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Effect of planting geometry and different levels of nitrogen on hybrid rice

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ABSTRACT

Field experiments were carried out during wet season of 2007 and 2008 at Regional Research Sub-Station of Bidhan Chandra Krishi Viswavidyalaya, West Bengal to find out the response of hybrid rice to planting geometry and different levels of nitrogen. The experiment was consisted of 9 treatment combinations with three different levels of nitrogen and three different spacings. Hybrid rice variety 'Pro Agro 6201' was taken as the test crop. The experimental result revealed that different planting geometry and level of nitrogen had a remarkable influence on almost all the yield attributing characters and yield of hybrid rice. Different yield attributing characters viz. number of effective tillers m^{-2}, panicle length, filled grains $panicle^{-1}$ and test weight were increased significantly with the increasing level of nitrogen from 50 to 150 kg ha^{-1}. On the other hand, closer spacing (15cm x 15cm) produced significantly higher grain yield (6.00 t ha^{-1}).

Key words : *hybrid rice, planting geometry, nitrogen, yield attributes, yield*

With the beginning of new era with hybrid rice technology, the yield potential of newly developed rice hybrids remain unexploited in different locations as well as in different seasons. For exploiting the full heterotic potential of hybrids it is necessary to assess the performance of promising rice hybrids at graded levels of nitrogen under optimum spacing. Effective nitrogen management plays an important role in increasing the response of the rice crop to fertilizer (Zaidi and Tripathi, 2007). Variation in plant spacing may affect crop yield (Kewat *et al.,* 2002). The spacing may vary with dose of fertilizer, variety and growing season. The information on planting geometry and optimum nitrogen requirement of hybrid rice is very meager in West Bengal. Therefore, the present study was conducted to fill this gap in Entisols of West Bengal.

Field experiments were conducted during two consecutive wet seasons of 2007 and 2008 at Regional Research Sub-station, Bidhan Chandra Krishi Viswavidyalaya, Nadia under new alluvial zone of West Bengal. The topography of land is medium having medium fertility status with good drainage facility. The soil was sandy clay loam (Entisol) having a pH 7.15, EC 6.50 ds m^{-1}, organic carbon 0.65%, available P_2O_5 15 kg ha^{-1} and available K_2O 120 kg ha^{-1}. The experiment was laid out in split-plot design with three replications. Three levels of nitrogen (50, 100 and 150 kg ha^{-1}) were taken as main plot treatment and 3 spacing (20cm x 20cm, 20cm x 15cm and 15cm x 15cm) were taken as sub-plot treatment. Hybrid rice variety 'Pro Agro 6201'suitable for eastern region was transplanted with single seedling $hill^{-1}$. One third of N (Urea) and full doses of P_2O_5 (Single Super Phosphate) and K_2O (Muriate of Potash) were applied just before transplanting. Rest 2/3rd of N was applied in two equal splits at active tillering and panicle initiation stages, respectively.

All the yield attributing characters of hybrid rice except percent chaffy grain increased with the increasing levels of nitrogen (Table 1). Padmavathi (1997) also reported that with the increment of N levels, filled grains $panicle^{-1}$ also increases. The percent increment of filled grains $panicle^{-1}$ at 100 and 150 kg N ha^{-1} were 3.14 and 10.56%, respectively over 50 kg N ha^{-1}. The grain yield of hybrid rice increased significantly with the advent of higher levels of nitrogen. The yield increment was 25.37 and 32.32% with 100 and 150 kg N ha^{-1}, respectively. The increase in yield of hybrid rice due to N fertilization was attributed directly by the significant improvement of all the yield attributing traits *viz*. effective tiller m^{-2}, panicle length,

Table 1. Effect of nitrogen levels and spacing on yield attributes and yield of hybrid rice (pooled data of 2 years)

Treatment	Effective tiller m^{-2}	Panicle length (cm)	Filled grains $panicle^{-1}$	Chaffy grain (%)	1000 –grain weight (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Harvest Index (%)
Nitrogen levels								
50 kg ha^{-1}	270	21.4	127	12.7	22.35	4.61	6.62	41.05
100 kg ha^{-1}	291	22.9	131	8.5	23.30	5.78	7.95	42.09
150 kg ha^{-1}	302	23.8	142	9.7	23.70	6.10	8.28	42.65
CD (P=0.05)	11.31	0.41	19.4	0.90	NS	1.95	1.99	-
Spacing								
20×20 cm	260	22.9	149	10.7	23.20	4.23	5.84	42.00
20×15 cm	295	22.8	141	11.3	23.1	5.53	7.27	43.20
15×15 cm	313	21.1	131	12.2	22.80	6.02	7.46	44.65
CD (P=0.05)	13.29	NS	11.7	0.72	NS	1.73	1.85	-

filled grains $panicle^{-1}$ and test weight. Results are corroborated with that of Dwivedi *et al.* (2000).

Transplanting of hybrid rice at different spacing had a significant influence on both yield attributing characters and yield of rice (Table 1). At wider spacing number of effective tiller m^{-2}, filled grains $panicle^{-1}$ and test weight recorded higher but produced lower yield due to lesser number of plants m^{-2} as compared to closer spacing. Similar results were also reported by Padmavati *et al.* (1998). Hybrid rice seedling planted at closer spacing (15cm ×15 cm) recorded maximum number of effective tillers m^{-2} (313) but filled grains $panicle^{-1}$ and percent chaffy grain was lower (131 and 22.80%, respectively). However, under same situation (closer spacing) the yield was significantly superior (6.02 t ha^{-1}) than wider spacing due to more number of plant population per unit area. These results are in accordance with Kewat *et al.* (2002). Superior yield attributing characters under wider spacing was nullified due to lower plant population per unit area than that of closer spacing. Padmaja and Reddy (1998) also reported significantly higher yield of hybrid rice with the adoption of closer spacing than wider spacing.

Thus, the result indicated that hybrid rice under 15cm x 15cm spacing performed better when fertilized with 150 kg N ha^{-1} in wet season under lowland situations of West Bengal.

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