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Study on Amylose Content of Ten Rice Varieties Recommended for Assam

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ABSTRACT

From the present study, the amylose content of the ten rice varieties of Assam was assessed. The varieties of polished and unpolished rice selected for this study were namely, Ranjit, Bahadur, TTB-404, Mulagabhuru, Luit, Disang, Joymoti, Kanaklata, Lachit and Chilarai. The amylose content of both the unpolished and polished varieties were found to be lowest i.e. 6.86±0.15 to 7.93±1.43g/100g. Whereas the highest amylose content in unpolished and polished varieties was found to be highest in Joymoti and Chilarai respectively. All the unpolished and polished varieties were found to be significantly different between the groups but are found to be significantly similar within them.

Key words: *Rice varieties, Polished, Unpolished, Amylose content*

INTRODUCTION

Rice (*Oryza sativa* L.) is one of the most important cereals in human nutrition, consumed by 2/3 of the global population[1, 2]. Rice is usually consumed as a whole grain after cooking, and in a regular Asian diet, can contribute for 40 to 80% of the total calorie intake[3,4,5]. The rice grain is enclosed within a husk or covering, which on removal gives brown rice. Brown rice is polished to get milled rice that is used for cooking. The rice grain is enclosed within a husk covering which on removal gives brown rice. Therefore, to produce white rice, the next layers underneath the husk i.e. the bran and the germ are removed, leaving mostly the starchy endosperm. Starch which is the major constituent of rice, mainly determines the acceptability of the rice cultivar in terms of physico- chemical properties and cooking characteristics. Rice starch has several advantages over other starches e.g. hypo-allergen city, blend flavour, small granules, white colour, greater acid resistance and spreadable[6]. Amylose and amylopectin are two glucose polymers in starch granules[7]. Amylose is essentially linear, consist of α-(1,4)-linked D-glucopyranosyl units while amylopectin is highly branched and made up of α-(1,4)-linked Dglucopyranosyl units joined through α-(1,6) linkages[8].On the basis of amylose content, rice is classified as waxy (0-2% amylose), low (10-20% amylose), intermediate (20-25% amylose) and high (>25 amylose)[9].

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Unique geographical location and climatic condition of Assam has a significant contribution to a diverse rice genetic pool. To match with diverse land situations encountered with varying growing season, different varieties had been traditionally grown in the state since unknown past. Being the single major source of agriculture, rice plays an important role in the state economy[10]. Assam has its climatic and physiographic features favourable for rice cultivation and the crop is grown in a wide range of agro-ecological situations. It is grown from hill slopes to very deep-water areas during very wet humid months to drier period of the year. Studies on rice quality have been carried out by various institutions/ researchers. However, information on the amylose content of rice varieties of Assam is limited. Based on these facts, the main objective of the present study was to compare and provide details for consumers on the amylose composition of different indigenous rice varieties of Assam both in their unpolished and polished form.

MATERIAL AND METHODS

Procurement of raw material

For the present study, ten varieties of rice were procured from the Regional Agricultural Research Station (RARS), Titabor, Jorhat, Assam. Each rice variety of 500gm was dehusked separately by passing through a Satake paddy dehusker to yield brown rice. After dehusking 250gm of brown rice was kept separately and the remaining was polished by Satake rice polisher for 35 seconds to get white rice. For each variety, required amount of polished and unpolished rice grains were ground with the help of an electrical grinder and sieved with BS 60 mesh size and stored in airtight container for chemical analysis.

Chemical analysis:

Determination of amylose content: Amylose content was determined based on the Iodine-binding procedure[11]. In brief, for 100mg of rice flour, 1ml of ethanol (95%) and 9ml of 1N NaOH were added in a volumetric flask (100ml) followed by thorough mixing. Further, samples were heated on a boiling water bath for 10 min to gelatinize the starch and later on cooled to room temperature. Five millilitre of gelatinized starch solution was then transferred to a 100ml volumetric flask followed by addition of 1ml of 1N acetic acid and 2ml of iodine solution, with the volume adjusted to 100ml with distilled water. All the contents were thoroughly vortex mixed and allowed to stand for 20min. The absorbance was measured at 620 nm using a spectrophotometer. The amylose content in samples was determined based on the standard curve prepared using potato amylose.

Statistical analysis:

All the analysis were performed in triplicates and presented as mean ± standard deviation. Statistical significance of the data obtained was analysed by One-way analysis of variance (ANOVA) by using Microsoft excel (2007). The significance difference was tested by F-test at 5% probability level.

RESULTS AND DISCUSSION

Amylose content can play a significant role in determining the overall cooking, eating and pasting properties of a rice variety[12]. Starch is the major constituent of rice and the amylose content of rice differ among the varieties. The results of the amylose content presented in table 1 revealed a wide range of variation in the amylose content of both polished and unpolished samples. The amylose content of the unpolished samples ranged from 6.86±0.15g/100g in *Disang* to 26.20±0.40g/100g in *Joymoti*. The present results are slightly similar with the study of Asghar *et al*.[13] who found the amylose content of brown rice varieties to be 22.90 to 26.19g/100g. Form the statistical analysis; it was found that the unpolished samples of *Bahadur, Luit, Chilarai* and *Joymoti* were found to be statistically at par ($p > 0.05$) within them. However *Ranjit, Kanaklata, TTB 404, Mulagabharu and Lachit* also contained amylose levels statistically similar within them. All the varieties were found to be significantly different between the groups but are found to be significantly similar within

them. The amylose content of the polished samples ranged from 7.93±1.43g/100g in *Disang* to 27.30±0.36g/100g in *Chilarai*. In a study by Thomas *et al.*[14] among different rice varieties, brown rice had the lowest amylose content of 3.36±0.60 % and the amylose content was found to be highest in the white rice i.e. 27.71±1.20%.

According to food classification based on amylose content[7], both the unpolished and polished varieties of *Disang* had very low amylose i.e. 6.86g/100g and 7.93g/100g respectively. The varieties namely *Ranjit Bahadur, TTB 404, Mulagabhuru, Kanaklata* and *Lachit* had intermediate amylose both in their unpolished and polished forms. While the unpolished and polished varieties of *Bahadur, Luit, Joymoti,* and *Chilarai* showed high amylose content. The observed levels of amylose are consistent with data in previous studies on milled rice varieties[15,16]. The samples studied by Odenigbo *et al.*[17] had amylose content in the range of 8.59% to 18.57% which is almost similar with the result of the present study on polished rice.

Percent increase in amylose content of the polished samples was recorded in all the varieties which ranged from 11.06% in *Bahadur* to 19.40% in *Ranjit*. The difference in the amylose content within the varieties may be due to differences in the variety, environmental factors such as temperature and processing. The difference may also be due to presence of bran layer in the brown rice which contains less amount of starch. The amylose content of polished varieties increased which may be due to the fact that starch is mostly concentrated in the endosperm and less in the bran.

Table 1: Amylose content of rice varieties (per 100g)

Sl. No.	Variety	Unpolished (mg)	Polished (mg)	% increase
1.	*Ranjit*	12.46 ± 0.58 ^{b}	15.46 ± 0.51 ^{b}	19.40
2.	*Bahadur*	21.46 ± 0.72 ^{a}	26.13 ± 0.32 ^{a}	11.06
3.	*TTB 404*	14.40 ± 0.45 ^{b}	15.86 ± 1.61 ^{b}	12.20
4.	*Mulagabharu*	14.53 ± 0.35 ^{b}	20.40 ± 1.08 ^{a}	14.26
5.	*Luit*	24.46 ± 0.51 ^{a}	25.90 ± 0.45 ^{a}	15.55
6.	*Disang*	6.86 ± 0.15 ^{c}	7.93 ± 1.43 ^{c}	13.49
7.	*Joymoti*	26.20 ± 0.40 ^{a}	26.30 ± 0.43 ^{a}	13.30
8.	*Kanaklata*	13.56 ± 0.66 ^{b}	14.03 ± 0.35 ^{b}	13.35
9.	*Lachit*	18.83 ± 0.21 ^{b}	15.20 ± 0.40 ^{b}	19.27
10.	*Chilarai*	25.10 ± 0.26 ^{a}	27.30 ± 0.36 ^{a}	18.05
	C.D.	1.22	1.63	

Values are mean ± SD. Variation in superscripts within the columns for given parameters indicate significant differences (ANOVA) ($p > 0.05$).

CONCLUSION

Rice being the staple food crop is widely cultivated and consumed in Assam. The present investigation provides information on amylose contents of indigenous rice varieties of Assam. Investigation on the polished and unpolished rice varieties indicated differences in the amylose composition. There were low, intermediate and high amylose content containing rice varieties. From the present study it was also observed that the amylose content was less in the unpolished varieties as compared to the polished varieties because during milling of the unpolished or brown rice to get the polished or white rice the bran gets removed and starch is mostly concentrated in the endosperm and less in bran, therefore the amylose content gets increased in the polished varieties.

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