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A FINE GRAIN MUTANT OF AN INDICA RICE VARIETY IR-6

Akbar Ali Cheema, M.A. Awan and Maqbool Ahmad

Nuclear Institute for Agriculture and Biology, Faisalabad

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Dry seeds of an indica rice cultivar (IR-6) were irradiated with fast neutrons and a fine grain mutant was selected from segregating generations. As regards yield, yield components, protein contents, cooking quality and sensory characteristics, the mutant was comparable to that of IR-6. However, the grains of mutant were long, slender, translucent and nonchalky as compared to coarse and chalky grains of the parent variety which resulted in 8 % higher head rice recovery in this fine grain mutant.

INTRODUCTION

In recent years, the use of induced mutations has played a significant role in the development of crops of improved plant stature and quality, higher yield, earliness and resistance to insect pests and diseases [1,2,3]. Several induced mutants in different crops have been released after improving one or few specific characters in an otherwise well adapted variety [4].

IRRI varieties occupy 50 % of the total rice area in Pakistan [5]. IR-6 is the predominantly grown variety among the IRRI varieties introduced in Pakistan. Although this variety possesses an ideal plant type (short straw and erect leaves) yet its cultivation in Pakistan is handicapped due to low market price and poor milling recovery. Low milling recovery is attributed to chalkiness in grain which results in high breakage during milling, while low market price is due to its coarse grain. Induction of translucent and fine grain mutants capable of giving high milling recovery has been reported in IR-8 variety [6,7]. The object of the present study therefore, was to improve the grain characteristics of IR-6 through use of induced mutations.

MATERIALS AND METHODS

One thousand good seeds of IR-6 were irradiated with fast neutrons (1500 rads) at IAEA Laboratory Seiberdorf in Vienna, Austria. Moisture content of the seed at the time of treatment was 14 %. M_1 generation was planted with one seedling/hill spaced 11 cm apart between and within rows.

At maturity, M_1 plants were harvested individually (three main panicles from each M_1 plant) and used for growing M_2 population as plant progeny rows. There were 15 plants in each row in M_2 and every 10th row consisted of the parent variety. The planting distance was kept 22 x 22 cm.

From M_2 population three fine grain mutants were selected. In M_3 generation, selection was made on the basis of clear and fine grains. Finally, only one mutant having fine and translucent grain (FG-6) was selected. The mutant alongwith parent variety was planted in micro-plot trial in randomized complete block design with three replications in M_4 generation (spacing 22 x 22 cm). The experimental plots were fertilized with 67 Kg N/ha.

At maturity a total number of 45 plants (15 per replication) were randomly selected from the mutant as well as the parent variety. Data on days from seeding to flowering, yield and yield components were recorded. Milled rice kernel classification was done according to the standards described by Grist [8]. Elongation ratio was determined as given by Aziz and Shafi [9]. The volume expansion and water absorption ratios, and amylose content were estimated following the procedures of Juliano *et al.* [10] and Juliano [11] respectively. Cohesiveness and aroma were evaluated organoleptically by scoring technique described by Larmond [12], while protein estimation was made by Udy method [13]. All the data was analysed statistically by the analysis of variance technique [14].

RESULTS AND DISCUSSION

There was no significant difference in yield and yield components of the fine grain mutant (FG-6) and the parent variety (Table 1). This suggests that FG-6 is comparable to its parent i.e., IR-6 in yield potential. The

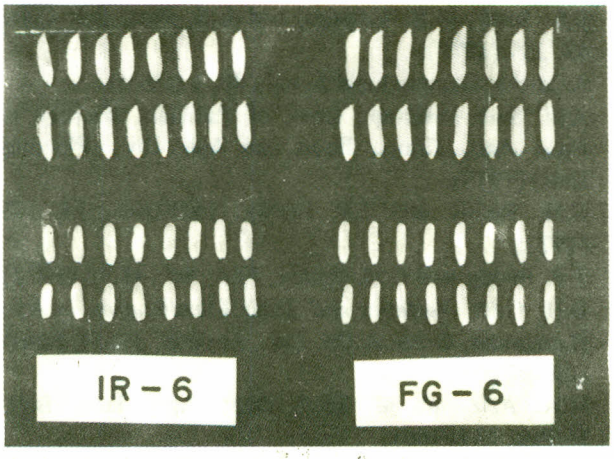

Fig.1 Comparison of paddy and milled rice grains of IR-6 and FG-6.

maturity period of FG – 6 is also similar to that of IR – 6. A significant increase in grain length, length/width ratio and decrease in width of mutant as compared to IR-6 was observed. These differences are also depicted in Fig.I. The above cited changes in kernal dimensions improved the fineness of grains and according to size and shape classification [8], this mutant can be classified as long and slender. Significant reduction in test grain weight of FG-6 was also noticed. This reduction in weight may be due to reduction in width of rice kernels. The grain of the FG-6 was translucent as compared to chalky grains of IR-6 which resulted in 8 % increase in head rice recovery as compared to its parent variety. Similar results have been reported by Reddy and Reddy (1972) in a coarse rice variety IR-8 [6]. As regards cooking and sensory quality characteristics, there was no significant difference in the

Table–1. Characters of parent variety (IR–6) and fine grain mutant (FG–6)

Characters	IR–6	FG–6	% increase or decrease over control	L.S.D. (P=0.05)
Days from seeding to flowering	109.60	108.40	–1.09	N.S.
Plant height (cm)	97.88	100.47	+2.65	N.S.
Tillers per plant	11.20	12.97	+15.80	N.S.
Panicle length (cm)	24.56	24.67	+0.45	N.S.
Fertility (%)	95.09	92.19	–3.05	N.S.
Test grain weight (gm)	12.48	11.79	–5.53	0.51
Panicle weight (gm)	33.25	32.73	–1.56	N.S.
Number of spikelets/panicle	148.70	132.05	–11.20	N.S.
Grain yield Kg/ha	3683.80	4036.40	+8.74	N.S.
Head rice recovery (%)	52.56	56.82	+8.11	0.07
Kernel dimensions				
Length (mm)	6.66	6.97	+4.65	0.17
Width (mm)	2.00	1.60	–20.00	0.05
Length/Width (ratio)	3.34	4.36	+30.54	0.17
Cooking quality				
Elongation (ratio)	1.43	1.49	+4.20	N.S.
Water absorption (ratio)	3.60	3.46	–3.89	N.S.
Volume expansion (ratio)	4.58	4.57	–0.21	N.S.
Protein (%)	7.53	7.25	–3.72	N.S.
Amylose (%)	24.38	22.29	–8.57	1.88
Organoleptic evaluation				
Cohesiveness (5-1)	2.80*	3.20*	+14.29	N.S.
Aroma (5-1)	2.20*	2.60*	+18.78	N.S.

*The values are average of five judgements; 5=Well separated, strongly aromatic; 1=Pasty, no aroma.

water absorption, volume expansion and elongation ratios and cohesiveness and aroma of cooked rice of FG-6 and IR-6. A significant decrease in amylose contents was found in FG-6 as compared to IR-6, however no difference was observed in protein contents.

This mutant with fine and translucent grain is a significant improvement over the parent variety and holds good chance of direct utilization as commercial cultivar. Due to its translucent and nonchalky grain, the mutant yielded significantly higher head rice recovery and may fetch better price in the market.

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