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Research Article

NUTRITIONAL COMPOSITION AND DIETARY FIBER ANALYSIS OF RICE BRAN OF SELECTED VARIETIES OF RICE

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A B S T R A C T

Rice is the second leading cereal crop and staple food of the world's population and bran is a by-product of the rice milling industry. The effective utilization of bran can be done by deactivating the lipase enzyme responsible for the hydrolytic degradation of the rice bran constituents which starts soon after bran detachment from the kernel. Thermal and non-thermal treatments are considered as effective stabilization method for the inactivation of lipase enzyme and making rice bran nutritious. Proximate composition and dietary fiber of varieties of rice bran (NDR-97 and Pusa Basmati Rice-1121) were selected and analyzed by using the A.O.A.C. method (5). In this study it is observed that crude fat, moisture content, total dietary fiber (TDF) in the NDR-97 and Pusa Basmati Rice-1121 were 14% and 12.3%, 10.63% and 9.17%, 5.93% and 30.39% respectively. Low amount of fat and moisture content and high amount of dietary fiber in the Pusa Basmati Rice indicated that Pusa Basmati Rice-1121 is more useful in the comparison of NDR-97 and can be used in different food industry for development of high fiber products which improve human health.

INTRODUCTION

Rice is a staple grain being consumed in its milled form by approximately half of the population of the world. It is grown in at least 114 countries with global production of 645 million tons [1]. Rough rice (paddy) is composed of white starchy tightly covered by a coating of bran, enclosed in tough siliceous hull [2]. On the removal of bran layers, the storage life of milled rice is improved. Approximately 30-32 million metric tons of bran are produced annually which comprise about 7% of the 450 million metric tons of annual world rough rice output. Rice bran is by product obtained from milling brown rice to produced white rice. Immediately following the milling process, rapid deterioration of the crude fat in the bran by lipase and to a lesser extent, oxidase occur and makes the bran unfit for human consumption. The effective utilization of bran can only be done by deactivating the lipase enzyme responsible for hydrolytic degradation of rice bran constituents. Stabilization is an effective treatment turning rice bran into a valuable dietary constituents. Microwave heating is considered as an effective stabilization method for the inactivation of lipase enzyme, responsible for rice bran degradation [1, 3].

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Rice bran is a significant source of nutrients. It is particularly rich in dietary fiber and essential fatty acid [4]. Rice bran is excellent source of essential vitamin, minerals, amino acids, phosphoric acids compounds, essential fatty acids, dietary fiber and more than 100 antioxidant nutrients that help to fight against to disease and promote good health [5]. Presence of antioxidants including tocopherol, tocotrienols and oryzanol brighten prospects of rice bran utilization for humans [1,6,7]. It is a rich source of B-vitamins and minerals such as phosphorus, potassium, sodium, iron, copper, magnesium, calcium, chlorine, magnese and zinc. The protein found in rice bran is reported approximately 12-15%. The nutritive value of rice bran is protein is relatively high lysine content, one of the essential amino acid [6, 7,8]. A major rice bran fraction contains 12-22% oil, 6-14% fiber [8].

Total dietary fiber content in stabilized rice bran ranges from 25 to 40% depending on the product. Rice bran's fiber composed of a relatively low proportion of soluble fiber (7-13%) and the rest is insoluble fiber. The role of dietary fiber in health and nutrition has stimulated a wide range of research activities. Accumulating evidence favors the view that increase intake of dietary fiber has beneficial effects against chronic disease such as cardiovascular diseases, diabetes and colon cancer [9]. The world health organization (WHO)

recommended for total dietary fiber intake is above 25g/day [10].

The abundant dietary fiber of rice bran is now being explored as an important ingredient of health foods. Because of its ideal fatty acid composition, rice bran oil considered to be superior to other edible oils [11]

Since rice bran is rich in most of the nutrients and so in most of the countries of the world it is being utilized in various ways and forms for both animal and human consumption. In India, so far, rice bran has not been exploited as a human food supplement. There is a great potential for using processed rice bran and its oil in Indian food preparations as a supplement for improving their nutritional value and health promoting potential. Both the bran and oil from rice bran have a range of bioactive phytochemicals with potential for reducing the risk of chronic generative diseases. Suitable rice bran preparations would be useful for improving the nutritional quality of rice based dishes, weaning and supplementary foods for children. At present only about half of potential source of rice bran is exploited. Paddy is cultivated throughout the world and India, however the varieties of paddy vary from one place to another place which may affect the quality and quantity of its functional properties like antioxidant and dietary fiber content. Most of work related to nutritional value and fiber content of bran has been carried out at Pakistan, China, Malaysia and south India. Data on the rice bran quality of varieties cultivated in North India is very limited, therefore then is need to explore the nutritional value of bran procured from North India paddy. There is need to utilize full potential of the available rice bran in country.

MATERIALS AND METHOD

Rice is a second leading cereal crop and staple food of the world's population and bran is a by product of rice milling industry. The two cultivars of rice namely NDR-97 and PUSA-1121 were obtained from ND University of Faizabad and SHIATS, Naini, Allahabad respectively. The milling process in larger commercial mills combines a number of operations that produces higher quality and higher yields of white rice from paddy or rough rice. The effective utilization of bran can be done by deactivating the lipase enzyme responsible for the hydrolytic degradation of the rice bran constituents which starts soon after bran detachment from the kernel. Thermal and non thermal treatment are considered as effective stabilization method for the inactivation of lipase enzyme and making rice bran nutritious. The stabilization of rice bran was carried out in Hot Air Oven, following the method of Malekian *et al*; (2000). Proximate composition and dietary fiber of varieties of rice bran were analyzed by using A.O.A.C. Method (2000). In the analysis of proximate composition, the fat content was analyzed by using Soxhelt method, the moisture content was determined by oven dry method, ash content was determined by using the calculations:

% Ash Content = (W2-W1)×100/W
W1= constant wt of crucible (g), W2= wt of crucible after ashing (g), W2-W1=wt of ash (g), W= wt of sample (g)

Crude fiber is the organic residue which remains after the food sample has been treated under the standardized condition with petroleum spirit, boiling dilute Sulphuric acid, boiling dilute Sodium Hydroxide solution and alcohol. Protein was estimated by micro Kjeldhal method. Kjeldhal method is based on the determination of the amount of reducing nitrogen present in the sample. Kjeldhal method is advanced and time saving method in which amount of sodium hydroxide and time distillation is previously set by control panel and then run the distillation with sample. In the rice bran quantitative estimation of carbohydrate is performed by Anthrone's method by using calculations:

Amount of carbohydrate present in 100 mg of the sample = mg of glucose×100/ volume of test sample
(where mg of glucose is optical density×factor)

For the estimation of total starch the sample is treated with 80% alcohol to remove sugars and then starch is extracted with perchloric acid. In hot acidic medium starch is hydrolyzed to glucose and dehydrated to hydroxymethyl furfural. This composed forms a green colored product with anthrone. This was extracted at 0°C for 20 min. solution was centrifuged and supernatant was retained.

In the estimation of the total dietary fiber it was determined the total dietary fiber content of food using a combination of enzymatic and gravimetric methods. Sample of dried, fat free foods was gelatinized with heat stable α-amylase and then enzymatically digested with proteases and amyloglucosidases is used to remove the protein and starch present in sample. Ethanol is used to precipitate the soluble dietary fiber. This residue is then filter and washed with ethanol and acetone. After drying the residue is weighed. Half of the sample is analyzed for protein and others are as ashed. Total dietary fiber is weighed of the residue is less the weight of the protein and ash. For the estimation of sugar profiling, 2 gm of sample was taken in a round bottom and mix with 200 ml of 80% of ethanol. This flask was undergone for refluxing and rotatory evaporator and rest of the volume of the sample was noted down. In the next step of this experiment 1 ml of the sample was taken in a Bioscan tube and added 9 ml of mili Q water then it filtered by 0.45µm pore size filter paper. Then sugar profiling (fructose, raffinose, xylose, maltose) was obtained by Bio scan machine in the selected varieties of rice bran. Mineral content also determined of varieties of rice bran.

RESULT AND DISCUSSION

Proximate Composition of selected varieties of Rice Bran

Rice bran varieties were analyzed for proximate composition like moisture, crude fat, crude fiber, protein, ash and (CHO) carbohydrates etc. The proximate composition of rice bran showed significant highest moisture content in NDR-97 (10.63%). As the NDR-97 Bran contains more cellulose and semi cellulose and other non polysaccharide that hold the moisture several time higher to its weight. Crude fiber content affected significantly Rice Bran. The highest crude fiber contents found in PUSA-1121 Rice Bran type of results obtain for ash content. These results are similar with (Mohammad A. Satter *et.al* 2014) conducted study on "Nutritional Composition And Stabilization Of Local Variety Rice Bran BRRI-28" and (Singh Priyanka *et al*, 2013). They resulted Proximate Composition parameter of Rice bran by cold treatmen might effectively improve the self life of rice bran that contained a good amount of vital nutrients for health benefit and is useful in many food applications such as food supplement and edible oil extraction.

Table 1 Proximate Composition of selected varieties of rice bran

S.N.	Experiment	NDR-97	PUSA-1121
1.	Moisture (%)	10.63 ±0.52	9.17 ±0.31
2.	Crude Fat (%)	14 ±0.03	12.3 ±0.02
3.	Crud fiber (%)	5.93 ±0.1	6.63 ±0.24
4.	Protein (%)	11.38 ±0.13	12.53 ±0.1
5.	Ash (%)	8.25 ±0.21	8.25 ±0.13
6.	CHO (%)	55.74 ±0.13	64.12 ±0.40

Chart: Proximate Composition of selected varieties of rice bran

Total dietary fibre, insoluble dietary fibre and soluble dietary fibre content of rice bran variety

Total dietary fibre (TDF), insoluble dietary fibre (IDF) and soluble dietary fibre (SDF) were assessed in both of the variety of rice bran. It was reported that the amount of TDF (24.70%),SDF(18.26%),IDF(12.44%) were higher in Pusa Basmati Rice-1121 with compare of the NDR-97 rice bran. The similar results were also observed by (charunch & et-al 2013).

Table 2 Total dietary fibre, insoluble dietary fibre and soluble dietary fibre content of rice bran variety

S.N	Test (%)	PUSA-1121	NDR-97
1	Total dietary fiber	24.70±0.01	20.11±0.05
2	Soluble dietary fiber	18.26±0.01	14.01±0.01
3	Insoluble dietary fiber	6.44±0.01	6.1±0.01

Chart: Total dietary fibre, insoluble dietary fibre and soluble dietary fibre content of rice bran variety

Total carbohydrate and total starch content in rice bran variety

Rice Bran were analysis for their total starch and total carbohydrates. The percentage of Total starch and Total carbohydrate were high in PUSA-1121 Rice Bran. The PUSA rice bran 5.04% total starch and 6.40 % found CHO.

Table 3 Total carbohydrate and total starch content in rice bran variety

S.N.	Rice Bran	Total Starch (%)	Total Carbohydrate (%)
1.	Pusa-1121	5.04±0.01	6.40±0.1
2.	NDR-97	3.78±0.01	4%±0.1

Chart: Total carbohydrate and total starch content in rice bran variety

Carbohydrate fractions of rice bran variety

Rice bran were analysed for carbohydrate fractions. If compare the Carbohydrate fractions in NDR-97 and Pusa-1121,it is determined that Xylose(1658.40mg/100g) and Fructose content were high in Pusa Basmati Rice-1121 whereas Raffinose (2921.56mg/100g) and Maltose were high in NDR-97.

Table 4 Carbohydrate fractions of rice bran variety

S.N.	Carbohydrate fraction (mg/100gm)	Pusa-1121	NDR-97
1	Xylose	1658.4±0.036	1168.095 ± 0.02
2	Raffinose	2921.56 ± 0.1	371.2 ± 0.032
3	Maltose	396±0.02	1299.03± 0.043
4.	Fructose	371±0.01	-

Mineral content of rice bran variety

Rice Bran were analysis for their mineral contents (Ca, Mg, Fe). The amount of Calcium (Ca), Magnesium (Mg) and Iron (Fe) were high in PUSA-1121 Rice Bran. The PUSA rice bran 75.04 mg Calcium and 30.1 mg found Iron. These results are similar with (Singh Priyanka *et al*, 2013).

Table 5 Mineral content of rice bran variety

S.N.	Experiment	PUSA-1121(mg)	NDR-97(mg)
1	Calcium	75.04±0.02	69.1±0.05
2.	Iron	30.1± 0.1	28.05±0.49
3.	Magnesium	6.02±0.1	3.03±0.01

Chart: Mineral content of rice bran variety

CONCLUSION

In this study it was observed that crude fibre (6.63 %), carbohydrate (64.12%) content was higher in Pusa Basmati Rice-1121. The crude fat content (14%) and protein content (12.3%) was found to be Pusa Basmati Rice-1121. TDF (24.70%), SDF (1.26%) and IDF (12.44%) was high in Pusa Basmati Rice-1121 variety of rice. Starch content (5.04%) was also high in Pusa-1121 variety of rice bran. Xylose (1658.40mg/100g) and Fructose content were high in Pusa Basmati Rice-1121 whereas Raffinose (2921.56 mg/100g) and Maltose were high in NDR-97. The calcium content (75.04 mg) and iron content (30.1 mg) was found to be Pusa Basmati Rice-1121.

References

Singh, Priyanka, *et al*. "Utilization of rice bran for the development of value added Indian Sweet." *International Journal of Agricultural and Food Science* 3.2 (2013): 76-79.

Lakkakula, N. Rao, Marybeth Lima, and Terry Walker. "Rice bran stabilization and rice bran oil extraction using ohmic heating." *Bioresource technology* 92.2 (2004): 157-161.

Tao, Jiaxun, R. Rao, and J. Liuzzo. "Microwave heating for rice bran stabilization." *Journal of microwave power and electromagnetic energy* 28.3 (1993): 156-164.

Gong-Yuanssheng, Y., and H. Yao-Huiyuan. "Purification e identification of gamma-oryzanol from rice bran." *J. Chin. Cer. Oils Assoc* 16 (2001): 30-34.

Malekian, Fatemeh. "Lipase and lipoxygenase activity, functionality, and nutrient losses in rice bran during storage." (2000).

Satter, Mohammed A., *et al*. "Nutritional composition and stabilization of local variety rice bran BRRI-28." *International Journal of Science and Technology* 3.5 (2014): 2049-7318.

Abbas, Aadil, *et al*. "Effect of processing on nutritional value of rice (Oryza sativa)." *World Journal of Medical Sciences* 6.2 (2011): 68-73. Tao, Jiaxun, R. Rao, and J. Liuzzo. "Microwave heating for rice bran stabilization." *Journal of microwave power and electromagnetic energy* 28.3 (1993): 156-164.

Sharif, Mian Kamran, *et al*. "Rice bran: A novel functional ingredient." *Critical reviews in food science and nutrition* 54.6 (2014): 807-816.

Anderson, James W., *et al*. "Health benefits of dietary fiber." *Nutrition reviews* 67.4 (2009): 188-205.

Who, Joint, and FAO Expert Consultation. "Diet, nutrition and the prevention of chronic diseases." *World Health Organ Tech Rep Ser* 916.i-viii (2003).

Houston, David Franklin, David Fairchild Houston, and G. O. Kohler. *Nutritional properties of rice*. National Academies, 1970.

AOAC, Official methods of analysis. Association of official analytical chemists 17th Ed., Gaithersburg, Maryland, USA 2000.

USDA, 1986

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