

STUDIES ON THE NUTRITIVE AND COOKING QUALITIES OF SOME EXOTIC RICE STRAINS

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Before the introduction of an exotic variety of paddy for large scale cultivation, it is necessary to ascertain its various qualities and acceptability to people. Different exotic varieties of rice have been introduced into Kerala in recent years for popularisation. The studies presented in this paper were hence undertaken to ascertain the various qualities of some of these varieties in relation to their acceptability to people. Under these studies the chemical composition, cooking quality and acceptability of three introduced varieties and two indigenous varieties were determined. The cooking quality and acceptability were determined of freshly harvested grains and of grains stored for one year.

Material and Methods

Tainan 3, Taichung Native 1, I R 8, Vellayani 1 and Kochuvithu were the strains of rice used in the present studies. They were tested in their raw and parboiled forms. The chemical components determined of these varieties were protein, total ash content, calcium, magnesium, phosphorus and potassium and these were determined by the standard A. O. A. C. methods.

The time required for cooking, the amount of water absorbed and the volume increase of the different varieties of rice were studied by cooking 10g of each sample in 100ml of water under controlled conditions in the laboratory.

Acceptability of the cooked samples was assessed by a scoring method following Jellinek (1964). Twenty judges were selected from among 33 housewives through a preliminary triangle test. Scores were awarded by the judges for such characters as colour, texture, taste, appearance and gluten content of cooked rice of all the varieties, served hot. The scoring system employed a numerical scale to grade each quality; a score of seven indicated the highest grade.

Results and Discussion

Table 1 gives the results of the chemical analysis of the different rice varieties. It will be observed that excepting protein no other component showed any significant difference in the different varieties.

Table 2 presents the data on the cooking characteristics of the different strains of rice. It will be observed that in general the cooking time of raw rice was less than half that of parboiled rice both in the fresh grains and in the grains stored for one year. The cooking time was the same (35m) for the raw rice in all the varieties excepting Vellayani 1 in which it was less (30m). On the other hand cooking time of

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(72ml), Kochuvithu=IR 8 (65ml) and Tainan 3 (62ml) while in the case of parboiled rice the greatest increase in volume was in Vellayani 1 (84ml) followed by Kochuvithu (78ml), Taichung Native 1 (72ml) IR 8 (63ml) and Tainan 3 (54ml). In general the volume increase in the grains was much more (more than double in Tainan 3 and IR 8) in those stored for one year than in fresh grains. This may be due to the change in the colloidal state of the starch from sol to gel and the decrease in amylase activity during the storage and due to the cell walls becoming stronger during storage (Juliano *et al* 1965).

Absorption of water and increase in weight on cooking were more in parboiled rice than in raw rice in Vellayani 1, Taichung Native 1 and IR 8, nearly equal in Kochuvithu and less in Tainan 3. The maximum absorption of water was shown by IR 8 and Kochuvitbu (120.7 and 120ml) and the least by Tainan 3 (65ml) in the case of boiled rice while in the case of raw rice the water absorbed was 100ml in all varieties excepting in Kochuvithu wherein it was 118ml. In general both volume in water absorbed and weight increase were more for stored grains than for the fresh grains.

Statistical analyses of the data on appearance, colour, tenderness, taste and glutinosity based on the scores of judges, gave the following results for the various characters :—

Appearance :

Fresh grain : $\overline{\text{IR 8 KV}} \quad \overline{\text{V 1 TN 1 T 3}} *$
 (both raw and parboiled)
 Stored grains : $\overline{\text{KV IR 8}} \quad \overline{\text{TN 1 V 1 T 3}}$

The cooked rice of IR 8 and Kochuvithu were thus found to have better appearance than Vellayani 1, Taichung Native 1 and Tainan 3 both for raw and parboiled rice and both for fresh and stored grains.

Colour :

Fresh grains : $\overline{\text{KV IR 8}} \quad \overline{\text{V 1 TN 1 T 3}}$
 Stored grains : $\overline{\text{KV IR 8}} \quad \overline{\text{T 3 TN 1 V 1}}$

Both in the raw grains and parboiled grains the varieties Kochuvithu and IR 8 were found to be superior to the rest in the matter of colour.

Tenderness :

Fresh grains :

Raw : $\overline{\text{KV IR 8 T 3}} \quad \overline{\text{TN 1 V 1}}$
 Parboiled : $\overline{\text{T 3 KV}} \quad \overline{\text{TN 1 IR 8 V 1}}$

Stored grains :

Raw and parboiled : $\overline{\text{T 3 IR 8 KV}} \quad \overline{\text{V 1}}$

There was significant variation between the judges in the case of fresh grains. Parboiling treatment lowered the tenderness significantly (mean scores for raw and parboiled being 3.55 and 3.02 respectively). In general the cooked grains of the variety KV and T 3 were significantly more tender than those of the rest. In the raw state the varieties Kochuvithu, IR 8 and Tainan 3 were superior to the rest in the matter of tenderness, while under the parboiled state Tainan 3 and Kochuvithu were

* KV = Kochuvithu, V 1 = Vellayani 1, TN 1 = Taichung Native 1, T 3 = Tainan 3.

parboiled rice varied considerably ; it was high (90m) in Vellayani 1 and Taichung Native 1, low (65m) in Tainan 3 and intermediate (75-80m) in IR 8 and Kochuvithu. Storage reduced the cooking time of raw rice in Vellayani 1 (from 30 to 25m) and Tainan 3 (35 to 27m) and increased in Kochuvithu (from 35 to 46m) and IR 8 (from 35 to 43m) while in Taichung Native 1 it remained more or less the same (35 and 34m).

The increase in volume of the grains on cooking was more in raw grains than in parboiled grains in Tainan 3, Taichung Native 1 and IR 8 and less in raw grains than in parboiled rice in Vellayani 1 and Kochuvithu. In the case of raw rice the maximum increase in volume was in Taichung Native 1 (75ml) followed by Vellayani 1

Table 1

Chemical contents of grains of different rice varieties
(Average of three experiments)

Strain		Protein	Total	Pota-	Calcium	Magne-	Phos-
		g%	ash	ssium	mg%	sium	phorus
		g%	g%	mg%		g%	g%
Tainan 3	Raw	10.5	1.3	134	9.8	0.09	0.31
	Parboiled	10.5	1.3	134	9.7	0.19	0.37
Taichung Native 1	Raw	7.6	1.5	136	10.5	0.27	0.43
	Parboiled	7.7	1.4	135	10.6	0.18	0.43
IR 8	Raw	8.7	1.3	133	10.0	0.18	0.38
	Parboiled	9.2	1.3	138	10.0	0.09	0.34
Vellayani 1	Raw	8.6	0.9	133	9.5	0.10	0.42
	Parboiled	8.6	0.9	134	9.7	0.20	0.45
Kochuvithu	Raw	6.4	0.6	133	10.0	0.12	0.39
	Parboiled	6.4	0.6	140	10.0	0.10	0.48

Table 2

The cooking qualities of different varieties of fresh and stored rice grains

Varieties		Cooking time		Increase in		Water absorb		Weight increase	
		(minutes)		(volume ml)		ed (ml)		over 100g (in g)	
		Fresh	Stored	Fresh	Stored	Fresh	Stored	Fresh	Stored
Vellayani 1	Raw	30	25	72	122.5	100	100	57	60
	Parboiled	90	92	84	138	110	130	84	90
Tainan 3	Raw	35	27	62	127.0	100	110	65	69
	Parboiled	65	65	54	129.0	65	140	54	61
Kochuvithu	Raw	35	46	65	129.0	118	150	53	62
	Parboiled	80	90	78	139.0	120	127	58	35
Taichung Native 1	Raw	35	34	75	148.0	100	147.5	58	58
	Parboiled	90	80	72	145.0	115	128	72	92
IR 8	Raw	35	43	65	156.0	100	111	59	65
	Parboiled	75	60	63	133.0	120.7	136.5	63	71