Stud Home Com Sci, 11(1): 7-11 (2017)
DOI: 10.31901/24566780.2017/11.01.02

Sensory Evaluation and Nutrient Content of *Namakparas* Prepared by Incorporating Pearl Millet

Anubha Mehra[1] and Uttara Singh[2]

Department of Foods and Nutrition, Government Home Science College, Panjab University, Chandigarh 160 011, India
E-mail: [1]<anubhamehra9@gmail.com>, [2]<usuttarasingh@gmail.com>

KEYWORDS Anti-nutritional Factors. *Bajra*. Hedonic Scale. Proximate Composition. Significant

ABSTRACT *Namakparas* was prepared by substituting refined flour with *bajra* flour. Different samples prepared were Type A, Type B, Type C, Type D and Type E in the ratios of (Refined flour: *Bajra* flour) 100, 75:25, 50:50, 25:75, 100 respectively. Highest energy, protein, carbohydrate, fibre and iron content were observed in Type E that is, 541 Kcal, 11.6 g, 72.2 g, 1.2 g and 8 mg respectively and in Type B highest Fat (25 g) and calcium content (42 mg). *Namakparas* prepared with twenty-five percent of *bajra* flour (Type B) was most acceptable and analysed for proximate content and mineral content along with standard *namakparas* (Type A). Result showed that *namakparas* prepared with *bajra* flour (Type B) was high in protein (14.6±0.5 g), fat (14.6±0.5 g), fibre (0.8±0.3 g), calcium (28.7±0.3 mg) and iron (3.2±0.3 mg) than standard *namakparas* (Type A).

INTRODUCTION

Pearl millet is small seeded grains, mainly produced in tropical and semi-arid region in India and Africa. It is underutilized and lesser known crop with capability of growing in less water areas on about 30 million ha in more than 30 countries of five continents viz., Asia, Africa, North America, South America, and Australia. India is the largest producer of the pearl millet in the world and its cultivation is next to rice, maize and wheat. The major pearl millet growing states in order of area are Rajasthan, Maharashtra, Gujarat, Uttar Pradesh and Haryana and these account for 87 percent of the total area under cultivation of pearl millet (Rana et al. 2012).

In Haryana, production area under this crop during 2014-15 of *karif* or summer crops which are domesticated plants that are cultivated and harvested was 383 hectare with total production of 670 lakh tonnes and average yield of 1749 kgs/ha (Anonymous 2015). It is cheap and economic crop of dual purpose which is used as food for human, feed for poultry birds and also dry as well as green fodder for cattle. Pearl millet commonly known as *bajra* and termed as "nutri-cereal" due to rich source of energy, carbohydrate, protein, fat and ash, besides, is also a rich source of dietary fiber and minerals (iron, calcium, magnesium, potassium etc.) (Abdalla et al. 2009). It is free from major antinutrients but contains variable amount of phytate and polyphenols and different treatments such as soaking, fermentation, blanching and roasting decrease the level of these antinutrients (Eyzaguirre et al. 2006; Hithamani and Srinivasan 2014; Lestienne et al. 2005).

In developing countries, the commercial processing of these locally grown grains into value-added food and beverage products can be an important driver for economy and to curb malnutrition, therefore, the objective of this study to analyze the sensory and nutrient content of *namakparas*.

Address for correspondence:
Anubha Mehra
T-16
Naveen Shahdara
Delhi 110 032, India
E-mail: anubhamehra9@gmail.com

METHODOLOGY

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).

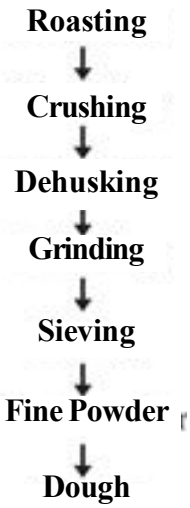

Fig. 1. Flow diagram of processing of pearl millet
Source: Author

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 *Namakparas*

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. Figure 2 depicted flow chart for preparation of *namakparas* and Table 1 depicted different combinations of refined flour and *bajra* flour.

Sensory Evaluation of *Namakparas*

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

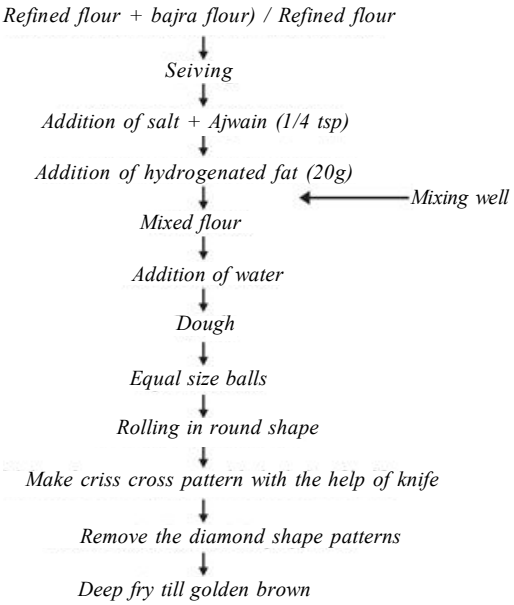

Fig. 2. Flow diagram for preparation of *namakparas*
Source: Author

Nutritional Evaluation of *Namakparas*

Nutritive values of all the recipes were calculated using Nutritive Value of Indian food by Gopalan et al. (2014).

Table 1: Proportion of *namakparas*

S. No.	*Ingredients*	*Type A*	*Type B*	*Type C*	*Type D*	*Type E*
1.	Refined flour	100	75	50	25	-
2.	*Bajra* flour	-	25	50	75	100

Estimation of Proximate Composition and Mineral Content of Standard and Most Acceptable *Namakparas*

The standard and most acceptable food products out of the ratios were evaluated to assess proximate and mineral composition as per the parameters mentioned earlier.

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.

RESULTS AND DISCUSSION

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

The analysis showed the composition of *bajra* in (Table 2). The moisture content of pearl millet was 12.6±0.2 percent. The earlier results of Modu et al. (2005) were quite close to the present with moisture content of 10.09 to 11.09 percent in different pearl millet varieties. Sehgal and Kawatra (2002) and Anju (2005) also reported a wide range of moisture content in different pearl millet varieties. Protein content was 9.9±2.8 g. Almost similar results in respect to protein content have been reported by Modu et al. (2005). They found protein content of pearl millet cultivars in range of 10.73 to 12.97 percent. Cheik et al. (2006) studied protein content of 14 pearl millet cultivars and reported a range of 8.66 to 17.11 percent. Fat content was 4.2±0.5. Anju (2005) earlier reported fat content for different pearl millet varieties range from 5.03 to 6.31 percent. The values of fibre content 2±2.6 g in the present study are in close agreement with 1.96 percent earlier reported by Anju (2005). Calcium content was 39.3±1.3 mg and iron 6.7±0.4. Balseiro et al. (2014), Thilagavathi et al. (2015) and Marmouzi et al. (2016) reported (6.56 mg/100g, 39.63 mg/100g and 211 mg/100g) calcium in pearl millet grain. Whereas Abdalla et al. (2010) and Maktouf et al. (2016) reported low value (16-23 mg/100g) of calcium in pear millet. Abdalla et al (2010) and Chaudhary (2011) reported higher iron content in pearl millet varieties ranging from 17.88-18.65 and 10.30-11.49 mg/100g, respectively. Phytic acid was 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 *Namakparas*

Five types of *namakparas* were developed from flour of the pearl millet in different proportions.

Sensory Evaluation of *Namakparas*

Results of sensory evaluation of *namakparas* prepared with *bajra* flour presented in

Table 3: Mean scores of sensory evaluation of *namakparas*

Types of namakparas	*Appearance*	*Colour*	*Texture*	*Flavour*	*Taste*	*Overall acceptability*
Type A(Rf::100)	8.4±0.39	8.4±0.39	8.4±0.39	8.2±0.39	8.4±0.25	8.4±0.03
Type B(Rf:P::75:25)	7.8±0.58	7.8±0.58	7.8±0.58	7.6±0.51	7.8±0.25	7.7±0.03
Type C(Rf:P::50:50)	7.8±0.58	7.6±0.31	7.8±0.58	7.8±0.31	7.6±0.25	7.0±0.04
Type D(Rf:P::25:75)	7.0±0.7	7±0.7	7.2±0.48	7.0±0.7	6.6±0.25	6.9±0.09
Type E(P::100)	6.4±0.39	6.4±0.39	6.6±0.24	6.6±0.24	6.4±0.25	6.4±0.04
Friedman Test	7.176	10.562	6.568	12.578	8.571	16.040
p-value	.127	.032*	.161	.014*	.073	.003**

* Significant at 5%
** Significant at 1%

Table 3 revealed that the overall acceptability of *namakparas* ranged from 6.4-8.4. This indicated that the recipes were found under the category of 'liked slightly' and 'liked very much'. Standard *namakparas* (Type A) exhibit highest scores for all sensory attributes that is, 8.4±0.39 (appearance), 8.4±0.39 (color), 8.4±0.39 (texture), 8.2±0.39 (flavour), 8.4±0.25 (taste) and 8.4±0.03 (overall acceptability) as compared to *namakparas* prepared with *bajra* flour. However incorporation of *bajra* flour in *namakparas* upto hundred percent level maintains like slightly on the basis of 9 point hedonic scale. Statistical data revealed that there was significant difference in color and flavour at $p \leq 0.05$ and overall acceptability at $p \leq 0.01$. However no significant differences were observed in appearance, texture and taste.

Nutritive Contribution of *Namakparas*

The data in respect to nutritive values of *namakparas* was depicted in Table 4. It was observed that *namakparas*, Type A contains 428 kcal energy, 11 g protein, 73.9 g carbohydrates, 20.9 g fat, 0.3 g fibre, 23 mg calcium and 2.7 g iron. Type B contains 531.2 kcal energy, 11.1 g protein, 72.2 g carbohydrates, 21.8 g fat, 0.5 g fibre, 27.5 mg calcium and 4.0 mg iron. Type C contains 534.4 kcal, 11.2 g protein, 70.8 g carbohydrates 22.8 g fat, 0.7 g fibre, 32.4 mg calcium and 5.3 mg iron. Type D contains 537.6 kcal, 11.4 g protein, 68.8 g carbohydrates, 23.8 g fat, 0.9 g fibre, 37.2 mg calcium and 6.6 mg iron. Type E contains 541 kcal, 11.6 g protein, 67.5 g carbohydrates, 25 g fat, 1.2 g fibre, 42 mg calcium and 8 mg iron.

Estimation of Proximate Composition and Mineral Content of Standard and Most Acceptable *Bajra Namakparas*

The data in respect to proximate analysis and mineral content of standard (Type A) and most acceptable *bajra namakparas* (Type B) were depicted in Table 5. It was observed that Type B has more protein (14.6±0.5 g), fat (14.6±0.1 g), fibre (0.8±0.3 g), moisture (8.1±0.2 %), ash (1.9±0.2 %), calcium (28.7±0.3 mg) and iron (3.2±0.3 mg) than Type A (12.2±0.5 g), (12.2±0.3 g), (0.6±0.2 g), (7.6±0.1 %), (1.8±0.4 %), (26.3±0.1 mg) and (2.2±0.5 mg) respectively. However Type A has more carbohydrate (66.5 g) than Type B (63 g).

Table 5: Proximate composition and mineral content of *namakparas*

	Type A	*Type B*
Proximate Composition		
Protein (g)	12.2± 0.5	14.6± 0.5
Carbohydrate (g)	66.5	63.0
Fat (g)	12.2± 0.3	14.6± 0.1
Fibre (g)	0.6± 0.2	0.8± 0.3
Moisture (%)	7.6± 0.1	8.1± 0.2
Ash (%)	1.8± 0.4	1.9± 0.2
Mineral Content		
Calcium (mg)	26.3± 0.1	28.7± 0.3
Iron (mg)	2.2± 0.5	3.2± 0.3

CONCLUSION

This study has demonstrated that addition of increasing levels (100%) of *bajra* flour in the *namakparas* affected the quality of sensory attributes and also it contains highest amount of energy, protein, fat, fibre and iron. The findings of the present study may help in developing commercial processing technology for effective utilization of *bajra* flour especially for preparation of *namakparas*. So it can be inferred from the present study that the *namakparas* developed by using *bajra* flour were nutritious and acceptable.

RECOMMENDATIONS

There is a great scope for use and marketing of value added *namakparas* using *bajra* and it can be concluded that *bajra* can be utilized for achieving food and nutritional security for nation.

Table 4: Nutritive values of *namakparas*

Types of namakparas	*Energy (kcal)*	*Protein (g)*	*Carbohydrate (g)*	*Fat (g)*	*Fibre (g)*	*Calcium (mg)*	*Iron (mg)*
Type A(Rf::100)	428	11	73.9	20.9	0.3	23	2.7
Type B(Rf:P::75:25)	531.2	11.1	72.2	21.8	0.5	27.7	4.0
Type C(Rf:P::50:50)	534.4	11.2	70.8	22.8	0.7	32.4	5.3
Type D(Rf:P::25:75)	537.6	11.4	68.8	23.8	0.97	37.2	6.6
Type E(P::100)	541	11.6	67.5	25	1.2	42	8.0

REFERENCES

Abdalla AA, Anmed UH, Ahmed AR, El-Tinay AH, Ibrahim KA 2009. Physicochemical characterization of traditionally extracted pearl millet starches. *J Appl Sci Res,* 5(11): 2016-2027.

Abdalla AA, Ahmed IA, El-Tinay AH 2010. Influence of traditional processing on minerals HCl-extractability of pearl millet. *J Agri Biol Sci,* 6(4): 530-534.

Anju 2005. *Nutritional Evaluation and Product Development from White and Yellow Pearl Millet Varieties.* MSc Thesis. Hisar, India: CCS Haryana Agricultural University.

Anonymous 2015. Department of Agriculture and Farers Welfare, Haryana. From <http://www. agriharyana. nic.in/Stat_Info/Final estimates.> (Retrieved on 5 June 2017).

AOAC 1980. *Official Methods of Analysis*. 13th Edition. Washington, DC, USA: Association of Official Analytical Chemists.

Balseiro G, Taron A, Garcia-Zapateiro L 2014. Nutritional properties of different composite flours from maize Zea mays. Variety ICA v109 and pearl millet *Pennisetum glaucum* malted with calcium chloride and gibberellic acid. *European Food Res Technol,* 240(3): 471-475.

Chaudhary G 2011. *Nutritional Evaluation of White and Grey Pearl Millet Varieties and Their Utilization for Product Development*. M.Sc. Thesis. Hisar, India: CCS Haryana Agricultural University.

Cheik Q, Yaya B, Alfred ST 2006. A comparative study on nutritional and technological quality of fourteen cultivars of pearl millet in Burkina Faso. *Journal of Science and Technology,* 20(5): 111-116.

Gopalan C, Shastri BV, Balasubramanian SC 2014. *Nutritive Value of Indian Foods*. Hyderabad: National Institute of Nutrition.

Eyzaguirre R, Nienaltowska K, Hasenack B, Nout M 2006. Effect of food processing of pearl millet (Pennisetumglaucum. IKMP-5 on the level of phenolics, phytate, iron and zinc. *J Sci Food and Agri,* 86(9): 1391-1398.

Haug W, Lantzch H 1983. Sensitive method for the rapid determination of phytic acid in cereal and cereal products. *J Food Sci Agri*, 34: 1423-1426.

Hithamani G, Srinivasan K 2014. Effect of domestic processing on the polyphenol content and bioaccessibility in finger millet Eleusinecoracana and pearl millet Pennisetumglaucum. *Food Chem,* 164: 55–62.

Lestienne I, Mouquet-Rivier C, Icard-Verniere C, Rochette I, Treche S 2005. The effects of soaking of whole, dehulled and ground millet and soybean seeds on phytate degradation and Phy/Fe and Phy/Zn molar ratios. *Int J Food Sci Technol,* 40(4): 391-399.

Marmouzi, I, Ali K., Harhar H, Gharby S, Sayah K, El Madani N 2016. Functional composition, antibacterial and antioxidative properties of oil and phenolics from Moroccan Pennisetumglaucum seeds. *J Saudi Soc Agri Sci,* (In Press).

Modu Lamina, NkamaI 2005. Production, chemical and sensory properties of Ogi from different pearl millet varieties. *Journal of Biological Science*, 5(2): 103-106.

Rana K, Kumar D, Bana R 2012. Agronomic research on pearl millet Pennisetumglaucum. *Indian J Agron,* 57(3): 45-57.

Sehgal A, Kawatra A 2002. Use of pearl millet and green gram flour in cake and their sensory and nutritional quality. *Journal of Food Science Technology,* 44(5): 536-538.

Singh U, Jambunathan R 1981. Sensitive method for the rapid determination of polyphenols in cereal and cereal products. *J Food Sci,* 46: 1364-1367.

Thilagavathi T, Kanchana S, Banumathi P, Hemalatha G, Vanniarajan C, Sundar M 2015. Physio-chemical and functional characteristics of selected millets and pulses. *Indian Journal of Science and Technology,* 8(27): 147-155.

Paper received for publication on March 2017
Paper accepted for publication on June 2017