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To Evaluate the "Nutritional and Sensory Properties of Chapatis and Biscuits Made from Pearl Millet Flour Blended with Egg White Protein, Flaxseeds and Carom Seeds"

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Abstract—*Pearl millet, (Pennisetum americanum L.) is commonly known as bajra in India, it is produced in large quantities. Pearl millet crops grown in semiarid regions of Africa and Asia (Ejeta, Hassen, & Mertz, 1987). It is belongs to grass family of Poaceae, sunfamily panicoideae (ICRISAT, 2006). Pearl millet rank 4th in India, after rice, wheat and sorghum (Khairwal et al., 2007) and almost 7.12 million hectare of land is under cultivation having an average production 8.06 million tonnes, with an average productivity of 1132 kg per hectare (AICRPPM, 2017). Pearl millet is a rich source of energy (361 Kcal/100 g) as compared to wheat (346 Kcal/100 g), rice (345 Kcal/100 g) maize (125 Kcal/100 g) and sorghum (349 Kcal/100 g) (NIN, 2003). The results observed that the proximate composition of raw material and products. The protein content of biscuits (13.04±0.33) and chapatis (11.68±0.08%) was higher than raw pearl millet flour (9.80±0.45%). This significant increase in protein content of both products due to incorporation of egg white protein powder in raw pearl millet flour for preparation of biscuits and chapatis, which improves the nutritional value of products. Overall acceptability score of sensory evaluation and the results of proximate composition analysis of both products showed that this fortified flour may be used in preparation of biscuits and chapatis. Pearl millet is used to make chapattis, porridge, baking products such as breads, cakes, muffins, cookies and biscuits by mixed with other grain flour like wheat. Other uses include bakery products and snacks to a very limited extent. It is estimated that 93% of pearl millet is used as food, the remainder 7% being divided between animal and poultry feed.*

1. INTRODUCTION

Pearl millet, (*Pennisetum americanum* L.) is commonly known as bajra in India, it is produced in large quantities. Pearl millet crops grown in semiarid regions of Africa and Asia (Ejeta, Hassen, & Mertz, 1987). It isbelongs to grass family of Poaceae, sunfamily panicoideae (ICRISAT, 2006). Pearl millet is called by different names in different languages like; Grano (Spanish), Type de graine (French), Bajra (Hindi), Kamboo (Tamil & Malayalam), Sajjalu (Telugu), Bajri (Marathi, Gujarati), Bajra (Bengali, Oriya, Punjabi &Urdu) (Malik, 2015).In india, pearl millet is in 4th rank after rice , wheat and sorghum.(Khairwal et al., 2007) and almost 7.12 million hectare of land is under cultivation having an average production 8.06 million tonnes, with an average productivity of 1132 kg per hectare (AICRPPM, 2017).

Major pearl millet growing areas are Gujarat, Maharashtra, Uttarapradesh, Rajasthan, Punjab, Haryana, Tamil Nadu, Karnataka, Madhya Pradesh, Andhra Pradesh and Jammu Kashmir in India. Accordingly to ICRISAT (2017), pearl millet grown in summer seasons to a lesser extent in Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

Pearl millet is a rich source of energy (361 Kcal/100 g) as compared to wheat (346 Kcal/100 g), rice (345 Kcal/100 g) maize (125 Kcal/100 g) and sorghum (349 Kcal/100 g) (NIN, 2003). Pearl millet are a rich source ofdietary fiber, micro nutrients high quality, proteins, fat and minerals such as calcium, iron, zinc, which are essential for human health (Malik, Singh, & Dahiya, 2002).

The carbohydratesand fat content in pearl millet amounts to 67.5 g/100 g and 0.005 g/100 g . Rathore et al., (2016) reported that pearl millet has 9% to 13% of protein content in general but variation of 6% to 21% has been observed. The essential amino acid profile shows more lysine, threonine, methionine and cystine in pearl millet protein than in proteins of sorghum and other millet.

Pearl millet is also called as 'nutri-cereals' because they have nutraceutical properties in the form of antioxidants. Pearl millet grain products consumption have been associated with reduced incidence of diseases such as obesity, diabetes,

cardiovascular disease, celiac, gluten allergy (due to non-glutinous) and cancer (Sarita et al., 2016).

Two types of processes are used for milling of pearl millet flour: traditional or mechanical processes. During storage, pearl millet flour undergoes quick deterioration and it turns bitter and rancid due to increase in free fatty acids and phytic acid. Increase of FFA is considered to be due to the active lipase enzyme which is responsible for the breakdown of glycerides (Tiwari et al., 2012).

Pearl millet is used to make chapatis, baking products (breads, cakes, muffins, cookies and biscuits) and porridge (ICRISAT, 2017).Usually wheat chapattis are consumed all over the India. Pearl millet chapatti is also consumed in many states of India, which is difficult to prepare because pearl millet flour's dough tear out very easily due to lack of gluten. Biscuits made from pearl millets are also very dark and hard in texture generally.

Gayas et al., 2012 reported that biscuits are considered as a good product for nutritional improvement. Generally, biscuits are made from wheat flour maida, shortening and sugar. It has a long shelf life, better taste and highly acceptablein all age groups.

The present investigation was undertaken with following objectivs, to evaluate the "Nutritional and sensory properties of chapatis and biscuits made from pearl millet flour blended with egg white protein, flaxseeds and carom seeds".

2. MATERIAL AND METHOD

2.1 Material

Pearl millet, flaxseeds, carom seeds and poultry eggs were procured from local market, Sirsa (Haryana). All the chemicals which were used of analytical grade. Swadesh bags were used to store the samples and products.

2.2 Method

2.2 Sample preparation

The clean and sound pearl millet grains were used for preparation of flour. Grains were ground with the help of an electric grinder into fine flour. The ground content was sieved through a sieve to obtain pure flour free from large particles. The powdered sample was stored in air tight container for further uses. Flax seeds and carom seeds were also ground to fine flour together in an electric grinder.

Eggs were boiled in large pot until they were thoroughly cooked, about 12 min. Then eggs were transferred to colander and run them under cold water. Boiled eggs were peeled off and whites portion of eggs were separated from yolks. Boiled whites portion of eggs were broken (cutting) into small pieces and arranged evenly spaced on non-stick or foil lined baking trays. Drying them at low temperature for 8-10 hrs. in oven. When eggs got crisped up and resembled thin pieces of toffee, it was removed from oven and then cool. When cooled, egg white pieces were ground in grinder until they become a fine powder. The powder was stored in air tight container for further uses.

2.3 Proximate Analysis

The pearl millet flour, chapatis and biscuits were tested for moisture, ash, fat, fiber and protein contents by employing the standards methods of analysis (AOAC, 2005). The carbohydrate content was calculated by difference. All the results were recorded on a dry weight basis.

2.6 Sensory Evaluation

The characteristics of chapati were subjected to sensory evaluation by panel of six members. Prepared products were evaluated for color, appearance, flavour, texture, taste and overall acceptability

3. RESULT

3.1 Chemical composition of Pearl millet flour

The moisture and ash content of pearl millet flour under investigation were 9.0±1.10% and 2.28±0.73%.The ash content is measure of mineral content in food products. Pearl millet is good source of minerals specially calcium. Kulthe et al., 2016 reported that moisture and ash content for pearl millet flour ranged from 6.22-12.43% and 2.05-2.72%, respectively (Saleh et al., 2013).The fat content of pearl millet flour was extracted with Soxhlet extraction method and the content was found to be 4.50±0.50%. Generally, pearl millet flour contain higher amount of fat as compared to other cereal flours. The protein and fibre content of pearl millet flour were 9.80±0.45% and 1.13±0.25%. Similar values for fat , protein and fiber content of pearl millet flour were observed by others 5.14-8.16%,9.0-17.4% and 2.07- 2.8% (Sawaya et al., 1983; Gull et al., 2015; Kulthe et al., 2016and Rathore et al., 2016).

The Carbohydrates content of pearl millet flour under consideration was found to be 73.29±0.60%.Gull et al., 2015 reported that values of carbohydrate content for pearl millet flour was observed 66.49-70.00% (Rathore et al., 2016; Kulthe et al., 2016).

Table 1: Chemical composition of pearl millet flour

Composition	Quantity
Moisture content	9.0±1.10%
Ash content	2.28±0.73%
Fat content	4.50±0.50%
Protein content	9.80±0.45%
Crude fibre content	1.13±0.25%.
Carbohydrate content	73.29±0.60%

3.3 Chemical composition of chapatis and biscuits

The moisture content of chapatis and biscuits prepared by blending the pearl millet flour with egg white protein, flaxseeds and carom seeds were 37.85±0.17% and 5.51±0.51%. The ash and protein content of the chapatis and biscuits were(2.40±0.48%and 3.68±0.20%) and (11.68±0.08% and 12.45±0.11%). Cheng et al., (2015) revealed that ash content of chapatis was 2.32±0.07%.A significant increase in protein content of chapatis as compared to raw pearl millet flour (9.80±0.45%) was observed. This increase was may be due to addition of egg white protein powder in raw pearl millet flour for preparation of chapatis. The fat and fibre content of biscuits were observed 20.44±1.0% and 1.013±0.26%, respectively. The carbohydrate content of pearl millet biscuits under consideration was 56.317±0.46%. Earlier studies on pearl millet biscuits observed the similar values of carbohydrate content 52.9-56.4% (Srivastava et al., 2012; Mehra et al., 2017).

Table 2: Chemical composition of chapatis and biscuits

Parameter	Chapati	Biscuit
Moisture content	37.85±0.17%	5.51±0.51%
Ash content	2.40±0.48%	3.68±0.20%
Crude fat content	4.90±1.50%	20.44±1.0%
Protein content	11.68±0.08%	13.04±0.33%
Crude fiber content	1.12±0.28%	1.01±0.26%
Carbohydrate content	42.05±0.50%	56.31±0.46%

3.4 Sensory evaluation of chapatis and biscuits

The sensory evaluation of chapatis and biscuit made from pearl millet flour blended with egg white protein powder and flaxseeds and carom seeds powder was evaluated using nine point hedonic scale and presented in (Table) and it was observed that prepared chapatis were found under category of 'slightly desirable'(6.4±0.26) and (6.95±0.23). Color, appearance, texture and taste were acceptable. Texture of chapatis had highest organoleptic score of 6.9±0.45 and appearance had least organoleptic score of 6.0±0.21%. The color of blended pearl millet flour was grey and soft to bite as compared to whole pearl millet flour chapatis which are usually hard to bite. The taste was sharp and slightly bitter. The color of biscuits was light grayish. The crispiness was well maintained and crumbiness texture made it more sensory acceptable. The taste was very desirable.

Table 3: Sensory evaluation of chapatis and biscuits

Sensory attributes	Chapatis	Biscuits
Color	6.2±0.32	6.5±0.42
Appearance	6.0±0.21	6.8±0.13
Taste	6.5±0.09	7.5±0.22
Texture	6.9±0.45	7.0±0.15
Overall acceptability	6.4±0.26	6.95±0.23

Figure 1: Picture of chapati and biscuits

4. CONCLUSION

The proximate chemical composition analysis of raw material and products were observed. The protein content of biscuits (13.04±0.33) and chapatis (11.68±0.08%) were higher than raw pearl millet flour (9.80±0.45%). This significant increase in protein content of both products due to incorporation of egg white protein powder in raw pearl millet flour for preparation of biscuits and chapatis, which improves the nutritional value of products. The protein content of chapati prepared by blending the pearl millet flour with egg white protein, flaxseeds and carom seeds (11.68 ± 0.08%) was higher as compared with wheat chapati (10.5%).

On the basis of sensory evaluation, product formed by pearl millet flour blended with egg white protein, flaxseeds and carom seeds are highly acceptable. After proximate analysis of fortified flour, it can be used in preparation of value added food products such as biscuits, chapatis as so on/etc.

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