Int.J.Curr.Microbiol.App.Sci (2020) Special Issue-10: 302-307

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-10 pp. 302-307**
Journal homepage: http://www.ijcmas.com

Original Research Article

Study of Cooking Quality Characteristics in Indigenous Rice Varieties in Uttar Pradesh, India

S.B. Singh[1*], S.P. Giri[2], B.P. Shahi[1] and Shailendra Singh[3]

[1]Krishi Vigyan Kendra, (ANDUAT), Nanpara, Bahraich-II, India
[2]Crop Research Station, (ANDUAT), Masodha, Ayodhya, India
[3]Krishi Vigyan Kendra, (ANDUAT), Bahraich, India

**Corresponding author*

A B S T R A C T

Study was conducted to evaluate the cooking and eating quality of fifty twoindigenous and non indigenous rice variety from different part of Eastern Uttar Pradesh. Quality parameters measured were; grain elongation (GE), cooking time (CT), solids in cooking gruel (SCW), gelatinization temperature (GT), alkali value, aroma and amylose content (AC). Some varieties were aromatic were grouped on the basis of alkali value and gelatinization temperature (GT) The result showed, values of the physico-chemical characteristics such as milling % ranged between (45-82%), kernel length before cooking ranged (3.11-7.86 mm) kernel breadth before cooking ranged (1.32-2.86mm), length breadth ratio ranged (1.81-3.01), kernel length after cooking ranged (4.11-9.10mm), kernel breadth after cooking (2.44-3.60mm) and length breadth ratio of cooked rice (2.11-3.17) of the grain among the 52 cultivars used in this study. Out of the 52 rice varieties Kasturi, Badshah Pasand, Kalanamak, T3 and Dubraj having very strong in aroma (scale-7), Rajbhog, Basmati 370, Pusa Basmati 1, Dhiya and Tarori Basmati was moderately strong aroma (scale-6). Alkali value score of Triveni, Sawani, Pankaj, Nagchoor, and Jaisurai were 7-6 indicated low gelatinization temperature (GT) less than 70^0C, whereas the alkali value score 6-5, was rice varieties of Benideoria, Lalmati, Ratna, Sahadoya and Bansi indicated intermediate gelatinization temperature.

Keywords

Indigenous rice, Gelatinization Temperature (GT), Length breadth ratio and Alkali value score

Introduction

Food security is defined as a condition in which "all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (Dawe, 2010). Rice is a food crop of world-wide importance and forms the foundation of the diet of over 3 billion people, constituting over half of the world's population (Cantral *et al.,* 2002). Rice (*Oryza sativa* L.) is the staple food crop in world which accounts for 21%, 14% and 21% of the global energy, protein and fat supply, respectively (Kennedy and Burlingame, 2003). Quality of rice may be considered from the view point of size, shape and appearance of grain, milling quality and cooking properties (Khush and Dela Cruz,

2000). Rice quality desired in rice vary from one geographical region to another and consumer demand certain varieties and favors specific quality traits of milled rice for home cooking (Juliano *et al.,* 1964; Azeez and Shafi, 1966). Indica rice consuming countries, long grain with intermediate amylose and gelatinization temperature is preferred since it become soft and fluffy after cooking (Hossain *et al.,* 2009). Rice texture is affected by factors such as rice variety, amylose content (AM), gelatinisation temperature (GT) and processing factor (Meullenet *et al.,* 1998). Through statistical methods, relationships between sensory and physicochemical properties are determined, allowing assessment of sensory quality for a target population or application (Champagne, 1997). Gelatinization time (GT) was evaluated by the French Standard (Norme Francaise, 1999).

The constituents that play important roles in cooking and eating quality are amylose content, gelatinization temperature, and gel consistency (Traore, 2005). According to (Horna *et al.,* 2005) grain quality is one of the key selection criteria highly prioritized by farmers and consumers of rice and therefore farmer select rice with traits that are desirable for consumption as well as for production and sale. However defining quality is very difficult since it is defined by the end user and their preferences are highly variable. There are several cultivars of rice under cultivation worldwide. These are selected based primarily on the quality of their seed and grain by consumers as well as producers (Horna et al., 2005). The rice millers prefer cultivars with high milling and head rice out turn, whereas consumers prefer cooking and textural quality attributes (Merca and Juliano, 1981). The loss of these traditional varieties would not only cause insecurity in the rice growing areas of India (Vijayalakshmi *et al.,* 2007).

Materials and Methods

The experiments were conducted at Crop Research Station, (ANDUAT), Masodha, Ayodha. The soil is sandy loam low in organic carbon. It is rich in potassium, medium in phosphorus and possesses good water holding capacity. The experimental material consisted of fifty two indigenous and non indigenous rice variety from different part of Eastern Uttar Pradesh. The nursery was sown 2nd week of June. After 25 days, seedlings transplanted in the main field in Randomized Block Design in three replications with a spacing of 20x15 cm. To evaluate the cooking and eating quality. After drying, the rice samples were shelled and milled with a rice machine. Since grading of cultivars belonged to the medium Slender, Medium Bold, Long Bold, Short Bold and long-slender grain class, they were milled during equal periods of time. After milling, part of samples was Amylose Content. AC, Gelatinization Temperature (GT), cooking test and sensory analysis were performed in the Grain Quality laboratory. Gelatinization temperature was determined by using the procedure of (Little et al 1958).Gelatinization temperature indexed by alkali spreading test [11]. The degree of spreading of individual milled rice kernel in a weak alkali solution (1.7% KOH) at room temperature (32±2℃) was evaluated on a 7-point numerical scale (IRRI, 1980). Each test was conducted three times, each time, 10 intact milled grains were placed on a petri dish to which 15 ml of 1.7% KOH was added. The grains were carefully separated from each other and incubated at ambient temperature for 23 hrs to allow spreading of the grains. Grains swollen to the extent of a cottony center and a cloudy collar were given an alkali spread value (ASV) score 4 and used as check for scoring the rest of the samples in the population. Grains that were unaffected were given ASV of 1 and grains that were dispersed and disappeared

completely were given a score of 7. A low ASV correspond to a high gelatinization temperature; conversely, a high ASV indicates a low GT.

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.

Results and Discussion

The values of the physico-chemical characteristics such as milling % ranged between (45-82%), kernel length before cooking ranged between (3.11-7.86 mm) kernel breadth before cooking ranged between (1.32-2.86mm), length breadth ratio ranged between (1.81-3.01), kernel length after cooking ranged between (4.11-9.10mm), kernel breadth after cooking (2.44-3.60mm) and length breadth ratio of cooked rice (2.11-3.17) of the grain among the 52 cultivars used in this study is shown in Table 1. Aroma was observed on the basis of the test panel. Out of the 52 rice varieties Kasturi, Badshah Pasand, Kalanamak, T3 and Dubraj having very strong aroma (scale-7), Rajbhog, Basmati 370, Pusa Basmati 1, Dhiya and Tarori Basmati was moderately strong aroma (scale-6), Lalmati, Pusa 33, NDR 6011 and Hansraj was slightly strong aroma (scale-5) and slightly week aroma of rice varieties of Lalsar and NDR 625 was scale 4. Rest of 33 rice varieties is non aromatic score 1 presented in table 2.

Table.1 Classification of rice based on alkali digestion value

Score	Alkali Digestion	Gelatinization Temperature	Temperature Range (ºc)
1−2	Low	High	75−79
3	Low/intermediate	High/ Intermediate	75−79/70−74
4−5	Intermediate	Intermediate	70−74
6−7	High	Low	55−69

Table.2 Genetic parameter for yield and its component of rice

Characters	Range		Mean
	Min.	Max.	
Seed length (mm)	3.56	7.98	5.77
Seed width (mm)	1.76	3.10	2.43
Milling per cent	45.00	82.00	63.50
Kernel length before cooking (mm)	3.11	7.86	5.49
Kernel breadth before cooking (mm)	1.32	2.86	2.09
Kernel length after cooking (mm)	4.11	9.10	6.61
Kernel breadth after cooking (mm)	2.44	3.60	3.02
Length breadth ratio	1.81	3.01	2.41
Length breadth ratio of cooked rice	2.11	3.17	2.64
Gelatinization temperature (ºC)	55.00	80.00	67.50
Grain yield (q/ha.)	20.10	52.60	36.35

Table.3 Aroma, Akali Value Score and GT in rice varieties

Sl No.	Variety/Line	Score	Type of Aroma	Alkali Value Score	Gelatinization Temperature (GT)
1	Kasturi	7	Very strong	5−4	70−74
2	Badshah pasand	7	Very strong	2−1	High
3	T3	7	Very strong	2−1	High
4	Juhi bengal	7	Very strong	2−1	High
5	Kalanamak	7	Very strong	4−3	High Intermediate
6	Bishnu Parag	7	Very strong	2−1	High
7	Dubraj	7	Very strong	2−1	High
8	Rajbhog	6	Moderately strong	3−2	High Intermediate
9	Basmati 370	6	Moderately strong	3−2	High Intermediate
10	Pusa Basmati 1	6	Moderately strong	3−2	High Intermediate
11	Dhaiya	6	Moderately strong	2−1	High
12	Tarori Basmati	6	Moderately strong	2−1	High
13	Lalmati	5	Slightly strong	6−5	70−72
14	Pusa 33	5	Slightly strong	4−3	High Intermediate
15	NDR 6011	5	Slightly strong	2−1	High
16	Hansraj	5	Slightly strong	3−2	High Intermediate
17	Lalsar	4	Slightly Week	5−4	70−74
18	NDR 625	4	Slightly Week	5−4	70−74
19	Saket 4	1	No Aroma	3−2	High Intermediate
20	Cauvery	1	No Aroma	5−4	70−74
21	NDR 80	1	No Aroma	4−3	High Intermediate
22	Nayana	1	No Aroma	5−4	70−74
23	Madhu	1	No Aroma	5−4	70−74
24	Benidcoriya	1	No Aroma	2−1	High
25	Triveni	1	No Aroma	7−6	Less then 79%
26	Gajraj	1	No Aroma	2−1	High
27	Karhani	1	No Aroma	4−3	High Intermediate
28	NDR 359	1	No Aroma	3−2	High Intermediate
29	Champa	1	No Aroma	4−3	High Intermediate
30	Sawani	1	No Aroma	7−6	Less then 79%
31	Ratna	1	No Aroma	6−5	70−72
32	Jhone 349	1	No Aroma	4−3	High Intermediate
33	Sagani	1	No Aroma	3−2	High Intermediate
34	Sahadoya	1	No Aroma	6−5	70−72
35	Sathi	1	No Aroma	3−2	High Intermediate
36	Sonkharcha	1	No Aroma	3−2	High Intermediate
37	Jaya	1	No Aroma	5−4	70−74
38	Sarjoo 52	1	No Aroma	4−3	High Intermediate
39	Indrasan	1	No Aroma	5−4	70−74
40	Gagharpari	1	No Aroma	5−4	70−74
41	Karanga	1	No Aroma	5−4	70−74

42	Chaikai 59	1	No Aroma	3−2	High Intermediate
43	Madhuker	1	No Aroma	5−4	70−74
44	Mahsuri	1	No Aroma	3−2	High Intermediate
45	Savita	1	No Aroma	4−3	High Intermediate
46	Pankaj	1	No Aroma	7−6	Less then 79%
47	Jaisurai	1	No Aroma	7−6	Less then 79%
48	Bani Dooriya	1	No Aroma	2−1	High
49	Muturu	1	No Aroma	2−1	High
50	Nagchoor	1	No Aroma	7−6	Less then 79%
51	Sahdoya	1	No Aroma	2−1	High
52	Bansi	1	No Aroma	6−5	70−72

Alkali value score of Triveni,Sawani, Pankaj, Nagchoor, and Jaisurai were 7-6 indicated low gelatinization temperature (GT) less then 70^0c, whereas the alkali value score 6-5, was rice varieties of Benideoria, Lalmati, Ratna, Sahadoya and Bansi indicated intermediate gelatinization temperature. The alkali value score was 5-4 and gelatinization temperature 70-74^0c of 11 rice varieties viz. Cauvery, Kasturi, Nayna, Madhu, Lalsar, Jaya, Indrasan, Ghaghapari, Karnga, Madhuker and NDR 625. The nine rice varieties namely NDR 80, Karhani, Champa, Jhona 349, Pusa 33, Sarjoo-52, NDR 6011, Savita and Kalanamak of alkali value score recorded 4-3 indicated high intermediate gelatinization temperature. The ten rice varieties viz. Saket 4, Rajbhog, NDR 359, Sathi, Sonkachra, Basmati 370, Chakia 59, Mahsuri, Pusa Basmati 1 and Hansraj was alkali value score of 3-2 also indicated high intermediate gelatinization temperature.

Eleven rice varieties of alkali value score 2-1 viz. Badshah pasand, T3, Juhi Bengal, Bishnu Parag, Dubraj, Dhaiya, Tarori Basmati, NDR 6011, Benidcoriya and Gajraj indicated high gelatinization temperature. The are also similar results finding (Bhattacharya and Sowbhagaya 1972, Mckenzio et, al. 1983).

References

Azeez, M.A. and Shafi, M. (1966). Quality in Rice. Department of Agric, West Pakistan Technology Bulletin. No. 13 pp. 50. Szczesniak, A. S. (1968), Correlations between objective and sensory texture measurements. Food Tech., 22, 981-98.

Bhattacharya, K.R. and Sowbhagaya C.M. (1972), An Improved Alkali reaction test for rice quality J.Food.Tech.7, pp. 326-328.

Cantral, R. P. and T. G. Reeves, (2002). The cereal of the World's Poor Takes Center Stage, Science, 296, 53.

Champagne, E. T. (1997), Rice quality criteria for new uses. In: International Symposium in Rice Quality. Nothingan. pp. 24-27.

Dawe, D. (2010). The rice crisis: markets, policies and food security. London: Food and Agriculture Organization (FAO) and Earths can.

Horna, J. D, Smale, M. and Von Oppen, M. (2005). Farmer willingness to pay for seed-related information: rice varieties in Nigeria and Benin. Washington DC. : International Food Policy Research Institute (IFPRI), EPT Discussion 142 pp.

Hossain, M. S., Singh, A.K. and Fasih-uz-Zaman. (2009). Cooking and eating

characteristics of some newly identified inter sub-specific (indica/japonica) rice hybrids. ScienceAsia 35: 320-325.

International Rice Research Institute (IRRI), (1980), Alkali digestion, In: Standard Evaluation for rice: International Rice Testing Program, 2nd Ed., IRRI, Manila, 43-44.

Juliano, B.O., Perez, C.M., Blakeney, A.B., Breckenridge, C., Castilo, D.T., Kongseree, N., Laignelet, B., Lapis, E.T., Murty, V.V.S., Paule, C.M. and Webb, D. (1981). International cooperative testing on amylose content of milled rice. Satarke 33: 157-162.

Kennedy. G., Burlingame, B. (2003). Analysis of food composition data on rice from a plant genetic resources perspective. Food Chemistry 80, 589596.

Khush GS and Dela Cruz (2000). Rice grain quality evaluation procedures. Aromatic rices. Singh RK, Singh US, Khush GS (eds). Oxford and IBH publishing Co. Pvt. Ltd. New Delhi, 15-28.

Little RR, Hilder GB, Dawson EH. (1958) Differential effect of dilute alkali on 25 varieties of milled white rice. American Association of cereal chemistry.; 25: 111-126.

Mckenzio, K.S. and Rutter, J.N. (1983) Genetic analysis of amylase content alkali spreading score and grain dimensions in rice. Crop. Sci., 23 pp: 303-313.

Merca, F. E. and Juliano, B. O. (1981). Physicochemical properties of starch of intermediate amylose and waxy rices differing in grain quality. Starch 33:253-260.

Meullenet J. F. C.; Gross J.; Marks B. P. and Daniels M. (1998), Sensory descriptive texture analyses of cooked rice and its correlation to instrumental parameters using an extrusion cell. Cereal Chemistry, 75, 714-720.

Norme Francaise, (1999), NF, ISO 6648, October, 1993: Détermination des propriété viscoélastiques á différents temps de cuisson.

Vijayalakshmi K, Arumugasamy S, Balasubramanian AV. (2007) Conserving indigenous seeds for livelihood security– Experiences from Tamil Nadu, India. LEISA India, Pp. 12-13.