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# EFFECT OF DIFFERENT PLANTING METHODS AND NITROGEN LEVELS ON GROWTH AND YIELD OF RICE (BASMATI·385)

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Field studies were conducted to evaluate the effect of two planting methods i.e. transplanting and direct seeding and three levels of nitrogen i.e. 0, 50 and 100 kg N ha'! on growth and yield of rice (Basmati-385) during the year 1998, The experiment was laid out in a randomized complete block design with split plot arrangement having 4 replications and a net plot size of 2 x 3 m. Yield and yield components were significantly affected by different planting methods and nitrogen levels. Transplanting produced significantly higher paddy and total dry matter yield (2.77 t ha'! and 8.54 t ha") than with direct sowing method (2.30 t ha'! and 7.46 t ha") but planting methods had no effect on harvest index. Among nitrogen levels, 100 kg N ha'! resulted in maximum paddy and total biomass yield of 3.03 and 9.74 t ha", respectively.Transplanting produced significantly more number of productive tillers per hill, more number of spikelets per panicle than direct sowing but planting method had no effect on lOOO-grainweight. Among nitrogen levels 100 kg N ha'! resulted in maximum number of tillers per hill, spikelets per panicle and lOOO-grainweight than rest of the nitrogen levels.

**Key words:** Basmati-385, growth and yield, nitrogen levels, planting methods

## INTRODUCTION

Rice *(Oryza sativa* L.) is an important cereal crop of the world and nearly more than half of the global population subsists on it. In Pakistan, it occupies second position after wheat, the staple food of the people. It supplies more calories than any other cereal. In addition, this crop plays a significant role in the economy of Pakistan as it contributes annually about Rs.18453 millions to the total national foreign exchange earnings (Anonymous, 1997). Transplanting and direct seeding are the two general methods used for rice planting. Although transplanting is the common method of rice production but it is more laborious, cumbersome, time consuming and entails a lot of expenditure on raising nursery, its uprooting, transporting etc., whereas for direct seeding only two man hours are required for the same area (Hashimoto et al., 1976). Careless transplanting by hired labour results in low planting densities in the farmer's field. The scarcity and high cost of farm labour invariably delay transplanting and often lead to the use of aged seedlings (Santhi et' al., 1998). Nitrogen is the most important nutrient for rice plant as it is required at much higher rates than other macro nutrients such as phosphorus and potash.

Increasing rate of nitrogen application significantly enhanced both paddy yield and TDM yield over control or lower rate of nitrogen application (Maqsood et al., 1998). Moreover, plant height, panicle length, tillers per hill and panicle bearing tillers per hill were also significantly affected by nitrogen application and 100 kg N ha'! was found to be an appropriate dose (Irshad, 1996). The application of nitrogen fertilizer either in excess or less than optimum rate deteriorates both yield and quality of rice to a remarkable extent. Thus proper management of crop nutrition is of immense importance. The present study, was, therefore, designed to compare the direct seeding technique with transplanting method and to investigate the effect of different nitrogen levels on rice (Basmati-385) and to determine the appropriate planting method and level of nitrogen that could help in achieving suitable paddy yield.

## MATERIALS AND METHODS

The experiment was conducted at the Agronomic research. area, University of Agriculture, Faisalabad during the year 1998. The experiment was laid out in a randomized complete block design with split plot arrangement and four replications. The plot size was 2m x 3m. The treatments comprised two planting methods viz. transplanting and direct seeding and 3 nitrogen levels viz. O(N), 50 (N!) and lOO($N_2$) kg N ha', Different planting methods were placed in main plots while different nitrogen levels were allocated to the subplots. The nursery for raising seedlings was sown in the first week of June and transplanting was done in the first week of July. At the same time, 24 hours water-soaked paddy seeds were sown direct by drill. There were 8 rows on each plot having row to row distance of 25 cm. Seed rate of 60 kg ha'! was used for direct-seeded rice. Phosphorus and potassium were applied @ 67 and 62 kg ha",

**Table 1. Effect of planting methods and nitrogen levels on yield and yield components of Basmati-385**

| | Paddy yield (t ha") | Total biomass (t ha") | Harvest index | No. of productive tillers hm[1] | No. of spikelets panicle" | 1000-grain weight (g) |
|---|---|---|---|---|---|---|
| **Planting method** | | | | | | |
| Direct sowing | 2.30b | 7,46b | 0.31 | 8.30b | 85.53b | 17.19 |
| Transplanting | 2.77a | 8.54a | 0.33 | 14.51a | 124.53a | 16.94 |
| **Nitrogen level** | | | | | | |
| OkgNha'1 | 1,91c | 6.28c | 0.31 | '8.51c | 85.03c | 15.70c |
| 50 kg Nha'l | 2.66b | 7.98b | 0.34 | 10.91b | 105,41b | 17.09b |
| 100 kg N ha'l | 3.03a | 9.74a | 0.31 | 14.78a | 124.65a | 18,40a |
| Linear | ** | ** | NS | ** | ** | ** |
| Quadratic | NS | NS | NS | NS | NS | NS |
| Mean | 2.53 | 8.00 | 0.32 | 11,40 | 105.03 | 17.06 |

Values in the same column having different letters differ significantly <p'~0.05).

respectively. All phosphorus and potassium and half of nitrogen was applied at the time of sowing and remaining half of nitrogen was applied one month after transplanting. All other agronomic operations except those under study were kept normal and uniform for all the treatments.' Standard procedures were adopted for recording the data on various growth and yield parameters. Data collected on paddy yield and yield components were analysed statistically. LSD test was applied for comparison of means (Steel and Torrie, 1984).

## RESULTS AND DISCUSSION

**Paddy Yield:** Data presented in Table 1 showed that transplanting gave significantly higher paddy yield (2.77 t ha") than direct seeding (2.30 t ha'). Increasing the nitrogen rate also significantly enhanced paddy yield, showing a linear response. The paddy yield was 1.91, 2.66 and 3.03 t ha" in control, 50 kg and 100 kg N ha", respectively. Overall average paddy yield of 2.53 t ha" was observed. Maximum paddy yield was obtained in transplanting at higher rates of N application. This contributed to effect lesser sterility, lesser abortive kernel and higher grain weight and thus higher yield. These results are supported by those of Singh and Singh (1993) and Maqsood (1998).

**Total Biomass Yield:** Total biomass yield was affected significantly by planting method. Transplanting increased total biomass yield to 8.54 t ha" than direct seeding method (7,46 t ha'I). Increasing rates of N application also influenced total biomass yield with a linear trend. The use of 100 kg N ha" gave the maximum total biomass yield of 9.74 t ha', The treatment 50 kg N ha" gave the total biomass yield of 7.98 t hal.whereas the minimum yield was produced by the control treatment. Generally, TDM increased with transplanting or with increasing nitrogen rates. Similar results were reported by other workers (Hussain, et al., 1989, Irshad ,1996 and Maqsood ,1998).

**Harvest Index:** Planting methods and nitrogen levels did not affect the harvest index. Similarly, the interaction between the planting method and nitrogen levels did not show any difference. Higher harvest index apparently was recorded in transplanting than with direct seeding and 100 kg N ha" but the differences did not attain the level of significance.

**Number of Productive Tillers** mll,l: Transplanting produced significantly more productive tillers hiU-[1] (14.51) than direct seeding (8.30). Different nitrogen levels also significantly affected the number of productive tillers hill,l showing a linear response. The maximum number of tillers (14.78) was recorded with the application of 100 kg N ha" followed by 50 kg N ha" (10.91) and 0 kg N ha'l (8.51), respectively. Application of N at enhanced rates led to the production of more tillers than with control

treatment. This probably was due to reduced competition for resources with these treatments compared to control, These results agree with those reported by Rafey et al. (1989).

Number of Spikelets Per Panicle: The number of spikelets panicle'l was significantly affected by the planting method. Transplanting significantly increased the number of spikelets per panicle over the direct seeding method by 31.32% (124.53 vs 85.53) (Table 1). Different nitrogen levels also significantly affected the number' of spikelets per panicle linearly. Among the fertilizer levels, the application of 100 kg N ha" produced the higher number of spikelets panicle" (124.65) followed by those with 50 kg N ha" and 0 kg N ha" which produced 105.41 and 85.03 spikelets per panicle, respectively. The maximum number of spiekelets panicle" obtained using transplanting could be due to sufficient amounts of moisture and nutrients available to the plants due to deep penetration and wide spread of roots at the panicle initiation and flowering stages, which eventually resulted in more panicle bearing and more number of spikelets panicle,l. The plants in direct sowing method were at disadvantage due to being shallow-rooted and high infestation of weeds which further reduced the availability of moisture and nutrient to the plants.

lOOO.GrainWeight: Thousand grain weight was not affected by planting methods. The average weight varied between 16.94-17.19 g/1000 grains in transplanting and direct seeding, respectively. However, different 'levels of nitrogen significantly affected the lOOO-grainweight and this response was linear (Table 1). The overall lOOO-grainweight was 17.06 g. These results do not agree with those reported by Singh et al. (1981) who showed higher grain weight in transplanting than direct seeding. Barner (1985) reported that application of 132 kg N ha" increased lOOO-grain weight. Results of the present study show that transplanting along with 100 kg N ha" is the appropriate technology for obtaining higher paddy yield under Faisalabad conditions.

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