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Performance of Different Plant Densities for Yield and Yield Attributes of Basmati in the District Kapurthala

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ABSTRACT

A field study was conducted to see the effect of different plant densities for yield and yield attributes of Basmati at Krishi Vigyan Kendra Farm, Kapurthala during *Kharif* 2013. The experiment was laid out in randomised block design with three treatments viz; 18 plants/m^2, 26 plants/m^2 and 33 plants/m^2 with five replications on loamy sand soils. Basmati rice when transplanted with 18plants/m^2 gave significantly higher number of effective tillers/m^2 (16.7) and significantly lesser unfilled grains per panicle (15.7). Lesser plant densities of 18 plants/m^2 also gave significantly higher grain yield (46.5 q/ha) and straw yields (61.3 q/ha) than the plant densities of 26 plants/m^2 and 33 plants/m^2. Highest harvest index was recorded with higher plant densities of basmati rice.

Key Words: Basmati rice. Plant densities, Grain yield, Harvest Index

INTRODUCTION

Basmari rice (*Oryza sativa* L.) cultivation may be one of the crop diversification options available with the farmers of Punjab. A new variety of basmati rice namely Pusa Punjab Basmati 1509 is emerging as new economic pursuit for the farmers who go for intensive cultivation as they prefer to take three crops per year. Being a relatively recent introduction of this variety in Punjab, adequate information on the spacing aspects of this crop are not locally available. The crop plants depend largely on temperature, solar radiation, moisture and soil fertility for their growth and nutritional requirements. A thick population crop may have limitations in the maximum availability of these factors. However, farmers mostly maintained plant population of 18-20 plants/m^2 due to the fact that nursery is transplanted mainly by migrant labour and due to peak transplanting season labour tries to transplant maximum area in a day. So to overcome the labour problem during peak transplanting season, mechanical transplanting is the one of the option with the farmers for timely transplanting of basmati or paddy nursery in the field for getting high yields. Simultaneously, Punjab Agricultural University, Ludhiana had recommended a plant population of 33 plants/m^2 for getting better grain yields. In spite of best efforts of all extension personnel farmers are reluctant to maintain high plant population i.e. 33 plants/m^2. Farmers are already getting higher grain yields with lesser plant densities. The present study was, therefore, undertaken with the objective to assess the performance of Pusa Punjab Basmati 1509 under different plant densities.

MATERIALS AND METHODS

A field study was conducted at Krishi Vigyan Kendra Farm, Kapurthala during *Kharif* 2013. The experiment was laid out in randomised block design with three treatments viz; 18 plants/m^2, 26 plants/m^2 and 33 plants/m^2 with five replications. The soil of experimental field was loamy sand in texture, low in available N, available P, available K and organic carbon. Before sowing of nursery, seeds were soaked for 24 hrs in water solution of 1g streptocycline + 20g bavistin per 8 kg. of seed. After 24 hrs. of soaking, excess water was drained out and seeds were kept in wetted jute bags for next two days for sprouting to take place. Water was sprinkled over the seeds as and when required or jute bags dried. Seed of basmati variety Pusa Punjab Basmati 1509 was sown on 10th of June, 2013 on prepared field and nursery was

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transplanted on 26th of July, 2013 at KVK, farm. The recommended dose of fertilizers viz. 135 kg Urea /ha, 67.5kg DAP/ha was used for raising the crop. One spray of chlorpyriphos @ 2.5 l/ha. and one spray of Tilt @ 500 ml./ha was applied at panicle initiation stage for taking care of insect pest and fungal diseases. The crop was harvested on 1st of November, 2013 as per treatments. Data pertaining to different yield attributes like plant height, number of tillers/ hill, panicle length, number of filled and unfilled grains/panicle, grain and straw yield was recorded and statistically analysed as per statistical methods of Cochran and Cox (1966).

RESULTS AND DISCUSSION

Yield attributes

The data (Table 1) indicated that wider spacing had increasing effect on the performance of individual plants. The plants grown with wider spacing have more area of land around them to draw the nutrition and had more solar radiation to absorb for better photosynthetic process and hence performed better as individual plants. The data pertaining to different yield attributes of basmati as affected by different plant population revealed that number of effective tiller/hill, number of spikelets/panicle, number of unfilled grains/ panicle, grain yield and biological yield significantly affected with the varying plant densities . Significantly higher number of effective tillers/hill (16.7) were obtained in the treatment where plant density was 18plants/m^2 followed by 26 plants/m^2 (13.0) were planted and significantly lower number of effective tiller/hill (9.7) was obtained in the higher plant density treatment i.e. 33 plants/m^2. However, plant height at harvest, panicle length, number of filled grains/panicle, total grains/panicle and 1000 grain weight were remained non significant with the changing plant densities.

Grain and Straw yield

The treatment where plant density was 18plants/m^2 gave significantly higher grain yield of basmati (46.5 q/ha) than the treatments where plant density was 26 plants/m^2 and 33 plants/m$^{2.}$. Baloch *et al* (2002) also reported that the performance of individual plant grown with wider spacing was better as compared to the plant with narrower spacing and concluded that the spacing of 22.5 x 22.5 cm between hills and rows was most suitable for obtaining optimum grain yield in the rice crop. Highest straw yield (61.3 q/ha) was recorded with lesser plant density of 18 plants/ m^2 and closely followed by 26 plants/m^2 but the lowest straw yield was obtained with higher number of plants per unit area i.e. 33 plants/m^2 (fig.1). However, maximum harvest index (44.9%) was recorded with 33 plants/m^2.Optimum plant spacing influences the availability of sunlight and nutrients for growth and development. Among the different factors of rice productivity, desired number of plant spacing per unit area is an important one for getting higher yield (Soratto, 2004). Similar finding was also reported by Sohel *et al* (2009) and Rao *et al* (1990) which might be due to the fact that under wide spacing, plant get more nutrients and moisture which eventually led to the development of more grains as compared to closer spacing. These results were also in consistent with those of Ghosh *et al* (1988). Sterility percentage was recorded highest in the treatment where plant density was 26plants/m^2 where as treatments with 18plants/m^2 and 33plants/m^2 have recorded almost same sterility percentage (fig. 2).

Table 1. Yield and yield attributes of Pusa Punjab Basmati 1509 as affected by different plant densities.

Treatments	Plant height (cm)	No. of tillers/ hill	Panicle length (cm)	No. of spikelets/ panicle	No. of filled grains/ panicle	No. of unfilled grains/ panicle	Total grains / panicle	1000 grain weight (g)	Grain yield (q/ha)	Harvest Index (%)
T_1:18 plants/m^2	98.4	16.7	25.8	8.1	60.5	15.7	76.2	29.0	46.5	43.2
T_2:26 plants/m^2	96.4	13.0	25.1	8.5	58.1	17.4	75.4	29.0	42.8	41.6
T_3:33 plants/m^2	101.1	9.7	25.9	8.0	62.7	16.2	78.9	28.8	43.8	44.9
	NS	2.3	NS	0.4	NS	1.0	NS	NS	2.3	-

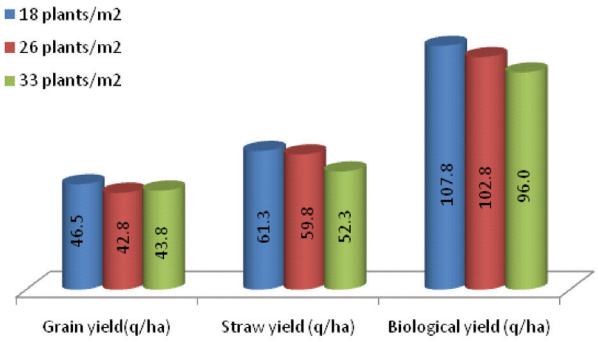

Fig.1: Grain yield and straw yield as affected by different plant densities

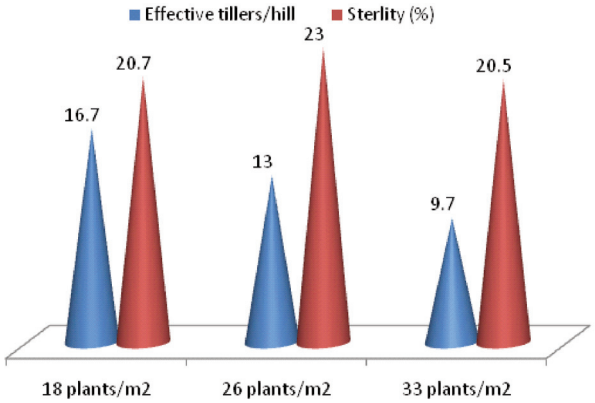

Fig.2: Effect of different plant densities on effective tillers per hill and sterility (%)

CONCLUSION

It was concluded from the field experiment that basmati rice when transplanted with 18 plants/ m^2 gave higher effective tillers/m^2, grain and straw yields and lesser unfilled grains/ panicle than the plant densities of 26 plants/m^2 and 33 plants/m^2. Highest harvest index was recorded with higher plant densities of basmati rice.

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