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Sensory Evaluation of Ladoo Prepared with Pearl Millet

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Abstract—*The objective of this study was to find out acceptability of ladoo containing five different combinations of bengal gram flour and pearl millet flour viz., 100, 75:25, 50:50, 25:75, 100 ratio. Acceptance was assessed using a hedonic scale of nine points. It was noticed that incorporation of pearl millet flour above 50 percent was least acceptable in ladoo. At this level of incorporation of pearl millet flour, the appearance of the product was affected i.e. darker in colour and taste wise, bitterness was found by the panel where as 25 percent incorporation produced highest acceptability. Data revealed that the overall acceptability of biscuit ranged from 8.7 to 7.0. This indicated that the recipes were found to fall under the category of liked very much to like moderately. It can finally be discerned from the sensory scores for ladoo prepared with 25 percent incorporation of pearl millet flour that the ladoo were equally acceptable as that of control.*

Keywords*: Hedonic scale, Pearl millet, Nutritive value.*

1. INTRODUCTION

Pearl millet (*Pennisetum typhoideum*), also classified as *P glaucum*, *P americanum*, or *spicatum*, and is locally known as *bajra* in India. It ranks third after wheat (*Triticum aestivum*) and rice (*Oryza sativa*) (GOI 2008).

Pearl millet (*Pennisetum glaucum*), also known as *bajra*, is a cereal crop grown in tropical semi-arid regions of the world primarily in Africa and Asia. It is well adapted to production systems characterized by low rainfall (200-600 mm), low soil fertility, and high temperature, and thus can be grown in areas where other cereal crops, such as wheat or maize, would not survive. In its traditional growing areas, pearl millet is the basic staple for households in the poorest countries and among the poorest people. It is also one of the most drought resistant crops among cereals and millets. Pearl millet is generally used as a temporary summer pasture crop or in some areas as a food crop. (Suma, 2012).

Pearl millet is one of the four most important cereals (rice, maize, sorghum and millets) grown in the tropics and is rich in iron and zinc, contains high amount of antioxidants and these nutrients along with the antioxidants may be beneficial for the overall health and wellbeing (Nambiar *et al*. 2013).

In India, pearl millet is primary source of dietary energy (360 kcal/kg) for rural population in drier parts of the country and fourth most important cereal after rice, wheat and sorghum. It is a rich source of protein, calcium, phosphorous and iron. Pearl millet grain contains fairly high amount of thiamine, riboflavin and niacin. A significant portion of pearl millet grain is also used for non-food purpose such as poultry feed, cattle feed and alcohol extraction (Basavaraj *et al*. 2010).

Pearl millet is used in making traditional foods, snacks such as porridge, chapatti, *khichri, laddoo*, *mathri*, baked products like cake, *nan khatai*, biscuits and extruded products like *sev* and sweet vermicelli, flakes and pops. It is also being used in various types of healthy food as it contains a higher proportion of insoluble dietary fibre which causes slow release of sugar, thus making the food products based on them especially suitable for those suffering from or prone to diabetes (Jaybhaye *et al*. 2009).

The present study was undertaken to know the effect of addition of *bajra* flour on sensory attributes of *ladoo*.

2. MATERIALS AND METHODS

2.1 Procurement of Pearl Millet

Pearl millet was procured from Sector-15 Market, Chandigarh.

Processing of Pearl Millet

The clean and healthy grain of pearl millet was used for preparation of flour. They were roasted in a pan and then ground with the help of electric grinder. Then the ground content was sieved through a mesh sieve to obtain flour. The powdered sample was stored in air tight container until further use for experiments (Fig.1)

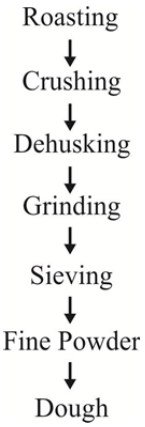

Fig. 1: Flow diagram of processing of pearl millet

Biochemical Analysis of Pearl Millet

Moisture, crude protein, fat, ash, crude fibre, iron and calcium were determined by the method of (AOAC,1980). Phytic acid was determined by the method of (Haug and Lantzch,1983). Polyphenols was determined by the method of (Singh and Jambunathan,1981).

Standardization and Development of Ladoo

A standard recipe is one in which the amount and proportion of the ingredients and method will consistently produce a high quality product. The ingredients are carefully balanced for the number of servings a recipe has to yield. Formulation was prepared by blending bengal gram flour and *bajra* flour in different proportions. Table 1 depicted different combinations of flour of bengal gram and *bajra* flour.

Table 1: Proportion of ladoo

Sr. No.	Ingredients	Type A	Type B	Type C	Type D	Type E
1.	Bengal gram flour	100	75	50	25	-
2.	*Bajra* flour	-	25	50	75	100

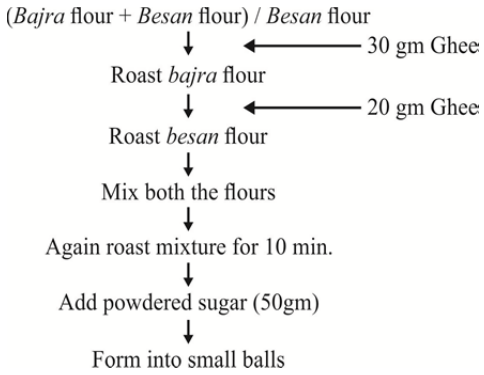

Fig. 2: Flow diagram of preparation of ladoo

Sensory Evaluation of Ladoo

The developed value added ladoo was standardised using sensory evaluation technique with the help of 5 panel members using 9-point hedonic scale. The developed value added ladoo along with standard sample was served to the panel members for sensory evaluation. Most acceptable level of *bajra* flour in ladoo was further analysed for its nutrient content.

Statistical Analysis

All the obtained data of chemical analysis and sensory evaluation were statistically analyzed using Mean, Standard error, Friedman-Test according to the standard method.

3. RESULTS AND DISCUSSION

Estimation of Proximate Composition, Mineral Content and Anti-nutritional Factors of Pearl Millet

The analysis showed the composition of *bajra* (Table 2) as moisture 12.6±0.2%, protein 9.9±2.8 g, fibre 2±2.6 g, fat 4.2±0.5 g, carbohydrate 69 g, ash 2.39±0.2 % **,** calcium 39.3±1.3 mg, iron 6.7±0.4 mg, phytic acid 647.8±0.1 mg and polyphenols 606±0.2 mg per 100 gram

Table 2: Proximate composition, mineral content and anti-nutritional factors of pearl millet

Proximate Composition	Mean (per 100 gram)
Moisture (%)	12.6±0.2
Protein (g)	9.9±2.8
Crude fibre (g)	2.0±2.6
Fat (g)	4.2±0.5
Ash (%)	2.3±0.2
Carbohydrate (g)	69
Mineral Content	
Calcium (mg)	39.3±1.3
Iron (mg)	6.7±0.4
Anti-nutritional Factors	
Phytic acid (mg)	647.8±0.1
Polyphenols (mg)	606±0.2

Development of Ladoo

Five types of *ladoo* were developed from flour of the pearl millet (*bajra*) in different proportions.

Sensory Evaluation of Ladoo

Results of sensory evaluation of ladoo prepared with *bajra* flour presented in (Table 3 and Fig. 3) revealed that the overall acceptability of ladoo ranged from 7-8.7. This indicated that the recipes were found under the category of 'liked moderately to liked very much. Standard ladoo (Type A) exhibit highest scores for all sensory attributes i.e. 8.6±0.25 (appearance), 8.6±0.24 (color), 8.8±0.2 (texture), 8.8±0.2 (flavour), 8.8±0.2 (taste) and 8.7±0.04 (overall acceptability) as compared to

ladoo prepared with *bajra* flour. However incorporation of *bajra* flour in ladoo upto 100 per cent level maintains like moderately on the basis of 9 point hedonic scale. Statistical data revealed that there were significant difference in mean rank in terms of taste at ($p \leq 0.05$) and overall acceptability at ($p \leq 0.01$). No significant difference was observed in terms of appearance, color, texture and flavour.

Table 3: Mean scores of sensory evaluation of ladoo

Types of *Ladoo*	Appearance	Colour	Texture	Flavour	Taste	Overall acceptability
Type A (Bg::100)	8.6±0.25	8.6±0.24	8.8±0.2	8.8±0.2	8.8±0.2	8.7±0.04
Type B (Bg:P::75:25)	8.2±0.2	8.2±0.37	8.6±0.39	8.6±0.39	8.6±0.4	8.4±0.09
Type C (Bg:P::50:50)	8.0±0.31	7.6±0.51	7.8±0.58	7.8±0.58	8.2±0.58	7.8±0.09
Type D (Bg:P::25:75)	7.4±0.6	7.0±0.7	7.6±0.51	7.6±0.51	7.6±0.51	7.4±0.11
Type E (P::100)	7.2±0.48	7.2±0.48	7.2±0.48	7.4±0.6	6.2±0.31	7.0±0.21
Friedman Test	4.810	6.048	7.442	7.556	10.667	16.043
p-value	.307	.196	.114	.109	.031*	.003**

*, ** Significant at 5%, Significant at 1% respectively

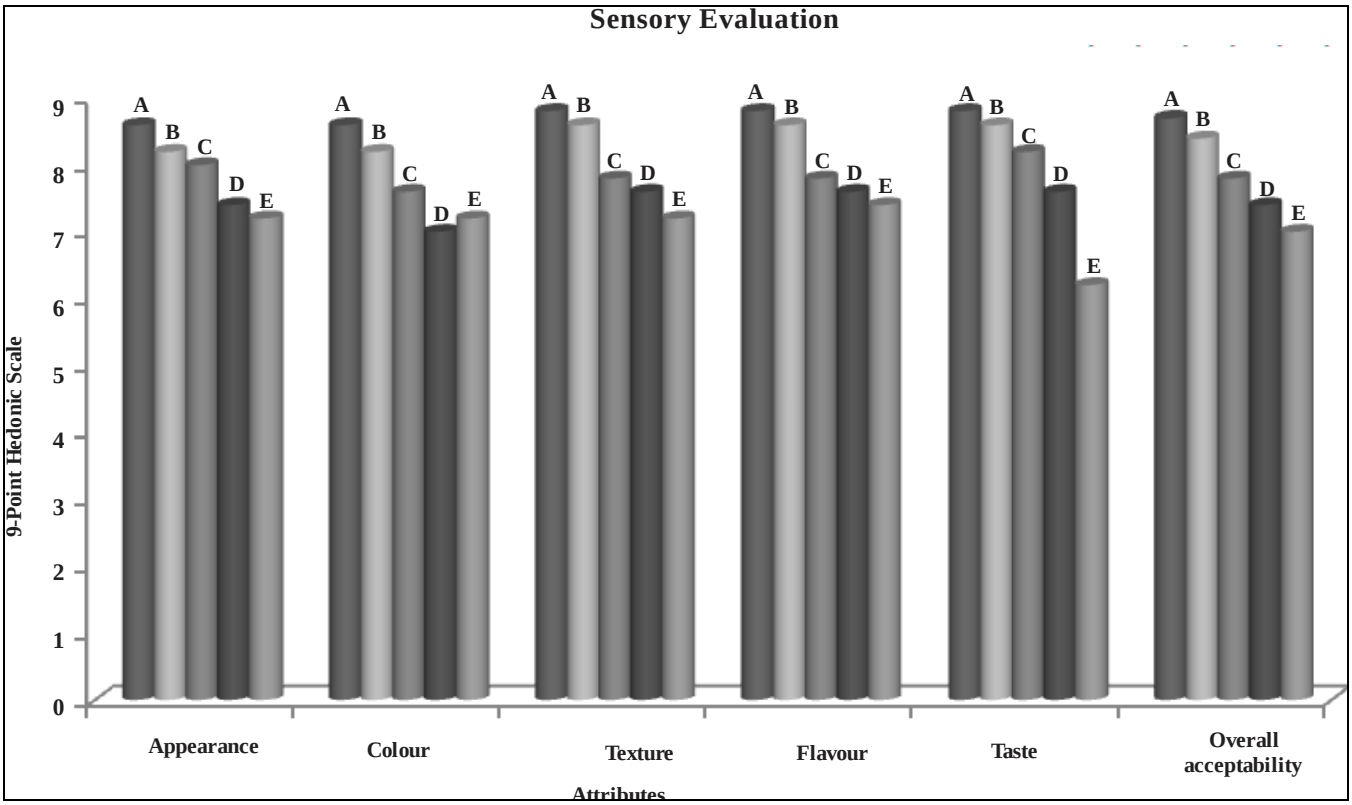

Fig. 3: Mean scores of sensory evaluation of ladoo

4. CONCLUSION

This study has demonstrated that addition of increasing levels (100 %) of *bajra* flour in the ladoo affected the quality of sensory attributes. Ladoo with 25 % *bajra* flour has highest acceptability. The findings of the present study may help in developing commercial processing technology for effective utilization of *bajra* flour especially for preparation of ladoo. So it can be inferred from the present study that the ladoo developed by using *bajra* flour was acceptable. Therefore, results suggest that there is a great scope for use and marketing of value added ladoo using *bajra* and it can be concluded that *bajra* can be utilized for achieving food and nutritional security for nation.

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