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Agronomic Traits of Fine Rice as Affected by Transplanting Time

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Abstract: Study pertaining to variable transplanting time on agronomic traits of fine rice (Basmati-385) revealed that the crop transplanted with 30-day old seedlings during 2nd week of July produced increased number of panicle bearing tillers and heavy grains, resulting in the maximum grain yield of 4.2 t ha^{-1}, while delayed transplanting during the 3rd week of July resulted in the minimum grain yield of 2.6 t ha^{-1}.

Key words: Agronomic traits, fine rice, transplanting time

Introduction

Sowing of nursery and transplanting of rice seedlings at the optimum time are very important for obtaining high yield and good quality of kernels. Delayed transplanting adversely affect grain yield, milling recovery and the cooking quality of the scented Basmati rice (Ali *et al.*, 1991). The maximum productivity can be achieved by planting the crop at the optimum time at any specific location, which may vary from variety to variety (Babu, 1987; Anonymous, 1992). Since plant may exhibit its yield potential only when it is exposed to proper temperature during its growth period. Too low or too high temperature adversely affect the spikelet fertility in rice. Thus, to improve the yield potential of fine rice, optimum transplanting time needs to be precisely determined. The study was, therefore, planned to evaluate the effect of different transplanting dates on morphological traits of fine rice, Basmati-385, under the agro-ecological conditions of Faisalabad in irrigated environment.

Materials and Methods

The experiment was conducted at the Agronomic Research Area, University of Agriculture, Faisalabad during 1997 and 1998. A promising rice variety, Basmati-385 was used as test crop. Except the experimental treatments, all other agronomic practices were normal and uniform for all the experimental units. The experimental soil was sandy-clay loam having pH 7.9, organic matter 0.78%, total nitrogen 0.05%, available phosphorous 5.90 ppm and potassium 173 ppm.

The treatments comprised five transplanting dates viz., D_1 (3rd week of June), D_2 (4th week of June), D_3 (1st week of July), D_4 (2nd week of July) and D_5 (3rd week of July). The nursery was sown on different dates in order to get 30-day old seedlings for each transplanting date. The experiment was laid out in Randomized Complete Block Design with four replicates. The not plot size was 2 × 3 m^2. A recommended basal dose of 120-75-75 kg NPK ha^{-1} was applied in the form of urea (46% N), single super phosphate (18% P_2O_5) and sulphate of potash (50% K_2O), respectively. The whole quantity of phosphorus and half of nitrogen was applied prior to transplanting and the remaining half of nitrogen was applied in two equal splits each at tillering and panicle initiation. To overcome the zinc deficiency, zinc sulphate (20%) was applied @ 25 kg ha^{-1} four days after transplanting. A granular insecticide Sunfuran-3 G (Carbafuran) was applied twice @ 20 kg ha^{-1} against leaf folder and stem borer.

Data on different morphological traits were recorded using standard procedures and analyzed statistically by using Fisher's analysis of variance technique. Least significant difference (LSD) test at 0.05 P was employed to compare the treatment means (Steel and Torrie, 1984).

Results and Discussion

Different transplanting dates/times affected significantly the number of tillers $hill^{-1}$ in both years (Table 1). During 1997, the crop transplanted during 2nd week of July (D_4) produced significantly more number of tillers $hill^{-1}$ (20.1) and was followed by D_3 (18.0), D_2 (16.6) and D_1 (15.7), which were also statistically different from one another. The crop transplanted during 3rd week of July (D_5) produced significantly the minimum number of tillers $hill^{-1}$ (14.6).

Similarly, during 1998, the crop transplanted in the 2nd week of July (D_4) produced significantly the highest number of tillers $hill^{-1}$ (17.0) and was followed by that of D_3 (14.9). The crop transplanted in the 3rd week of June (D_1) and 4th week of June (D_2) produced statistically the same number of tillers $hill^{-1}$ (13.3 and 13.5, respectively). Significantly the minimum number of tillers $hill^{-1}$ (11.0) was produced by the crop transplanted in the 3rd week of July (D_5). These results are in concurrence with those of Kakiyaki (1980) and Gotyo and Hoshikawa (1989), who reported that the number of tillers under low temperature exceeded that obtained under high temperature. These results are, however, contrary to those of Xie *et al.* (1996), who stated that number of tillers increased under late sowing.

Transplanting times affected significantly the number of panicle bearing tillers $hill^{-1}$ in both years. In 1997, the crop transplanted during the 2nd week of July (D_4) although produced significantly more number of panicle bearing tillers $hill^{-1}$ (14.6) than that planted during the 3rd week of June (D_1) or 3rd week of July (D_3) but was at par with D_3 (1st week of July) and D_2 (4th week of June) which produced on the average 14.2 and 13.5 panicle bearing tillers $hill^{-1}$, respectively.

Similarly, in 1998, D_4 (2nd week of July) produced significantly greater number of panicle bearing tillers $hill^{-1}$ (12.7) than D_1, D_2 and D_3, which were at par with one another and produced 10.4, 10.5 and 11.0 panicle bearing tillers $hill^{-1}$, respectively. However, significantly the minimum of 8.9 panicle bearing tillers $hill^{-1}$ were recorded in D_5. These results are in line with those of Dhiman *et al.* (1996), who reported that the number of panicles m^{-2} was significantly higher at early planting than late planting.

Transplanting dates had significant effect on number of spikelets $panicle^{-1}$ during 1997. Transplanting during the 1st or 2nd week of July (D_3 and D_4) although produced statistically similar number of spikelets $panicle^{-1}$ (251.2 and 254.8, respectively) but were significantly higher than that recorded in D_2, D_1 and D_5, which were also statistically different from one another and produced on the average 225.6, 215.5 and 175.3 number of spikelets $panicle^{-1}$, respectively. The minimum number of spikelets $panicle^{-1}$ were recorded in D_5, which is attributed to reduced vegetative and reproductive period due to delayed transplanting as a result of which development of panicle was adversely affected.

The results were, however, non-significant during 1998 and the number of spikelets $panicle^{-1}$ on the average ranged between 161.5 and 196.2. The different transplanting dates affected significantly the 1000-grain weight in 1997 but during 1998, the results were non-significant. The crop transplanted during 4th week of June (D_2) although produced significantly heavier grains than D_1 and D_5 but was at par with D_3 (1st week of July) and D_4 (2nd week of July).

These results are in line with Mahmood *et al.* (1995), who reported that 1000-grain weight decreased with delay in transplanting time and contrary to Lee and Jun (1998), who stated that for 1000-grain weight sowing time had no effect.

The different transplanting dates/times affected the grain yield

Table 1: Effect of transplanting time on the yield and yield components of fine rice (CV. Basmati-385) during 1997 and 1998

Transplanting dates	Number of tillers hill^{-1}	Panicle bearing tillers hill^{-1}	Number of spikelets panicle^{-1}	1000-grain weight (g)	Grain yield (t ha^{-1})	Harvest index (%)
1997						
D_1 (15/6)	15.7d	12.3b	215.5c	19.5b	3.8b	20.6a
D_2 (23/6)	16.6c	13.5ab	225.6b	20.8a	4.2a	21.8a
D_3 (1/7)	18.0b	14.2a	251.2a	20.2ab	4.6a	23.4a
D_4 (9/7)	20.1a	14.6a	254.8a	21.3a	4.5a	22.5a
D_5 (17/7)	14.6e	12.0b	175.3b	19.0b	3.1c	17.4b
LSD value	0.6	1.5	7.2	1.3	0.4	3.0
1998						
D_1 (15/6)	13.3c	10.4b	182.4NS	20.1NS	3.2bc	17.7bc
D_2 (23/6)	13.5c	10.5b	182.2	19.7	3.1c	18.0bc
D_3 (1/7)	14.9b	11.0b	185.9	20.1	3.4b	20.0b
D_4 (9/7)	17.0a	12.7a	196.2	20.5	3.9a	25.9a
D_5 (17/7)	11.0d	8.9c	161.5	19.2	2.2d	15.5c
LSD value	0.5	1.5	-	-	0.4	3.9

Means sharing not a letter in common differ significantly at 0.05 P level using LSD test NS = non-significant

ha^{-1} significantly in both years. During 1997, significantly the highest grain yield (4.6t ha^{-1}) was produced by the crop transplanted during 2nd week of July (D_4), which was similar to that transplanted during 4th week of June (D_2) or 1st week of July (D_3). The crop transplanted during 3rd week of June (D_1) differed significantly from that transplanted during 3rd week of July (D_5) which gave significantly lowest grain yield (3.1t ha^{-1}).

During 1998, the crop transplanted during 2nd week of July (D_4) gave the highest grain yield (3.9t ha^{-1}). The crop transplanted during 1st week of July (D_3) or 3rd week of June (D_1) gave similar yield. Significantly the lowest grain yield (2.2 t ha^{-1}) was produced by the crop transplanted during 3rd week of July (D_5). These results are in agreement with those documented by Ram *et al.* (1978), Cai and Ling (1983), Acikgoz (1987), Mahmood *et al.* (1995), Paliwal *et al.* (1996) and Andrade *et al.* (1996), who established that grain yield decreased with delay in transplanting.

The different transplanting dates/times affected the harvest index significantly in both years. During 1997, the crop transplanted during 1st week of July (D_3) although gave significantly the highest harvest index (23.4%) but was similar to that transplanted either during 3rd week of June (D_1), 4th week of June (D_2) or 2nd week of July (D_4), against significantly the lowest (15.5%) for 3rd week of July (D_5).

By contrast, during 1998 the crop transplanted during 2nd week of July (D_4) showed significantly the highest harvest index (25.9%). The crop transplanted during 1st week of July (D_3) did not differ from the crop transplanted during 3rd week of June (D_1) or 4th week of June (D_2). Significantly lowest harvest index (15.5%) was obtained in crop transplanted during 3rd week of July (D_5) which was also at par with the crop transplanted during 3rd week of June (D_1) or 4th week of June (D_2). The results are partially in line with those of Jodon and Mellarth (1971) and Reddy and Reddy (1986) who stated that harvest index decreased with delay in transplanting.

Based upon the findings it can be concluded that fine rice be transplanted during 2nd week of July and for that purpose its nursery should be sown in the 2nd week of June to obtain 30-day old seedlings.

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