sup> ±0.19	7.13 <sup>abc</sup> ±0.22	6.93 <sup>a</sup> ±0.26	6.86 <sup>a</sup> ±0.22	7.26 <sup>a</sup> ±0.59
PSC <sub>3</sub>	8.27 <sup>bc</sup> ±0.60	7.46 <sup>b</sup> ±0.19	7.46 <sup>ab</sup> ±0.21	7.93 <sup>bc</sup> ±0.24	7.80 <sup>cd</sup> ±0.22	7.73 <sup>bc</sup> ±0.74
Mean	7.73	7.28	7.18	7.43	7.31	7.44
CD	0.40	0.43	0.66	0.68	0.55	0.47
SE of mean	0.08	0.10	0.11	0.13	0.10	0.08
CV (%)	7.26	8.15	12.60	12.5	10.40	8.54

Note: Values are expressed as mean ± standard deviation of three determinations.  
 Means within the same column followed by a common letter do not significantly differ at p≤0.05  
 Control: 100% wheat flour  
 PSC<sub>1</sub>: 95% Wheat flour + 5% PSP incorporation  
 PSC<sub>2</sub>: 90% Wheat flour + 10% PSP incorporation  
 PSC<sub>3</sub>: 85% Wheat flour + 15% PSP incorporation

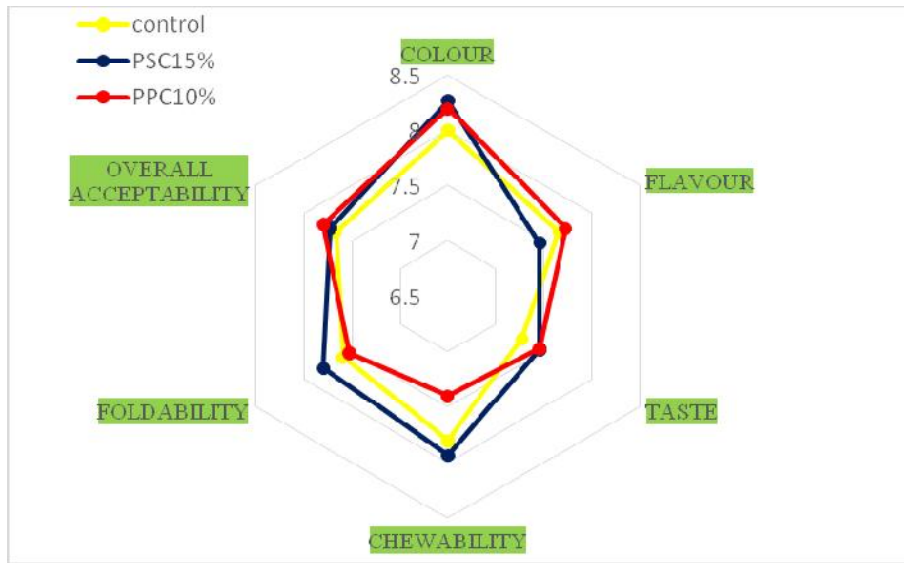


Fig. 1. Sensory attributes of developed chapathis

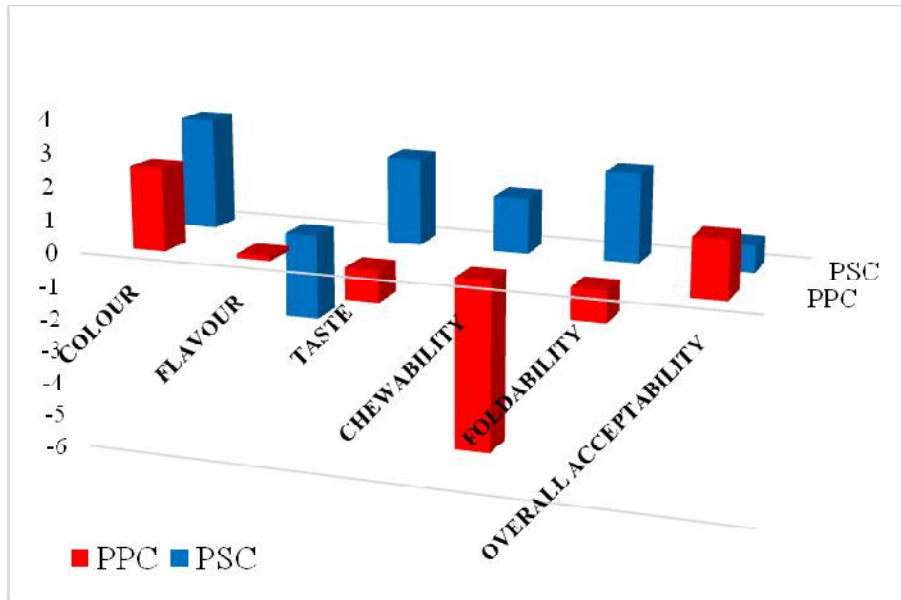


Fig. 2. Percentage change in the sensory attributes of developed chapathis in comparison with control chapathi

showed no significant difference ( $p < 0.05$ ) among the chapathis. The highest rating for colour, taste, chewability and taste was for 15% PSP incorporated chapathi. Flavour was highest with control chapathi and least for 5% PSP incorporation. Hence as the results showed that chapathis with 15% addition had significantly highest rating for colour ( $8.27 \pm 0.59$ ), chewability ( $7.93 \pm 0.235$ ), foldability ( $7.80 \pm 0.215$ ) and overall acceptability ( $7.73 \pm 0.74$ ) on the 9 points

hedonic scale. The sensory attributes of developed chapathis were shown in Fig. 1 and percentage change in the sensory attributes of developed chapathis compared with control chapathi were given in Fig. 2.

#### 4. CONCLUSION

The chemical and nutritional composition of PPP and PSP showed that it is a good source of fibre,

minerals and carotenoids. The carbohydrate and protein digestibility of developed chapathis were low compared to the control sample. Blanched papaya peel paste and powder can successfully be incorporated to chapathis to improve nutritional quality characteristics like its dietary fibre contents, minerals and antioxidant activity (unpublished data). The papaya peel powder at 10% and papaya peel paste at 15% were found most acceptable during sensory evaluation. Thus, papaya peel, a by-product from the processing industry, could be utilised for the preparation of chapathis and other food products with improved functional and nutraceutical properties.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

### REFERENCES

1. Kim JS. Radical scavenging capacity and antioxidant activity of the E vitamin fraction in rice bran. *Journal of Food Science*. 2005;70(3):208–213.
2. Abul-Fadl MM. Nutritional and chemical evaluation of white cauliflower by products flour and the effect of its addition on beef sausage quality. *Journal of Applied Sciences Research*. 2012;8(2):693-704.
3. Mello VJ, Gomes MT, Lemos FO, Delfino JL, Andrade SP, Lopes MT, Salas CE. The gastric ulcer protective and healing role of cysteine proteinases from *Carica candamarcensis*. *Phytomedicine*. 2008;15: 237–244.
4. Djilas S, Brunet CJ, Cetkovic G. By products of fruits processing as a source of phytochemicals. *Chemical Industry and Chemical Engineering Quarterly*. 2009; 15(4):191-202.
5. Cheng YF, Bhat R. Physicochemical and sensory quality evaluation of chapati (Indian flat bread) produced by utilizing underutilized jering (*Pithecello biumjiringa* Jack.) legume and wheat composite flours. *International Food Research Journal*. 2015;22(6):2244-2252.
6. Ajila CM, Leelavathi K, Prasada Rao, UJS. Improvement of dietary fibre content and antioxidant properties in soft dough biscuits with the incorporation of mango peel powder. *Journal of Cereal Science*. 2008;48:319-326.
7. Murcia MA, Jimenez AM, Martinez-Tome M. Evaluation of the antioxidant properties of Mediterranean and tropical fruits compared with common food additives. *Journal of Food Protection*. 2001;64: 2037–2046.
8. Waghmare AG, Arya AS. Use of fruit by-products in the preparation of hypoglycemic thepla: Indian unleavened vegetable flat bread. *Journal of Food Processing and Preservation*; 2012. ISSN1745-4549.
9. Meilgaard M, Civille GV, Carr BT. Sensory evaluation techniques. 3<sup>rd</sup> ed. CRC press: Boca Raton; 1999.

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