Indian J. Genet., 80(1) 115-117 (2020)
DOI: 10.31742/IJGPB.80.1.16

Short Communication

Development of a red rice variety with excellent health properties and attractive grain qualities

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(Received: August 2019; Revised: December 2019; Accepted: January 2020)

Abstract

A fragrant long grain red rice variety named 'Red Fragrant' where excellent health properties are combined with attractive grain qualities has been developed in Sri Lanka. It has attractive grain qualities similar to 'Basmathi' rice. Low glycemic index (47), high antioxidant properties and high contents of protein, dietary fiber and vitamin B in the grain are its health properties. The variety is high yielding with high head grain percentage making it commercially viable.

Key words: Grainquality, health properties, rice, variety

Health properties of rice (*Oryza sativa* L.) have recently been reviewed by Prabha et al. (2018). Low glycemic index (GI), high antioxidant activity and high protein, dietary fiber and vitamin B particularly B_1 (Thiamine), B_2 (Riboflavin), B_3 (Niacin), B_5 (Pantothenic Acid) and B_6 (Pyridoxine) contents in the rice grain are related to human health. While rice with health properties are gaining increased attention at present, Basmathi rice is popular due to its high grain quality characteristics. Therefore, if a rice variety is developed by combining Basmathi type grain quality with health properties, it will definitely be a healthy palatable rice that is beneficial for rice consumers at all ages. Such a rice variety has been developed in Sri Lanka and it is presented in this paper.

Breeding methodology of 'Red Fragrant'

The new variety was developed through conventional hybridization and selection (Pedigree method) and it was tested for grain yield and quality and for antioxidant properties by the methods proposed earlier (Jun et al. 2012; Sutharut and Sudarat 2012; Brand-williams et al. 1995). Grain crude protein, dietary fiber and vitamin B_1, B_2, B_3, B_5 and B_6 contents were determined by the AOAC standard methods with slight modifications. A red long slender grain variety and At 405, a highly aromatic variety having long grains and sticky rice with improved plant type, were used as parents After rigorous selection in advancing segregating populations, many uniform red pericarp lines having improved plant type with superior grain qualities similar to Basmathi rice were selected. These selected lines were then screened for health properties and the most promising line with Basmathi grain qualities combined with health properties was finally selected. Simultaneously the selections in each generation were tested for disease and pests infection/infestation. The elite selected lines were tested for grain yield in the research station in comparison to Indian Basmathi 370 as well as in multi-locational yield trials in farmers' fields. The grain quality characteristics namely, grain length (L), breadth (B) and L/B ratio and ability to elongate grain and producing aroma while cooking and also the milling quality in terms of final head grain percentage of the selected line were tested and compared with Indian Basmathi 370 to maintain statndard quality. Glycemic Index is an index to measure how foods affect the rise in blood sugar level after a meal (Wolever et al. 1991). GI of newly selected line was determined two times in two independent studies by the *in-vivo* method of Jenkins et al. (1981). No individual in the test samples exceeded fasting blood glucose level above 100 mg/dl and had a family

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Published by the Indian Society of Genetics & Plant Breeding, A-Block, F2, First Floor, NASC Complex, IARI P.O., Pusa Campus, New Delhi 110 012; Online management by www.isgpb.org; indianjournals.com

history of diabetes. Also none of them were under medication. After thorough testing, an elite line was identified as a new red and aromatic rice variety named 'Red Fragrant'.

Red Fragrant gave significantly higher grain yield (3.74-4.02 t/ha) than that of Indian Basmathi 370 (1.48-1.75t/ha) and very close grain yield to high yielding (5-5.5t/ha) common rice in research fields. No serious major pest and disease incidences were reported on Red Fragrant and its grain yields in farmers' fields were always higher than 3t/h. Grain quality characteristics of Red Fragrant comply with Basmathi grain qualities and its cooked rice was non-sticky while its head grain % was 65 indicating its high commercial viability (Table 1). Total phenolic and anthocyanin contents and antioxidant activity of Red Fragrant were 339.2±3.80 mg GAP/100g, 32.4±3.5 mg/100g and 71.0±0.7% and they were much higher than 178.3±1.48 mg GAP/100g, 1.1±0.9 mg/100g and 24.8±0.9 % recorded in Basmathi 370, respectively. Abeysekara et al. (2019) reported that Red Fragrant had more than 2 times and 10 times total phenolic content and antioxidant activity, respectively when compared to that of Pakistan Basmathi rice. Somaratne et al. (2017) also reported comparatively higher phenolic and anthocyanin contents and antioxidant activity in Red Fragrant. GI of Red Fragrant assessed by two independent studies were 47±3 and 46±3 allowing it to be categorized under low GI group (GI < 55). Somaratne et al. (2017) reported a GI as low as 41±2.8 in Red Fragrant. The crude protein content of Red Fragrant was much higher than that of Basmathi 370 (Table 2). Samaranayake et al. (2018) reported a grain protein content as high as 11.4% in Red Fragrant. The maximum crude protein content reported by Sood et al. (2006) in Basmathi rice was 8.41±0.02. Vitamin B_1 and B_2 contents in Red Fragrant were 3 and 2.8 times higher, respectively than that of Basmathi 370. Red Fragrant is also rich in vitamin B_3, B_5 and B_6 and high in dietary fiber content (2.5%) (Table 2). It is expected that the newly developed scented rice variety will benefit the Srilankan farmers by boosting their farm income while satisfy the consumers demand.

Table 1. Grain quality characteristics and head grain percentage of Red Fragrant in comparison to Indian Basmathi 370

Variety	Raw rice grain				Cooked rice grain			
	Length (L) mm	Breadth (B) mm	L/B ratio	Head grain %	Length mm	Elongation ratio	Aroma	Stickiness
Red Fragrant	7.0	1.6	4.66	65	10.6	1.51	High	No
Indian Basmathi 370	7.5	1.5	5.00	35	13.0	1.70	High	Slight

Table 2. Crude protein, dietary fiber and vitamin B_1, B_2, B_3, B_5 and B_6 contents of Red Fragrant in comparison to Basmathi 370

Variety	Nutritional Properties (Mean±SE*)						
	Protein (%)	Dietary fiber (%)	Vitamin B (mg/100g)				
			B_1	B_2	B_3	B_5	B_6
Red	10.30	2.50	0.22	0.10	5.19	1.59	0.09
Fragrant	±0.05	±0.13	±0.02	±0.02	±0.20	±0.04	±0.01
Basmathi	8.20	±0.96	0.07	0.035	- [a]	-	-
370	±0.03	±0.03	±0.001	±0.001			

±SE-Standard error of mean

a-Data not available

Authors' contribution

Conceptualization of research (SA); Designing of the experiments (SA); Contribution of experimental materials (SA); Execution of field/lab experiments and

data collection (SA, DG); Analysis of data and interpretation (SA, DG); Preparation of the manuscript (SA, DG).

Declaration

The authors declare no conflict of interest.

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