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THE YIELD AND YIELD COMPONENTS OF FINE RICE AS INFLUENCED BY DIFFERENT SPACINGS

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Basmati-370 was grown at the rate of 44 (15x15 cm), 25 (20x20 cm), 16(25x25 cm), 11(30x30 cm) and 6(40x40 cm) hills per square metre to ascertain their effects on the yield and yield components of the rice cultivar Basmati-370. There has been consistent increase in the number of total as well as panicle bearing tillers per hill and 1000-grain weight with the decrease in planting densities. Plant height, number of grains per square metre and paddy yield per sq. m. were not affected significantly by the various planting densities. The maximum and minimum paddy yield of 280.07 and 219.7 g. per sq. m. was obtained by growing rice at the rate of 11 and 6 hills per sq.m. respectively.

Key words: *Oryza sativa* L. Spacing, Seedling densities.

INTRODUCTION

In spite of all the efforts made in the past to increase the rice production in Pakistan the average yield per ha. is still far below the potential yields of present recommended varieties. This situation provides a great impetus to our research workers for increasing per ha. yield. There are many factors responsible for low yield but planting density is considered to be the key factor limiting rice production. Planting density lower or higher beyond a certain limit affects the yield adversely. Rumiati and Oldman [10] observed that number of tillers and panicles per hill as well as the number of filled grains per panicle were decreased with increasing planting densities, while 1000-grain weight was increased significantly. Planting density had non-significant effect on grain yield of rice [9]. Similar paddy yields of cultivar Aswathi and Triveni were obtained by growing rice at five different planting densities [5]. Whereas, Lin *et al.* [8] reported a consistent increase in the yield with the decreased spacing. Similarly Shukla and Anjaneyulu [12] obtained significantly higher yields by growing two rice varieties at 10 x 10 and 10 x 15 cm. than growing at 15 x 15, 15 x 20 and 20 x 20 cm. According to Akita [1] increased planting densities decreased the number of panicles as well as grains per plant, while grain yield was reduced with increased plant densities. Increase in seeding rate increased the panicle number and did not affect grain yield [7]. Rice grown at spacing of 10 x 10 cm gave higher grain yield than that grown at wider spacing [11]. Bhosale *et al.* [4] revealed that 20 x 20 cm spacing produced significantly more rice yield than 20 x 15 and 15 x 15 cm spacing. Ghobrial [6] obtained more panicles/m^2 and fewer grains per panicle with increased planting densities. But the differences in paddy yield due to different planting densities were non-significant. Amir *et al.* [2] reported that 20 x 20 cm spacing produced higher grain yield than 10 x 10, 30 x 30 and 40 x 40 cm spacing. Increase in spacing significantly increased the number of panicles, 1000-grain weight and grain yield per hill. 20 x 20 cm spacing yielded significantly higher than 15 x 15 and 25 x 25 cm spacings [3]. Keeping these contradictory results in view studies were undertaken to determine the optimum planting density for fine rice variety Basmati-370.

MATERIALS AND METHODS

The investigations to study the effect of different spacing between hills and rows on the yield and yield components of rice, were carried out at the Agronomic Research Area, University of Agriculture, Faisalabad. The experiment was laid out in the randomized complete block design with four replications having a net plot size of 6 x 6 m. Six-week old seedlings were transplanted at distances of 15 x 15, 20 x 20, 25 x 25 and 40 x 40 cm between hills and rows with two seedlings per hill on 10 July 1983. The crop was fertilized at the rate of 50 kg N, 66 kg P_2O_5 and 66 kg K_2O per ha. in the form of urea, single superphosphate and potassium sulphate at the time of transplanting, while another dose of 50 kg N was applied 55 days after transplanting. Standard cultural practices were carried out till the crop matured. Ten hills

per plot were selected at random for detailed observations on different plant characteristics such as plant height, total and panicle bearing tillers per hill and 1000-grain weight. The data were analysed statistically by the Fisher Analysis of Variance technique and Duncan's Multiple Range Test at 5 % probability to compare treatment means.

RESULTS AND DISCUSSION

The data pertaining to yield and yield components presented in Table 1 indicated that planting density did not affect the plant height significantly. However, there had been consistent increase in plant height with increase in planting density. The plant height varied from 206.85 to 201.82 cm with the 15 x 15 and 40 x 40 cm spacing respectively. The increase in plant height with increased planting density had been due to more competition for light and air among the plants in case of higher planting density. Total tillers per hill were affected significantly by the planting density. All the planting densities differed significantly from one another. The maximum and minimum total tillers per hill were produced by 40 x 40 and 15 x 15 cm spacing respectively. Increased total tillers per hill with decreased planting densities were also observed by Rumiati and Oldman [10].

The trend of total tillers per hill were reflected in the panicle bearing tillers per hill almost in the same order. The 40 x 40 cm spacing produced significantly the maximum number of panicle bearing tillers per hill. 15 x 15 cm spacing not differing significantly from 20 x 20 cm produced the least number of panicle bearing tillers per hill than all other planting densities. The results are lent strong support by those of Rumiati and Oldman [10], Akita [1] and Bari *et al.* [3]. The number of grains per sq.m. were not affected significantly by any of the treatment under study and being varied from 11.7 x 10^3 to 15.9 x 10^3 in the case of 6 and 11 hills per sq.m. respectively. The non-significant differences had been due to more panicle bearing tillers per hill in case of wider spacing. 1000-grain weight was also affected significantly by planting densities. Grain weight was increased by decreasing the planting densities. The maximum 1000-grain weight (18.67 g) was obtained by growing rice at 40 x 40 cm spacing which remained at par with 30 x 30 and 25 x 25 cm spacing. The lowest 1000-grain weight (15.72 cm) was obtained by growing rice at 15 x 15 cm spacing which remained at par with 20 x 20 and 25 x 25 cm spacing. 30 x 30 cm spacing differed significantly from 15 x 15 cm spacing. The results are in conformity with those of Rumiati and Oldman [10] and Bari *et al.* [3] who observed an increase in 1000-grain weight with the increase in spacing.

The grain yield depends on individual plant performance as well as total number of plants grown per unit area. As regard paddy yield per sq.m. there were non-significant differences among all the five spacing treatments because of compensatory effect of proportionate increased tillering per hill and 1000-grain weight in the case of wider spacing treatments. However, highest paddy yield of Basmati-370 (280.07 g./m^2) was obtained from plots planted in hills of 30 x 30 cm. The results further led to the conclusion that Basmati rice (B. 370) should not be planted at a narrower spacing of less than 30 x 30 cm between hills and rows. The results are lent strong support by those of Devi *et al.* [5], Ghobrial [6] and Oyedokun [9] who obtained non-significant differences in paddy yield due to planting densities to a certain limit. But contradictory

Table 1. Yield and yield components of Basmati-370 as influenced by different spacings.

Plant spacing (cm)	Number of hills/m^2	Plant height (cm)	Number of total tillers per hill	Number of panicle bearing tillers/hill	Number of grains/m^2	Thousand grain weight (g)	Paddy yield/m^2 (g)
T_1 15 x 15	44	206.85$^{N.S}$	8.42 c	7.12 d	15.5x$10^3$$^{N.S}$	15.72 c	244.25$^{N.S}$
T_2 20 x 20	25	204.77	15.75 d	11.35 d	14.6x10^3	16.90 bc	247.25
T_3 25 x 25	16	204.52	22.97 c	18.8 c	15.8x10^3	17.25 abc	274.07
T_4 30 x 30	11	203.62	29.35 b	25.45 b	15.9x10^3	17.57 ab	280.07
T_5 40 x 40	6	201.82	38.45 a	33.97 a	11.7x10^3	18.67 a	219.7

(1) Means followed by different letters in the same column are significantly different from each other at 5 % level of significance = (ii) N S. = Non-significant.

results have been reported by Kupkanchanakul [7], Lin *et al.* [8] and Shukla and Anjaneyulu [12] who obtained higher paddy yield at closer spacing.

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