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## Sensory evaluation of value added Laddu prepared from multigrain flour and herbal powder

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#### Abstract

The present study was carried out with the objectives to find out the sensory evaluation of value added Laddu Prepared from Multigrain flour and Herbal Powder. The product prepared were "Laddu" by incorporation of Bengal gram flour, Multigrain flour and Herbal mix (basil leave and curry leave powder) in different proportions T<sub>1</sub> 85:15:30:30, T<sub>2</sub> 70:30:40:40, T<sub>3</sub> 55:45:50:50 and T<sub>4</sub> 40:60:60:60 respectively T<sub>0</sub>, without incorporation of Multigrain flour and herbal mix (basil leave and curry leave powder) served as control. The products were sensory evaluation by using 9- point Hedonic scale. The data obtained during study were analyzed statistically using analysis of variance (ANOVA), C.D techniques. It was concluded that after sensory evaluation best treatment T<sub>2</sub> had highest score with regards overall acceptability contains Bengal gram flour 70 gm, Multigrain Flour 30gm, Basil leaves powder 40gm, and Curry leaves powder 40gm. On the basis of findings it was concluded that Multigrain flour and herbal mix can be incorporate successfully in the "Laddu" as well as sensory.

**Keywords:** Multigrain flour, herbal powder, incorporation, value-added and sensory evaluation

#### Introduction

From a nutritional perspective, multigrain flour is very important with respect to healthy and nutrition. Multigrain flour improves the nutritional quality of food products. Multigrain flour prepared is found to be rich in protein, dietary fiber and mineral content (Kumar *et al.* 2015)<sup>[12]</sup>. Some of the grains used in the multigrain premixes are cereals, pulses, oil seeds and millets. The cereals like barley and oats are excellent sources of soluble and insoluble dietary fibers, particularly beta-glucan, which is reported to lower cholesterol levels (Izydorczyk and Dexte 2008)<sup>[10]</sup>. Pulses like chickpea, green gram, and pea are rich sources of protein and essential amino acids like lysine, arginine, leucine, isoleucine which are limiting in other grains (Indrani *et al.* 2010)<sup>[9]</sup>. Soya is known for its rich protein content with high levels of lysine and other micronutrients (Aleem *et al.* 2012)<sup>[1]</sup> whereas, millets like pearl and finger millet are rich in minerals (calcium, iron, zinc and phosphorus) and a good source of dietary fiber (Anuradha *et al.* 2010)<sup>[2]</sup>.

Finger millet (Ragi, *Eleusine coracana*) is an important staple food. It is usually used for preparation of flour, pudding, porridge and roti (Chaturvedi and Srivastava, 2008)<sup>[21]</sup>. With the changes in scenario of utilization of processed products and awareness of the consumers about the health benefits, finger millet has gained importance because of its functional components, such as slowly digestible starch and resistant starch (Wadikar *et al.*, 2007)<sup>[22]</sup>.

Maize (*Zea mays*) is major source of carbohydrates, vitamin B, protein, vitamin A (yellow maize) and minerals. Maize flour, is a major ingredient in home cooking and in many industrial food products. They constitute a vital component of the diet and can provide excellent means of improving the nutritional quality through the incorporation of vegetable protein. By supplementing wheat flour with a good quality soy protein, the nutritional quality of the blend can be improved significantly (Godswill C.A. 2019)<sup>[7]</sup>.

Pearl millet (*Pennisetum glaucum*) is an important coarse cereal crop in western India (Gujarat, Rajasthan and Haryana). Pearl millet was effective in improving the sensory attributes, *in vitro* protein digestibility, Invitro starch digestibility, and soluble dietary fiber of pearl millet biscuits but also significantly decreased protein, starch and insoluble dietary fiber (Archana R. *et al.* 2004)<sup>[4]</sup>.

Bengal gram (*Cicer arietinum*) was an excellent source of carbohydrates and proteins, which constitute about 80% of the total dry seed weight. Dried chickpeas contain about 20% protein. The bulk of the seed was made up of carbohydrates (61%) and 5% fat. Crude fiber is mostly located within the seed coat. The seeds were relatively rich in lecithin, potassium, phosphorus,

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calcium, folate and vitamin C, and also have small quantities of vitamins A and B. 100 g of chickpeas can supply about 350 calories (62, 77-78). Raw whole seeds contain per 100 g: 357 calories, 4.515.69% moisture, 14.9-24.6 g protein, 0.8-6.4% fat, 2.1-11.7 g fiber, 2-4.8 g ash, 140-440 mg Ca, 190-382 mg P, 5.0-23, 9 mg Fe, 0-225 mg b-carotene equivalent, 0.21-1.1 mg thiamin, 0.12-0.33 mg riboflavin, and 1.3-2.9 mg niacin.

Oats (*Avena sativa*, Jau) are a source of several natural antioxidants such as tocopherols, alk(en)ylresorcinols and phenolic acids and their derivatives, and a unique source of avenanthramides (Ncinnamoylanthranilate alkaloids) and avenalamic acids (ethylenic homologues of cinnamic acids), which are not present in other cereal grains (Mattila *et al.*, 2005) [14].

Soybean (*Glycine max*) is one of the most important oil and protein crops of the world (Islam *et al.*, 2007) [23]. Soybeans contain 30 to 45% protein with a good source of all indispensable amino acids (Serrem *et al.*, 2011) [17]. The protein content of soybean is about 2 times of other pulses, 4 times of wheat, 6 times of rice grain, 4 times of egg and 12 times of milk. Soybean has 3% lecithin, which is helpful for brain development. It is also rich in calcium, phosphorous and Vitamins A, B, C and D, it has been referred to as “the protein hope of the future” (Islam *et al.*, 2007) [23].

Sorghum (*Sorghum bicolor* (L.) Moench) is a gluten free stable food, which is semi-arid crop grown in tropic area of the world (Mamoudou H. Dicko *et al.*, 2006) [13]. The antioxidant activity of sorghum phenolic compounds appears to be important in the progression of health and illness. The phenolic chemicals in sorghum are thought to be responsible for its functional benefits, which are most noticeable when extracts from black or red sorghum are utilized. (Burdette A *et al.* 2010) [5].

## Materials and Methods

### Experimental site

The present Study was conducted in the research laboratory of Foods Nutrition and Public Health department, ECHs, SHUATS, Prayagraj.

### Procurement of Raw Materials

Sorghum (*Sorghum bicolor*), pearl millet (*Pennisetum americanum*), bengal gram (*Cicer arietinum*), Oats (*Avena sativa* L.), Finger millet, Maize (*Zea mays*) and soya bean (*Glycine max*), other ingredients such as sugar, honey and nuts, were procured from local market and herbal leaves such as. Basil leaves and Curry leaves were collected from the University Campus of Shuats.

**Preparation of the Multigrain Flour:** The multigrain flour were prepared by processed grains like Oats, Maize, Pearl Millet, Soyabean, Bengal Gram, Sorghum and Ragi and following processing methods were used for the selected grains-

### Roasting of Bengal gram and Soyabean

Bengal Gram and soyabean was clean and roasted in hot air oven at 115 °C for 10-15 Minute. After the roasting Bengal gram were grinded into fine powder and utilized in the development of multi-grain flour. Source-Shrilakshmi (2003) [24].

## Development of Oats, Maize, Pearl Millet, Sorghum and Finger millet flour

The selected grains i.e. Oats, Maize, Pearl Millet, Sorghum and Finger millet. All these grains were cleaned and further grinded with milling machine. Collected the flour from the machine and sieved. The flour got stored in air tight containers for development of multigrain flour and further analysis.

### Development of Multigrain flour

For the preparation of value-added *Nutribar* we prepared multigrain flour by the utilization of different flours in different ratio. Oats flour 20 gm, Maize flour 20 gm, Soyabean flour 15 gm, Bengal Gram flour 15 gm, Pearl Millet flour 10 gm, Finger millet flour 10gm and Sorghum flour 10 gm.

### Preparation of Herbal Powder

Fresh Basil and Curry leaves collect washed under clean tap water so as to remove the dirt and dust. Blanch the leaves with hot water for 3 minutes. Later on tray dried for 60-65 °C for 6-7 hours. After that herbs churned in mixer grinder for making herbal Powder and stored in an air tight container. Sources: Srivastava and Kumar, (2009) [11].

### Formulation of the value-added Laddu

For the standardize formulation of value-added *Laddu* selected four treatments.

**Table 1:** Formulation of the value-added *Laddu*

Ingredients (Gram)	Treatments				
	T0	T1	T2	T3	T4
Bengal gram flour	100	85	70	55	40
Multigrain flour	-	15	30	45	60
Basil leaves Powder	-	30	40	50	60
Curry leaves Powder	-	30	40	50	60

### Sensory Evaluation

Sensory evaluation of value-added *Laddu* was done by the 9 point hedonic scale parameter by panel member in Ethelind college of Home Science, SHUATS, Naini, Prayagraj. Average of score for all sensory attributes, i.e. Colour and Appearance, Taste and Flavour, Body and Texture was expressed in term of Overall acceptability (Srilakshmi, 2009) [25].

### Statistical analysis

The data was statistically analyzed by using analysis of variance (two way classification) and critical difference technique. A significant difference between the treatments was determined by using CD (Critical difference) test. The significance level of  $p \leq 0.05$  and F value were considered. Gacula and Singh (2008) [6].

### Results and Discussion

The experiment was conducted for “Sensory evaluation and Nutritional analysis of value added *Laddu* Prepared from Multigrain flour” The present investigation was undertaken to evaluate the acceptability and nutritional content of value-added *Laddu*.

**Table 2:** Average sensory scores of control and experimental sample of value-added *Laddu*

Control and Treatments	Colour and Appearance	Body and Texture	Taste and Flavour	Overall Acceptability
T <sub>0</sub>	8.06	7.76	7.6	7.46
T <sub>1</sub>	7.23	7.83	7.33	7.1
T <sub>2</sub>	7.6	8.2	7.4	8.16
T <sub>3</sub>	8	8.53	8.23	7.9
T <sub>4</sub>	6.94	8.76	7.6	7.13
F <sub>Cal</sub> (5%)	8.75	14.1	3.40	8.25
F <sub>Tab</sub> (5%)	3.84	3.84	3.84	3.84
CD (P<0.05)	0.41	0.26	0.08	0.41
S.A.	S*	S*	NS**	S*

The above table no. 2 shows that average sensory score of value-added *Laddu* on the basis of sensory parameters, i.e. Colour and appearance, Body and texture, Taste and flavour, and Overall acceptability. A result of sensory evaluation of value-added *Laddu* by using 9 point hedonic scale shows that in relation to colour and appearance T<sub>0</sub> had the highest score 8.06 followed by T<sub>3</sub> (8), T<sub>2</sub> (7.6), T<sub>1</sub> (7.23) and T<sub>4</sub> (6.94) respectively. Roasted Bengal gram flour and Multigrain flour was gave golden brown colour to value-added "*Laddu*".

Body and Texture indicate that T<sub>4</sub> had the highest score 8.76 followed by followed by T<sub>2</sub> (8.2), T<sub>1</sub> (7.83), T<sub>0</sub> (7.76), and T<sub>3</sub> (6.53) respectively. The incorporation of Multigrain flour and Herbal Powder of Basil Leafs and Curry Leafs gave a round shape of the body and soft and coarse texture to the "*Laddu*". The reason of course texture is due to roasting of flours. Taste and Flavour of the value-added *Laddu* indicate that T<sub>3</sub> had the highest score 8.23 followed by T<sub>4</sub> (7.6), T<sub>0</sub> (7.6) T<sub>2</sub> (7.4), and T<sub>1</sub> (7.33) respectively. The incorporation of Multigrain flour and fresh leaf Powder of Basil Leafs and Curry Leafs gave bitter taste to the *Laddu*. The bitter Taste and Flavour is due to Presence of antioxidant in Leafs such as polyphenols, and flavonoids in the Basil Leafs and curry Leafs. The sensory score of Overall acceptability of value-added "*Laddu*" treatment T<sub>2</sub> had the highest score 8.26 followed by T<sub>0</sub> (7.46), T<sub>4</sub> (7.13), T<sub>3</sub> (7.9) and T<sub>1</sub> (7.1) respectively. The amount of best treatment T<sub>2</sub> had ratio of Bengal gram flour+ Multigrain Flour + Basil Leafs Powder + Curry Leafs Powder 70:30:40:40 respectively.

The statistical analysis carried out on different sensory parameters. When calculated value of 'f' is greater than the tabulated value of 'f' on 4 and 8 degree of freedom at 5% probability level, then consider as significant. In the relation to colour and appearance calculated value of 'f' (8.75) due to treatments was higher than the tabulated value of 'f' (3.84). Therefore indicates that there was significant difference in Colour and Appearance between the four treatments of "*Laddu*". It compared against Critical Difference (C.D.) value i.e. (0.41) was significant the difference in the mean value of (T<sub>0</sub>, T<sub>1</sub>) (T<sub>0</sub>, T<sub>2</sub>) (T<sub>0</sub>, T<sub>4</sub>) (T<sub>1</sub>, T<sub>3</sub>), (T<sub>2</sub>, T<sub>4</sub>) and (T<sub>3</sub>, T<sub>4</sub>) because mean value higher than value of C.D., (0.41).

In the relation to body and texture calculated value of 'f' (14.1) due to treatments was higher than the tabulated value of 'f' (3.84). Therefore, indicates that there was significant difference in body and texture between the four treatments of "*Laddu*". It compared against Critical Difference (C.D.) value i.e. (0.26) was significant the difference in the mean value of (T<sub>0</sub>, T<sub>2</sub>) (T<sub>0</sub>, T<sub>3</sub>), (T<sub>0</sub>, T<sub>4</sub>) (T<sub>1</sub>, T<sub>2</sub>), (T<sub>1</sub>, T<sub>3</sub>) (T<sub>1</sub>, T<sub>4</sub>) (T<sub>2</sub>, T<sub>3</sub>) and (T<sub>2</sub>, T<sub>4</sub>) because mean value higher than value of C.D., (0.26). Uttara and Anubha (2017) [20] finding that laddoo made with bajra flour, standard laddoo (Type A) had the greatest scores

for Body and Texture was 8.80.2 (texture) and 8.70.04 (total acceptability).

In the relation to taste and flavour calculated value of 'f' (3.40) due to treatments was less than the tabulated value of 'f' (3.84). Therefore, indicates that there was non-significant difference in taste and flavour between the four treatments of "*Laddu*". In the relation to overall acceptability calculated value of 'f' (6) due to treatments was higher than the tabulated value of 'f' (3.84). Therefore, indicates that there was significant difference in overall acceptability between the four treatments of "*Laddu*". It compared against Critical Difference (C.D.) value i.e. (8.25) was significant the difference in the mean value of (T<sub>0</sub>, T<sub>2</sub>) (T<sub>0</sub>, T<sub>3</sub>), (T<sub>1</sub>, T<sub>2</sub>), (T<sub>1</sub>, T<sub>3</sub>) (T<sub>2</sub>, T<sub>4</sub>) and (T<sub>3</sub>, T<sub>4</sub>) because mean value higher than value of C.D., (0.41). Yuvarani S and Anitha V (2016) [26] observed that appearance, texture, colour, aroma, mouth feel, taste and overall product score of multigrain laddoo was remarkable. Thus the product proved to be a consumer acceptable product.

### Conclusion

The present investigation provides value added *Laddu* form multigrain flour and herbal powder. Value added *Laddu* prepared from multigrain flour and herbal powder was successfully incorporated with having good acceptability. The Value added *Laddu* reduced risk of CVD, obesity and cholesterol.

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