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Original Research Article

Comparative Grain Quality Evaluation of Rice Varieties

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A B S T R A C T

Rice is rich in genetic diversity, with thousands of varieties grown throughout the world. Rice cultivation is the principal activity and source of income for about 100 million households in Asia and Africa. Rice has potential in a wide range of food categories. Besides having nutritional and medicinal benefits, the byproducts of rice are equally important and beneficial. By-products from growing rice create many valuable and worthwhile products. Rice grain quality characteristics such as physiological and chemical based on consumer preferences like appearance, cohesiveness, tenderness on touching, chewing, taste, aroma, elongation and overall acceptability were studied for hybrid and landraces/traditional rice varieties.

Keywords

Grain, milling, organoleptic, kernel length and variety

Introduction

Rice (*Oryza sativa* L.) is a plant belonging to the family of Poaceae. It is one of the three major food crops of the world and forms the staple diet of about half of the world's population. The global production of rice has been estimated to be at the level of 650 million tones and the area under rice cultivation is estimated at 156 million hectares (FAOSTAT, 2008). Physiological characters of the plant are inherent characters determining the crop yield which plays an important role in variety selection (Miah *et al.*, 1996). Keeping the quality of aroma and other grain quality in aromatic fine rice is a big challenge as yield is inversely related to protein and aroma content (Terman, 1969). Hybrid rice is reported to contribute 5.6% of India's total rice production, nearly 15 years after its introduction and promotion. Hybrid rice is used in several preparations and has commercial and industrial importance. Besides grain its straw is used as fodder, packing insulation materials and in the manufacturing of the card board etc. In the Asian diet rice contributes almost 28- 54% proteins. Rice provides 27% of the world nutritional energy and 20% of overall nutritional protein (Bashir *et al.*, 2007). Grain quality in rice is very difficult to define with precision as preferences for quality vary from country to country. The cooking quality preferences vary in different countries (Azeez and Shafi, 1966). The aim of this study was to determine the physicochemical characteristics of selected

hybrid rice landraces/traditional rice based on physicochemical properties.

Materials and Methods

The experiment was conducted during *Kharif* season 2014-2015 at the G.P.B. farm Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad. Randomized Block Design was adopted with three replications. Varieties of rice were collected from CRS at Masodha and GPB department of NDUAT, Kumarganj and classified as hybrid and landraces/traditional rice varieties. The observations were recorded and techniques were employed in present investigation are summarized as under:

Seed colour

Seed coat colour of rice variety was determined on the basis of visual observations.

Test weight

1000 Seed from each treatment were subjected to test weight. These value expressed in gm.

Hulling Percentage

100 grams of sample were cleaned and dried to grain moisture level of 12-15% and were subjected to dehusked by dehusking machine. The dehusked rice was weighed and the hulling percentage was calculated as under (Anonymous 2004):

$$\text{Hulling percentage} = \frac{\text{Weight of dehusked rice}}{\text{Weight of paddy sample}} \times 100$$

Milling Percentage

The dehusked rice obtained after dehusking was given 45 second polishing by milling machine and the polished rice so obtained was weighed. The milling percentage was calculated as under:

$$\text{Milling percentage} = \frac{\text{Weight of polished rice}}{\text{Weight of paddy sample}} \times 100$$

Head Rice Recovery

After removal of bran during polishing whole grain rice was separated and weighed with the help of electronic balance and the percentage of head rice recovery calculated as under:

$$\text{Head rice recovery percentage} = \frac{\text{Weight of head rice}}{\text{Weight of paddy sample}} \times 100$$

Seed Size (mm)

Length and breadth of the five seed were taken with the help of DIAL,

Thickness Gage No. 7301 and its average length and breadth were taken.

Kernel length (mm)

Ten dehusked whole kernels were measured for length with the help of DIAL,

Thickness Gage No. 7301 and its average length was taken to find out kernel length.

Kernel Breadth (mm)

Ten dehusked whole kernel were measured for breadth with the help of DIAL, Thickness Gage No. 7301 and its average breadth was taken to find out kernel breadth**.**

L: B ratio

L: B ratio of various treatments were determined on the basis of average length and breadth ratio of kernel rice (Bhattacharjee and Kulkarni, 2000).

Grain Classification

Length and breadth of the five seed were taken with the help of DIAL, Thickness Gage No. 7301 and it was calculated by (IRRI 2002).

Starch iodine Blue Value

1 ml of 1% solution of sample was taken in test tube. Then, 4-5 drops of iodine solution (0.005 N iodine solution in 3% potassium iodine solution) was added in to it and mixed the content gently and colour of the solution was noted.

Aroma

5 g of rice sample was taken in conical flask then 15 ml of distilled water was added, soaked for 10 min and cooked for 15 min, transferred into a Petri dish and placed in refrigerator for 20 min. Then the cooked rice was smelled by a random panel: Strongly Aromatic; slightly Aromatic; Non Aromatic (Anonymous, 2004).

Organolaptic test

5 g of rice sample was taken in conical flask then added 15 ml of distilled water and soaked for 10 min. Rice samples were cooked in water bath for 15 min and scored as per panel test performance (Anonymous, 2004).

Statistical Analysis

The statistical analysis of data obtained was carried out by Gomez and Gomez, 1984 method.

Results and Discussion

Data on physicochemical characters, grain quality and aroma in hybrid and landraces/traditional rice varieties are presented in table-1, table-2 and table-3. Seed colour was can be seen that Narendra Lalmati has reddish yellow colour and all the varieties have straw yellow colour. It can be inferred from the results that none of variability in seed colour of hybrid rice and landraces/traditional rice varieties witnessed as fully favoured may be due to strong base of genetic potential. The results are in close agreement to the findings of Singh *et al.,* 2005. Test weight was recorded maximum in MEPH 113 (25.85 g) followed by Pusa RH 42 (25.81g) and Sarjoo 52 (25.40 g) and minimum was recorded in Narendra Lalmati (19.77 g). Variation in test weight was proven statistically significant. It may be due to environment factor *i.e.* temperature effect seed weight and also correlated with moisture percentage. Variations in test weight are closely related with findings of Kanchana *et al.,* (2012) and Babu *et al.,* (2013). Hulling percentage varied from 69.53 to 80.27. Hulling percentage was recorded maximum in MEPH 113 (80.27) followed by Ankur 7042 and minimum was recorded in IR 64 (69.53). Hulling per cent of MEPH 113 was recorded significantly superior over IR 64 followed by Sarjoo 52. The hulling percentage of hybrid rice and traditional rice varieties varied from 69.53 to 80.27. Maximum hulling percentage was recorded in hybrid rice MEPH 113. The findings on hulling percentage varied significant. Variation in hulling percentage may be due to differences in genetic potential and moisture content. Similar findings have also been reported by Subudhi *et al.,* (2012). The milling per cent ranged from 61.65 to 73.07. Maximum milling percentage was recorded in Pusa RH 42 (73.07) followed by MEPH 113 and minimum was recorded in NDR 2064. Milling percentage of hybrid rice and traditional rice varieties varied significantly. The variations in milling percentage in

hybrid rice and traditional rice varieties may be due to variations in genetic characteristics and moisture percentage. Similar observations were also recorded by Subudhi *et al.,* (2012) and Babu *et al.,* (2013). Head rice recovery per cent ranged from 27.30 to 67.63. Head rice recovery per cent was recorded maximum in MEPH 113 (67.63) followed by Sarjoo 52 (66.27) and KPH 466 (66.17) and minimum was recorded in NDR 97 (27.30). Head rice recovery per cent of MEPH 113 was recorded highly superior over NDR 97. Head rice recovery per cent was recorded statistically significant. Variation in head rice recovery in different varieties is closely related with moisture content and force of the milling machine. Similar results were recorded by Babu *et al.*, (2013). Variation of maximum seed length (mm) ranges from 7.87 to 10.37 and the seed breadth varied 1.96 to 3.10.

The maximum seed length was recorded in MEPH 113 and seed breadth was recorded in KPH 466 and MEPH 113. Variations in seed size may be due to its genetic diversity. MEPH 113 was recorded significant over all hybrid rice and traditional rice varieties. The results are favourably supported by the reports of Singh *et al.,* (2005). Kernel length of the hybrid rice and landraces/traditional rice varieties were ranged from 5.81 to 7.83 mm. The kernel length was recorded maximum in NDR 2064 (7.83 mm) followed by NDR 97 (7.69 mm) and Pusa RH 42 (7.17 mm) and minimum was recorded in Narendra Lalmati (5.81 mm). The present data obtained was found to be similar to the value reported by Babu *et al.,* (2013). It was found that kernel breadth ranged from 1.86 to 2.19 mm. Maximum kernel breadth was recorded in Sarjoo 52 (2.19 mm) followed by KPH 466 (2.15 mm) and minimum kernel breadth was recorded in Narendra Lalmati. Kernel breadth of Sarjoo 52 was significantly superior among all the varieties and highly superior over Narendra Lalmati followed by Ankur 7042, NDR 97 and Pusa RH 42. The variations in kernel breadth in different varieties may be due to its genetic characteristics. Similar observations have also been recorded by Srivastava and Jaiswal (2013). L/B ratio was recorded highest in NDR 97 (3.67) followed by NDR 2064 (3.65) and Pusa RH 42 and minimum was recorded in Sarjoo 52. The variation of L/B ratio in hybrid rice and traditional rice varieties may be due to its genetic characteristics. The present data obtained was similar to findings of as Thomas *et al.,* (2013). Grain classification of the hybrid rice and landraces/traditional rice varieties is depicted in Table 2. Hybrid rice variety KPH 466 and traditional rice variety Sarjoo 52 are classified as long bold grain type and a traditional rice variety Narendra Lalmati is classified as short slender and rest of the hybrid and traditional rice varieties are classified as long slender. The variations in grain type may be due to its genetic potential. The present data obtained was similar to easier report by Sarkar *et al.,* (1994). The Starch iodine blue value of all rice varieties showed blue colour (Table 3).

Aroma is an important trait, has high demand in the global market. The native varieties studied during this investigation showed the presence of aroma, for which these varieties are preferred by local people for consumption. Strong aroma was detected in varieties like Lalmati. Nadaf *et al.*, 2007 reported that Basmati rice contains more aroma than the traditionally cultivated scented rice varieties. The organoleptic test was conducted for the appearance, cohesiveness, tenderness on touching, tenderness on chewing, taste, aroma, elongation and overall acceptability of cooked rice and evaluated by trained assessors using the above descriptive analysis in a control panels.

Table.1 Data of seed colour, test weight, hulling percentage, milling percentage and head rice recovery percentage of rice varieties

Treatment/Varieties	Seed Colour	Test Weight	Hulling %	Milling %	HRR %
Ankur 7042	Straw Yellow	21.43	79.74	72.60	62.20
XRA-27934	Straw Yellow	19.00	78.41	67.80	54.60
KPH-466	Brown Spotted Yellow	24.30	78.44	73.50	67.00
MEPH-113	Straw Yellow	25.70	80.13	71.40	67.40
Pusa-RH 42	Straw Yellow	22.06	79.56	71.50	63.60
Narendra Lalmati	Reddish Yellow	17.90	82.92	63.20	50.20
Sarjoo-52	Straw Yellow	25.16	74.97	59.80	45.50
IR-64	Straw Yellow	23.05	80.41	63.20	38.40
NDR-2064	Straw Yellow	25.65	80.66	68.70	49.10
NDR-97	Straw Yellow	21.28	75.40	64.60	48.20
CD at 5%	-	**0.3114**	**1.1782**	**1.55**	**2.00**

Table.2 Data of seed size, kernel length, kernel breadth, L: B ratio and grain classification of rice varieties

Treatment/Varieties	Seed Size		Kernel Length	Kernel Breadth	L:B ratio	Grain Classification
	Seed length	Seed breadth				
Ankur 7042	6.71	2.9	6.33	2.1	3.01	Long slender
XRA-27934	6.87	3.03	6.44	2.04	3.15	Long slender
KPH-466	6.63	3.70	6.31	2.25	2.80	Long bold
MEPH-113	7.48	3.40	6.92	2.07	3.34	Long slender
Pusa-RH 42	8.08	3.07	7.79	2.03	3.83	Long slender
Narendra Lalmati	7.03	2.03	5.92	2.01	2.94	Medium slender
Sarjoo-52	8.05	3.06	6.32	2.16	2.92	Long bold
IR-64	8.27	2.88	7.04	1.94	3.62	Long slender
NDR-2064	9.37	3.01	7.67	2.13	3.60	Long slender
NDR-97	9.14	2.98	7.50	2.13	3.52	Long slender
CD at 5%	**0.3789**	**0.2039**	**0.16**	**0.1266**	-	-

Table.3 Data of starch iodine value, aroma and organoleptic quality of rice varieties

Treatment/Varieties	Starch iodine value	Aroma		Organoleptic Quality	
		Score	Rating	Score	Rating
Ankur 7042	Blue colour	*	Non-aromatic	8	Like very much
XRA-27934	Blue colour	*	Non-aromatic	5	Neither like nor dislike
KPH-466	Blue colour	*	Non-aromatic	6	Like slightly
MEPH-113	Blue colour	*	Non-aromatic	5	Neither like nor dislike
Pusa-RH 42	Blue colour	**	Slightly aromatic	7	Like moderately
Narendra Lalmati	Blue colour	***	Strong aromatic	9	Like extremely
Sarjoo-52	Blue colour	*	Non-aromatic	7	Like moderately
IR-64	Blue colour	**	Slightly aromatic	8	Like very much
NDR-2064	Blue colour	*	Non-aromatic	2	Dislike very much
NDR-97	Blue colour	*	Non-aromatic	1	Dislike very much

Sensory specifications are those that can be used to check if a product complies with the stated requirements Costell, 2002. The excellent overall acceptability characters were recorded in Lalmati, IR-64, Ankur-7042, Pusa RH-42, Sarjoo-52, KPH-466, XRA-27934, MEPH-113, NDR-2064 and NDR-97 respectively.

The paper has concentrated on the physicochemical characteristics and organoleptic test with consumer preferences of rice varieties. Organoleptic analysis always helps the consumers to select better rice varieties for their consumption and use. It is also emphasized that the training and recruiting the sensory expert panel are important in the process of sensory analysis and organoleptic test. The present study revealed that some of the strongly aromatic and slightly aromatic rice varieties have potential for consumer's preferences and it could be used for breeding programmes and biotechnological research for the improvement of valuable grain quality traits. The paper has concentrated on the physicochemical characteristics, grain quality and aroma analysis with consumer preferences of different hybrid and landraces/traditional rice varieties. On the bases of overall study the landraces/traditional rice varieties were superior over the hybrid rice varieties.

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