

## Effect of planting date and nitrogen level on grain yield of hybrid rice

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### ABSTRACT

An experiment was conducted to find out grain yield and nitrogen uptake by hybrid rice under different planting dates and N levels during 2007 and 2008. The hybrid rice planted on July 1 or July 15 had significantly higher grain yield and N uptake. Delayed planting between August 1 and August 16 significantly reduced the grain yield to the extent of 21.1% and 36.4%, respectively compared with planting of July 1. Number of effective tillers, grains panicle<sup>-1</sup>, test weight, grain yield, N concentration and uptake by grain and straw increased significantly with increasing levels of N from 60 to 120kg ha<sup>-1</sup>.

**Key words:** hybrid rice, planting date, nitrogen, level, concentration, grain yield

The yield improvement associated with hybrid rice necessitates development of appropriate cultural management practices to achieve the potential yield. Productivity of hybrid rice can be increased by scheduling the planting date according to weather conditions. Studies carried out by Om *et al.* (1999) showed significant difference in grain yield of rice due to change in planting dates only. Moreover, efficiency of N in hybrid rice is greater than conventional rice, but to make soil environment favorable for N absorption by plant, sufficient amount has to be supplied in soil system. Therefore, an experiment was undertaken to study the effect of planting date and N levels on yield N concentration and N uptake of hybrid rice.

A field experiment was conducted during wet season of 2007 and 2008 at Krishi Vigyan Kendra, Bhanjanagar, Odisha. The soil characteristics of the experimental field were sand 76%, Silt 11%, Clay 13%, Texture Sandy loam, pH (1:2) 6.61, EC (dsm<sup>-1</sup>) 0.06, Organic C (g kg<sup>-1</sup>) 5.05, Available N (kg ha<sup>-1</sup>) 197, Available P (kg ha<sup>-1</sup>) 22 and available K (kg ha<sup>-1</sup>) 246, respectively. Twelve treatment combinations consisted of 4 planting date and 3 nitrogen levels laid out in split plot design with 3 replications having planting dates as main and N levels as sub-plot treatments. The planting dates were July 1, July 15, August 1 and August 16 and 3 N levels were 60, 90 and 120 kg ha<sup>-1</sup>. A uniform dose of 60kg P<sub>2</sub>O<sub>5</sub> and 60kg K<sub>2</sub>O ha<sup>-1</sup> was supplied to the crop. Twenty five % N, whole amount of P and 50% of K were given as basal while 25% N was supplied at

tillering stage and rest 25% N and 50% K were applied at panicle initiation stage. Twenty-one days old seedlings of rice hybrid Rajalaxmi were planted at a spacing of 20cm x 15cm.

Planting of hybrid rice on July 1 and July 15 produced significantly higher grain yield than that of delayed plantings on August 1 and 16 (Table 1). Hybrid rice planted on August 16 reduced grain yield by 36.4% compared with that planted on July 1. The reduction in grain yield due to planting on August 1 was to the extent of 21.1%. The increase in grain yield of early planted crop was due to favorable environmental conditions such as temperature and relative humidity during its different phenophases compared to late planting (Verma *et al.*, 2008). The reduced grain yield in lated planted hybrid crop was mainly associated with the significant reduction in effective tillers, numbers of filled grains and test weight. The sterility percentage also increased under late planting compared to early planting. The results are in agreement with the findings of Lakpale *et al.* (1995) and Pandey *et al.* (2008). The harvest index of hybrid rice was significantly reduced under late planting.

Number of effective tillers, number of filled grains and test weight were significantly increased with increase in levels of N from 60 to 120kg N ha<sup>-1</sup> (Table 1). The increase in above yield components due to application of 120kg N ha<sup>-1</sup> significantly increased the grain yield of hybrid rice as the intensity and capacity

**Table 1. Effect of planting dates and nitrogen levels on yield components and grain yield of hybrid rice Rajalaxmi.**

Treatments	Effective tillers m <sup>-2</sup>	Filled grains ear head <sup>-1</sup>	1000 grain weight (g)	Sterility (%)	Grain yield (q ha <sup>-1</sup> )	Straw yield (q ha <sup>-1</sup> )	Harvest index
Planting dates							
1 <sup>st</sup> July	242	139	25.96	26.22	64.43	80.23	0.45
15 <sup>th</sup> July	237	136	25.75	26.93	60.65	78.83	0.43
1 <sup>st</sup> August	231	127	25.61	29.21	53.19	76.29	0.41
16 <sup>th</sup> August	223	119	25.55	30.35	47.22	73.51	0.39
CD (P=0.05)	5.20	3.85	NS	3.26	3.85	1.26	0.01
N levels (kg ha <sup>-1</sup> )							
60	221	127	25.35	26.86	52.04	74.30	0.41
90	246	133	25.65	27.35	60.97	77.81	0.44
120	261	142	26.98	32.54	67.46	82.46	0.45
CD (P=0.05)	4.25	4.47	0.24	3.76	3.40	2.20	0.02

**Table 2. Effect of planting dates and nitrogen levels on N concentration and uptake by grain and straw of hybrid rice.**

Treatments	Grain N conc. (%)	Straw N conc. (%)	Grain N uptake	straw N uptake	Total N uptake	available N in soil at harvest
Planting dates						
1 <sup>st</sup> July	1.42	0.37	91.49	29.69	121.18	203
15 <sup>th</sup> July	1.41	0.35	85.52	27.59	113.11	206
1 <sup>st</sup> August	1.35	0.31	71.81	23.65	95.46	210
16 <sup>th</sup> August	1.33	0.28	62.80	20.58	83.38	222
CD (P=0.05)	0.05	0.03	8.42	2.35	8.60	4.25
N levels (kg ha <sup>-1</sup> )						
60	1.33	0.27	69.21	20.06	89.27	201
90	1.38	0.32	84.14	24.90	109.04	214
120	1.44	0.37	97.14	30.51	127.65	226
CD (P=0.05)	0.04	0.04	5.86	3.12	7.95	3.98

of the soil to supply nitrogen was met by application of 120kg N ha<sup>-1</sup>. The application of 60kg N ha<sup>-1</sup> produced the lowest sterility percentage which was significantly lower than that of highest level of N application. The increase in yield attributes and grain yield due to N fertilization has also been reported by Pandey *et al.* (2008). Delayed planting also significantly reduced N concentration and uptake by grain and straw. The planting of hybrid rice on July 1 or 15 found to be equally effective for N concentration and uptake in grain and straw due to increased concentration and dry matter production as also reported by Pandey *et al.* (2008). Available N in soil at harvest significantly increased in planting of hybrid rice on August 16. The N concentration and uptake by both grain and straw increased significantly with increase levels of N from 60 to 120kg ha<sup>-1</sup> (Table 2).

Thus, planting of hybrid rice between July 1 and 15 along with 120kg N maintained sufficient N

concentration in grain and straw as well as increased grain and straw yield during wet season.

## REFERENCES

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