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## Development and evaluation of instant dosa mix from underutilized brown top millet

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### Abstract

Millet has immense potential health benefit and plays important role in national food security. An experiment was carried out to develop an instant dosa mix from brown top millet. A millet-based dosa mix formulated with 30% rice, 40% brown top millet, 25% black gram, dhal and 5% fenugreek seeds achieved a top overall acceptability score of 8.5. The instant dosa mix had moisture 7.1 g, protein 15.87 g, carbohydrate 67.73 g, crude fiber 10.16 g total mineral 3.64 g, total energy 337 K.cals, dietary fiber 9.0 gm, calcium 39.6 mg and iron 6.7 mg per 100 g. Shelf life study revealed that overall acceptability scores decreased gradually in samples stored at ambient condition (8.5 to 5.50). Moisture and peroxide values increased with increased storage period (7.15 to 7.70 g and 0.05 to 0.11 MEA/kg respectively). *E. coli* was not detected during storage period.

**Keywords:** Brown top millet, dosa mix, nutritional composition, sensory evaluation, shelf life

### Introduction

Millets are considered as crop of food security because of their sustainability in adverse agro-climatic condition. These crops have substantive potential in broadening the genetic diversity in the food basket and ensuring improved food and nutrition security. Along with nutrition millets offer health benefits in daily diet and help in the management of disorders like diabetes mellitus, obesity, hyper lipidemia, etc. (Veena, 2003) [5].

Brown top millet (*Urochloa ramosum*) is one of the most uncommon and under-explored millets among all the others. It is a historical crop of India particularly in Tumkur, chitradurga, chikkaballapura and bellary of Karnataka but also thrives in Andhra Pradesh (Mallikarjuna, 2016) [7]. Brown top millet is one of many small millets, but its significance has only recently come to light because of its enormous potential to produce a high yield under resource-poor and vulnerable ecological conditions, ensuring the economic and nutritional security of small farm holders as well as the sustainability of their operations. Brown top millet is a abundant source of crude fibre with 4.92 g/100 g, dietary fibre with 12.43 g/100 g and minerals (calcium-26.24 mg, iron-6.98 mg, zinc-2.88 mg, copper-1.43 mg and manganese-0.88 mg/100 g) which helps in the overall health and development (Ponnappalli H *et al.*, 2023) [6].

Though it is rich in nutrients its consumption restricted to festival and few occasion in form traditional foods only. Knowledge of different food preparation from small millets in daily diet was also less in housewife which hinders the regular consumption. Hence to this study was aimed in eliminating the inconvenience in the preparation of millet foods and increasing its consumption through development of ready-to-cook foods. Therefore, the present study is designed with following major objectives

1. To develop and standardization of instant food mixes from brown top millet
2. To assess the nutritional and keeping quality of instant food mixes

### Methodology

The present investigation was conducted under demand driven project in ICAR krishi Vigyan Kendra Koppal, University of Agricultural Sciences Raichur, Karnataka. Brown top millet rice will be procured from millet progressive farmer of koppal district. Other raw materials like rice flour, black gram are procured from local market of koppal district.

**Preparation of Instant dosa mix:** Five variations of instant dosa mix were created by adjusting the ingredients of a standard dosa mix with added value ingredients, and the resulting products were then made. (Table, 1).

**Table 1:** Different formulations of dosa mix

Trials	Rice flour (g)	Brown top millet flour (g)	Black gram dhal (g)	Fenugreek seeds (g)
T <sub>0</sub> (Control)	70	-	25	5
T <sub>1</sub>	50	20	25	5
T <sub>2</sub>	30	40	25	5
T <sub>3</sub>	10	60	25	5
T <sub>4</sub>	-	70	25	5

**Preparation of dosa:** 100 g of the dosa mix was taken to which 50 ml of curd and 200 ml water was added and the batter was prepared. Salt was added to taste. It was allowed to ferment for 30 minutes at room temperature. The tawa was heated and batter was spread, smeared with oil (3 ml) and cooked till the colour turned to golden brown and the prepared product was organoleptically evaluated. (length) to thickness ratio (Shreshta and Noomhorm 2002) [10]. The water absorption and oil absorption capacity were determined by standard method (Sosulski *et al.*, 1996) [11].

**Sensory evaluation of dosa mixes:** The dosa prepared from different formulation and are sensory evaluated in comparison with basic variation by semi trained panel members using nine point ranking scale. The product which scored high sensory score was further subjected to nutritional analysis.

**Nutritional composition:** The proximate properties like moisture, protein, crude fat, total ash, crude fibre, carbohydrates, energy and minerals (Ca and Fe) of instant dosa mix were analysed according to Anon, 2019 [2].

**Dietary fibre (%) of accepted instant dosa mix:** The soluble, insoluble and total dietary fibre of instant dosa mix was estimated by using  $\alpha$ -amyl glucosidase method (Asp *et al.*, 1983) [4].

### Keeping quality

**Storage quality evaluation:** The Control and instant dosa mix was packed in aluminium silver pouch and plastic pouches, heat sealed and stored in cardboard boxes at ambient temperature for a period of 90 days. The storage quality of control dosa mix and instant dosa mix were

evaluated for moisture content, free fatty acid (FFA), peroxide value (PV) and sensory quality at the interval of 45 days for a period of 90 days.

**Microbial load:** Microbial load was analysed by using standard protocols. Pour plate method was followed for estimation of microorganisms. For bacteria used Nutrient Agar (NA), for fungi used Rose Bengal Agar (RBA), for Coliforms used Eosine Methalene Blue Agar (EMBA). Microbial load was analysed on initial day, 45th day and 90<sup>th</sup> day.

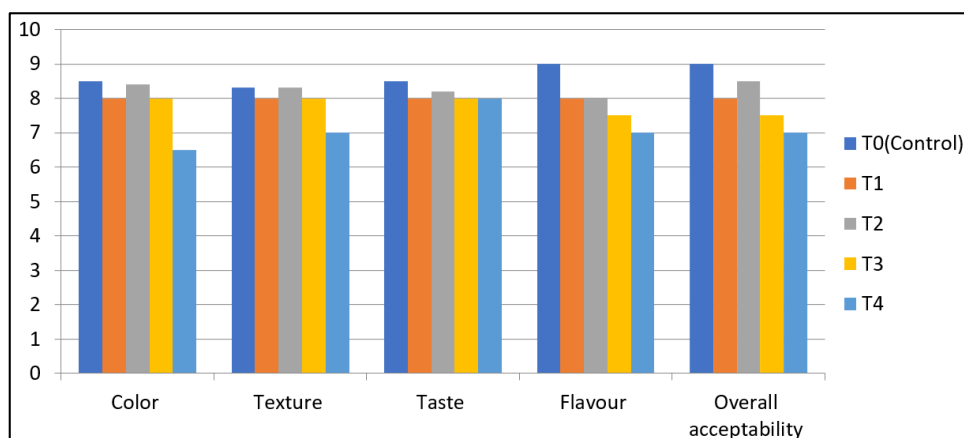
**Statistical analysis:** All the experiments were performed in triplicates and completely randomized design was carried out for the experimental values in order to know the significant difference (at 5% significant level). Free fatty acids and Microbial quality of accepted product will be analysed before and after storage of three months.

### Results and Discussion

Brown top millet is one of the underutilized millets having good nutritional and health benefits. The sensory evaluation of different instant dosa mixes was revealed in the table.2 and figure 1. The results showed that the T<sub>2</sub> (30% rice, 40% brown top millet, 25% black gram dhal and 5% fenugreek seed) was accepted as best formulation with overall acceptability score of 8.5. As the increase in the millet flour incorporation except taste, sensory qualities such as colour, flavour, texture and over all acceptability were decreased. This may be due to tannins present in millet influence colour of the product. There was no significant difference in taste of dosa. Millet based dosa from all formulations was accepted 'likely very much'. The addition of millet, regardless of the quantity, did not affect the taste of the dosa, demonstrating its ability to blend seamlessly with other ingredients.

**Table 2:** Mean score values of sensory quality attributes of instant dosa mix

Treatment	Color	Texture	Taste	Flavour	Overall acceptability
T <sub>0</sub> (Control)	8.5	8.3	8.5	9.0	9
T <sub>1</sub>	8.0	8.0	8.0	8.0	8.0
T <sub>2</sub>	8.4	8.3	8.2	8.0	8.5
T <sub>3</sub>	8.0	8.0	8.0	7.5	7.5
T <sub>4</sub>	6.5	7.0	8.0	7.0	7.0
SEM	0.15	0.08	0.09	0.18	0.13
CD at 5%	0.47	0.31	0.29	0.51	0.42



**Fig 1:** Mean score values of sensory quality attributes of dosa mix

The physical and cooking characteristics of dosa (Table, 3) shows that an increase in the millet content diameter, spread ratio decreased and thickness, weight of the product and cooking time increased. This may be due to presence of fibre content increased the water absorption. Increase in the water absorption decreased the spread ratio and increased

the weight of the product and cooking time (Poongodi.V. T., *et al.*, 2011 and Roopa. S.S. *et al.*, 2017) [8, 9]. The results showed that the T<sub>2</sub> showed better spradability with almost similar cooking time. Hence treatment T<sub>2</sub> was further subjected to nutritional analysis

**Table 3:** Physical and cooking quality characteristics of dosa mix

Treatment	Volume of batter/dosa (ml)	Diameter (cms)	Thickness (cms)	Spread ratio	Weight of the cooked product (g)	Cooking Time (mins)
T <sub>0</sub> (Control)	50	12.11	0.41	29.5	51	1.5
T <sub>1</sub>	50	12.0	0.38	31.5	52	2.0
T <sub>2</sub>	50	11.5	0.38	30.2	54	2.1
T <sub>3</sub>	50	10.1	0.44	22.5	56	2.3
T <sub>4</sub>	50	9.5	0.48	20.0	58	2.5
SEM	0.57	0.08	0.007	0.578	0.56	0.056
CD at 5%	1.81	0.251	0.023	1.85	1.7	0.18

#### Nutritional analysis of the instant dosa mix:

The protein content in millet-based dosa mixes is significantly higher when using brown top millet and black gram, as indicated by Table 4. This is attributed to the inherent high protein levels found in both brown top millet and black gram.. This also might be due to higher protein content of millets as well as fermentation which causes to increase the availability of protein content (Roopa.S.S, *et al.*, 2017) [9]. The fat content of millet dosa mix is 3.56 g per 100 g. This may due to fat content in the millet. It is observed that the fibre content of millet incorporated dosa mix showed high fibre content because of high fibre content

in brown top millet (12.3 g/100 g). Similarly, dosa mix was also high in calcium content (39.4mg) and iron (4.7mg/100 g) which also due to high content of calcium and iron in brown top millet and black gram. The energy content was 337 K calorie which may be due to high protein and. fat content in the product (Poongodi. V. T., *et al.*, 2011 and Roopa. S.S. *et al.*, 2017) [8, 9]. Dietary fibre helps to reduce the problem of lifestyle disorders such as obesity, diabetes, cancer etc., calcium helps to reduce the problem of osteoporosis and other bone related problems. Iron helps to overcome the problem of anaemia. Brown top millet based dosa mix can be used for therapeutic purpose.

**Table 4:** Nutrient composition of accepted dosa mix (T<sub>2</sub>)

Nutrients	Accepted dosa mix
Moisture (g)	7.15
Protein (g)	15.04
Fat (g)	3.56
Total minerals (g)	2.94
Carbohydrate (g)	67.39
Energy (K cal)	337
Dietary fiber (gm)	9.0
Calcium (mg)	39.4
Iron (mg)	4.7

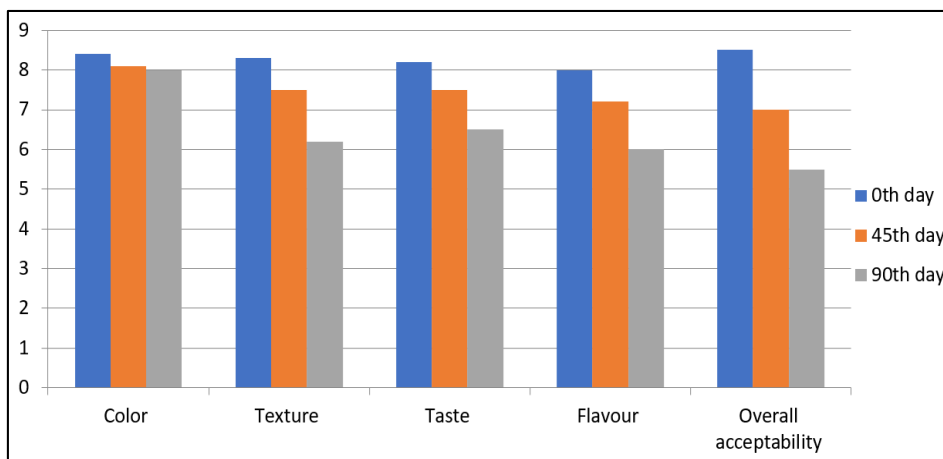
**Storage study:** The table 5 shows the changes in sensory parameters of instant. dosa mix during storage. The taste texture, flavour and over all acceptability of the instant dosa mix was reduced as the storage increases (8.2 to 6.5, 8.3 to 6.2, 8.0 to 6.0 and 8.5 to 5.5 respectively). This may be due to hygroscopic nature of the flour and beginning of rancidity in millets.

The shelf-life results of brown top instant dosa mix shows moisture content of the product was increased from 7.15 to

11.7 g and peroxide value from 0.05 to 0.11 MEA/Kg. This may be due to hygroscopic nature and rancidity of millet in the product. The microbial studies of the product shows that total plate count, yeast and molds are within the safe limits. No coliform was found in the product during 90 days storage. Similar results also seen in the studies of Vijayalakshmi *et al.*, 2020 [12] where free fatty acid, peroxide value and microbial load of kodo millet dosa mix were within safe limits up to 6 months.

**Table 5:** Changes in sensory parameters of dosa mix during storage

Treatment	Color	Texture	Taste	Flavour	Overall acceptability
0 <sup>th</sup> day	8.4	8.3	8.2	8.0	8.5
45 <sup>th</sup> day	8.1	7.5	7.5	7.2	7.0
90 <sup>th</sup> day	8.0	6.2	6.5	6.0	5.5



**Fig 2:** Changes in sensory parameters of dosa mix during storage

**Table 6:** Shelf life results of brown top instant dosa mix  
A. Changes in moisture content and peroxide value

Details	0 <sup>th</sup> day	45 <sup>th</sup> day	90 <sup>th</sup> day
Moisture (g)	7.15	8.40	11.70
Peroxide value (MEA/Kg)	0.05	0.09	0.11

MEA:-Milliequivalents of free iodine per kilogram of fat

B. Microbial results

Details	0 <sup>th</sup> day	45 <sup>th</sup> day	90 <sup>th</sup> day
TPC	<10 cfu	<10 cfu	<12 cfu
Yeast and mold	< 5	< 5	< 5
Coliforms	Negative	Negative	Negative

TPC:-Total plate count CFU:-Colony forming units

### Conclusion

The millet-based instant dosa mix is both nutritious and well-liked, based on the study's findings. This suggests the product is a good choice for those seeking a healthy and tasty meal option. The formulation of millet based dosa mix at 30 percent rice, 40 percent brown top millet and 25 percent black gram and 5 percent fenugreek seed accepted as best formulation with overall acceptability score of 8.5. Rice will be replaced with brown top millet. These millet instant mixes can be regarded as therapeutic food for health-conscious peoples and also can be prepared at cottage industries to improve women empowerment.

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