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Performance of Four Varieties of Fine Rice for Best Yield and Yield Components Under Climatic Conditions of Bahawalpur (Pakistan)

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ABSTRACT

The study was conducted in 2004 - 05 at Arid Zone Research Institute Bahawalpur, Pakistan under Complete Randomized Block Design (CRBD) with four varieties of Rice (Rachna, Shaheen, Super & Basmati – 385) as treatments to screen out comparatively high yielding and best performing variety with respect to its other yield components, especially for Bahawalpur region. The variety Rachna performed at the top in terms of yield and yield components as compared to the remaining three fine rice varieties. The yield components like plant height (cm), tiller per plant, spike per plant and weight of 1000 grains were taken as performance parameters to compare the four varieties. Result based recommendations include the most important one linked with Rachna to be adopted on large scale in the rice based cropping system in arid zone around Bahawalpur, where subsoil water irrigation facility is available.

Key Words: Fine rice varieties; Performance; Yield (kg ha^{-1}); Yield parameters or components; Food crop

INTRODUCTION

Rice is the second most important food crop of the world as well as Pakistan. It is a staple food of more than half of the world's population and especially in those areas of the world, where population densities are highest (Ironan, 1972). In Asia alone 90% of the world's rice is produced and consumed. It is foreseen that the world's population may exceed 8 billion by 2025 and will need 765 million tons of rice for annual consumption, which is 70% more than consumed today (Duwayrie *et al*., 1999). It is a major export item, which account for 5.7% of the total value added and 1.3% to the GDP. But its export declined to around 1.7 million tons by 2004 - 05 as the targets could be achieved due to poor planning (Anon, 2005). This increase in rice production must be achieved through utilization of less land, less water and little agro-chemical use as well as by growing high yielding varieties of rice so that the difference between potential and actual yield can be bridged up.

Rice is cultivated throughout Pakistan under wide range of climatic conditions. It is the 2nd most important staple food after wheat and earn major foreign exchange after cotton. In-spite of the prime position of rice in the country's economy, the average yield is 1970 kg ha^{-1}, which is much less than other rice growing countries of the world. In Pakistan, it covers an area 2460.6 thousand hactares with an annual production of 4847.6 thousand tons in the years 2003 – 04 (Anon, 2005).

The study was designed to see the potential of rice varieties and to recommend the best high yielding variety for the area. It was observed that most of the farmers of Bahawalpur region use to grow rice under sub soil irrigation but they were un-aware of the fact that, which variety would be suitable for their area. Moreover, proper production technology was also not known to the farmers as they were not growing this crop since very long. Therefore, this study was direly needed for the area.

However, a major break through have been achieved in raising the yield of rice crop through transplanted rice culture but due to costly labour, compaction of soil structure due to puddling and failure of nursery due to various factors e.g., un-favourable weather conditions, nutrient deficiencies, toxicities and lack of plant protection measures, the farmers are reluctant to adopt transplanted rice culture. Moreover the un-predictable and aberrant floods and droughts have created instability in rice production and therefore heavy input rice culture is taken as a risky enterprise particularly for poor farmers of traditional rice growing areas. In addition to this any abnormality in nursery raising adversely affect not only the productivity of the rice crop alone but also the productivity of the whole rice-based cropping system (Chaudhry *et al*., 1966; Singh & Bhattacharyya, 1987; Baloch, 1994).

MATERIALS AND METHODS

Four rice varieties i.e. Rachna, Shaheen, Super, Basmati-385 were evaluated for yield and yield components for two Kharif seasons of the years 2004 and 2005 at AZRI, Bahawalpur. The land was prepared with mould board plough followed by double cultivator along with planking, after the harvesting of wheat crop. The fertilizers doses were used @ 100, 67, 62 (kg ha^{-1}) of NPK, respectively

(Chaudhry *et al*., 1986). All of the P and K and half of the N was incorporated into the soil at the last ploughing and the remaining half of N was top dressed at 30 - 35 days after transplantation (Chaudhry *el al*., 1966; Khan, 1997; Ashraf *et al.,* 1999). After preparation of the land heavy irrigation of sub-soil water (1149 ppm) was given and the depth of water in the field was maintained up to 3 - 4 cm after proper pudding (Muhammad *et al*., 1990).

Rice seedlings (25 days old) of the above mentioned varieties were transplanted with two seedling per hill with row to row and plant to plant distance of 23 cm (Chaudhry *et al*., 1966; Mannam *et al*., 1991; Singh & Singh, 1992). The row length used was 4 m with 6 rows plot^{-1} (Singh, 1982; Khalid *et al*., 1999). Complete Randomized Block Design was used with three replications of each variety. The transplantation of seedling in the field was made on June 15 in each season of Kharif 2004 and 2005.

The observation were recorded in both Kharif seasons for plant height, tiller plant^{-1}, no. of spikes plant^{-1}, 1000 grains weight (gm) and yield kg ha^{-1} at the maturity of the crop. The data collected were subjected to Fisher's analysis of variance technique and LSD was used to compare difference among treatments mean (Steel & Torrie, 1980). The soil as growing media was also analyzed, which revealed the soil type as heavy loam with pH value at 8.5.

RESULTS AND DISCUSSION

The results regarding yield (kg ha^{-1}) of four varieties, showed significant difference. The variety Rachna out classed other three varieties by yielding 4009.590 kg ha^{-1} followed by Basmati-385, Shaheen and Super with the production of 3678.983, 2939.257 and 2175.303 kg ha^{-1}, respectively (Table I). The highest yield of Rachna variety was due to the best performance in terms of tillers plant^{-1}, spike plant^{-1} and weight of 1000 grains. However, the plant height (cm) of Rachna was at 2nd position (125.400 cm) after Basmati-385 at 129.767 cm followed by Shaheen at 177.33 cm and Super at 114.73 cm, respectively. The comparison of yield and other components in terms of their significant levels is given in Table I as per standard procedure. These results supported the results of (Chaudhry *et al*., 1986; Singh & Yadev, 1990; Yadev, 2000).

The results pertaining to tillers plant^{-1} showed significant difference among the four varieties of rice. The maximum number of tiller plant^{-1} (18) were obtained by variety Rachna, which significantly differ from variety Super that produced 10 tiller plant^{-1} and variety Shaheen that produced 14 tillers plant^{-1} but not varied significantly from Basmati-385 that produced 17 tillers plant^{-1} (Table I). These results supported the results of Cheema *et al*. (1985).

In case of spike plant^{-1}, the result showed the same trend with significant difference among the rice varieties (Table I). The maximum number of spike plant^{-1} 18 were shown by variety Rachna, which differ significantly from variety Super and Shaheen that produced 9.2 and 14 tillers plant^{-1}, respectively (Table I), but comparable to the number of tiller plant^{-1} produced by Rice variety Basmati-385 i.e., 17 (Table I). These results supported the results of Cheema *et al*. (1985).

Table I. Comparison of Means of Grain Yield and Yield Components of Four Fine Rice Varieties (Average of two years, 2004-2005)

Varieties	Plant Height (cm)	Tiller/plant	Spike/plant	1000 grain weight (gm)	Grain Yield (kg ha^{-1})
Rachna	125.400ab	18 a	18 a	21.50 a	4009.590a
Shaheen	177.333c	14cd	14 c	17.50 c	2934.257c
Super	114.73cd	10 c	9.2d	16.15cd	2175.303d
Basmati-385	129.767a	17ab	17ab	20.00ab	3678.983b

The greatest response in terms of grain weight, grain yield, no. of tillers plant^{-1}, no. of spike plant^{-1} was in Rachna ($p<0.05$).

CONCLUSIONS AND RECOMMENDATIONS

The result and discussion based on material and method has given the conspicuous conclusion and recommendation emphasizing the importance of Rachna variety as spelled out below:

1. Rachna variety is the best in terms of yield and allied components, which should be adopted on large scale in rice based cropping system of arid climatic conditions around Bahawalpur, where sub-soil water irrigation facility is available.
2. Wheat straw of Rachna is recommended for further research about its environment friendly utility for raising the facility to the farmers as well as for food of local livestock.
3. The agronomic practices needed for cultivation of Rachna variety are recommended to be further refined to reduce the input requirement for lowering the cost of production on one hand and increasing the yield further on the other hand.

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