

## Effect of age of seedling and application of nitrogen on wet season rice

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### ABSTRACT

Field experiment conducted at BCKV Farm, West Bengal, with rice during wet season (2005-06) with two cultivars, seedling of two ages (25 and 35 days) and three fertility levels (40 Kg N + 60 Kg P<sub>2</sub>O<sub>5</sub> + 40 Kg K<sub>2</sub>O ha<sup>-1</sup>, 80 Kg N + 60 Kg P<sub>2</sub>O<sub>5</sub> + 40 Kg K<sub>2</sub>O ha<sup>-1</sup> and 15t FYM + 60Kg P<sub>2</sub>O<sub>5</sub> + 40 Kg K<sub>2</sub>O ha<sup>-1</sup> revealed that Khitish showed better performance over Satabdi increasing grain yield by 20.47%. Twenty five days old seedlings were superior to 35 days old seedlings resulting in increased grain yield by 4.90% and FYM @ 15 t ha<sup>-1</sup> gave best result over 40 Kg and 80 Kg N<sup>-1</sup> increasing grain yield by 18.41% and 5.89%, respectively. Maximum grain yield was associated with the highest no. of tillers m<sup>-2</sup>, no. of panicles m<sup>-2</sup>, length of panicle, filled grains panicle<sup>-1</sup> and test weight. The decrease in yield as a result of transplanting of aged seedlings (35 days old) for both the cultivars was associated with corresponding decrease in yield components. For maximum grain yield (3.86 t ha<sup>-1</sup>) the best combination was transplanting of 25 days old seedlings of Khitish with FYM @15 t ha<sup>-1</sup>.

**Key words :** rice, seedling age, nitrogen, farm yard manure.

As rice is highly sensitive to diverse ecological situations, optimum age of seedlings and fertilization are the vital factors in influencing the grain yield. The age of seedlings at the time of transplanting is important for uniform stand establishment and for realizing desired level of productivity. An ideal age of seedlings for transplanting is governed by the duration of the variety and field conditions (Murty and Sahu, 1979; Nandini Devi and Ibopishak Singh, 2000). Even the application of recommended NPK fertilizers devoid of organics has not been able to sustain crop productivity because rice is an exhaustive feeder of nutrients. Use of organic manure in addition to chemical fertilizers is known to improve the physico-chemical and biological properties of soil. Thus, integrated use of organic and chemical fertilizers was found promising not only in maintaining higher productivity, but also in providing maximum stability in crop yield (Rathore *et al*, 2004). Studies on the effect of farm yard manure and its interaction with N are limited on rice. Therefore, the present study was initiated to evaluate the correct age for transplanting the high yielding rice cultivars and their response to nitrogen and FYM.

Field experiment was conducted at Bidhan Chandra Viswa Vidyalaya Farm, West Bengal, during wet seasons of 2005 and 2006 under irrigated condition in Gangetic alluvial sandy loam soil, having 0.07% N, 24.85 Kg ha<sup>-1</sup> available P<sub>2</sub>O<sub>5</sub>, 185.51 Kg ha<sup>-1</sup> available K<sub>2</sub>O, 0.62% organic carbon and pH 6.8. The experiment was laid out in split plot design having 12 treatment combinations of 3 factors and 3 replications. Treatments comprised two rice cultivars Khitish (115 days duration) and Satabdi assigned to main plots; seedlings of two ages (25 and 35 days old) in sub-plots and three fertility levels (40 Kg N + 60 Kg P<sub>2</sub>O<sub>5</sub> + 40 Kg K<sub>2</sub>O ha<sup>-1</sup>, 80 Kg N + 60 Kg P<sub>2</sub>O<sub>5</sub> + 40 Kg K<sub>2</sub>O ha<sup>-1</sup> and 15 t FYM + 60 Kg P<sub>2</sub>O<sub>5</sub> + 40 Kg K<sub>2</sub>O ha<sup>-1</sup>) in sub sub-plot. The seeds of two cultivars were sown in nursery bed in the third and last week of June for two years of experimentation. Twenty five and 35 days old seedlings were transplanted in third week of July in a plot size of 5m×3m at 20cm.×20cm. spacing with 2-3 seedlings hill<sup>-1</sup> and irrigated as per requirement. Half the dose of nitrogen, full dose of phosphorus, potash, and well-decomposed air dried FYM were applied as basal at puddling, before transplanting and 25% N at active tillering stage and remaining 25% N at panicle initiation stage was top

dressed. Observations on various parameters were recorded at 15, 30, 45 and 60 days after transplanting (DAT) for number of tillers  $m^{-2}$  and at harvest (119 days) for plant height, number of matured panicle  $m^{-2}$ , length of panicle, filled grained panicle $^{-1}$ , test weight, grain yield, straw yield and harvest index and were analysed over two years' pooled data. Economics for cultivation were computed.

panicle length over Khitish (Table 1). It might be because of plant height and panicle length are varietal characters and little influenced by external factors.

Younger seedlings i.e. 25 days old recorded significantly more number of tillers and panicles  $m^{-2}$ , greater plant height and panicle length, which ultimately increased grain and straw yield and harvest index. But

**Table 1. Effect of age of seedlings and fertility levels on grain yield and yield attributing characters of rice.**

Treatments	No. of tillers $m^{-2}$	Plant height (cm)	No. of matured panicles $^{-2}$	Length of panicle	Filled grains panicle $^{-1}$	Test weight (g)	Grain yield (t ha $^{-1}$ )	Straw yield (t ha $^{-1}$ )	Harvest index (%)
Cultivars									
Satabdi	326	96.92	284	25.06	68	17.49	2.86	2.95	43.28
Khitish	356	90.57	286	24.04	128	23.16	3.44	4.52	49.24
CD (p = 0.05)	19.89	NS	1.97	0.59	31.87	0.49	0.27	0.27	5.70
Ages of seedlings									
25 days old seedling	350	98.61	291	24.98	97	20.29	3.23	3.78	46.85
35 days old seedling	332	88.88	279	24.13	99	20.35	3.08	3.69	45.67
CD (P = 0.05)	9.42	6.44	8.89	0.71	NS	NS	0.12	0.81	0.60
Fertility levels									
40kg. N+60Kg. P <sub>2</sub> O <sub>5</sub> +40Kg. K <sub>2</sub> O	308	91.72	251	24.30	88	19.88	2.86	3.52	45.46
80kg. N+60Kg. P <sub>2</sub> O <sub>5</sub> +40Kg. K <sub>2</sub> O	350	95.08	295	24.92	99	20.50	3.20	3.72	46.95
15+FYM + 60 kg. P <sub>2</sub> O <sub>5</sub> +40kg. K <sub>2</sub> O	365	94.43	309	24.45	106	20.59	3.39	3.98	46.37
CD (P = 0.05)	16.09	NS	5.20	NS	5.79	0.26	0.83	0.11	0.50

NS = Not Significant

Number of tillers  $m^{-2}$ , number of matured panicles  $m^{-2}$ , filled grains panicle $^{-1}$  and test weight were significantly higher for the variety Khitish over Satabdi, resulting in the increase of grain and straw yield and harvest index. Whereas plant height did not differ significantly. Satabdi recorded significantly higher

other parameters like number of filled grains panicle $^{-1}$  and test weight did not differ significantly between the seedling of two ages (Table 1). This result corroborated with the findings of AICRIP (1976) and Singh *et al.* (1999). In young seedlings, more tillers were produced which increased straw yield. Three fertility levels

**Table 2. Effect of interaction among cultivars, age of seedling and fertility levels on grain yield and yield parameters of rice (pooled for two years)**

Treatments	Panicle $m^{-2}$	Grains panicle $^{-1}$	Grain yield (t ha $^{-1}$ )
Satabdi 25 days old seedling N <sub>40</sub> P <sub>60</sub> K <sub>40</sub>	283	67	2.77
Satabdi 25 days old seedling N <sub>80</sub> P <sub>60</sub> K <sub>40</sub>	318	74	3.19
Satabdi 25 days old seedling FYM <sub>15t</sub> P <sub>60</sub> K <sub>40</sub>	335	80	3.36
Satabdi 35 days old seedling N <sub>40</sub> P <sub>60</sub> K <sub>40</sub>	228	53	2.29
Satabdi 35 days old seedling N <sub>80</sub> P <sub>60</sub> K <sub>40</sub>	265	64	2.72
Satabdi 35 days old seedling FYM <sub>15t</sub> P <sub>60</sub> K <sub>40</sub>	281	68	2.81
Khitish 25 days old seedling N <sub>40</sub> P <sub>60</sub> K <sub>40</sub>	252	117	3.23
Khitish 25 days old seedling N <sub>80</sub> P <sub>60</sub> K <sub>40</sub>	315	136	3.54
Khitish 25 days old seedling FYM <sub>15t</sub> P <sub>60</sub> K <sub>40</sub>	331	142	3.86
Khitish 35 days old seedling N <sub>40</sub> P <sub>60</sub> K <sub>40</sub>	242	116	3.15
Khitish 35 days old seedling N <sub>80</sub> P <sub>60</sub> K <sub>40</sub>	281	124	3.35
Khitish 35 days old seedling FYM <sub>15t</sub> P <sub>60</sub> K <sub>40</sub>	289	136	3.53
CD (p = 0.05)	10.22	14.59	0.36

**Table 3. Effect of cultivars and fertility levels on rice with respect to economic evaluation**

Treatments	Cost of cultivation except fertilizer (Rs. ha <sup>-1</sup> )	Fertilizer/manure Cost(Rs. ha <sup>-1</sup> )	Total Cost (Rs. ha <sup>-1</sup> )	Gross return (Rs. ha <sup>-1</sup> )	Net return (Rs. ha <sup>-1</sup> )	Benefit : Cost ratio
V <sub>1</sub> F <sub>1</sub>	17,000/-	478/-	17,478/-	20,912/-	3,434/-	0.196
V <sub>1</sub> F <sub>2</sub>	17,000/-	956/-	17,956/-	23,961/-	6,005/-	0.334
V <sub>1</sub> F <sub>3</sub>	17,000/-	15,000/-	32,000/-	25,285/-	- 6,715	-0.209
V <sub>2</sub> F <sub>1</sub>	17,100/-	478/-	17,578/-	28,168/-	10,590/-	0.602
V <sub>2</sub> F <sub>2</sub>	17,100/-	956/-	18,056/-	30,0451/-	11,995/-	0.664
V <sub>2</sub> F <sub>3</sub>	17,100/-	15,000/-	32,100/-	32,060/-	- 40/-	- 0.001

Cost of urea = Rs. 5.50/-Kg<sup>-1</sup>; Cost of SSP = Rs. 6/- Kg<sup>-1</sup>; Cost of MOP = Rs. 6/-Kg<sup>-1</sup>; Cost of paddy = Rs. 11/- Kg<sup>-1</sup>

significantly differed among themselves in influencing all the yield parameters except plant height and length of panicle, where 15 t FYM ha<sup>-1</sup> was significantly superior to other treatments. Between the nitrogen levels, 80 Kg N ha<sup>-1</sup> was significantly better over 40 kg N ha<sup>-1</sup> (Table 1). This is in agreement with the findings of Bhat *et al.* (2005); Muhammad *et al.* (2003) and Rathore *et al.* (2004).

The interaction effect among variety, seedling age and fertility levels was found to be significant only in respect of number of panicles m<sup>-2</sup>, number of filled grains panicle<sup>-1</sup> and grain yield. Twenty five days old seedlings of Kshitish with 15 t FYM ha<sup>-1</sup> recorded more panicle m<sup>2</sup> and granis panicle<sup>-1</sup> over other treatment combinations (Table 2). It was observed that though the variety Kshitish with 15 t FYM ha<sup>-1</sup> gave highest grain as well as straw yield, it was not the economically best treatment, because of the more fertilizer cost of Rs. 15000/-. With respect to economic point of view, Kshitish with 80 Kg ha<sup>-1</sup> gave highest net return of Rs. 11,995/- (Table 3). It gave highest benefit:cost ratio (0.664). Effect of FYM was also observed that it is persistent and it influenced the soil physical properties thereby increasing the production of both preceding and succeeding crop (Rathore *et al.*, 2004). However, if the FYM used in the treatment was an on-farm resource then it would be the best treatment for low cost.

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