Physical, Cooking and Organoleptic Quality of Some Rice Varieties of Eastern Uttar Pradesh

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ABSTRACT The present study was undertaken to determine the physical, cooking and organoleptic quality of five rice cultivars namely- Pusa Basmati, Sambha Mansoori, Thakur Bhog, Nati Mansoori and NDR-359, grown commonly in eastern U.P. The physical parameters determined were including 1000-kernal weight, L/B ratio, density, bulk density and porosity per cent. The cooking quality parameters included cooking time (min), water-uptake ratio, elongation ratio and solid losses in gruel. Organoleptic quality of cooked rice was also determined. 1000 kernal weight, L/B ratio, bulk density and porosity of different varieties ranged from 9.26 to 16.20 g, 1.9 to 4.8, 0.71 to 0.81, 1.29 to 1.72 and 37.20 to 52.90 percent. Minimum cooking time was recorded in Thakur Bhog, (18.7 min) while, maximum cooking time was taken by NDR-359 (27.17 min), water uptake ratio was minimum in Thakur Bhog (5.06), while elongation ratio was maximum in Nati Mansoori, Pusa Basmati showed the maximum losses in cooking water (0.06%). The overall acceptability score of Pusa Basmati was highest (3.43%), followed by Thakur Bhog, Nati Mansoori, NDR-359 and Sambha Mansoori.

INTRODUCTION

Rice is the staple diet for more than half of the world's population and is consumed principally in Asia. Rice constitutes up to 80 per cent of the food intake in some countries. It is cooked in boiling water and eaten mostly with cooked pulses, vegetables, fish and meat. Different varieties of rice are suited for cultivation in different environmental conditions. The physical parameters of grains of different varieties vary considerably. Freshly harvested rice has poor cooking quality. Storage of rice considerably improves the cooking quality due to conversion of amylose to amylopectin. Korde et al. (2006) reported increase in water uptake ratio and decrease in leaching losses due to storage of rice. The physical, cooking and organoleptic quality of rice grain plays an important role in determining its consumer acceptability and prices. Therefore, the present study was undertaken to determine the physical, cooking and organoleptic qualities of five rice varieties grown in Eastern Uttar Pradesh because no such previous study has been undertaken, or information is available regarding these varieties.

METHODOLOGY

Five rice varieties namely Pusa Basmati, Sambha Mansoori, Thakur Bhog, Nati Mansoori and NDR-359 were collected from Masodha (Faizabad), Albanpura (Faizabad), Marzapur village and Anjana (Faizabad). The physical quality of selected varieties was determined by using following methods:

1. ***1000-Kernel Weight:*** 1000-kernels of milled rice were counted randomly in triplicates and weighed separately. The average weight of 1000-kernals was recorded in grams.
2. ***Length/Weight Ratio:*** 10 kernels of milled rice were arranged length and width wise and their cumulative measurements in cm were recorded with scale. The value was determined by dividing the length with width.
3. ***Bulk Density:*** Kernel of milled rice were poured in certain known volume from fixed height and mass of sample occupying that volume was determined. The ratio was calculated as gm/ml.
4. ***Density:*** This was determined by the kerosene oil displacement method of Bhattacharya and Sowbhagya (1972). Ten gram sample was added to sufficient amount of kerosene oil in graduated burette and volume displaced was noted. Density was expressed in gm/ml.
5. ***Porosity:*** The fraction of void space in bulk of grain that is, porosity was calculated as:

Porosity (%) = Density-Bulk density/ Density x 100

Cooking Quality

Cooking quality of rice in terms of minimum cooking rime, water uptake ratio, elongation ratio and solid losses in gruel was determined using standard methods.

1. **Minimum Cooking Time:** 2 gm head rice were taken and cooked in 20 ml distilled water in boiling water bath. The minimum cooking time was determined by removing few kernels at different time intervals during cooking and pressing them between two glass plates till no white core left.
2. **Water Uptake Ratio:** 2 gm rice with distilled water was cooked for minimum cooking time in boiling water bath. The contents were drained out and superficial water was sucked by pressing the kernels between the folds of filter paper sheets. The cooked samples were weighed accurately and the water uptake ratio was calculated.
3. **Elongation Ratio:** This was determined by dividing the cumulative length of 10 cooked kernels by the length of 10 uncooked kernels.
4. **Solid Loss in Gruel:** 2 gm rice was cooked in 20 ml distilled water for minimum cooking time in a boiling water bath. The gruel was transferred to 50 ml volumetric flask with several washing and made the volume with distilled water 10 ml aliquot having leached solids was evaporated in 3 petridishes at 70^0C until completely dry. Then solids were weighed and percent solids loss in gruel was calculated.

Organoleptic Quality

The organoleptic quality of cooked rice was determined by cooking 25 g sample from each variety in 100 ml distilled water in boiling water bath. The excess water was drained off. The cooked samples were evaluated by panel of judges for taste, appearance, cohesiveness, stickiness, color, whiteness, tenderness, hardness and aroma.

RESULTS AND DISCUSSION

Physical Characteristics

The data regarding 1000 kernels weight, L/B ratio, density, bulk density and porosity of five rice varieties are given in Table 1. 1000-kernel weight of different varieties differed significantly. The highest kernel weight was recorded in NDR-359 (16.2g) while, lowest in Thakur bhog (9.26g). L/B ratio was highest in Pusa Basmati (4.8) followed by Sambha Mansoori (3.2), NDR-359 (3.0), Nati Mansoori (3.0) and least in Thakur Bhog (1.9). Bulk density and density percent of different varieties also varied significantly. Porosity percent was maximum in Thakur bhog (52.90%) and minimum in Nati Mansoori (37.20 %). Korde et al. (2006) reported effect of storage on dimensional variation in rice before and after cooking. The L/B ratio of rice before storage was 3.33 before cooking and 2.95 after cooking. Whereas, after storage in different containers the L/B ratio before cooking ranged from 3.30 to 3.33 and after cooking ranged from 2.91 to 2.95.

Cooking Quality of Milled Rice

Data regarding minimum cooking time, water uptake ratio, elongation ratio and solid losses in gruel of different rice varieties varied significantly (Table 2). Thakur Bhog took least time to cook (18.7 min). Water up take ratio was maximum in Sambha Mansoori whereas elongation ratio was highest in Nati Mansoori. Solid losses in gruel in different varieties ranged from 0.02 to 0.06 percent. The cooking time of rice before storage was found to be 17.2 min, whereas, after storage for 180 days the cooking time was reduced to 16.3 min. Water uptake ratio before storage and

Table 1: Physical characteristics of rice varieties

S. No.	Variety/ parameters	1000-kernel weight (g)	L/B ratio	Bulk density (g/ml)	Density (g/ml)	Porosity (%)
1.	Pusa Basmati	15.63	4.8	0.71	1.36	43.38
2.	Sambha Mansoori	11.93	3.2	0.81	1.40	43.57
3.	Thakur Bhog	9.26	1.9	0.81	1.72	52.90
4.	NDR-359	16.2	3.0	0.81	1.44	43.75
5.	Nati Mansoori	9.5	3.0	0.79	1.29	37.20
	CD (0.05%)	1.98	0.63	0.03	0.10	3.38

Table 2: Cooking quality of milled rice

S. No.	Variety	Cooking time (Min.)	Water uptake ratio	Elongation ratio	Solid losses in gruel (%)
1.	Pusa Basmati	20.17	6.52	1.30	0.06
2.	Sambha Mansoori	19.52	6.77	1.30	0.02
3.	Thakur Bhog	18.70	5.06	1.48	0.05
4.	NDR-359	27.17	5.61	1.68	0.03
5.	Nati Mansoori	24.30	5.57	1.71	0.02
	CD (0.05%)	3.01	0.59	0.16	0.01

Table 3: Organoleptic quality of cooked rice

S. No.	Variety	Colour	Flavour	Texture	Taste	Overall acceptability
1.	Pusa Basmati	3.75	4.0	3.0	3.0	3.43
2.	Sambha Mansoori	0.25	0.5	3.0	2.75	1.63
3.	Thakur Bhog	3.75	3.0	3.0	2.25	3.0
4.	NDR-359	2.00	2.25	1.25	1.75	1.81
5.	Nati Mansoori	1.75	2.0	2.5	2.5	2.19
	CD (0.05%)	0.89	0.78	0.46	0.29	0.77

after storage of rice were 263.1 and 272.2 to 275.1 per cent on dry basis (Korde et al, 2006). Ali et al. (1977) stated that cooking time of rice obtained from 10 months stored paddy did not vary due to storage.

Organoleptic Quality

Data regarding organoleptic quality of cooked rice is presented in Table 3. Results revealed significant differences among varieties for color, flavor, texture, taste and overall acceptability. Pusa Basmati scored highest overall acceptability score on four points. Shayo et al. (2006) studied the sensory quality attributes of five local rice cultivars grown in Morogoro, Tanzania on five point hedonic scale. The cultivar Supa was the most acceptable on the basis of appearance, taste and general acceptability.

CONCLUSION

1000-kernel weight, L/B ratio, bulk density and porosity of different varieties ranged from 9.26 to 16.20 g, 1.9 to 4.8, 0.71 to 0.81, 1.29 to 1.72 and 37.20 to 52.90 percent. Minimum cooking time was recorded in Thakur Bhog, (18.7 min) while, maximum cooking time was taken by NDR-359 (27.17 min), water uptake ratio was minimum in Thakur Bhog (5.06), while elongation ratio was maximum (0.06%). The overall acceptability score of Pusa Basanti was highest (3.43), followed by

Thakur Bhog, Nati Mansoori, NDR-359 and Sambha Mansoori.

RECOMMENDATIONS

The physico-chemical characteristics and cooking quality characteristics greatly influence farmers and consumers' acceptability, marketability and prices. The physical, cooking and sensory quality attributes have to be manipulated by researchers so as to identify better rice verities and popularizing their cultivation so as to increase the market value of the rice. The varieties namely Thakur Bhog and Pusa basmati were found to be organoleptically superior to others, thus, their cultivation needs to be extended.

REFERENCES

Ali N, Majumdar GC, Singh K, Rao YP, Ojha TP 1977. Effect of storage on milling and cooking quality of rice. *Harvester*, 19: 18-20.

Bhattacharya KR, Sowbhagya CM 1972. Water uptake by rice during cooking. *Cereal Sci, Today, 16(1):* 420-424.

Korde , SR , Agrawal AK, Sahu C 2006. Cooking quality of rice obtained from paddy stored in bamboo storage structure. *J Food Sci Technol,* 43(3): 318-321.

Shayo NB, Mamiro P, Nyaruhucha, Mamboleo T 2006. Physico-chemical and grain cooking characteristics of selected rice cultivars grown in Morogoro. *Tanz J Sci,* 32(1): 29-35.