International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(3): 2535-2537

Received: 24-03-2018
Accepted: 25-04-2018

Mridula S Barooah
Department of Food Science and Nutrition, College of Home Science, Assam Agricultural University, Jorhat, Assam, India

Mamoni Das
Department of Food Science and Nutrition, College of Home Science, Assam Agricultural University, Jorhat, Assam, India

Lipika Chatterjee
Department of Food Science and Nutrition, College of Home Science, Assam Agricultural University, Jorhat, Assam, India

Chandrama Baruah
Department of Food Science and Nutrition, College of Home Science, Assam Agricultural University, Jorhat, Assam, India

Sushmita Khatoniar
Department of Food Science and Nutrition, College of Home Science, Assam Agricultural University, Jorhat, Assam, India

Correspondence
Mridula S Barooah
Department of Food Science and Nutrition, College of Home Science, Assam Agricultural University, Jorhat, Assam, India

Nutrient composition of some traditional breakfast cereals of Assam

Mridula S Barooah, Mamoni Das, Lipika Chatterjee, Chandrama Baruah and Sushmita Khatoniar

Abstract
The study was undertaken to assess the nutrient composition of some selected traditional breakfast cereals of Assam such as *Komal chawl, Bora chawl, Sandahguri, Red rice* and *Red chira*. The selected cereals were evaluated for their nutritional quality for its mineral content and total antioxidant capacity. Among the minerals, the iron and calcium content were found highest in *Red chira* which are 16.60 mg/100g and 5.10 mg/100g respectively. *Red rice* contained highest phosphorous content (114.00mg/100g) followed by *Red chira* (95.00mg/100g) and the lowest content was found in *Bora chawl* (43.00mg/100g). The potassium content ranged from 62.00 mg/100g to 130.00mg/100g with the lowest in *Bora chawl* and highest in *Red chira*. The total antioxidant capacity was highest in *Red rice* which was 160mg/100g of sample followed by *Sandahguri* which was 77.50mg/100g. The antioxidant activity for *Red chira, Bora chawl* and *Komal chawl* were 68.80mg/100g, 53.00mg/100g and 50.00mg/100g respectively. Results generated in this study might be able to provide vital information's on identifying 'superior traditional breakfast cereals of Assam', based on their mineral content as well as on their total antioxidant activity.

Keywords: Breakfast cereals, antioxidant activity, mineral content

Introduction
Cereal grains have been the major component of man's diet throughout the world for centuries. The grains are named cereals after the Roman Goddess *Ceres*, Goddess of grain. Rice, *Oryza sativa* L., is one of the most important cereals in the world and is the staple food of East, South East and South Asia. Among the north-eastern states of India, Assam is unique in terms of a mixed culture as well as both hilly and low land vegetation. Assam has enriched its genetic pool where rice varieties of wide genetic diversities are found. With rice being the traditional staple crop in the state, it is also used as processed products to celebrate festive occasions and to consume as breakfast cereals (Borah, 2000) [6]. Breakfast cereals play an important role in a balanced diet (McKevith and Jarzebowska, 2010) [11] and dietary guidelines state that the high nutrient dense breakfast cereals (especially whole grain breakfast cereals) makes them a significant source of vital nutrients (NHMRC, 2013) [13]. In addition to it breakfast cereals are also potentially imperative sources of antioxidants (Ryan *et al.*, 2011) [19] and phytoestrogens (Kuhnle *et al.*, 2009) [9]. Now-a-days, inevitable ranges of breakfast cereals differing in shapes, sizes and flavours are available fortified with vitamins and minerals and play a positive role in maintaining a balanced and healthy diet. In modern times with nuclear family becoming the norm, people are depending more and more on these types of convenience foods to manage with time and labour factors. The rice products of Assam are also convenience foods and are traditionally being consumed as ready-to-eat breakfast cereals. A unique characteristic of these rice products is that they soften and become consumable on simple soaking in water. The significant rice products of Assam are *Komal chawl, Bora chawl, Sandahguri, Hurum,* etc. *Komal chawl* is a whole grain, ready-to-eat product, which needs no cooking and can be consumed after simply soaking in cold to lukewarm water. *Sandahguri* is obtained as a coarsely ground powder of parboiled rice for which *chowkua* rice is most preferred. *Hurum* is an expanded rice product made from waxy rice. While *Komal chawl* is soaked in water for softening before consumption, *Sandahguri* and *Hurum* are straightway eaten. These rice products are traditionally mixed with milk/curd/cream and jaggery/sugar and eaten. The present study was carried out to analyze the nutritional quality of some breakfast cereals for its mineral content and total antioxidant capacity.

Methodology

Moisture, ash, calcium and potassium were estimated following AOAC standard methods (2000, 1984) [4, 3]. Iron content was determined using Wong's method and phosphorous was estimated by method described by Fiske and Row (Ranganna, 1986) [17]. Methanolic extracts were prepared for estimation of the total antioxidant capacity of the samples by extracting 5g of sample in 50ml methanol. The total antioxidant capacity of the extracts was evaluated by the phosphor molybdenum method according to the procedure described by Prieto *et al.* (1999) [16]. A 0.3 ml of extract was combined with 3 mL of reagent solution (0.6 M sulfuric acid, 28 mM sodium phosphate and 4 mM ammonium molybdate). The tubes containing the reaction solution were incubated at 95ºC for 90 min. Then, the absorbance of the solution was measured at 695 nm using a UV-VIS spectrophotometer (UVmini-1240) against blank after cooling to room temperature. Methanol (0.3 mL) in the place of extract was used as the blank. The total antioxidant activity is expressed as the number of gram equivalent of ascorbic acid. The calibration curve was prepared by mixing ascorbic (1000, 500, 250, 125, 62.5 and 31.25 µg/ml) with methanol.

Results and Discussion

Mineral constituents

The selected traditional breakfast cereals of Assam were evaluated for their nutritional quality and are presented in Table 1.

Moisture content, which plays a significant role in determining the shelf-life was found to be highest in *Bora chawl* which was 14.04g/100g, while *Red chira* contained lowest moisture content of 12.58g/100g among the samples and the values were slightly similar to the findings of Pathak (2008) [15]. However, the moisture content was found to be slightly higher than the values reported by Yodmanee *et al.* (2011) [21] and Oko *et al.* (2012) [14]. The variation in the moisture content obtained in the present study may be possibly due to the differences in the application of nitrogen, method of processing, climate, stage of maturity and their storage conditions.

In the present investigation, the ash content of the selected samples were found to be in the range of 0.93g/100g to 2.06g/100g, with the lowest in *Bora chawl* and highest in *Red chira*. The amount of ash present in a food sample plays an important role while determining the levels of essential minerals (Bhat and Sridhar, 2008) [5]. However, Anjum *et al.* (2007) [2] reported the ash content of few rice samples ranging from 0.80 g/100g to 3.13 g/100g which was within the range as compared to the present study. Slightly, similar findings were reported by Abbas *et al.* (2011) [1] who found the ash content to be ranging from 1.00g/100g to 1.50g/100g and stated that the differences may be due to difference in the variety and degree of polishing or may also be due to environmental factors such as soil type, ambient temperature during ripening and genital makeup which may cause differential absorption of mineral nutrients from the soil.

In the present investigation, the calcium and iron content were found to be highest in *Red chira* which are 16.60 mg/100g and 5.10 mg/100g respectively. Abbas *et al.* (2011) [1] in a study on the effect of processing on nutritional value of rice found that the calcium content of brown rice was 0.10mg/100g which was much lower than the present results. Another study by Mbatchou and Dawda (2013) [10] showed calcium content in the range of 4.60mg/100g to 12.30mg/100g which was also lower than the results obtained in the present study. However, the results obtained from the present study was found to be higher than the earlier findings of Jagadeesh *et al.* (2013) [8], who reported the iron content to be ranging from 0.41mg/100g to 0.78mg/100g. It was found in a study by Yodmanee *et al.* (2011) [21] that the pigmented rice had iron content in the range of 0.91-1.66 mg/100g sample which was lower than the values obtained in the present study i.e., 3.10mg/100g. The differences in iron content of rice may be affected by their growing environments and genetic differences (Meng *et al.*, 2005) [12]. Borua *et al.*, (2004) [7] reported 2.8 to 4.60 mg/1000g of iron in 64 scented rice cultivars of North East India which was lower than the present results.

Red rice contained highest phosphorous content (114.00mg/100g) followed by *Red chira* (95.00mg/100g) and lowest was found in *Bora chawl* (43.00mg/100g). In a study on different varieties of rice, it was revealed that the phosphorus content varied widely from 28mg/100g per cent to 41mg/100g (Reddy *et al.,* 2004) [18] which was much lower in range as compared to the present study. The potassium content ranged from 62.00 mg/100g to 130.00mg/100g with the lowest in *Bora chawl* and highest in *Red chira* which was much lower in range as compared to a study by on 2 rice genotypes, who found the potassium content to be in the range of 215.00mg/100g to 220.00mg/100g.

Table 1: Mineral composition of the selected breakfast cereals (per 100g)

Sl. No.	Samples	Moisture (g)	Ash (g)	Calcium (mg)	Iron (mg)	Phosphorus (mg)	Potassium (mg)
1	*Komal chawl*	13.30	1.02	13.00	2.00	46.00	74.00
2	*Bora chawl*	14.04	0.93	10.40	3.05	43.00	62.00
3	*Sandahguri*	12.66	1.10	14.20	4.80	61.00	68.00
4	*Red rice*	13.62	1.67	15.60	3.10	114.00	82.00
5	*Red chira*	12.58	2.06	16.60	5.10	95.00	130.00

Total antioxidant activity

From the Figure 1, it is observed that the total antioxidant capacity was highest in *Red rice* which was 160mg/100g of sample followed by *Sandahguri* which was 77.50mg/100g. The antioxidant activity for *Red chira*, *Bora chawl* and *Komal chawl* were 68.80mg/100g, 53.00mg/100g and 50.00mg/100g respectively. Similar results were obtained from a previous study by Yodmanee *et al*., (2011) [21] who found that the pigmented rice has increasing antioxidant activity as compared to the non-pigmented varieties as this may be related to polyphenol contents.

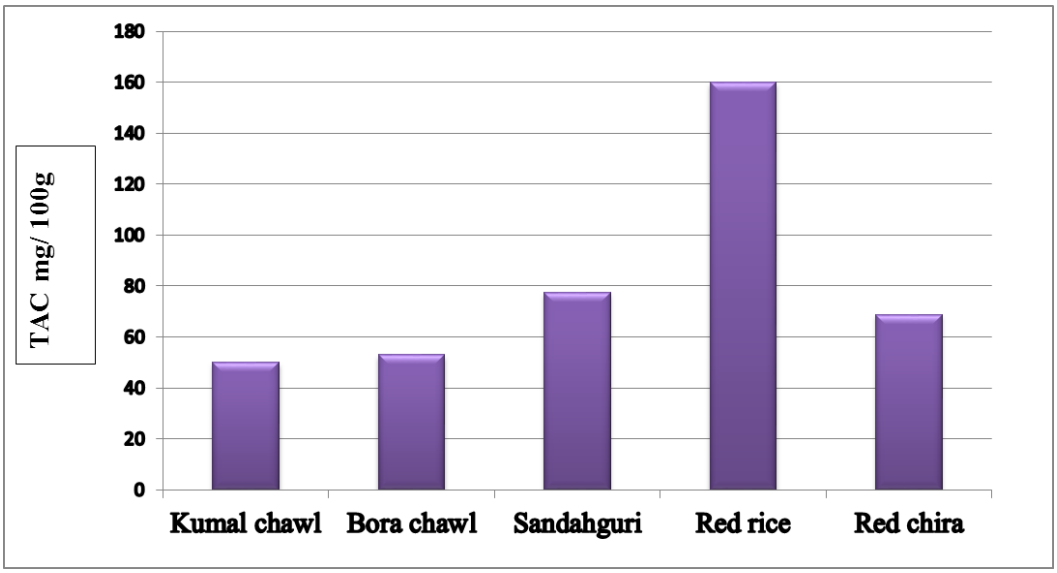

Fig 1: Total antioxidant activity of traditional breakfast cereals

Conclusion

Rice has been rightly considered as the queen among cereals for its nutritional quality and higher digestibility. It contains several minerals of nutritional importance in varying properties. Though they are present in very small amount, they play very important role in human nutrition (Anjum *et al*., 2007) [2]. This study revealed that these traditional breakfast cereals of Assam possess good mineral profile as well as antioxidant activity. Natural antioxidants that are present in rice are responsible for inhibiting or preventing the deleterious consequences of oxidative stress. Therefore, proper commercialization of this popular Assamese breakfast cereal is needed in present times to sustain its consumption in view of its good nutrient composition and ease of consumption.

References

1. Abbas A, Murtaza S, Aslam F, Khawar A, Rafique S, Naheed S *et al.* Effect of Processing on Nutritional Value of Rice (*Oryza Sativa* L). World J. Med. Sci. 2011; 6(2):68-73.
2. Anjum FM, Pasha I, Bugti MA, Butt MS. Mineral composition of different rice varieties and their milling fractions. Pak. J. Agri. Sci. 2007; 44:33-36.
3. AOAC Official Methods of Analysis (14th Ed.). Association of Official Analytical Chemists, Washington, D.C, 1984.
4. AOAC Official Methods of Analysis (17th Ed.). Association of Official Analytical Chemists, Washington, D.C, 2000.
5. Bhat R, Sridhar KR. Nutritional quality evaluation of electron beam-irradirated lotus (*Nelumbo Nucifera*) seeds. Food Chem. 2008; 107:174-184.
6. Borah N. Non starch lipids and starch lipids in waxy rice of Assam. M.sc. Thesis, Assam Agricultural University, 2000.
7. Borua I, Ahmed SA, Sarkar CR, Das D. Biochemical evaluation of scented rice of northeastern India. Bioprospecting of commercially important plants. Proceedings of the national symposium on"Biochemical approaches for utilization and exploitation of commercially important plants. Indian Society of Agricultural Biochemists. Jorhat, India, 2004, 79-85.
8. Jagadeesh BR, Krishnamurthy R, Surekha K, Yogesh GS. Studies on high accumulation of iron and zinc contents in some selected rice genotypes. J. Bio Sci. and Biotech, 2013; 2(4):539-541.
9. Kuhnle GG, Dell'Aquila C, Aspinall S, Mulligan A, Bingham S. Phytoestrogen content of cereals and cereal based foods consumed in the UK. 2009; 61:302-9.
10. Mbatchou V, Dawda S. The nutritional composition of four rice varieties grown and used in different food preparations in Kassena-Nankana district, Ghana. Int. J. Res. Chem. Environ. 2013; 3:308-315.
11. McKevith B, Jarzebowska A. The role of breakfast cereals in the UK diet: headline results from the National Diet and Nutrition Survey (NDNS) year 1 Nutr Bull. 2010; 35:314- 9.
12. Meng F, Wei Y, Yang X. Iron content and bioavailability in rice. J. Trace Elements in Medicine and Bio. 2005; 18(4):333-338.
13. National Health and Medical Research Council. Eat for health Australian dietary guidelines. National Health and Medical Research Council, Canberra (Australia), 2013, 18.
14. Oko AO, Ubi BE, Efisue, Dambaba N. Comparitive Analysis of chemical nutrient composition of selected local and newly introduced rice varieties grown in Ebonyi State of Nigeria. Int. J. Agril. Forest 2012; 2(2):16-23.
15. Pathak K. Bioprospecting of glutinous rice of Assam. Phd Thesis. Assam Agricultural University, Jorhat. 2008.
16. Prieto P, Pineda M, Anguilar M. Anal. Biochem. 1999; 269:337.
17. Ranganna S. Manual of Analysis of Fruit and Vegatable Products. McGraw Hill Publishing, 1986.
18. Reddy BS, Chakraverty A. Physical Properties of raw and parboiled paddy. Biosys. Engg. 2004; 88: 461-466.
19. Ryan L, Thondre P, Henry C. Oat-based breakfast cereals are a rich source of polyphenols and high in antioxidant potential, J Food Compos. Anal. 2011; 24:929-34.
20. Wong. Estimation of iron. In: B.L. Oser (ed.). Hawks physiological chemistry 14th ed, 1094, 1928.
21. Yodmanee S, Karrila TT, Pakdeechanuan P. Physical, chemical and antioxidant properties of pigmented rice grown in Southern Thailand. Int. J Food Res. 2011; 18(3):901-906.