



# Formulation And Evaluation Of Papad Developed With Partial Replacement Of Rice Flour With Little Millet (*Panicum Sumatrense*) Flour

Nisarga R

Dept. of Food Science And Nutrition, Yuvaraja's College (Autonomous), University of Mysore, Mysuru, Karnataka, India

## ABSTRACT

Little millet, scientifically known as *Panicum sumatrense* and belonging to the *Poaceae* family, is particularly beneficial for diabetics due to its slow digestion compared to rice and wheat. Additionally, papad, a traditional savory food known by various names such as appalam or papadam, holds a significant place in Indian dietary practices. By keeping little millet, enormous health benefits, the present study aims to use little millet for development of papad by partially replacement of rice flour (20%, 40%, 60%, 80%, and 100%) was explored. These concentrations were labeled as L1, L2, L3, L4, L5, and L6, respectively. These formulations were evaluated for sensory attributes by a panel of semi-trained panelists (n=30). It was found that papad incorporating 60% little millet showed similar acceptability compared to the control, while those with 80% and 100% replacement scored lower in overall acceptability. Therefore, the papad made with 60% replacement of little millet was selected for nutritional analysis, revealing higher levels of protein (), fiber (), calcium (), and iron () compared to the control. This improved nutritional profile positions the pseudo-cereal papad as superior to traditional rice papad.

**Key words:** *Panicum sumatrense*, papad, replacement, little millet.

## Introduction

The little millet is minor millet which belongs to the family of *Poaceae* (*Gramineae*). The common name of the crop is kutki, sawa, samai, samalu (Padulosi *et al.*, 2009). It originated in the Indian subcontinent. It is one of little millet is comparable with other cereal grains such as rice and wheat as a source of protein, fat, carbohydrates and crude fibre, apart from minerals and vitamins. It also contains phytochemicals, such as phenolic acids, flavonoids, tannins and phytate (ICRISAT). The crop is highly drought tolerant and

nutritionally as well as medicinally superior or at par with other cultivated cereals. Grains are recommended for diabetic and patients of cardio –vascular diseases. The grain of little millet possess excellent storage properties and can be stored for several years without fear of store grain pests under ordinary storage conditions. Little millet is well known for its drought tolerance and is considered as one of the least water demanding crop. Being eco-friendly, the crop is suitable for fragile and vulnerable agro-ecosystems. The little millet husked grain is cooked as like rice and sometimes made into flour for different types of food preparations. Considering the growing awareness among the consumers regarding the health benefits of millet, there is a need to meet the diversified demands for millet based food products.

Papad is an Indian traditional food prepared using cereal or legume flours or a combination of both with minor quantities of spices, vegetable oil, sodium chloride and alkaline additives. (Shurpalekar and Venkatesh 1975). It is a ready to prepare snack food item with thin wafer like product prepared from a variety of ingredients and is liked very much by population of India. Nowadays, it is gaining international recognition and is termed as India's unique contribution to international menu. The current study aims to develop millet-based papad by partially substituting rice flour with little millet flour, evaluating its sensory attributes, and conducting nutritional analysis of the little millet papad. The research includes sensory profiling of the papads and discusses their nutritional positioning based on the analysis.

## **MATERIALS AND METHODS**

### **Raw materials:**

The present study was carried out in the department of Food Science and Nutrition, Yuvaraja's college (Autonomous), University of Mysore, Mysuru. The raw materials such as rice flour, pepper powder, jeera and salt were procured from local market in a single lot and the little millet flour was ordered from Jiwa organic and refrigerated till use.

### **Preparation of papad:**

Papad was prepared by mixing varying ratios of rice flour and little millet flour into boiling water (100°C). The addition of flour ensured a lump-free consistency. Pepper powder, cumin (jeera), and salt were added and thoroughly stirred to form a soft dough. Small balls weighing approximately 12 g were formed from the dough, which were then flattened into discs using a rolling pin. Subsequently, the papads were sun-dried and deep-fried over medium heat until they turned golden brown and became crisp.

The recipe for the preparation of little millet papad was standardized in filler trials by varying the quantities of little millet and other ingredients in various proportions (100, 20:80, 40:60, 40:60 & 100) in order to develop palatable product.

TABLE 1

## Formulation of the product

Variations	Rice flour	Little millet flour	Pepper powder	Jeera	Salt	Water (ml)
Control	100	-	1	0.75	3	300
B1	80	20	1	0.75	3	300
B2	60	40	1	0.75	3	300
B3	40	60	1	0.75	3	300
B4	20	80	1	0.75	3	300
B5	-	100	1	0.75	3	300

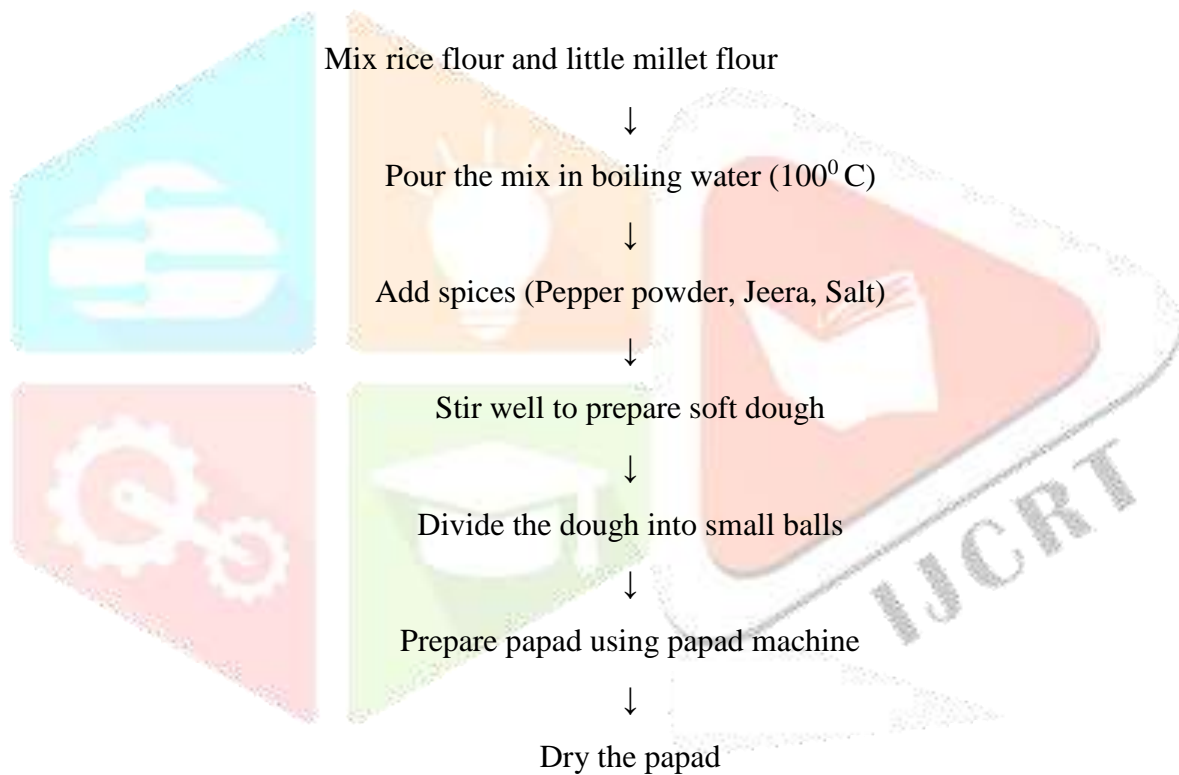


Fig 1: Flow chart of little millet papad preparation



**Fig 2: Different variation of the little millet papad**

### Proximate estimation:

Little millet papad were analysed for proximate composition namely moisture, ash, energy, crude fat and crude fiber according to the standard procedures described by Ranganna (1986). The carbohydrate content was calculated by difference method. Estimation of minerals such as calcium, magnesium, sodium, potassium, phosphorous, manganese, and iron were estimated according to standard AOAC (2005) method.

### Sensory Analysis:

Sensory evaluation of little millet papad with varying proportion of little millet flour was done to obtain a product with higher acceptability. The samples were subjected to sensory evaluations by 30 semi trained panellists using 9-point Hedonic scale (from Like extremely to dislike extremely) to determine the acceptability of product with respect to colour, flavour, taste, texture and overall acceptability (Obatolu *et al.*, 2006). Best accepted little millet papad on the basis of sensory evaluation was further studied for nutritional analysis.

### Statistical analysis:

The experiments were performed with three independent trials, and data are presented as mean  $\pm$  standard deviation (SD). The data was analysed with SAS software 9.3 using two way analysis of variance. Duncan's Multiple Range Test was applied to differentiate among the means of different samples ( $P \leq 0.05$ ).



## RESULTS AND DISCUSSION

TABLE 2

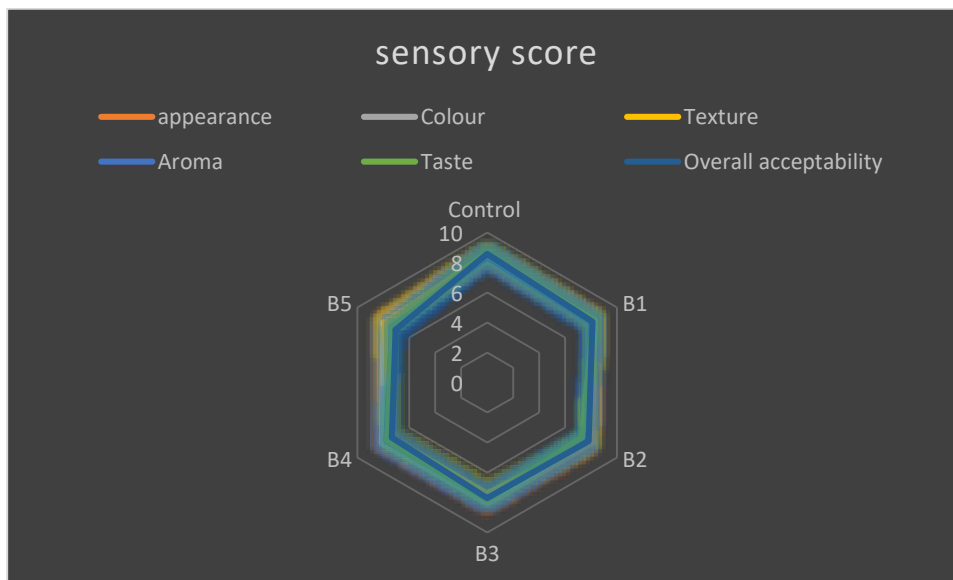
## Mean sensory score of little millet papad

Products	Sensory attributes					
	Appearance	Colour	Texture	Aroma	Taste	Overall acceptability
Control	9.0±0.00	9.0±0.12	8.98±0.23	8.9±0.30	8.9±0.31	8.98±0.13
B1	8.61±0.4	8.66±0.35	8.65±0.21	8.66±0.21	8.55±0.22	8.60±0.21
B2	8.45±0.35	8.42±0.35	8.45±0.32	8.45±0.35	8.47±0.31	8.41±0.34
B3	8.21±0.21	8.27±0.35	8.23±0.49	8.22±0.48	8.20±0.48	8.21±0.49
B4	7.80±0.21	7.90±0.35	7.83±0.49	7.82±0.48	7.90±0.48	7.81±0.49
B5	7.65±0.43	7.60±1.17	7.40±0.91	7.36±0.5	7.27±0.9	7.25±0.49
F value	*	*	*	*	*	*
S. Em±	0.204	0.176	0.212	0.219	0.224	0.220
CD at 5%	0.577	0.500	0.601	0.621	0.634	0.623

Values are mean ± standard deviation (n=3), \*- Significant at 5 %, S. Em± - standard error of mean. CD – Critical difference, Control –Papad without addition of little millet, B1 – little millte flour (80 %), B2 - little millte flour (60 %), B3 – little millte flour (40 %), B4 – little millte flour (20 %) , B5– little millte flour (100 %)

The mean sensory scores of little millet papad at different levels of little millet replacement is depicted in Table 2. Statistically significant difference was observed with respect to appearance, texture, colour, aroma, taste and overall acceptability (OAA). The control papad got highest sensory scores for all the sensory attributes. The little millet papad with 100 % little millet flour scored lowest for all the sensory attributes. The 40 % replacement of rice flour had higher overall acceptability (OAA) scores followed by 60 % as it was obvious that as the percentage of replacement of rice flour increases sensory parameters such as colour, texture and flavour parameters contributed for decreased OAA scores. Looking into the OAA scores of 40 and 60 % replacement (8.41 and 8.21) there was not much difference. However, looking into the nutritional benefits of little millet flour replacement in the products, the 60 % was taken for further studies.

Similarity study by Senthil *et al.*, (2006) determined the papad prepared by blackgram at different brand blackgram. The results revealed that sensory profiling of all the samples had good overall quality and had higher intensity scores for attributes color, crispness, snappiness and blackgram aroma.



**Fig 3: Sensory score of little millet papad**

**TABLE 3**

**Nutrition composition of little millet papad (100 g)**

Nutrients /100 g	Control	B3	t- value
Moisture	1.80 ±0.2	1.98±0.01	49.20*
Protein	5.92±0.12	6.02±0.08	68.93*
Fat	3.58±0.01	3.44±0.02	41.10*
Ash	2.63±0.01	2.79±0.02	33.83*
Carbohydrates	81.81±0.08	79.98±0.01	356*
Crude fiber	4.98±0.01	5.97±0.01	104*
Energy (kcal)	383.14±0.08	374.96±0.01	3257.82*
Sodium (mg %)	14.23±0.12	16.02±0.21	379.716*
Potassium (mg %)	148.25±0.23	169.36±0.26	466.69*
Calcium (mg %)	126±0.21	144±0.31	8.485*
Phosphorus (mg %)	138.32±0.23	159.34±0.24	99.702*
Magnesium (mg %)	58.12±0.21	62.42±0.12	912.168*
Iron (mg %)	1.93±0.21	4.58±0.31	562.15*
Manganese (mg %)	1.28±0.32	2.98±0.24	328*

Values are mean ± standard deviation (n=3). \*- Significant at 5 %, S. Em± - standard error of mean. CD – Critical difference, Control –rice flour papad, B3 – little millet papad (60 %)

The nutritional composition of control (rice flour papad) and little millet papad (B3) were analysed and depicted in Table 3. The results revealed that the nutritional composition of little millet papad varied statistically. Moisture content of control and little millet papad was 1.80 % and 1.98 % respectively. Were the papad is having a very little amount of moisture content as a result it can be keep for longer period of time without effect its quality. The little millet papad had significantly more protein (6.02 g), crude fiber (5.97 g). Minerals such as calcium (144 mg ), magnesium (62.42 mg ), phosphorous (159 mg ), sodium

(16.02 mg), potassium (169.36 mg), manganese (2.98 mg) and iron (4.58 mg) were significantly higher in the little millet papad than the control which contained lower values for all the parameters (Table 3). Calcium and magnesium help in establishing a natural energy boost by energy yielding metabolism, routine functioning of the nervous system and rich in iron content is beneficial. While, phosphorus is an important mineral for energy production and is an essential component of ATP (the energy store of the body). It also forms an essential part of nervous system and cell membranes (Coulibaly *et al.*, 2012). Similar kind of variation in nutritional composition of different level of filed pea incorporated in the papad was reported by Meenakshi Garg *et al.*,(2015).

### Conclusion:

Little millet is the smallest among millets, yet it surpasses others in nutritional value. It has significant benefits for diabetic individuals, as demonstrated in a study where gluten-free papad was made by substituting rice with little millet. This substitution showed positive effects compared to rice papad. Little millet is nutritionally superior and the papad made from it can be stored for extended periods without compromising quality under ambient conditions.

### Reference:

- AOAC, 2005, Official Methods of Analysis, Association of official analytical chemists, 18th ed. Washington, D.C., USA, 2-38.
- Garg, M., & Sabharwal, P. K. 2015. Physico-Chemical Properties of papad from Field Pea Cultivar. *International Journal of Science and Research (IJSR)*, **4**(1), 1399-1403.
- Obatolu V A, Omucti C O and Ebenerer A A., 2006. Qualities of extruded puffed snacks from maize/soybean mixture. *Journal of Food Process Engineering* **29**: 149–61.
- Padulosi, S., Bhag Mal, B., Bal Ravi, S., Gowda, J., Gowda, K.T.K., Shanthakumar, G., Yenagi, N. and Dutta, M., 2009. Food security and climate Change: role of plant genetic resources of minor millets. *Indian J. Plant Genetic Resources*, **22**(1): 1-16.
- RANGANNA, S., 1986. Hand book of analysis and quality control for fruits and vegetable products, 2nd ed. Tata McGraw-Hill publishing company limited, New Delhi.
- Senthil, A., Ravi, R., & Vasanth Kumar, A. K., 2006. Quality characteristics of blackgram papad. *International journal of food sciences and nutrition*, **57**(1-2), 29-37.
- Shurpalekar, S. R., & Venkatesh, K. V. L., 1975. Studies on papads based on blends of blackgram with cereals, pulses and starches. *Journal of Food Science and Technology, India*, **12**(1), 32-35.