

**RESEARCH ARTICLE :**

## Development of instant idli mix from proso millet (*Panicum miliaceum*)

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**SUMMARY :** Proso millet (*Panicum miliaceum*) is an annual warm season grass which was used to prepare some foods in some parts of Karnataka. The present study was focused on development of ready-to-cook Idli mix using proso millet, by varying the levels of proso millet and chiroti rawa in the ratio of 90:10 and 80:20, respectively. The proximate composition of the idli mix was found to contain 7.12 (g), 0.92 (g), 13.82 (mg), 4.14 (g) and 49.85 (g) of protein, fat, calcium, crude fibre and carbohydrates, respectively. The product was stored in three different packaging materials namely, Polyethylene, Polypropylene and Aluminium Laminated Foil pouch for 2 months under ambient condition for shelf life study. Ready-to-cook Idli mix was subjected to sensory evaluation and nutritional analysis. The results of the study revealed that Ready-to-Cook Idli mix packed in aluminium laminated foil pouch showed highest score with respect to Appearance (8.19), Texture (7.44) Colour (7.75), Aroma (7.50), Taste (7.63) and Overall acceptability (7.69) compared to Idli mix stored in other two packaging materials that is Polyethylene and Polypropylene. Results also revealed that it can be stored up to three months under ambient condition without any quality deterioration. Idli mix with 80 per cent millet was found to be best accepted.

**KEY WORDS :**

Proso millet, Sensory evaluation, Packaging materials, Shelf-life

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### **BACKGROUND AND OBJECTIVES**

The term “Millet” is used for several small seeded annual grasses that are of minor importance in the Western world but a staple in the diets of African and Asiatic people. Millets can be cultivated in a wide range of soils and climates are of special importance in semiarid regions because of their short growing seasons (Schery, 1963). *Panicum miliaceum*, also known as proso millet, Hershey, broom corn, or hog millet, is planted in some African countries as a food crop. It is

the only species of economic importance in the United States at present. Many farmers in Eastern Colorado and Western Nebraska are including proso in three-year and five-year rotation systems. Proso Millet planted after wheat in a wheat-proso-fallow rotation is an excellent way to control or at least reduce infestation of annual weeds (Nelson and Daigger, 1975). Proso Millet is used in feeding rations, as bird seeds, and also as human food (Hinze, 1972). Suggested food applications of dehulled Proso Millet in the United States

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include a puffed or cooked breakfast cereals or replacement for upto 30% of wheat flour in certain baked products and other household recipes (Hinze, 1972).

Proso Millet is the largest grain among the millet rices in addition to all the general millet characteristics (gluten-free, low glycemic index, high fibre, etc). It is golden in colour, so it's also called the "Golden Millet". Proso Millet is a part of the staple diet of many cultures. Finger Millet (*Eleusine coracana*), Kodo Millet (*Paspalum scrobiculatum*), Proso Millet (*Panicum miliaceum*), Foxtail Millet (*Setaria italica*), Little Millet (*Panicum sumatrense*) and Barnyard Millet (*Echinochloa utilis*). They are hardy and grow well in dry zones as rain fed crops, under marginal conditions of soil fertility and moisture. They are one of the oldest food grains known to humans and possibly the first cereal grain to be used for domestic purposes. Small Millets are the staple food of the millions inhabiting the arid and semiarid tropics of the world. They are distributed in most of the Asian and African countries and parts of Europe. They are the most important species in terms of cropped area and contributions to food security in regions of Africa and Asia. (Rao *et al.*, 2011). They are also unique due to their short growing season and can develop from planted seeds to mature, ready to harvest plants in as little as 65 days. This is important in heavily populated areas. If properly stored, whole grains can be kept for two or more years. Small Millets are highly nutritious, non-glutinous and non-acid forming foods. Hence, they are soothing and easy to digest. They are considered to be the least allergenic and most digestible grains available. Small Millets contain about 8 per cent protein and 4 per cent fat. They are rich source of vitamins and minerals. Small Millets are especially rich in calcium. The dietary carbohydrate content of millets is also relatively high. Starch is the main carbohydrate component and they contain a higher proportion of non-starchy polysaccharides (dietary fibre) also. In spite of these nutritional advantages the consumption of small millets has drastically declined in the last four decades across South Asia. Some of the important reasons for the decline of Small Millets consumption are: Lack of adequate scientific proof of the nutritional benefits and near absence of Small Millet food products in the market. This is in turn a reflection of inadequate research on nutrient analysis, development of attractive food products and bioavailability of products. Any effort for increasing

consumption of Small Millets to address the malnutrition and rising incidence of non-communicable diseases have to address these research gaps.

## RESOURCES AND METHODS

### Procurement of raw materials :

Whole proso millet was procured from PC Unit AICRP on Small Millets, University of Agricultural Sciences, GKVK, Bangalore. Other ingredients were obtained from local market, Bangalore.

### Milling of millet :

Milling of proso millet was done in Centre of Excellence on Small Millets, University of Agricultural Sciences, GKVK, Bangalore. Proso Millet grits were made in pulverize and sieving using a mesh to obtain fine grits.

### Drying of vegetables :

Chilly and carrot was cut into 1cm length. Carrot, chilly and curry leaves were kept for drying at 45°C in dehydration unit. Carrots were dried after blanching. Blanching was done by dipping vegetables in boiling water for 3 minutes followed by immediate cooling.

### Preparation of mix :

Two formulations of Idli mix were prepared by incorporating proso millet and chiroti rawa at two levels (90:10 and 80:20)

### Ingredients used for proso millet idli mixes :

Proso millet grits, Curd, Coriander, Curryleaves, Salt, Carrot gratings, Bengal gram, Mustard seed, Oil and Cashewnut pieces.

Table A : Formulation of proso millet idli mix		
Proso millet idli	A	B
Proso millet grits (g)	90	80
Chiroti Rawa (g)	10	20
Curd (Cup)	1	1
Coriander leaves(g)	5-6	5-7
Curry leaves (g)	5-10	5-10
Salt (g)	3-5	3-5
Bengal gram dal (g)	5-10	5-10
Mustard seed (g)	2-3	2-3
Cashewnut pieces	5	5

**Preparation of idli from proso millet idli mix :**

Idles were prepared by soaking 100 g of idli mix in 30 ml of curd for 20 min and steamed for 12 min.

**Nutrient composition of proso millet idli mix :**

Nutrient compositions of developed mix were calculated by computational method using the analyzed nutritive value of proso millet.



Fig. A : Proso millet idli

**Sensory evaluation of proso millet idli :**

Developed products were evaluated by 10 semi-trained panel members from the Centre of Excellence on Small Millets, and AICRP on Post-Harvest Engineering and Technology, GKVK, UAS, Bangalore. The products were evaluated for appearance, texture, colour, aroma, taste and overall acceptability using 9 point hedonic scale.

**Shelf-life study of developed proso millet idli mix:**

The best accepted proso millet Idli mix from sensory

evaluation were packed in three different packaging materials namely, Polyethylene covers (PE 200 gauge) Polypropylene covers (PP 200 gauge) and Aluminium Laminated Foil Pouches (200 gauge) for shelf life studies under ambient condition ( $28\pm 2^{\circ}\text{C}$ ). The sensory evaluations of these stored products were done at interval of 30, 60 and 90 days.

**OBSERVATIONS AND ANALYSIS**

The results obtained from the present study as well as discussions have been summarized under following heads and Table 1 to 3 :

**Sensory evaluation :**

The results pertaining to the sensory evaluation of two different formulations of proso millet idli mix are presented in the Table 1. Among formulation, 80:20 of proso millet Idli mix was found to be best accepted, compared to 90:10. There is a significant difference between the formulations for all attributes except for overall acceptability, but all the variations were in the acceptable level.

**Nutritive value :**

The nutritional composition of Proso millet Idli mix revealed that it contained high protein and fibre content of 9.71 and 3.42 %, respectively along with high phosphorus and calcium content.

**Shelf-life study :**

The effect of storage on the sensory evaluation of the proso millet Idli mix stored at ambient temperature is presented in the Table 3. As the storage time increases the scores for all sensory characteristics decreases. There is a significance difference were observed in appearance,



Fig. B : Instant proso millet idli mix packed in different packaging material

**Table 1 : Sensory evaluation of different formulation of proso millet idli mix**

Sensory attributes	Formulation	
	90:10	80:20
Appearance	6.70	8.06
Texture	6.20	7.73
Colour	6.71	7.80
Aroma	6.54	7.61
Taste	5.79	7.92
Overall acceptability	6.50	7.82

**Table 2 : Nutritional composition of Proso Millet Idli Mix**

Parameters	Composition
Protein (%)	9.71
Fat (%)	7.43
Mineral (%)	1.52
Crude fibre (%)	3.42
Carbohydrates (%)	51.12
Energy (Kcal)	301
Calcium (mg)	29.73
Phosphorus (mg)	175.03
Iron (mg)	3.68

texture, colour, aroma, taste and overall acceptability scores under different packaging condition.

The sensory score for “Appearance” of Idli Mix stored in various packages for different storage periods are presented in Table 3. The Appearance scores generally decreased with storage period. The Appearance scores of Idli Mix decreased from an initial value of 7.44, 7.36, 7.33 and 7.30 in Polypropylene; 7.44, 7.39, 7.36 and 7.35 in Polypropylene; 7.44, 7.44, 7.42 and 7.41 in Aluminium laminate pouch after 0, 30, 60 and 90 days of storage, respectively. The results showed that Idli Mix packed in aluminium laminate pouch maintained a high acceptability score of 7.41.

The Texture scores generally decreases with increase in storage period. The Texture scores of Idli Mix decreased from an initial value of 7.69, 7.66, 7.60 and 7.55 in Polyethylene; 7.69, 7.68, 7.65 and 7.59 in Polypropylene; 7.69, 7.66, 7.65 and 7.60 in Aluminium laminate pouch after 0, 30, 60 and 90 days of storage, respectively. The results showed that Idli Mix packed in aluminium laminate pouch maintained a high acceptability score of 7.60.

The sensory score for “Colour” of Idli Mix stored in various packages for different storage periods are presented in Table 3. The Colour scores of Idli Mix decreased from an initial value of 7.88, 7.81, 7.76 and 7.71 in Polyethylene; 7.88, 7.79, 7.70 and 7.65 in Polypropylene; 7.88, 7.87, 7.82 and 7.80 in Aluminium laminate pouch after 0, 30, 60 and 90 days of storage, respectively.

The Aroma scores generally decreases with increase in storage period. The Aroma scores of Idli Mixes decreased from an initial value of 7.56, 7.52, 7.43 and 7.39 in Polyethylene; 7.56, 7.50, 7.48 and 7.44 in Polypropylene; 7.56, 7.52, 7.49 and 7.45 in Aluminium laminate pouch after 0, 30, 60 and 90 days of storage, respectively. The results showed that Idli Mix packed in aluminium laminate pouch maintained a high acceptability score of 7.45.

The sensory score for “Taste” of Idli Mix stored in various packages for different storage periods are presented in Table 3. The Taste scores generally decreases as the storage period increases. The Taste scores of Idli Mix decreased from an initial value of 7.96, 7.90, 7.85 and 7.80 in Polypropylene; 7.96, 7.95, 7.93 and 7.88 in Polypropylene; 7.96, 7.91, 7.90, and 7.89 in Aluminium laminate pouch after 0, 30, 60 and 90 days of storage, respectively.

The Overall Acceptability scores of Idli Mix

**Table 3 : Mean sensory scores of idli prepared from stored proso millet idli mix**

Sensory parameters	Packaging materials											
	Polyethylene				Polypropylene				Aluminium laminated pouches			
	Storage period (Days)				Storage period (Days)				Storage period (Days)			
	0	30	60	90	0	30	60	90	0	30	60	90
Appearance	7.44	7.36	7.33	7.30	7.44	7.39	7.36	7.35	7.44	7.44	7.42	7.41
Texture	7.69	7.66	7.60	7.55	7.69	7.68	7.65	7.59	7.69	7.66	7.65	7.60
Colour	7.88	7.81	7.76	7.71	7.88	7.79	7.70	7.65	7.88	7.87	7.82	7.80
Aroma	7.56	7.52	7.43	7.39	7.56	7.50	7.48	7.44	7.56	7.52	7.49	7.45
Taste	7.96	7.90	7.85	7.80	7.96	7.95	7.93	7.88	7.96	7.91	7.90	7.89
Overall acceptability	7.19	7.11	7.07	7.06	7.19	7.15	7.11	7.09	7.19	7.18	7.15	7.14

decreased from an initial value of 7.19, 7.11, 7.07 and 7.06 in Polypropylene; 7.19, 7.15, 7.11 and 7.09 in Polypropylene; 7.19, 7.18, 7.15 and 7.14 in Aluminium laminate pouch after 0, 30, 60 and 90 days of storage, respectively. The results showed that Idli Mix packed in aluminium laminate pouch maintained a high acceptability score of 7.14.

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