DETERMINATION OF KEY QUALITY PARAMETERS IN RICE GENOTYPES OF TUNGABHADRA COMMAND AREA[1]

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Abstract:

A project on assessment of quality parameters of rice genotypes was undertaken during the year 2009-10. Nine genotypes of rice grown in Tungabhadra project area namely Gangavathi Mallige(IET-21727). JGL-1798, gidda emergency Gangavathi emergency (IET-19251), BPT-5204, Gangavathi Sanna(IET-19828), ARS emergency (NES-07-03), Ratan sagar, Gangavathi sona(IET-20594) were analysed for their, cooking quality parameters, biochemical properties and physical parameters by using rice kernels. Cooking quality parameters such as kernel length and breadth, before and after cooking swelling number, were observed sensory evaluation was done using organoleptic evaluation sheet on nine point scale ranging from like extremely to dislike extremely from panel of Judges. Biochemical properties such as Nitrogen, Oil content and percentage of starch were also assessed by using Micro-Kjeldahl, NMR and spectrophotometer method respectively. Results revealed that, Gangavathi sanna has the lowest

[1] The research paper is part of the staff research project submitted by the first author to University of Agricultural Sciences, Raichur during the year 2010-11

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weight and highest head rice recovery and highest LB ratio. Gangavathi Mallige had the highest expansion ratio. Biochemical properties of rice genotypes revealed that BPT-5204 had the highest starch content and Gangavathi sona had comparatively lower starch content

Key words: rice genotypes, biochemical properties, sensory evaluation, cooking quality parameters,

Introduction

It has been estimated that, half of the World's population subsists wholly or partially on rice. Almost 90% of the world crop is grown in India, China and Japan and most of it is consumed domestically. Rice is grown in an area of about 43 m ha accounting for about 20% of the total cropped area in India. During 2010-11 India produced about 105 mt of paddy. It is estimated that, the productivity of Karnataka is highest (3.8 t/ha), but the same in Raichur is 2.5 t/ha accounting for a gap of 1.3 t/ha. It is also projected that, there is still scope for increasing the production of rice to maintain the present level of self sufficiency (Nirmala *et al*. 2009). Rice is also gaining importance in the making of infant foods, breakfast cereals, beer, fermented products and rice bran oil and rice wine remains a major alcoholic beverages in east Asia. The coarse and silica rich rice hull is finding new use in construction materials. It serves as an important cattle feed throughout Asia. Because rice flour is nearly pure starch and free from allergens, it is the main components of face powders and infant formulae (Ziolko and Kheradmandan, 2003).

Rice is the main cereal crop of Tungabhadra Project Area, hence it is called as the rice bowl of Karnataka. There are innumerable number of varieties /genotypes of rice in Raichur district . Some of these varieties yield more, but the acceptability from nutritional point of view is less, while some other yield less, but fetch more price, due to high acceptability. Hence there is a need to assess the acceptability quality among the existing genotypes for their consumer preference in order to exploit the produce to the fullest extent, as the use of rice in industrial purpose is increasing.

Thus, with the major aim of screening the rice genotypes for quality parameters, a study was undertaken with the following objectives.

1. To assess the nutritional quality parameters of rice genotypes
2. To assess the physical and cooking quality parameters of rice genotypes.

Material and Methods

Nine genotypes of rice, which are popularly grown in Tungabhadra project area were assessed for the quality parameters. Thus the genotypes selected are Gangavati mallige(IET-), JGL-1978, Gidda emergency, Gangavathi emergency(IET-19251), BPT-5204, Gangavathi sanna(IET-19828), ARS emergency(NES-07-03), Ratan Sagar, Gangavathi Sona(IET-20594). The parameters tested as per the method given in the following table.

Parameters	Method of analysis
Physical parameters	
a. Seed weight	Weight of 1000 seeds randomly selected
b. Kernel weight	Weight of 1000 dehusked , unbroken kernels selected randomly
c. Milling percentage	$\frac{\text{Weight of 1000 kernel}}{\text{weight of 1000 seeds}} \times 100$
d. Head rice recovery	$\frac{\text{Weight of broken rice}}{\text{weight of the total rice}} \times 100$
e. Colour	Visual observation
Cooking quality parameters	
a. Kernel length before and after cooking	The length of uncooked and cooked rice placed separately on a scale and measured for its length (mm) . Ten grains were randomly selected both from cooked and uncooked rice and the average length was taken.
b. Kernel breadth before and after cooking	The breadth of uncooked and cooked rice placed separately on a scale and measured for its breadth (mm) . Ten grains were randomly selected both from cooked and uncooked rice and the average breadth was taken.
c. Cooked weight	Quantity of Volume of cooked rice weighed on an electronic balance (g).
d. Swelling no.	Ratio of volume of cooked rice to the volume of raw rice.
e. L/B ratio before and after cooking	Ratio of Length of rice to the breadth of rice before cooking and similarly after cooking
Sensory evaluation of cooked rice	
a. Colour	By using the sensory evaluation sheet . Appearance, colour, texture, taste and overall acceptability of the
b. Texture	

c. Aroma	cooked rice were scored on nine point scale ranging from like extremely to dislike extremely from the panel of judges
d. Taste	
e. Grain size	
f. Overall acceptability	
Biochemical properties	
a. N-Content	Using micro-Kjeldahl method
b. Percent Oil content	NMR method
c. Starch content	Spectrophotometer method

N.B. For the biochemical properties crushed sample of rice was used.

The rice sample were moderately polished.

Results and Discussion:

Head rice yield is the weight of whole white rice grains remaining after milling, as a percentage of total weight of the paddy. Breakage of grain during milling reduces the percentages of whole grain and it can be due to a number of factors. Chalky grains are softer than translucent grains and are more likely to break during milling. Grains that are cracked, either from moisture cycles in the field or rough handling are also likely to break during milling. Head rice yield is often the most important quality parameters to millers since the head rice yield is generally linked to the payment they receive. It is observed from the above table that, Gangavathi Mallige had the highest seed as well as kernel weight, but the head rice recovery is lowest among all the genotypes. Among the selected genotypes, Gangavathi Sanna has the lowest weight, and highest head rice recovery. Gangavathi Emergency, BPT-5204, ARS Emergency, Ratan Sagar, Gangavathi Sona were emerged as the highly acceptable genotypes. Since the rice samples were moderately polished, the colour of cooked rice ranged from dark to light brown.

The length and width of a rice grain are important attributes that determine the class of the rice. Grain weight provides information about the size and density of the grain. Grains of different density mill differently, and are likely to retain moisture differently and cook differently. Uniform grain weight is important for consistent grain quality. It is observed that LB ratio (cooked rice) of all the selected genotypes ranged from 2.5 mm to 3.30mm. Gangavathi sanna has the highest LB ratio (3.30), followed by Gangavathi mallige and JGL-1798. But it was observed that, after cooking, Gangavathi mallige had the highest expansion capacity, while JGL-1798, Gangavathi sanna and ARS emergency had the same expansion capacity.

Texture describes, what we might experience in our mouths when eating rice; initial mouth feel, hardness, adhesiveness, cohesiveness, springiness, resilience, gumminess and chewiness. These characters are generally measured by a sensory panel, a group of people who are very experienced in determining and describing the texture of rice. Flavour in the fragrant rice is produced by volatile compounds, many of which are evaporated during cooking to produce an aroma. The results from table 3 shows that, Gangavathi emergency had the lowest acceptability compared to all the genotypes. The judges opined that, Gidda emergency and Gangavathi emergency genotypes are suitable for preparation of curd rice.

The comparison of biochemical properties of rice genotypes indicated that, BPT-5204 (86%) had the highest starch content, followed by Gangavathi Sanna (84%) and Gangavathi emergency(82%). While Ganagvathi Sona had comparatively lower starch content (72%) compared to all other genotypes. Hence, this variety had the maximum acceptability due to lower swelling number and less gummy when compared to other genotypes. Similarly Malleshi and Rudraradhya (2010) in their study found that, starch content of bran (35-50%), rice germ (15%), brown rice (72.5%), polished rice (77.8%) and medium polished rice as 74.0%.

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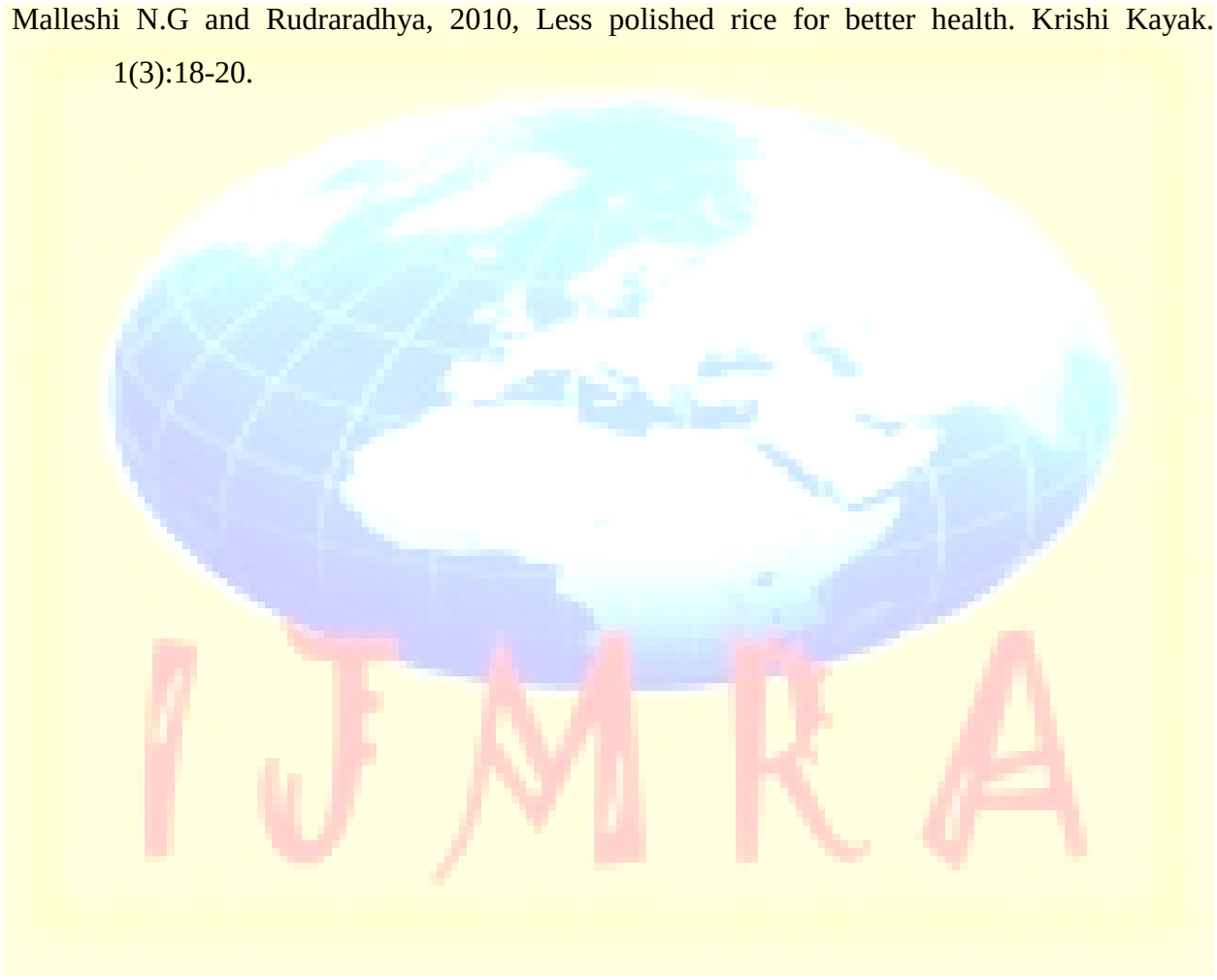

Table 1. Physical parameters of the rice genotypes of TBP area

Sl. No.	Name	1000 seed weigh t (gm)	1000 kernel weight	Milling (%)	Head rice recover y(%)	Color	Size	Overall accepta bility
1	Gangavathi mallige(IET-21727)	23	14.8	65.21	22%	Light brown	Long and thick	7
2	JGL-1798	16	9.5	59.37	54 %	Mediu m brown	Medium	8
3	Gidda emergency	19	11.1	57.89	46%	Dark brown	Short	8
4	Gangavathi emergency(I ET-19251)	18	12.7	70.55	70%	Brown	Medium and Thick	9
5	BPT-5204	15	10.4	69.33	42%	Light brown	Short and thin	9
6	Gangavathi sanna(IET-19828)	12	8.5	70.83	72%	Light brown	Short and thin	7
7	ARS emergency(N ES-07-03)	16	11.7	73.13	56%	Off brown	Medium and thick	9
8	Ratan Sagar	13	9.9	76.15	40%	Off brown	Medium and thick	9
9	Gangavathi sona(IET-20594)	15	10.7	71.33	56%	Light brown	Short and medium thick	9

Table 2. Cooking quality parameters(per 100 gm of rice) of rice genotypes of TBP area

Sl. No.	Name	L/B ratio before Cooking	L/B ratio before Cooking	Cooked volume (gm)	Swelling no.
1	Gangavathi mallige	3.00	3.50	330	3.3
2	JGL-1798	2.92	3.2	360	3.6
3	Gidda emergency	2.50	2.8	370	3.7
4	Gangavathi emergency	2.70	2.30	328	3.28
5	BPT-5204	2.50	3.40	344	3.44
6	Gangavathi sanna	3.30	3.20	356	3.56
7	ARS emergency	2.70	3.20	300	3
8	Ratan Sagar	2.60	2.70	380	4.55
9	Gangavathi sona	2.70	2.70	350	3.5

Table 3. Sensory evaluation of cooked samples rice genotypes of TBP area

Sl. No.	Name	Colour	Grain Size	texture	Aroma	Taste	Overall acceptability	Remarks
1	Gangavathi mallige	Brown mixed cream	Bold and long	Non sticky	7	7	7	Suitable for pulao
2	JGL-1798	Creamy white	Short and thin	Non sticky	7	8	8	-
3	Gidda emergency	Creamy white	Medium	Sticky	7	7	7	Suitable for curds rice
4	Gangavathi emergency	Creamy white	Medium length and bold	Sticky	7	7	5	Suitable for curds rice
5	BPT-5204	white	Short and thin	Non sticky	7	9	9	-
6	Gangavathi sanna	white	Short and thin	Non sticky	9	9	9	-
7	ARS emergency	Creamy white	Medium	Non sticky	9	9	9	-
8	Ratan Sagar	Creamy white	Short and medium	Sticky	6	6	6	Suitable for curds rice
9	Gangavathi sona	Creamy white	Medium	Non sticky	7	8	8	-

Table 4. Biochemical properties of rice genotypes of TBP area

Sl. No.	Name	N content(%)	Oil content(%)	Starch content(%)
1	Gangavathi mallige	0.924	2.8	80
2	JGL-1798	0.946	2.6	76
3	Gidda emergency	0.834	2.5	75
4	Gangavathi emergency	0.806	2.6	82
5	BPT-5204	0.818	2.7	86
6	Gangavathi sanna	0.711	2.7	84
7	ARS emergency	1.142	2.2	81
8	Ratan Sagar	1.254	2.8	78
9	Gangavathi sona	0.638	2.6	72