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AGRONOMIC AND QUALITY TRAITS OF SOME ELITE RICE GENOTYPES

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Four elite lines and a cultivar of rice (*Oryza sativa* L.) were evaluated for agronomic and some of the quality characteristics during 1992 at NARC, Islamabad. DR45 and DR48 out yielded the check variety, KS282 by producing 18% and 11% higher grain yield. The highest elongation ratio (after cooking) was exhibited by KS282 while the highest protein content (8.66%) was recorded for DR46. Productive tillers/hill showed the highest coefficient of variability (10.8%). Whereas flowering duration showed the lowest (0.61%). All the genotypes possessed similar grain quality. DR46 was ranked as inferior, in terms of paddy yield.

Key words: Rice varieties, Physico-chemical, Agronomic and quality characteristics.

Introduction

Rice (*Oryza sativa* L.) plays a significant role in the agricultural sector of Pakistan both as food staple and an export item. It is one of the major export commodities of the country. Pakistan rice fetches a higher price in the International market due to its superior cooking and eating quality. To maintain this status breeders must divert their attention to improve quality alongwith yield. Quality matters more than quantity as rice consumers have become more and more discriminating while purchasing rice due to high standard of living. Quality in rice is described by a combination of many physico-chemical properties of its kernels such as dimension, shape, weight, dormancy, pigmentation, hardness, milling properties, chemical composition of the endosperm, aroma and nutritional value. Distribution and performance of rice grain quality characteristics are country or region specific [1]. Improvement of rice quality means to develop the desired character for a particular group of consumers. It is well documented that rice grain yield and protein may be improved simultaneously upto a point beyond which an increase in yield results in a decrease in proteins [2]. Grain quality in rice is influenced by the environment, where the plant is grown, land preparation methods [3] and nitrogen fertilizer level [4].

One of the ways to identify high yielding and good quality rice genotypes is to evaluate new advanced strains for both these parameters. The purpose of present investigation was to evaluate components of quality and production potential of some advanced promising lines for their utilization as donors in the breeding projects to develop higher yielding rice cultivars.

Materials and Methods

Four advanced lines (DR39, DR45, DR46 and DR48) collected from Rice Research Institute Dokri alongwith a local cultivar (KS282) were evaluated for their agronomic performance and some of the quality parameters. The trial was laid out in Randomized Complete Block Design (RCBD) in three replicates with plot size of 3x5m at National Agricultural Research Centre, Islamabad during 1992. Twenty-days old seedlings were transplanted at a spacing of 20x20cm and fertilized with 120-60-0 NPK kg/ha. The crop was fully protected from the insect-pests by applying proper insecticides. Data for days to 50% flowering, days to maturity, plant height at maturity, productive tillers/hill and panicle length were recorded. The crop was harvested at a moisture level of 18-20%. It was dried to 10 to 11% moisture level and stored for 3-4 months before performing physico-chemical analysis. For the estimation of kernel size, the length of twenty kernels from each variety was measured and classified on average basis as reported by Khush *et al.* [5].

Nitrogen contents in the grain was estimated by Kjeldahl method and converted into protein by multiplying with a factor of 5.95 [6]. Amylose content and alkali spreading value were determined by techniques described by Juliano [7] and [8]. Elongation ratio was calculated according to the method of Aziz and Shafi [9].

Results and Discussion

Variation among the genotypes for different agronomic traits were observed (Table 1). A significant difference was noticed in maturity period among the cultivars ranging from 132 to 154 days. DR39 had longer maturity period than KS282 (check) while DR45, DR46 and DR48 had considerably shorter maturity period representing earlines. Reduction in plant height may improve their resistance to lodging and reduce substantial yield losses associated with this trait [10]. Plant height differ significantly. It ranged from 96 to 129 cm. All the advanced lines had more plant height than check KS282 (99.67cm) except DR46 (96cm). DR48 (129cm) had

maximum plant height followed by DR39 (111cm).

Productive tillers/hill, panicle length, seed setting percentage and 1000 grain weight are the yield attributing traits. A great variability was exhibited for productive tillers/hill (8 to 12) among the advance lines and KS282. DR48 had significantly fewer tillers/plant, while its higher 1000 grain weight compensated this negative factor to give high yield. KS282 had maximum productive tillers followed by DR45. Panicle length ranged from 23.1 to 27.3 cm. Increase in grain yield was attributed by high seed setting percentage [11]. DR39 had maximum panicle length and due to lower grain fertility exhibited lower grain yield. Similarly DR46 had lower yield than KS282 with lower fertility percentage depicting the contribution of grain fertility toward yield.

Thousand grain weight ranged from 21 to 26 grams. Reduction in grain weight was observed in DR46 which could be due to reduction in kernel breadth. Earlier findings of some previous workers [12] are in agreement with our findings. It indicated that reduction in grain yield exhibited by DR46 is due to decrease in all the three basic components of yield i.e. panicle length, seed setting percentage and 1000 grain weight respectively, compared to other genotypes studied. Similar observation was made by Maurya and Singh [13]. Thus it is suggested that for judging the various genotypes, different traits need to be considered simultaneously rather than relying on yield alone.

Physico-chemical characteristics of elite lines are presented in Table 2. The length (size) and length/breadth ratio (shape) of grains ranged from 6.23 to 7.23mm and 2.70 to 3.46mm respectively (Table 2). Based on these two parameters, DR48 is grouped as medium while all other varieties had long slender grains. Bari *et al.* [14] reported that linear ralationship existed between increased L/B ratio and better grain quality. Considering L/B ratios of advanced lines, DR48 may be ranked as inferior in terms of grain quality compared to all the other advanced lines and the check variety which possessed similar grain quality. DR39, DR45, DR46 and KS282 had greater grain length and L/B ratios compared to DR48 which had more grain thickness. These kernel physical dimensions are ascribed to the finess of the kernel [12]. Based on L/B ratios, DR39 and DR46 are finer with lower yield compared to other varieties. DR46 had the highest protein content (8.66%) and lowest yield (5.0 t/ha) (Table 2). It is a well documented fact that quality and quantity do not go together. Similar findings had been exhibited from our experiments which were in line with the results reported by Carnahan *et al.* [15].

Amylose content has a pronounced effect on the cook-

TABLE 1. AGRONOMIC CHARACTERISTICS OF SOME MEDIUM LONG GRAIN GENOTYPES.

Genotypes	Flowering (days)	Maturity (days)	Plant height (cm)	Productive tillers/hill (no)	Panicle length (cm)	Spikelet fertility (%)	1000 grain weight (g)	Paddy yield (t/ha)
DR39	114a	154a	111.33b	10.33ab	27.30a	78.91c	25ab	6.4c
DR45	106d	133c	100.33c	12.00a	24.07bc	86.58ab	25ab	8.5a
DR46	109c	134c	96.0d	9.67bc	23.10c	81.19bc	21c	5.0d
DR48	111b	132c	129.33a	8.00c	25.57b	86.46ab	26a	8.0ab
KS282 (check)	111b	147b	99.67cd	12.33a	24.90b	89.19a	24b	7.2bc
Mean	110.2	140.0	107.33	10.47	24.97	84.47	24.20	7.02
CV(%)	0.61	0.8	2.03	10.82	3.33	3.77	3.81	2.1

Means followed by the same letter do not differ significantly from each other according to Duncan multiple range test.

TABLE 2. PHYSICO CHEMICAL CHARACTERISTICS OF MEDIUM LONG GRAIN GENOTYPES OF RICE.

Genotypes	Kernal length (mm)	Kernel breadth (mm)	Kernel thickness (mm)	L/B ratio	Alkali value	Protein content (%Nx5.95)	Amylose content (%DB)	Elongation ratio
DR39	6.70c	2.2ab	1.63b	3.0	5.10c	7.73b	28.16a	1.67b
DR45	7.23a	2.20ab	1.73ab	3.29	7.00a	8.06b	26.50b	1.73b
DR46	6.80b	2.07b	1.70ab	3.29a	6.80ab	8.66a	27.50ab	1.77b
DR48	6.23e	2.30a	1.80a	2.70b	6.63b	8.20ab	27.50ab	1.77b
KS282 (check)	6.6d	2.2ab	1.76a	3.0	7.0a	8.1b	27.5ab	2.03a

Means followed by the same letters are not significantly different from each other on 5% level of significance.

ing and eating quality of rice [16]. All the advanced lines were high amylose rice. Amylose content ranges from 27.5% to 28.16%. DR39 had maximum amylose contents (28.16%) followed by all the other lines which had about the same value (27.5%) while DR45 had different trend (26.5%). Alkali spreading score, an estimate of gelatinization temperature is an additional starch characteristics considered to be of prime importance to rice quality [17]. DR45 and KS282 had the highest alkali spreading value (7.0) followed by DR46 (6.8) and DR48 (6.63) while DR39 had the lowest value (5.1). Alkali spreading score indicated that DR45 and KS282 had the same cooking time but lesser than other varieties. While DR39 had maximum cooking time followed by DR48 and DR46.

Protein contents varied from 7.73 to 8.66% and were significant (Table 2). DR46 had the highest protein content (8.66%) followed by DR48 (8.20%) while the other lines had the same statistical value for protein content. The highest value for elongation ratio (2.03) was found for KS282 which was due to grain linear elongation and proved its better cooking quality as compared to other varieties.

The highest coefficient of variability was observed for productive tillers/hill followed by 1000 grain weight (3.81), seed setting percentage (3.77), panicle length (3.33), plant height (2.03) and days to flowering (0.61) respectively.

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