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Analysis of the proximate composition, mineral content and antioxidant compound of pearl millet flour

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Abstract
This study was carried out to determine the proximate composition, Mineral content and Antioxidant compounds of pearl millet flour. Proximate analysis was performed using standard AOAC methods, mineral contents were determined using atomic absorption spectrometry while the antioxidant were analysed using standard methods. The results revealed that the moisture content of 10.70±0.10, ash content of 1.23±0.01 g/100 g and crude protein content of 8.40±0.10 g/100 g. The value of the mineral content of Iron 14.70±0.03 µg/mg, Zinc 01.84±0.01 mg/100 g and calcium content of 16.26±0.02 mg/100 g. the antioxidant analysis was performed The total carotenoid content0.44±0.003 mg/100 g, DPPH Activity 31.87±2.0 QDE/g of dw and Ferric ion Reducing Antioxidant Power 11.2±0.005FSE/g of dw in pearl millet flour. results obtained indicate that pearl millet good source of protein, dietary fibre, iron, Zinc and calcium.

Keywords: Proximate composition, mineral content, anti-nutrients, pearl millets

Introduction
Pearl millet (Pennisetum glaucum) is a crop grown in the semi-arid and dry lands of Africa and Southeast Asia (Baltensperger, 2002) [17]. Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is th the 5 most important cereal crop in the world after rice, wheat, maize and sorghum. Pearl millet is more nutritious than commonly pearl millet improvement through research, technology consumed staple crops such as wheat, rice, maize and generation and transfer. The grain is rich in carbohydrates, proteins, and 65 varieties were identified and released for fats, fibres, resistant starch, vitamins, antioxidants, cultivation in different agro ecological zones of the essential micronutrients such as iron and zinc and has a country through AICRP on Pearl millet. A number of more balanced essential amino acid profiles than maize or production and protection technologies specific to sorghum. Lipids are dominated with omega-3 and different agro-ecological regions which will prove useful omega-6 fatty acids (polyunsaturated fatty acids) that in enhancing the productivity of improved cultivars to contribute to good health of heart and brain. Pearl millet commercial farming scales and increase the profitability is not expensive like pearl but definitely it has pearl like of pearl millet growers were developed through this quality which is beneficial to the body. 100 grams of bajra contains- energy (360 calories), moisture (12 g), protein ICAR-AICRP on Pearl millet is actively (12 g), fat (5 g), mineral (2 g), fiber (1 g), carbohydrate collaborating as technology and knowledge partner in (67 g), calcium (42 mg), phosphorus (242 mg) after in the recent times of transforming diets, food habits Pearl millet is the first crop in the world to introduce and the food industry. Hence, pearl millet is gaining lot of bench mark levels for Fe (42 ppm) and Zn (32 ppm) in popularity among health conscious people all over the cultivar promotion and release since 2018 ensuring world. It can play a vital role in overcoming malnutrition nutritional security in the country falling in line with the to ensure food and nutritional security.

Materials and Methods
Sample collection
Pearl millet was collected from the local market. These were then cleaned, thoroughly washed with water and sun-dried. The cleaned pearl millet was ground in a domestic grinder (Philips). The pearl millet was sieved through a 100-150 mesh sieve. The pearl millet flour was kept in airtight container during its storage period.

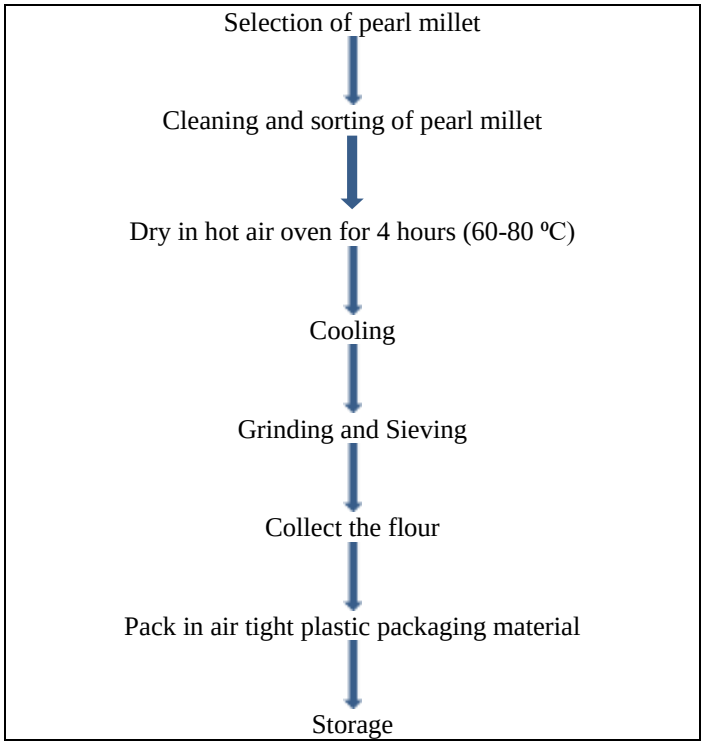

Fig 1: Preparation of pearl millet flour

Proximate Analysis

Proximate analysis was carried out according to the procedure of Association of Official Analytical Chemist (A.O.A.C., 2005 for moisture, ash, crude fibre and crude protein content. The carbohydrate was calculated by difference method (A.O.A.C., 2005) by subtracting the sum (g/100 g dry matter) of crude protein, crude fat, ash and fibre from 100 g. The energy was calculated by factorial method.

Mineral Analysis of metal using FAAS Elemental analysis was carried out by Flame Atomic Absorption Spectrometry (FAAS). Calcium, iron and zinc were measured using flame photometer.

Analysis of Antioxidants

1. Estimation of Total carotenoid content (Ranganna 2002)

The total carotenoid content was calculated using the following formula: Carotenoids content µg / g = A × V mL × 1 0 4 A 1 cm 1% × P g where A = Absorbance; V = Total extract volume; P = sample weight; $A_{1cm}^{1\%}$ = 2592 (β-carotene Extinction Coefficient in petroleum ether).

2. DPPH (2,2-di-phenyl-2-picryl-hydrazyl) radical scavenging activity(Tailor and Goyal,2014)

The effect of the extract on DPPH (2,2 di phenyl-2-picryl-hydrazyl) radical was determined according to the method used by Uddin *et al;* (2008). Antioxidants react with DPPH and as consequence the absorbance decreases. The degree of discoloration indicates the scavenging potential of the antioxidant compounds or extracts in terms of hydrogen donating ability.

3. Ferric ion Reducing Antioxidant Power (FRAP) assay (Benzie and Strain, 1996

FRAP assay is based on the rapid reduction in ferric-tripyridyltriazine (Fe^{III}-TPTZ) by antioxidants present in the samples forming ferrous-tripyridyltriazine (Fe^{II}-TPTZ), a blue-colored product (Benzie and Strain [1996]).

Statistical analysis

Each sample was extracted in triplicate. All data was reported as the mean±standard error of triplicate determinations, analyzed using one-way analysis of variance (ANOVA) with significant differences between means determined standard deviation and measured with Bonnenferri multiple range tests using the graph Pad Prism 8.3.

Results

Table 1 represents the result of the proximate composition of Pearl millet flour. The pearl millet flour showed 10.70% moisture content. Ash content was 1.23±0.01 g/100 g. Crude fat content of 4.36±0.15 g/100 g, Crude fibre content of 2.59±0.01 g/100 g. Crude protein and carbohydrate were 8 .40±0.02 g/100 g and 72.72 g/100 g respectively. The pearl millet flour showed a Energy of 363.72 kcal/100 g.

Table 1: Proximate composition of pearl millet flour

Parameters	Pearl millet flour (g/100 g)
Moisture %	10.70±0.10
Protein	8.40±0.10
Fat	4.36±0.15
Fibre	2.59±0.01
Total Ash	1.23±0.01
Carbohydrate	72.72
Energy(kcal)	363.72

All values except for moisture are expressed in dry weight

All values represent mean±standard deviation of triplicate determinations

Table 2 represents the mineral content of pearl millet flour in mg/100 g. iron was 14.70±0.03 mg/100 g, Zinc (01.84±0.01 mg/100 g), calcium was 16.26±0.02 mg/100 g.

Table 2: The mineral content of pearl millet flour

Minerals	Pearl millet flour
Iron(µg/100 g)	14.70±0.03
Zinc(mg/100 g)	01.84±0.01
Calcium(mg/100 g)	16.26±0.02

Data are mean of triplicate results±standard deviation of triplicate determinations

Table3 represents the antioxidant compounds of pearl millet flour in mg/100 g. Total carotenoids content of pearl millet flour was 0.44±0.003 mg/100 g. DPPH Activity of pearl millet flour was 31.87±2.0 QDE/g of dw. Ferric ion Reducing Antioxidant Power (FRAP) activity of pearl millet flour was11.2±0.005 (FSE/g of dw)

Table 3: Antioxidant compounds of pearl millet flours

Antioxidant compounds	Pearl millet flour
Total Carotenoid Content (mg/100 gm)	0.44±0.003
DPPH Activity (QDE/g of dw)	31.87±2.0
FRAP (FSE/g of dw)	11.2±0.005

Data are mean of triplicate results±standard deviation of triplicate determinations

Discussion

The result of proximate composition of pearl millet flour revealed that the sample had an average moisture content of 10.70. Ash content was 1.23±0.01 g/100 g. Crude fat content of 4.36±0.15 g/100 g, Crude fibre content of 2.59±0.01 g/100 g. Crude protein and carbohydrate were 8 .40±0.02 g/100 g and 72.72 g/100 g respectively. The pearl millet flour showed

a Energy of 363.72 kcal/100 g. the mineral content of pearl millet flour in mg/100 g. Iron was 14.70±0.03 mg/100 g, Zinc (01.84±0.01 mg/100 g), calcium was 16.26±0.02 mg/100 g. the antioxidant compounds of pearl millet flour in mg/100 g. Total carotenoids content of pearl millet flour was 0.44±0.003 mg/100 g. DPPH Activity of pearl millet flour was 31.87±2.0 QDE/g of dw. Ferric ion Reducing Antioxidant Power (FRAP) activity of pearl millet flour was11.2±0.005 (FSE/g of dw).

Conclusion

The proximate and mineral analyses of pearl millet flour have shown that pearl millet good source of protein, fibre, and mineral content iron and calcium. Pearl millet is a staple food with superior nutritional value and health benefits. As consumers are more attentive towards their health so the pearl millet has one of the alternative options for nutritious food. Despite high nutrition value and health benefits, use of pearl millet is limited because high lipid content which reduce the shelf life and acceptability of pearl millet products. Some methods are described to process pearl millet but more detailed research is needed to assess the real potential and availability of this "nutri-cereal" to improve the quality of pearl millet product.

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