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Comparative Study of Proximate Characteristics of different Black Rice Cultivars

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Abstract—*Oryzasativa, rice, is a genus of perennial grass in the Poaceae (grass family). Black rice (Oryzasativa L.) belongs to Oryzasativa, the same species as white rice and red rice. Colors in the rice are due to the deposition of large amounts of anthocyanin pigment in the rice coat. Anthocyanins are a group of flavonoid-based pigments that impart various colors such as red, blue, and purple to flowers and fruits. Black rice is commonly used as a condiment, dressing or as decoration for different types of desserts in many countries around the world. Because of its unusual purple color it is very popular as desserts. In Korea black rice is usually consumed mixed with white rice. Some popular products of black rice are black rice pasta, wine, chocolates, cake, cookies, bread, porridge, chips, dessert and Noodles also have been produced from black rice. The results observed that moisture content of Organic black rice was 9.4% while the conventional black rice was 8.5%. The ash content and fat content of two varieties ranged from 1.48 to 2.53% and 1.20 to 2.21%. In terms of nutraceutical potentials, black rice is rich in phytochemicals specially anthocyanins, Vitamin and fibers, minerals, vitamins than the white rice. Black Rice helps in many diseases such as hypoglycemic, anticancer, anti-inflammatory effects and anti-atherogenic, arteriosclerosis, weight loss, Fibers are known to protect the body from diabetes mellitus.*

INTRODUCTION

Rice (Oryzaesativa L.) is a major cereal crop in the developing countries. Rice is common staple food and about half of the world population consumes rice as their major source of carbohydrate (Bhattacharjee et al, 2002). India is the 2nd largest producer of rice. The carbohydrate content of rice is approximately 87%, protein content is 7-8%, 10% moisture content, fat and ash content is 1-2% and crude fibre is low in rice (Anon, 2004).

Black rice (*Oryzasativa L.)* belongs to *Oryzasativa*, the same species as white rice and red rice (Abdel-Aal et al, 2006 and Yang et al, 2008). Black rice is also known as forbidden rice (with a thin layer of black bran present in it), purple rice, heaven rice and imperial rice (Kushwaha, 2016). The color of black rice is due to the deposition of anthocyanin pigment, it belongs to flavonoid group. Anthocyanins give several colors like blue, red and purple. (Chaudhary, 2003, Adachi and Yoshitama, 2004).

The richest country of black rice resources is China (62%) after that Sri Lanka (8.6%), Indonesia produces 7.2%, India (5.1%), Phillipines (4.3%), Bangladesh (4.1%), and few in Malaysia, Thailand and Myanmar. Black rice is cultivated only in few area especially Manipur- a North Eastern State of India. In Manipur, two varieties of aromatic black rice are grown. Anonymous, (2012) reported that *ChakhaoPoireiton* is characterized as sweet sticky purple rice and *Chakhaoamubi* is characterized as sweet sticky black rice. Black rice important crops in world-wide. It contain high amount of proteins, vitamins included vitamin B, riboflavin and niacin, minerals, being a rich source of antioxidants (Yawadio et al, 2007). Black rice grains had higher total phenolic content (841.0–1244.9 mgGAE/100 g) and Total flavonoid content (162.86-415.10) than in non-pigmented rice (63.06-114.49 mg CE/100 g) (Mira et al, 2009; Shao et al, 2017 and Shen et al, 2008).

MATERIAL AND METHODS

Materials

The varieties of Black Rice are Assam Organic Black Rice and Conventional Black Rice were taken. All the chemicals used of analytical grade. Transparent clear resealable Zip lock bags were used to store the samples.

Proximate Analysis of Black Rice Flour:

a) Determination of Moisture Content:

To estimate the moisture content of Black Rice Sample (AOAC, 2000), about 2.0 g of sample was taken in pre weighed Petri plate and put in hot air oven at 105°C for 5 hr. After complete incubation, samples were cooled in desiccators and again weighed. The moisture content (%) was calculated as follows:

$$\% \text{ Moisture} = \frac{w_1 - w_2}{w_1 - w} \times 100$$

w = Weight of Petri plate

w_1= Weight of Petri plate + sample before drying

w_2 = Weight of Petri plate + dried sample.

b) Determination of Ash Content:

About 2.0 g of each selected sample was weighed into a porcelain crucible and semi ashing of each sample is done before incinerated the sample into muffle furnace. Each sample was incinerated at 550°C for 5 hrs. in a muffle furnace until ash was obtained (AOAC, 2000). The porcelain crucibles containing ash were cooled in a desiccator and reweighed. The % ash content in the sample was calculated as:

$$\% \text{ Ash} = \frac{\text{Weight of ash}}{\text{Weight of original sample}} \times 100$$

c) Determination of Fat:

The total fat content in sample was determined by Soxhlet extraction method. About 250 ml clean round bottom flasks were dried in an oven at 105-110°C for about 30 min and cooled in a desiccator. Approximately, 2.0 g of each sample were weighed accurately into labeled thimbles. The dried round bottom flasks were weighed correspondingly and filled with about 250 ml of petroleum ether (boiling point 40-60°C). The extraction thimbles were plugged tightly with cotton wool. After that, the Soxhlet apparatus was assembled and allowed to reflux for 6 hr. The thimble was removed with care and petroleum ether collected from the top container and drained into another container for reuse. After that, the flask was dried at 105-110°C for 1 hrs. when it was almost free of petroleum ether. After drying, it was cooled in a desiccator and weighed (AOAC, 2000). Then, % fat in the sample was computed using the formula below:

$$\% \text{ Fat} = \frac{\text{Weight of Fat}}{\text{Weight of Sample}} \times 100$$

RESULT

Proximate analysis of Black Rice Flour

The results of the proximate analysis of various black rice flour varieties are shown in Table- 2.

a) Proximate composition is important in determining the quality of raw material and often the basis for establishing the nutritional value and overall acceptance of the consumers (Moses et al, 2012). The low moisture content of flour would enhance its storage stability by avoiding mould growth and other biochemical reactions. Moisture content is an important factor for the preservation, convince in packaging and transportation. The moisture content of Organic Black Rice flour was 9.4520% while the Conventional Black Rice flour was 8.565%.There was slightly difference between the observed moisture content and reported values by researchers (Chanu et al, 2016 and Reddy et al, 2017). Previously recorded moisture content varied 9.2 to 12.25 %. Among the studied varieties, organic black rice had slightly high moisture content as compared to conventional black rice.

b) The amount of ash content plays an important role while determining the levels of essential minerals. The ash content of two varieties ranged from 1.48 to 2.53%. Chanu et al, (2016) and Yodmanee et al, (2011) observed the ash content varied from and 0.83 to 2.8%. The ash content range was similar to Chanu et al, (2016). It was observed that there was significant difference in the ash content of conventional and organic black rice. Conventional black rice was found to have significant higher ash content as compared to organic black rice.

c) High fat content in a flour leads to the rancidity of flour and change in the flavour. The fat content of black rice was found to be in the range of 1.20 to 2.21%. Chanu et al, (2016) and Reddy et al, (2017) reported the fat content varied from 1.9 to 3.2% and 3.05 to 3.33% respectively .The observed fat content similar to the reported range of Chanu et al, (2016). Among the studied varieties, the fat content of conventional black rice flour is higher than the organic black rice flour.

Table 2: Proximate Analysis of Black Rice Flour

Sample	Moisture (%)	Ash (%)	Fat (%)
Conventional Black Rice	8.565	2.53	2.21
Organic Black Rice	9.4520	1.48	1.20

CONCLUSION

The present study was based on the study of proximate characteristics of different Black Rice cultivars. Rice is widely used crop in the world. But nutritive value of black rice is superior to any other rice and this rice is free of gluten, free of cholesterol, low in sugar and fat. In terms of nutraceutical potentials, black rice is rich in phytochemicals specially anthocyanins, Vitamin and fibers, minerals, vitamins than the white rice. Black Rice helps in many diseases such as hypoglycemic, anticancer, anti-inflammatory effects and anti-atherogenic, arteriosclerosis, weight loss, Fibers are known to protect the body from diabetes mellitus. The acceptability of black rice in traditional recipes showed that black rice was well accepted in sweet dishes, pasta, wine, chocolates, cake, cookies, bread, porridge, chips, dessert and noodle and snacks. Flavor is considered the single most critical quality trait in rice affecting consumer preference.

There were significant differences in moisture, ash and fat among the organic black rice and conventional black rice. The physical properties were observed higher in organic black rice than the conventional black rice. This is may be due to different morphological properties of rice grains. But the

proximate observations were higher in conventional black rice than the organic black rice. Because of low fat content in black rice it helps in weight loss.

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