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RICE BASMATI-385 RESPONSE TO SINGLE AND SPLIT APPLICATION OF NITROGEN AT DIFFERENT GROWTH STAGES

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A field study to evaluate the effect of single vs. split application of nitrogen at different growth stages on agronomic traits of rice Basmati-385 was conducted at the agronomic research area, University of Agriculture, Faisalabad during 1998. The whole of P and K were applied each @ 75 kg ha" at the time of transplanting while N @ 125 kg ha" was applied; full at transplanting, full at tillering, full at panicle emergence, 1/2 at transplanting + 1/2 at tillering, 1/2 at tillering + 1/2 at panicle emergence stage, 1/2 at transplanting + 1/2 at panicle emergence stage and 1/3 at transplanting + 1/3 at tillering + 1/3 at panicle emergence stage. Nitrogen. as split application at different growth stages significantly affected leaf area per plant, number of spikelets per panicle, 1OOO-grainweight, grain and straw yields. Nitrogen applied in three equal splits each at sowing, tillering and panicle emergence stage gave the highest paddy yield of 4.92 t ha" which was statistically at par ~th that obtained from N split application as 1/2 at tillering + 1/2 at panicle emergence stage (4.90 t ha"). Nitrogen applied full at sowing also produced higher yield (4.73 t ha") against the minimum of 4.29 t ha:¹ in plots given full nitrogen at panicle emergence.

Key words: Single and split application of nitrogen, growth stages, agronomic traits, basmati-385.

INTRODUCTION

Rice (Oryza sativa L.) is an important cereal crop and plays a vital role in strengthening the economy of Pakistan, as it earned foreign exchange of Rs.21248 millions besides meeting the dietary requirements of the people (Anon,2000). Improper use of fertilizers and low plant population are the main causes for low yield in rice. (Chaudhry and All, 1982) Judicious and proper use of fertilizers can markedly increase the yield and quality of rice (place et al., 1970). According to Mahapatra (1971), proper fertilization can bring a break through in rice production. Similarly, Matheiu (1979) stated that a major constraint for low yield in rice is the unbalanced and injudicious use of fertilizers. Generally 50% of the applied nitrogen is used by rice plant and the rest of it is lost through volatilization, denitrification and! or leaching, and thereby resulting in very low N-use efficiency (Bonki et aI., 1996). Nitrogen use efficiency may be increased through its appropriate level and split application (Hussain, 1984). Like-wise Bacon (1980) observed that split application of N fertilizer at sowing, tillering and panicle emergence produced the highest paddy yield. Since proper and judicious use of fertilizer contributes a lot to improve rice Yield and gr~n quality, there is a need to find out a proper fertilizer application technique to minimize N losses and to improve its use efficiency. The present study was planned to determine the response of rice Basmati-385 to single and split application of nitrogen at different growth stages under the agro-ecological conditions of Faisalabad.

MATERIALS AND MEmODS

The experiment was conducted at agronomic research area, University of Agriculture, Faisalabad in a randomized complete block design with 3 replications. The net plot size was 2x3 m. The seed for raising nursery was sown in the 1st week of June and transplanting was done on 8th July 1998. There were 8 lines in each plot with row to row and plant to plant distance of 25 cm. The treatments comprised; full N at transplanting (Tl), full at tillering (T2), full at panicle emergence (T3), half at transplanting + half at tillering (T4), half at tillering + half at panicle emergence (T5), half at transplanting + half at panicle emergence (T6), 1/3 at transplanting + 1/3 at tillering + 1/3 at panicle emergence (T7)- Both the P and K @ 75 kg ha" were applied at the time of transplanting and 125 kg N ha" was applied as per treatments. The data on number of tillers per hill and number of spikelets per panicle were recorded on the basis of randomly selected 10 hills in each plot. Paddy and straw yields were recorded and converted at 12% moisture. The data collected were analyzed statistically by using Fisher's analysis of variance technique and differences among treatments were compared by LSD at P = 0.05 (Steel and Torrie, 1984).

RESULTS AND DISCUSSION

Leaf area is an important physiological variable which determines photosynthetic rate of field crops, thus their production capacity.

Table I showed that leaf area was significantly affected by nitrogen application at different growth stages. Although

T3 (full N at panicle emergence) produced the maximum leaf area per plant (45.57 cm') but was at par with T2, T6 and T7 which produced on an 44.77, 43.22 and 44.55 cm per plant, respectively. This was probably due to the reason that in this treatment (T3) full nitrogen was applied late at panicle emergence stage which prolonged the vegetative growth. Minimum leaf area (37.61 cm') was recorded in T4 where nitrogen was applied in two splits (1/2 at transplanting + 1/2 at tillering).

Plant height was not affected significantly either by single or split application of nitrogen at different growth stages and it varied from 159.60 to 169.93 cm for different treatments. (Table I.)

The number of panicle bearing tillers per plant was not influenced significantly by treatment, and number of panicle bearing tillers per hill ranged from 14.93 to 19.23 for different treatments. The number of spiklelts per panicle was also not affected significantly by nitrogen split applications. Hong (1995) reported that for increasing the number of spike1ets per panicle, full nitrogen should be applied at 3rd leaf stage.

The lOOO-grain weight (Table I) revealed that nitrogen application at different growth stages singly or in split significantly affected this parameter. Treatment T7 (1/3 N at sowing + 1/3 at tillering + 1/3 at panicle emergence) gave the maximum lOOO-grain weight compared to all the other treatments which were statistically similar to one another, Higher l000-grain weight in T7 might be due to availability of adequate nitrogen and its better utilization throughout the growing period. It was further observed that N stress at any of the above growth stages reduced the grain weight. These results are in agreement with those of Hong (1995) who reported that split application of N at various growth stages increased yield by increasing leaf area per plant, decreasing spikelet sterility and increasing the number of grains per panicle and 1000-grain weight.

Grain yield is a function of interplay of various yield components such as number of fertile tillers per unit area, number of grains per spike and 1000- grain weight. It is evident from Table I that paddy yield was significantly affected by spliting the nitrogen at different growth stages. Nitrogen applied in three spilts (T7) gave maximum paddy yield (4.92 t ha") followed by T5 (N as 1/2 at tillering + 1/2 at panicle emergence stage) which were statistically at par with each other. Higher paddy yield in these treatments may by attributed to their more number of spikelets per panicle and lOOO-grain weight. Yield variation can be associated with changes in anyone of these components. Minimum paddy yield of 4.29 t ha" was obtained from T3 (nitrogen applied full at panicle emergence) which was statistically at par with T2, T4 and T6. Overall nitrogen at earlier stages and in splits was superior in producing paddy yield. Many workers have reported similar yield trend by N application at various growth stages (Hussain, 1984 and Bacon, 1980).

Straw yield followed the same pattern as was observed in paddy yield. Among treatments, T7 produced significantly higher straw yield (12.46 t ha") which was statistically at par with the treatments T4, T2 and Tl. However, treatment T7 significantly differed from T6, T5 and T3 which was statistically at par with T4, T2 and Tl treatments while treatment T7 significantly differed from T6 and T3.

CONCLUSIONS

Nitrogen application in three equal splits at transplanting, tillering and panicle emergence is essential, as nitrogen applied in splits is utilized in a better way towards increasing grain yield. It is, therefore, recommended that nitrogen spilt application at three growth stages (transplanting, tillering and panicle emergence stage) should be followed to obtain higher paddy yield and greater economic benefits under the agroecological condition of Faisalabad.

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Table I. Effect [illegible] vs. split application of nitrogen at different growth stages on paddy yield and yield components of rice Basmati-385

Treatment	Leaf area plant-1 (cm²)	Plant height (cm)	Panicle bearing tiller plant⁻¹ (no.)	Spiklets per panical⁻¹ (no.)	1000-grain wt. (g)	Grain yield (t ha⁻¹)	Straw yield (t ha⁻¹)
T1	38.64cd	164.08 NS	14.43 NS	206.20 NS	18.00b	4.73ab	11.95ab
T2	44.77a	159.60	16.23	203.06	18.07b	4.48bc	11.95ab
T3	45.57a	162.73	14.93	203.06	18.04b	4.29c	11.08b
T4	37.61d	165.65	15.50	209.90	17.98b	4.53bc	11.73ab
T5	41.22bc	160.46	16.37	225.25	18.27b	4.90a	9.80c
T6	43.22ab	163.60	15.90	205.73	18.23b	4.37c	11.12b
T7	44.53a	169.93	19.23	215.93	19.11a	4.92a	12.46a
LSD	2.84				0.64	0.26	0.96

Means sharing a common letter differ non significantly at P= 0.05)

NS-non significant