

Effect of fertiliser and weed management of direct seeded rice (*Oryza sativa*) on nutrient utilization

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Received: December 1997

ABSTRACT

A field experiment was carried out during rainy seasons of 1993 and 1994 on sandy loam soil at IIT, Kharagpur to study the effect of fertilizer and weed management on nutrient uptake by direct seeded rice and associated weeds. Application of 60 kg N, 30 kg P_2O_5 and 30 kg K_2O + 6 t FYM/ha recorded significantly higher N, P and K uptake by rice as compared to others; whereas, the highest nutrient removal by weeds was noted under 60 kg N, 30 kg P_2O_5 and 30 kg K_2O /ha. Hand weeding and chemical weeding treatments significantly decreased the nutrient removal through weeds as well as increased the uptake by crop and gave higher grain (1.51 and 1.07 t/ha) and straw (2.39 and 1.97 t/ha) yields. However, minimum nutrient uptake by crop and maximum N, P and K removal by weeds was noted under unweeded check.

Key words: Fertilizer, Weed, Rice, Nutrient

In high rainfall region of eastern India, direct seeded rice is generally grown. Under such condition, weeds compete for moisture, space and light thereby create adverse environment which results in poor crop growth. Weeds usually grow faster than crop plants and thus absorb the available nutrients earlier resulting in lack of nutrients for growth of crop plants. Thus the effective weed control in direct seeded rice is not only important to check the loss of nutrients but also to increase the efficiency of applied fertilizer. Hence present experiment was undertaken.

MATERIALS AND METHODS

A field experiment was conducted during

rainy seasons of 1993-1994 on sandy loam soil being low in nitrogen (228 kg/ha), medium in phosphorus (10.2 kg/ha) and high in potassium (392 kg/ha) at IIT, Kharagpur. The experiment was laid out in split plot design with three replications. The main plot treatments consisted of four levels of fertilizer viz. $N_{30}P_{15}K_{15}$ + 3 t/ha FYM, $N_{60}P_{30}K_{30}$ + 6 t/ha FYM, $N_{30}P_{15}K_{15}$ and $N_{60}P_{30}K_{30}$ while sub-plot received four weed management practices viz unweeded check, hand weeding at 20 and 40 DAS, mechanical weeding at 30 DAS and chemical weeding with butachlor @ 1.5 kg/ha as preemergence. An additional treatment of butachlor @ 1.5 kg/ha as preemergence + 0.5 kg/ha 2,4-D as

Table 1. Effect of fertilizer and weed management on grain yield, dry matter of weeds and nutrient uptake by crop and weeds (pooled data of 2 years).

Treatment	Yield (kg/ha)		Dry matter of weeds (g/m ²)	Nutrient uptake by crop (kg/ha)			Nutrient removal by weeds (kg/ha)		
	Grain	Straw		N	P	K	N	P	K
<i>Fertility level</i>									
N ₃₀ P ₁₅ K ₁₅ + 3 t FYM/ha	1.37	2.62	74.05	39.95	3.40	34.95	7.90	1.20	5.10
N ₆₀ P ₃₀ K ₃₀ + 6 t FYM/ha	1.70	3.14	107.75	54.05	4.45	45.60	13.10	2.05	9.90
N ₃₀ P ₁₅ K ₁₅	1.30	2.57	95.30	41.20	3.40	35.15	9.20	1.35	7.50
N ₆₀ P ₃₀ K ₃₀	1.45	2.86	132.35	53.10	4.20	43.90	15.00	2.30	12.90
CD (P = 0.05)	0.09	0.23	5.83	3.47	0.24	2.97	0.57	0.12	0.53
<i>Weed management</i>									
Unweeded check	0.68	1.45	194.10	18.30	1.40	16.55	17.95	2.95	15.70
Hand weeding	2.19	3.84	19.85	74.75	5.50	59.20	3.55	0.50	1.80
Mechanical weeding	1.18	2.35	124.70	34.85	2.90	30.25	13.90	2.10	10.85
Chemical weeding	1.62	3.16	99.00	53.65	4.70	47.35	12.85	1.85	9.75
Chemical (Butachlor) + chemical, (2, 4-D) weeding	1.88	3.68	38.10	66.20	5.60	59.50	5.00	0.90	4.40
CD (P = 0.05)	0.85	0.17	6.13	2.87	0.18	2.66	0.80	0.15	0.78

post emergence was included in 1994. Half dose of N and full doses of P and K were applied as basal and remaining half dose of N was applied in 2 equal splits at 20 and 40 DAS. IR 36 rice was drilled in rows 20 cm apart with 80 kg seed rate/ha.

RESULTS AND DISCUSSION

Nutrient uptake by rice

Fertilizer level up to $N_{60}P_{30}K_{30}$ (60 kg N, 30 kg P_2O_5 and 30 kg K_2O /ha) + 6 t FYM/ha significantly increased the N, P and K uptake by crop as compared with other levels of fertilizers applied through inorganic source or in combination with FYM. Significantly higher yield (grain and straw) obtained under this treatment leads to greater uptake of N, P and K. Among the weed management practices, hand weeding at 20 and 40 DAS resulted in significantly higher uptake of nitrogen as compared to other practices. However, P and K uptake was significantly higher under butachlor @ 1.5 kg/ha as preemergence + 2,4-D @ 0.5 kg/ha as post emergence treatment than others. Though it remained at par to hand weeding at 20 and 40 DAS. This was due to less crop-weed competition as is apparent from less dry matter production of weeds in these treatments (Table 1). Moreover, nutrient uptake is a function of both dry matter and nutrient concentration. The high dry matter production, concentration and yield in these treatments increased N, P and K uptake. Similar results were also reported by Murthy and Murthy (1978).

Nutrient uptake by weeds

Fertilizer levels and weed management

practices significantly influenced the nutrient removal by weeds (Table 1). Application of 60 kg N, 30 kg P_2O_5 and 30 kg K_2O /ha ($N_{60}P_{30}K_{30}$) resulted in significantly higher removal of N, P and K by weeds as compared to other levels of fertilizer applied either through inorganic source or in combination with FYM. Lowest removal of nutrients by weeds was observed under $N_{30}P_{15}K_{15}$ + 3 t FYM/ha. In general, all the weed management practices significantly reduced the nutrient removal by weeds compared to unweeded check. Hand weeding at 20 and 40 DAS showed the minimum nutrient removal by weeds, whereas, maximum removal was observed under unweeded check. Similar findings were also reported by Singh *et al.* (1987) and Rammoorthy (1991). Hence it is apparent that where the removal of nutrients by weeds was more the corresponding uptake by the crop was less and vice versa. Therefore, for efficient utilization of applied nutrients as well as to harvest increased yield, the weeds should be kept under control.

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