

Amino Acid Profiles in Some Scented Rice Varieties

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Summary. Twelve scented (basmati) and one non-scented variety were analysed for their amino acid composition. The essential amino acid profiles of scented varieties when compared with non-scented, revealed that these varieties exhibited higher values, which ranged from 2.82 to 4.86 gm/100 gm protein for lysine, 1.92 to 3.13 for methionine, 1.67 to 4.23 for tyrosine, 3.65 to 4.91 for phenylalanine, 5.50 to 8.95 for leucine, 2.25 to 3.40 for isoleucine, 2.84 to 3.46 for threonine, 3.36 to 5.33 for valine. When these values were compared to FAO recommended standards, it was observed that most of the scented varieties had comparable or superior values, while varieties such as, 'Type 3', 'Basmati sufaid 100', 'Likitimachi', 'Randhunipagalu' and 'Basmati 370' showed superior lysine, phenylalanine, leucine, and methionine content. These observations suggest that the scented varieties possess better amino acid profiles and exhibit superior nutritional qualities, which could be utilised in breeding varieties with improved amino acid composition.

Key words: Scented rice – Amino acid profiles – Essential amino acids

Introduction

Basmati types of rice occupy a unique place in the sphere of consumer preference and command a preeminent place in the world rice markets, by virtue of their aroma, grain elongation during cooking and other desirable qualities. Several attempts have been made to develop high yielding varieties combining basmati qualities. Scented rices have such unique grain quality characteristics as medium amylose content and low birefringence end point temperature (Juliano 1979). Although the physico-chemical properties of basmati rice such as kernel elongation, volume expansion, etc.,

have been studied (Chaudhury and Ghosh 1978), studies on the amino acid composition of these rices are limited in number. In the present study, amino acid profiles were studied in twelve scented varieties and were compared to that of the non-scented variety.

Materials and Methods

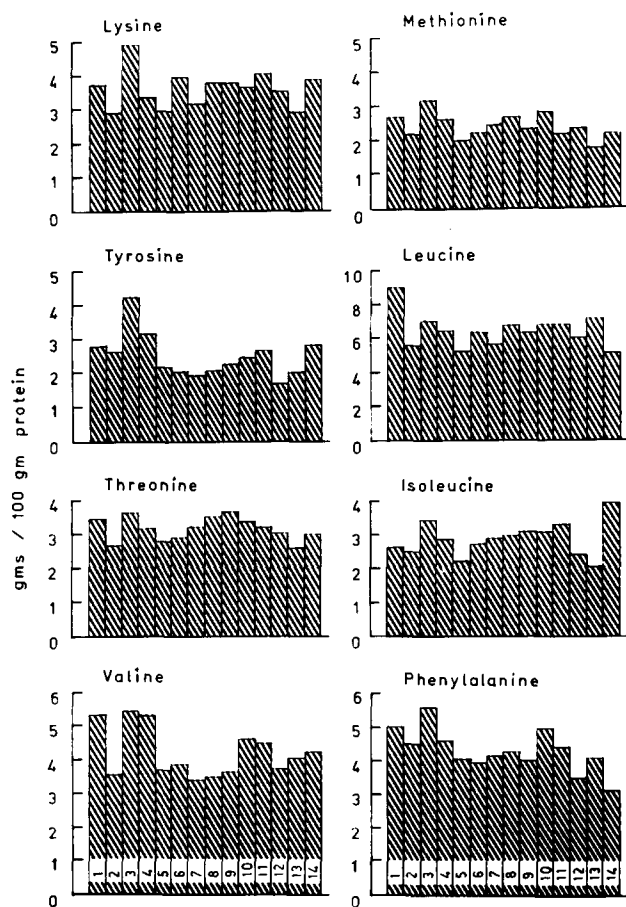
Twelve scented varieties, 'Randhunipagalu', 'Godavari Isuka', 'Type 3', 'Basmati 370', 'Seetabhog', 'Likitimachi', 'Kanakjeer', 'Ambemohar', 'Bindli', 'SO 19', 'Basmati 93 R', 'Basmati sufaid 100' and a non-scented variety 'Tellahamsa' were used in the present study. All the varieties were raised under uniform conditions and fully matured seeds were ground to a fine powder for the analysis. Hundred mg of the sample from each variety was transferred to a hydrolysis tube and 3 ml of 6 N HCl was added to it. The tubes were sealed under vacuum and kept in an oven at 110°C for 24 h. After hydrolysis, the samples were dried in a vacuum dessicator and diluted to 15 ml with citrate buffer (pH 2.2). The analysis was done on a JEOL JC 6 amino acid analyser with LC-R2 resin. A one ml sample was loaded onto each of the columns and the amino acids were calculated in terms of percentage basis of protein. Tryptophan and cysteine were not estimated. Protein was estimated by the conventional microkjeldhal method using the conversion factor 5.95.

Observations and Discussion

The amino acid composition of the varieties is shown in Table 1. There was a wide variation for most of the amino acids among the different varieties. The values for different amino acids ranged considerably: aspartic acid (5.82 gm/100 gm protein to 8.79 gm/protein), threonine (2.58 to 3.66), serine (2.61 to 5.16), glutamic acid (11.78 to 16.52), proline (2.06 to 4.50), glycine (2.48 to 6.65), alanine (2.73 to 5.33), valine (3.28 to 5.33), methionine (1.82 to 3.13), isoleucine (2.15 to 3.40), leucine (5.50 to 8.95), tyrosine (1.84 to 4.23), phenylalanine (3.64 to 5.52), lysine (2.82 to 4.86), histidine (1.21 to 2.70) and arginine (6.11 to 10.85). Protein percentages

Table 1. Amino acid composition of different rice varieties (gm/100 gm protein)

Amino acid	'Randhunipagalu'	'Godavari Isuka'	'Type 3'	'Basmati 370'	'Seetabhog'	'Likitimachi'	'Kanakjeer'	'Ambemohar'	'Bindli'	'SO 19'	'Basmati Sufaid 100'	'Basmati 93 R'	'Tellahamsa'	Mean	S. D.
Aspartic acid	8.79	5.82	7.81	6.91	6.19	7.79	7.06	7.99	7.87	8.19	6.69	6.82	6.36	7.25	0.87
Threonine	3.46	2.73	3.66	3.34	2.91	3.22	2.84	3.28	3.53	3.47	3.29	3.01	2.58	3.17	0.39
Serine	5.16	4.06	5.44	4.71	2.61	3.96	3.71	4.58	4.52	4.83	4.29	3.99	3.97	4.29	0.69
Glutamic acid	16.52	12.65	13.36	11.98	11.78	12.14	12.73	13.99	13.62	14.48	12.31	11.97	13.15	13.13	1.33
Proline	3.65	3.97	4.50	3.97	3.37	3.52	3.89	4.03	3.86	4.04	3.73	3.69	2.06	3.71	0.55
Glycine	4.97	3.96	6.65	4.76	2.48	3.56	3.29	3.79	3.72	4.51	4.07	3.46	3.43	4.05	0.98
Alanine	4.90	3.94	5.33	4.60	3.97	4.34	4.79	4.86	4.46	5.85	5.66	4.03	2.73	4.57	0.79
Valine	5.21	3.53	5.33	5.29	3.64	3.69	3.28	3.36	3.77	4.49	3.41	3.64	4.03	4.06	0.73
Methionine	2.63	2.21	3.13	2.67	1.92	2.17	2.28	2.53	2.26	2.77	2.01	2.07	1.82	2.34	0.36
Isoleucine	2.58	2.51	3.40	2.79	2.25	2.64	2.76	2.83	2.82	2.89	2.97	2.45	2.05	2.69	0.33
Leucine	8.95	5.81	7.79	6.66	5.50	6.35	5.95	6.89	6.57	6.61	6.60	5.78	7.00	6.65	0.88
Tyrosine	2.77	2.69	4.23	3.13	2.05	1.91	1.84	2.01	2.14	2.34	2.56	1.67	1.84	2.38	0.68
Phenylalanine	4.97	4.31	5.52	4.41	3.96	3.95	4.15	4.21	4.01	5.06	4.33	3.64	4.08	4.35	0.85
Lysine	3.66	2.87	4.86	3.22	2.82	3.92	3.16	3.87	3.87	3.83	4.09	3.55	3.85	3.58	0.57
Histidine	2.03	1.52	2.70	1.92	1.21	1.95	1.81	1.87	2.27	1.86	1.76	1.84	1.75	1.88	0.34
Arginine	8.56	6.11	10.85	7.91	7.96	9.14	6.62	8.54	9.74	9.64	8.36	7.46	6.94	8.29	1.27
Protein %	7.08	8.09	11.36	11.22	9.80	9.23	10.18	7.03	10.89	10.18	8.36	9.95	10.20	9.50	1.39



varied from 7.08 to 11.36. Houston et al. (1969) in their study of amino acid composition of rice and its byproducts found relatively little variation for amino acid content in milled rice. In the present study, however, a large amount of variation was found for most of the amino acids in scented rices. This variation can be exploited in the breeding of superior rice varieties.

The composition of essential amino acids, lysine, methionine, threonine, leucine, isoleucine, valine and phenylalanine in different varieties were compared with that of the recommended standards of Food and Agriculture Organisation (FAO). The pattern is shown in Fig. 1. For lysine content, varieties, 'Randhunipagalu', 'Likitimachi', 'Ambemohar', 'Bindli', 'SO-19', and 'Basmati sufaid 100' had comparable values while 'Type 3' exceeded this value. The rest of the varieties, including the non-scented variety, had lower values than that of the FAO. For methionine content, all the scented varieties had higher values than the non-scented one and all values were comparable to the FAO standard. The varieties 'Type 3', 'Basmati 370' and 'SO-19' had the highest values among the scented varieties

Fig. 1. Essential Amino acid profiles of different rice varieties. 1 'Randhunipagalu'; 2 'Godavari Isuka'; 3 'Type 3'; 4 'Basmati 370'; 5 'Seetabhog'; 6 'Likitimachi'; 7 'Kanakjeer'; 8 'Ambemohar'; 9 'Bindli'; 10 'SO 19'; 11 'Basmati sufaid 100'; 12 'Basmati 93 R'; 13 'Tellahamsa'; 14 FAO recommended value

and the non-scented variety 'Tellahamsa' had a lower value than that of the FAO. For leucine content, all the varieties, with the exception of 'Seetabhog', had higher values than the FAO standards. 'Randhunipagalu' had the highest value followed by 'Type 3'. For isoleucine content, all the varieties had lower values when compared to FAO standards. Among the scented varieties, 'Type 3' had the highest value.

For threonine content, all the varieties with the exception of 'Seetabhog' and 'Tellahamsa' had comparable or higher values than the FAO standards whereas 'Randhunipagalu', 'Type 3' and 'Bindli', exhibited the highest values. For valine content, 'Randhunipagalu', 'Type 3', and 'Basmati 370' had the highest values and exceeded the FAO standard. For phenylalanine content, all the varieties exceeded the FAO standard and 'Type 3' had the highest value, followed by 'Randhunipagalu', and 'SO 19'.

Although rice has the highest content of lysine among the cereals, nevertheless its first limiting amino acid is lysine itself, followed by threonine and tryptophan (Juliano 1972). In the present study, most of the scented rices had either comparable or better values than FAO standards for such amino acids as lysine, threonine, methionine and other essential amino acids. Similar varietal differences in lysine content was observed among different rice varieties (Palmiano et al. 1968). These observations clearly suggest that scented varieties exhibit superior nutritional qualities due to their high amino acid profiles, although it is not clear whether the superior amino acid profiles are associated with scentedness. Varieties like 'Type 3', 'Randhunipagalu', 'Basmati sufaid 100' and 'Basmati 370', which exhibited the highest values for most of the

amino acids, may be utilised in breeding programs aimed at improving nutritional quality.

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