PROXIMATE COMPOSITION AND PHYTOCHEMICAL CONTENTS OF TWO SCENTED RICE VARIETIES: BIRAN AND KALI KHASA OF TRIPURA, NORTHEAST INDIA

Gopal Debnath1, Kripamoy Chakraborty2 and Ajay Krishna Saha1

1Research Scholar, Mycology and Plant pathology Laboratory, Department of Botany, Tripura University, Suryamaninagar- 799022, Tripura, India.
2Research Scholar Microbiology Laboratory, Department of Botany, Tripura University, Suryamaninagar- 799022, Tripura, India.
1 Professor Mycology and Plant pathology Laboratory, Department of Botany, Tripura University, Suryamaninagar- 799022, Tripura, India.

*Corresponding Author: Gopal Debnath
Research Scholar, Mycology and Plant pathology Laboratory, Department of Botany, Tripura University, Suryamaninagar- 799022, Tripura, India.

ABSTRACT
Kali khasa and Biran are two important rice varieties of Tripura, Northeast India. The present study was carried out to evaluate the nutritional status and phytochemical contents of Biran and Kali khasa rice varieties. Carbohydrate, protein, lipid, fat, crude fibre, ash and moisture contents were determined for nutritional status analysis and alkoid, flavonoid, tannin, saponin and phenol contents were analyzed as phytochemicals. In Kali khasa higher contents of protein (9.76%), fat (2.4 %), fibre (1.037%) and carbohydrate (77.09%) were found. Ash (1.85%) and moisture contents (12.5 %) were found higher in amount in Biran. Among phytochemicals, alkoid (3.7%), tannin (1.83%), saponin (7.3 %) and phenol (21 g%) were found higher in amount in Biran where as flavonoid content (2.3%) was higher in Kali khasa. Kali khasa showed more energy value 363.86 KJ per 100 g than Biran. The study indicated that two rice varieties Kali khasa and Biran possessed functional food ingredients and natural phytochemicals.

KEYWORDS: Biran, Kali khasa, Nutritional status, Phytochemicals

INTRODUCTION
Rice is a major food item throughout the world. Rice varieties are categorized as aromatic and non aromatic varieties based on aroma, aromatic rice hold a scent in their plant parts and grains emit the scent in the fields and retain the scent in storage and cooking (Gibson 1976 and Jefferson 1985). Indian grazier grow a large number of rice varieties which include some of the finest quality of aromatic rice of all shapes, sizes and colours are available in the country represent the greater genetic diversity observed in the various agro climatic regions, 2 acetyl-1-pyrroline content in scented rice is responsible for aroma and it varies with genetic and environmental conditions (Nadaf et al. 2006). Traditionally, many varieties of aromatic and non-aromatic rice are grown by Indian farmers and sold at a premium price in local and international markets because of their superior grain quality and pleasant aroma (Nayak et al 2002).

Rice is major staple food of Tripura used in preparation in purred and flaked rice. The entire population consumes it in various form and also in preparation of wine. In handloom industry starch derived from rice widely used. Various aromatic rice varieties namely Gobinda Bhog (white), Gobinda Bhog (black), Sada khaja, Kalakhau and Kalijira are available in Tripura (Ahuja et al. 2018). Aromatic rice possess incompatible flavor of Tripura and owns local varieties namely Kali khasa, Gobinda Bhog, Thakur Bhog, and others. Basmati having the high export potential qualities to earn foreign revenue. The said varieties of paddy grow well under rain fed conditions in Tripura. Aromatic rice varieties are good source of different phytochemical such as phenolic compounds, anthocyanin, flavonoids and components are most likely associated with the reduction of degenerative human diseases due to their antioxidative and free radical scavenging properties (Basu et al. 2012). In order to cope with the increasing population, food security, nutrient security, urbanization, climate change and changing food preferences, there is need for not only high yielding varieties but also for nutritionally adequate rice varieties. Hence present study was undertaken to generate details on the nutritional composition and phytochemical
composition of selected two scented rice varieties Kali khasa and Biran of Tripura.

MATERIALS AND METHODS
Sample collection and preparation
Scented rice varieties (Fig.1) namely Kali khasa was collected from Melagharh, Latitude 24° 23’ 20.08”, Longitude 92° 12’ 22.29” and Biran was collected from Nadiapur, Dharmanagar, Latitude 23° 30’ 11.5”, Longitude 91° 18’ 40.65” of Tripura were shown in (Fig.2). The rice grain were dried in the oven at 50°C for 2 hours. Then, the rice grain were husked manually and ground into powdered using pestle and mortar for further study.

Fig. 1: Rice varieties. (a) Biran and (b) Kali khasa.

Fig. 2: Map of Tripura showing the cultivation place of rice varieties, Kali khasa and Biran.

Proximate composition
Moisture content was determined by the method of AOAC (1990). Ash content was determined by the method of Raghuramulu (2003). Crude fat content was determined by the method of AOAC (1960). Crude fibre content was determined by the method of AOAC (1990). Total protein content was estimated by the method of Lowry (1951). Rice powdered was extracted with K-P buffer and then cool centrifuged, supernatant was taken for soluble protein estimation and for insoluble protein estimation precipitate dissolved in 2 N NaOH and hydrolyze at 100°C for 10 min in a boiling water bath. Total protein content (soluble + insoluble) was calculated in gram percent. Total carbohydrate were calculated by difference as follows: total carbohydrates (% fresh weight) = 100 – (g water content + g protein + g lipids + g ash) (Beluhan and Ranogajec 2011). Total energy was calculated according to the following equation: energy (kcal) = 4 x (g protein + g carbohydrate) + 9 x (g lipid) (Manzi et al. 2001).

Phytochemical content
Alkaloid content was determined by using the method Harborne (1973). Tannin content was determined by using the method of Van Buren and Robinson (1981). Flavonoid content was determined by using the method of Bohm and Kopicai (1994). Saponin content was determined by using the method of Obadoni and Ochuko (2001). Phenolic content were determined by using the method of Malick and Singh (1980). All measurements were carried out in triplicate for each of the sample. All the values are expressed in terms of mean ± SD using Origin 7.

RESULTS AND DISCUSSION
Nutritional components of two varieties of aromatic rice Kali khasa and Biran are shown in Table 1. Moisture content has a marked influence on quality and palatability of rice grains (Oko and Onyekwere, 2010), it plays a significant role in determining the shelf life (Webb, 1985). In the present study moisture content 10
g% was found in Kalikhasa and 12.5 g% was found in Biran aromatic rice varieties. This study is under the range of values reported by Oko and Onyekwere (2010), Sompong et al (2011), Saikia et al (2012), Asaduzzaman et al. (2013), and Thomas et al. (2013) for other rice accessions. Low moisture content in variety may be attributed to long term storage of rice.

Table 1. Proximate composition of two varieties of rice Kali khasa and Biran red.

<table>
<thead>
<tr>
<th>Proximate composition</th>
<th>In gram percentage</th>
<th>Kali khasa</th>
<th>Biran</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td></td>
<td>10±0.02</td>
<td>12.5±0.05</td>
</tr>
<tr>
<td>Fat</td>
<td>2.4±0.01</td>
<td>1.6±0.03</td>
<td></td>
</tr>
<tr>
<td>Fibre</td>
<td>1.03±0.03</td>
<td>0.95±0.02</td>
<td></td>
</tr>
<tr>
<td>Total protein</td>
<td>9.76±0.15</td>
<td>7.5±0.17</td>
<td></td>
</tr>
<tr>
<td>Ash</td>
<td>1.25±0.05</td>
<td>1.85±0.03</td>
<td></td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>77.09±0.2</td>
<td>75.55±0.5</td>
<td></td>
</tr>
<tr>
<td>Total energy(Kcal)</td>
<td>363.86±0.01</td>
<td>355.6±0.04</td>
<td></td>
</tr>
</tbody>
</table>

Three values are expressed as mean±SD

Proteins are vital to the living process and carry out a wide range of functions essential for sustenance of life. In the present study Protein content of Kalikhasa is 9.76 g% and Biran is 7.5 g%. Sompong et al.(2011) reported protein value in rice as 7.16 to 10.85/100 g. Varietal difference in protein content may be attributed to several factors including environmental stresses such as the application of fertilizer (nitrogen content), growing conditions and time and also location of growing areas (Buresova et al, 2010).

In the present study Fat content of Kalikhasa is 2.4 g% and Biran is 1.6 g%. These observation is closely similar to the work of Saikia et al. (2012).Fat values are significantly different in between studied aromatic rice varieties. Varietal difference in fat content in different rice varieties may be due to oxidation of fat because most of fat in rice grains is unsaturated which undergoes oxidation easily by atmospheric oxygen (Hirokadzu et al., 1979).

The amount of fibre content in a food decreases the blood cholesterol and sugar after meals in diabetics (Yeager, 1998). In the present study fibre content of Kali khasa is 1.03 g% and Biran red varieties is 0.95 g%. In 2015, Nadiger and Kasturiba also reported crude fibre content in aromatic rice varieties varied from 0.83-2.18 g/100 g. Kali khasa contains more fibre content than Biran varieties. Higher crude fibre content in studied rice varieties can be attributed to bran portion of the grains.

Ash content plays an important role to determining the levels of essential minerals (Bhat and Sridhar, 2008). Ash content of Kali khasa is 1.25 g% and Biran is 1.85 g%. Results are consistent with literature data on proximate composition of rice varieties reported Nadiger et al. (2015 ). There is no significant difference in ash content of studied aromatic rice varieties.

Carbohydrates of rice are mainly starch which is composed of amylase and amylpectin. High level of starch makes the individual grains stucked to each other while low starch content prevents well from the sticking of the grains together after cooking (Verma and Srivastav, 2017). In the present study carbohydrate content of kali khasa is 77.09 g% and Biran is 75.55 g%. The similar observation of the carbohydrate content of different rice varieties has also been reported by Oko and Onyekwere (2010), Saikia et al. (2012), Thomas et al. (2013).

According to Thomas et al.(2013) food energy is a value that obtained from food via cellular respiration. In the present study we obtained food energy value of aromatic rice Kali khasa is 363.86 KJ per 100g and Biran red 355.6 KJ per 100g. This observation of food energy of studied aromatic rices is closely similar to the values of food energy recorded in the work of Sompong et al. (2011).

Phytochemical contents of two varieties of aromatic rice Kali khasa and Biran are shown in Table 2. Flavonoid content of aromatic rice Kalikhasa is 2.3 g% and Biran contains 1.3 g%. These results are closely similar to flavonoid content in different rice varieties reported by Hansakul et al. (2011) and Asaduzzaman et al. (2013).There is significant difference between studied aromatic rice varieties. Genotype and environmental variation may affect on flavonoid content in different aromatic rice varieties (Asaduzzaman et al., 2013).

Table 2: Phytochemical contents of two varieties of rice Kali khasa and Biran.

<table>
<thead>
<tr>
<th>Phytochemicals</th>
<th>In gram percentage</th>
<th>Kali khasa</th>
<th>Biran</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloid</td>
<td>3.6±0.18</td>
<td>3.7±0.11</td>
<td></td>
</tr>
<tr>
<td>Flavonoid</td>
<td>2.3±0.3</td>
<td>1.3±0.25</td>
<td></td>
</tr>
<tr>
<td>Tannin</td>
<td>0.385±0.52</td>
<td>1.83±0.37</td>
<td></td>
</tr>
<tr>
<td>Phenol</td>
<td>0.94±0.48</td>
<td>21±0.11</td>
<td></td>
</tr>
<tr>
<td>Saponin</td>
<td>6.8±0.56</td>
<td>7.3±0.03</td>
<td></td>
</tr>
</tbody>
</table>

Three values are expressed as mean±SD

Alkaloid extracts of plant are applied as essential medicinal ingredients for their bactericidal, antispasmodic and analgesic effects (Stray, 1998). In the present study alkaloid content of Kali khasa is 3.6 g% and Biran is 3.7 g%. Results are closely similar to alkaloid content in different rice bran reported by Egbedike et al. (2016). There is no significant difference in alkaloid content between studied aromatic rice varieties.

According to Okwu and Omodamoro (2005), the trace quantities of phenolic compounds indicate that the sample could act as immune enhancers, hormone modulators, antioxidant, anti-clothng and anti-inflammatory. Total phenolic content of Kali khasa is 0.94 g catechol/100 g rice flour and Biran is 21 g catechol/100g rice flour. In 2014, Moko et al. reported
that total phenolic content of rice bran varieties was in the range of 5.85- 23.90 g%, they used gallic acid as standard. There is significant difference in total phenolic content in the present study of aromatic rice varieties.

Biran contains more tannin content (1.83 g%) than Kali khasa (0.385 g%). The value of tannin content of aromatic rice varieties in this study is lower than tannin content of rice bran varieties reported by Egbedike et al. (2016) but greater than the value of tannin content of rice bran varieties reported by Kaur et al. (2011). According to Okwu and Okwu (2004) the presence of tannin in the flour will support their use in treating hemorrhoid, varicose ulcers, frostbite, burns in herbal medicine and wound.

Saponin has important role in preventing osteoporosis, peptic ulcer, lowering blood cholesterol and enhance liver function (Kao et al., 2008). Saponin content of Kali khasa is 6.8 g% and Biran is 7.3 g% in the present study. This result is closely related to saponin content of wild rice varieties reported by Umar et al. (2013). There is no significant difference in saponin contents of studied aromatic rice varieties.

CONCLUSION
In this study, nutrient and phytochemicals content of two scented rice varieties Kalikhasa and Biran were investigated. The results showed that both varieties were exhibited good nutrient and phytochemical contents. Kalikhasa contains more nutrient contents (fat, fibre, protein and carbohydrate) than Biran varieties and phytochemical contents (alkaloid, tannin, saponin and phenol) are more in case of Biran red varieties than Kalikhasa varieties. Both varieties are good for consumption by human.

ACKNOWLEDGEMENTS
The authors are grateful to the Head, Department of Botany, Tripura University for providing all sorts of facilities. The first author is thankful to the UGC- BSR, Government of India for the financial assistance.

REFERENCES
21. Malick CP, Singh MB. In: Plant enzymology and Histo Enzymology, Kalyani publishers New Delhi, India, 1980; 286