www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(8): 1861-1864

www.thepharmajournal.com
Received: 01-06-2023
Accepted: 04-07-2023

Harichandana Ponnapalli
Ph.D. Scholar, Department of Food Science and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India

Sarojani J Karkannavar
Dean Student Welfare, University of Agricultural Sciences, Dharwad, Karnataka, India

Hemalatha S
Professor and Head, Department of Food Processing and Technology, College of Community Science, Dharwad, Karnataka, India

Corresponding Author:
Harichandana Ponnapalli
Ph.D. Scholar, Department of Food Science and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India

The nutritional composition of browntop millet

Harichandana Ponnapalli, Sarojani J Karkannavar and Hemalatha S

Abstract
The world is dealing with both agricultural and nutritional issues. Utilizing dry soils to produce enough high-quality grains is difficult because of their poor productivity. Millets, a crop that complies with climate change regulations, outperform other staple grains like rice, wheat and maize in terms of poor growth conditions and high nutritional value. Browntop millet is one of many small millets, but its significance has only recently come to light because of its enormous potential to produce a high yield under resource-poor and vulnerable ecological conditions, ensuring the economic and nutritional security of small farm holders as well as the sustainability of their operations. Exploring the nutritional properties of browntop millet enables its incorporation in various value-added products. The present study found that the browntop millet is a rich source of crude fibre with 4.92 g/100 g, dietary fibre with 12.43 g/100 g and minerals (calcium - 26.24 mg, iron – 6.98 mg, zinc – 2.88 mg, copper – 1.43 mg and manganese – 0.88 mg/100 g) which helps in the overall health and development.

Keywords: Browntop millet, proximate composition, carbohydrate profile, mineral content

Introduction
Climate change, declining resources, scarcity of food, an enormous rise in world population and other socioeconomic effects pose the most significant threat to food, nutrition, and agricultural security in nations worldwide, especially among the poor. There is therefore a need for alternative, nutrient-rich food sources (Ashoka and Sunitha, 2020) [3]. Functional food consumption is growing in acceptance to treat diseases brought on by diet. The use of secondary metabolites for medicinal reasons includes nutraceuticals and bioactive dietary ingredients. In this era of therapeutic foods, millets have gained widespread recognition as super food (Kumar *et al*., 2020) [5].

Although millets were one of the first cereal grains to be used for domestic and household purposes, they are currently only the sixth most significant grain in the world (Changmei and Dorothy, 2014) [6]. Millets are a group of extremely varied, small-grained, annual cereals from the grass family that thrive in semi-arid climates like those in Asia and Africa. They were exceptionally resilient to droughts and adverse weather, making them suitable for dry land farmers (Fahad *et al*., 2017; Rao *et al*., 2017) [8, 19].

Due to their high dietary fibre content, millets are beneficial for those with disorders like diabetes, obesity, diabetes, cardiovascular disease, constipation, cataracts, cancer, celiac disease and diverticulosis (Kalpana, 2017) [11]. Browntop millet (*Urochloa ramosum*) is one of the most uncommon and under-explored millets among all the others. It is a historical crop of India particularly in Tumkur, Chitradurga, Chikkaballapura and Bellary of Karnataka but also thrives in Andhra Pradesh (Mallikarjuna, 2016) [14].

Due to its resilience to heat, drought and flooding, browntop millet is a hardy crop that can withstand harsh climatic conditions. It has the capacity to spread deep and wide in the soil. Because it is farmer-friendly and offers good nutrition, this millet can therefore be a standout option among others. When relative to other millets, browntop millet is renowned for having a high concentration of nutritional fibre. Additionally, this tiny, greenish grain contains calcium, magnesium, potassium, zinc and iron, among other nutrients (Sarita and Singh, 2016) [21]. The knowledge of the nutritional properties of browntop millet is less, therefore the present study is designed with a major objective to determine the nutritional composition of browntop millet.

Materials and Methods
The present investigation was conducted at the Department of Food Science and Nutrition, College of Community Science, University of Agricultural Sciences Dharwad, Karnataka.

The dehusked browntop millet was procured from Green Organics, Dharwad, Karnataka.

The proximates of browntop millet: The proximate properties like moisture, protein, crude fat, total ash, crude fibre, carbohydrates and energy of browntop millet were analysed according to Anon, 2019 [2].

The carbohydrate profile of browntop millet

Total starch

The total starch of the browntop millet flour was estimated by following the method of McCready *et al*. (1950) [15]. The sample was repeatedly treated with hot 80 per cent alcohol to remove sugars. The residue rich in starch was solubilised with perchloric acid and the filtered extract was treated with anthrone sulphuric acid to determine glucose. The glucose value was multiplied by 0.9 to convert it into the starch value.

Amylose

One hundred mg of browntop millet sample was weighed accurately and taken in 100 ml volumetric flask. One ml of alcohol was added and mixed well followed by 10 ml of 1 N NaOH, left overnight. Next day the volume was made up to 100 ml with distilled water and mixed thoroughly. Five ml aliquot was taken into a 100 ml volumetric flask, to those three drops of phenolphthalein indicator and 50 ml of distilled water was added, which turned pink. Then, 0.1 N HCI was added was drop wise till it turned colourless. To this, 2 ml of 0.2 per cent iodine reagent solution was added and volume was made up to 100 ml with distilled water. The purple-blue colour was read at 600 nm. High amylose corn starch was used as standard.

Amylose was calculated by following formula:

$$\text{Amylose g/100g} = \frac{\text{Absorbancy} - \text{Y intercept}}{\text{Slope}} \text{x1.06}$$

Amylopectin

The amylopectin content of browntop millet flour was derived after subtracting amylose from total starch content (Sowbhagya and Bhattacharya, 1979) [22].

Resistant starch

The resistant starch content of browntop millet flour was estimated by megazyme enzyme assay kit by AOAC Method, where protein; digestible starch was removed by enzymatic hydrolysis followed by solubilization and enzymatic hydrolysis of RS; and finally, quantification of RS as glucose released (Anon, 2002) [1].

Dietary fibre (%)

The soluble, insoluble and total dietary fibre of browntop millet was estimated by using α-amyloglucosidase method (Asp *et al.*, 1983) [4].

Total, reducing and non-reducing sugars

The total, reducing and non-reducing sugars of browntop millet was estimated by Nelson-Somogyi's method (Ranganna, 1986) [18].

The mineral content of browntop millet

Minerals (mg/100g): The minerals (calcium, iron, zinc, copper and manganese) were estimated by wet digestion using triacid mixture. A known aliquot of browntop millet sample was diluted and micro minerals in the test sample (Ca, Cu, Mn, Zn and Fe) were determined using atomic absorption spectrophotometer (Anon., 2019) [2]. Calibration of measurements was performed using commercial standards.

Results and Discussion

The proximates of browntop millet

The proximates like moisture, protein, fat, ash, crude fibre, carbohydrates and energy of browntop millet were determined and the results are presented in Table 1. These results were found similar to the findings of Hemamalini (2020) [10], Maitra (2020) [13] and Sravani (2020) [13]. However, slight differences were found due to variations in dry matter, origin, growth settings and post-harvest technologies (Qaisrani *et al*., 2019) [17].

Table 1: The proximates of browntop millet

Proximates	Browntop millet
Moisture	8.69±0.03%
Protein	13.37±0.05%
Fat	4.23±0.02%
Ash	5.48±0.06%
Crude fibre	4.92±0.06%
Carbohydrates	63.32±0.07%
Energy	345 k. cal

Note: The values are displayed as mean ± standard deviation of three replications

The carbohydrate profile of browntop millet

The carbohydrate profile includes the analysis of starch, amylose, amylopectin, resistant starch, total dietary fibre, soluble dietary fibre, insoluble dietary fibre, total sugars, reducing sugars and non-reducing sugars. The results of the carbohydrate profile of browntop millet are displayed in Table 2. The browntop millet had a total starch content of 56.43 g/100g out of which amylose and amylopectin were 14.16 and 42.25 g/100 g respectively. Verma *et al*. (2018) [25] found that barnyard millet and finger millet had 58.56% and 57.25% of total starch which were found similar to the browntop millet in the present study. According to (Bangar *et al*., 2021) [5], the amylose content of foxtail millet (16.61%), kodo millet (13.99%) and barnyard millet (14.42%), is equivalent to the amylose level of browntop millet (14.16 g/100 g) in the current study.

The resistant starch content of browntop millet was 1.20 g/100g which was on par with that of the browntop millet reported by Srilekha (2022) [24]. The total dietary fibre of browntop millet was 12.43 g/100g out of which soluble and insoluble dietary fibre was 5.89 and 6.65 g/100g respectively. Comparing the results of Roopa (2015) [20] and Ashoka and Sunitha (2019) [3], who found that foxtail millet had 8.09%, kodo millet had 9.0% and barnyard millet had 10.19 g/100g of total dietary fibre, the browntop millet in the present study had high total dietary fibre content (12.43 g/100g). Depending on the type of fiber consumed, fiber has different biological and metabolic effects. Dietary fibber's physiological and metabolic functions are mostly governed by its solubility in water, hydration potential, adsorptive attraction, and ferment ability. Dietary fiber that is soluble delay stomach emptying and lessens the impact of digestive enzymes, which helps people with diabetes mellitus by delaying the absorption of glucose. Insoluble dietary fiber, on the other hand, promotes satiety and has a laxative effect, supporting intestinal health. Insoluble dietary fiber's satiating action reduces overeating, which aids in maintaining a healthy weight and blood sugar level (Gropper and Smith, 2016) [9].

Table 2: The carbohydrate profile of browntop millet

Carbohydrate profile		Browntop millet
Starch	Total starch (g/100g)	56.43±0.49
	Amylose (g/100g)	14.16±0.01
	Amylopectin (g/100g)	42.25±1.04
Resistant starch (g/100g)		1.20±0.03
Dietary fibre	Total dietary fibre (g/100g)	12.43±0.46
	Soluble dietary fibre (g/100g)	5.89±0.28
	Insoluble dietary fibre (g/100g)	6.76±0.19
Sugars	Total sugars (g/100g)	0.97±0.01
	Reducing sugars (g/100g)	0.49±0.02
	Non reducing sugars (g/100g)	0.48±0.02

Note: Values are displayed as mean ± standard deviation of three replications.

The browntop millet had 0.97 g/100g of total sugars out of which reducing and non-reducing sugars were 0.49 and 0.48 g/100g respectively. The results of the present study were similar to the findings of Ocheme and Chinma (2008) [16] who revealed that the pearl millet had pearl millet total sugars of 1.74 g/100g and reducing sugars of 0.54g/100g.

The mineral content of browntop millet

The minerals analysed for browntop millet were calcium, iron, zinc, copper and manganese and were displayed in Table 3. The browntop millet had 26.24 mg/100g of calcium, 6.98 mg/100g of iron, 2.88 mg/100g of zinc, 1.43 mg/100g of copper and 0.88 mg/100g of manganese. These results were comparable to the findings of Roopa (2015) [20]. The development of oxidative stress is facilitated by chronic hyperglycemia, which either boosts the production of free radicals and reactive oxygen species or lowers the activity of the antioxidant defense system. As a cofactor of the antioxidant defense system enzyme superoxide dismutase, zinc lowers the oxidative stress brought on by diabetes. Additionally, it increases the phosphorylation of insulin receptors, facilitating the entrance of glucose into cells that are resistant to insulin (Cruz *et al*., 2015) [7].

Table 3: The mineral content of browntop millet

Minerals	Browntop millet
Calcium (mg/100g)	26.24±0.89
Iron (mg/100g)	6.98±0.15
Zinc (mg/100g)	2.88±0.01
Copper (mg/100g)	1.43±0.06
Manganese (mg/100g)	0.88±0.04

Note: Values are displayed as mean ± standard deviation of three replications.

Conclusion

The browntop millet has enormous unexplored possibilities for drylands in terms of providing smallholders with secure access to food, nutrition, and a means of subsistence. Thus, in the present study, the proximate composition, carbohydrate profile and minerals of browntop millet were analysed. From the present study, it was found that the browntop millet had a high amount of crude fibre, dietary fibre and ash. Therefore, this nutri-cereal can be used for value addition for overall improvement in health and prevention of several lifestyle diseases like diabetes, obesity and cardiovascular diseases.

Acknowledgement

The authors thank the honourable Vice Chancellor of the University of Agricultural Sciences, Dharwad, Karnataka for his encouragement.

References

1. Anonymous. Official Methods of Analysis, Association of Official Analytical Chemists, 21st edition, Washington, DC, USA, 2002.
2. Anonymous. Official Methods of Analysis, Association of Official Analytical Chemists, 21st edition, Washington, DC, USA, 2019.
3. Ashoka P, Sunitha NH. Review on browntop millet-a forgotten crop. Journal of Experimental Agriculture International. 2020;42(7):54-60.
4. Asp NG, Johansson CG, Hallmer H, Siljestorm M, 1983, Rapid enzymatic assay of insoluble and soluble dietary fibre. Journal of Agricultural and Food Chemistry. 2020;31:476-481.
5. Bangar SP, Ashogbon AO, Dhull SB, Thirumdas R, Kumar M, Hasan M, *et al*. Proso-millet starch: Properties, functionality, and applications. International Journal of Biological Macromolecules. 2020;190:960-968.
6. Changmei S, Dorothy J. Millet-the fungal grain. International Journal of Scientific Research and Reviews. 2014;34:75-90.
7. Cruz KJC, de Oliveira ARS, do Nascimento Marreiro D. Antioxidant role of zinc in diabetes mellitus. World journal of Diabetes. 2015;6(2):333.
8. Fahad S, Bajwa AA, Nazir U, Anjum SA, Farooq A, Zohaib A, *et al*, Crop production under drought and heat stress: plant responses and management options. Frontiers in Plant Science. 2017;8:1147.
9. Gropper SS, Smith JL, Advanced Nutrition and Human Metabolism. Wodworth cengage learning, USA, 2013.
10. Hemamalini Ch, Patro TSSK, Patro Anuradha N, Triveni U, Jogarao P, Estimation of nutritive composition of seven small millets. Journal of Pharmacognosy and Phytochemistry. 2020;9(3):1871-1874.
11. Kalpana K. Can we achieve micronutrient adequacy and cognitive in children through millets. Food and Nutrition Journal. 2017;4:1-3.
12. Kushagra D, Rajiv S, Ruchi G, Neelesh M. *In-vitro* evaluation of anti-urolithic activity of leaves extract of *Costus igneus*. Research Journal of Pharmacy and Technology. 2020;13(3):1289-1292.
13. Maitra S. Potential horizon of brown-top millet cultivation in drylands: A review. Crop Research. 2020;55:57-63.
14. Mallikarjuna H. Korale’s growing popularity. Deccan Herald News Paper, 2016.
15. McCready RM, Guggoiz J, Silveira V, Owens HS. Determination of starch and amylase in vegetables. Analytical Chemistry. 1950;22:1156-1558.
16. Ocheme OB, Chinma CE. Effects of soaking and germination on some physicochemical properties of millet flour for porridge production. Journal of food Technology. 2008;6(5):185-188.
17. Qaisrani SN, Murtaza S, Khan AH, Bibi F, Iqbal SMJ, Azam F, *et al*. Variability in millet: Factors influencing its nutritional profile and zoo technical performance in poultry. Journal of Applied Poultry Research. 2019;28(2):242-252.

18. Ranganna S. Handbook of analysis and quality control of fruit and vegetable products. 2nd Ed, Tata McGrow-Hill Education, New York, 1986.
19. Rao DB, Bhaskarachary K, Arlene Christina GD, Sudha Devi G, Vilas AT, Tonapi A. Nutritional and health benefits of millets. ICAR_Indian Institute of Millets Research (IIMR): Hyderabad, Indian, 2017.
20. Roopa OM. Nutritional analysis and development of value added products from browntop millet. M. Sc Thesis, University of agricultural sciences, Bangalore, Karnataka, India, 2015.
21. Sarita, Singh E. Potential of millets: Nutrients composition and health benefits. Journal of Scientific and Innovative Research. 2016;5(2):46-50.
22. Sowbhagya CM, Bhattacharcya KR. Simplified determination of amylose in milled rice. Starch/Starke. 1979;31(5):159-163.
23. Sravani M. Effect of processing methods on nutritional and anti-nutritional qualities of browntop millet (*Brachiaria ramosa*), Ph.D. Thesis, Professor Jaya Shankar Telangana State Agricultural University, Hyderabad, Telangana, India, 2020.
24. Srilekha K. Development and evaluation of browntop (*Urochloa ramosa*) millet based resistant starch rich health mix. Ph.D. Thesis, University of agricultural sciences, Dharwad, Karnataka, India, 2022.
25. Verma VC, Singh A, Agrawal S. Ethnobotanical study of small millets from India: Prodigious grain for nutritional and industrial aspects. International Journal of Chemical Studies. 2018;6(4):2155-2162.