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INTEGRATED NUTRIENT MANAGEMENT FOR NEEDED YIELD TARGET OF RICE (*ORYZA SATIVA*) IN VARYING SOIL FERTILITY OF CALCAREOUS SOIL

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ABSTRACT

Nutrient requirements for the production of one quintal rice, on an average, were 2.21 kg N, 0.61 kg P_2O_5 and 3.12 kg K_2O. Percentages of utilization of fertilizer nutrients were 29.7 N, 17.4 P and 95.4 K. The percentages of contribution of compost nutrients were 16.0 N, 11.5 P and 22.6 K in rice nutrition. This indicates that a fraction of compost-nutrients are available to rice and rest of nutrients are available to succeeding crops. Targeted yield equations for scheduling of fertilizer dose for specific yield of rice were computed. The results of demonstration trials on farmer's field indicated that application of fertilizers based on soil testing always ensured economy and efficiency of fertilizer use. High yield of rice has been realised without over depleting the soil fertility when fertilizers are applied on the basis of soil testing.

Rice is a major crop of Bihar grown in 5490.5 thousand hectares with average yield only 977 kg/ha which is less than the average yield of country. The major constraint in its production is low fertilizer-use-efficiency and less fertilizer use by farmers. Fertilizer-use-efficiency hardly exceeds 30-40% for N, 15-20% for P and 60-70% for K in calcareous soil. It is essential to maximise fertilizer-use-efficiency and fertilizer use for increasing rice production.

The objectives of the present investigation were to evolve simple workable fertilizer adjustment equations under integrated use of chemical fetilizers with organic manure and to verify the validity of these equations for different yield target of rice in farmer's field of calcareous soils.

MATERIALS AND METHODS

Field experiments were conducted on rice (Var. Saket 4) at Rajendra Agricultural University, Pusa during 1987-88. The details of physical and chemical properties of main experiment and follow up trials are given in Table 1. Four gradients referred to as $N_0P_0K_0$, $N_{½}P_{½}K_{½}$ $N_1P_1K_1$ and $N_2P_2K_2$ were simulated by applying different amounts of N, P and K fertilizers ($N_1P_1K_1$ means 100 kg N/ha, 150 kg P_2O_5/ha and 100 kg K_2O/ha, respectively) and a previous exhausting crop of wheat was raised to stabilise the treatment. Each fertility gradient strip (85 m × 4 m) was divided into sub-plots (2.5 m × 4 m) which received 28 selected treatments from combinations of 5 levels of N (0, 40, 80, 120 and 160 kg/ha), four levels of P_2O_5 (0, 40 80 and 120 kg/ha), 3 levels of K_2O (0, 40 and 80 kg/ha) and four levels of FYM 0, 5, 10 and 15 t/ha) and 2 plots were kept untreated as control. Full doses of P and K and half of N were applied at transplanting

Table 1. Growth and yield attributes of linseed as influenced by sowing dates and varieties

Treatment	Plant height (cm)		Branches/plant		Capsules/plant		Grains/plant		1,000-grain weight (g)	
	1988–89	1989–90	1988–89	1989–90	1988–89	1989–90	1988–89	1989–90	1988–89	1989–90
Sowing date										
25 Oct	58.0	63.9	9.7	12.8	36.8	47.5	226.7	220.4	7.7	7.6
5 Nov	57.8	55.9	8.8	12.4	35.7	38.0	210.8	204.8	7.3	7.3
15 Nov	57.5	53.1	8.2	11.1	34.3	31.4	204.3	202.8	7.2	7.2
25 Nov	57.0	54.5	7.7	10.7	23.4	17.5	154.0	146.6	7.1	7.1
5 Dec	56.1	54.4	7.6	10.6	17.7	16.7	111.9	104.8	6.9	7.1
15 Dec	54.8	51.5	6.7	9.2	12.3	16.1	91.8	83.9	6.5	7.0
CD (P = 0.05)	NS	3.8	1.3	1.7	10.3	3.2	54.7	54.1	0.49	NS
Variety										
'R 17' (Local check)	55.5	54.5	7.4	10.2	25.1	25.5	153.9	142.2	7.7	7.6
'Jawahar 23'	59.8	55.9	7.9	11.3	25.6	28.6	156.2	142.5	6.9	7.1
'R 552'	55.3	56.2	9.0	11.9	29.5	29.6	189.6	196.9	6.8	6.9
CD (P = 0.05)	2.8	NS	0.63	0.83	2.10	2.72	NS	23.8	0.44	0.42

Table 2. Yield, total dry matter and net return form different varieties of linseed grown under different dates

Treatment	Maturity (days)	Straw yield (q/ha)		Grain yield (q/ha)		Total dry matter (q/ha)		Net profit (Rs/ha)	
		1988–89	1989–90	1988–89	1989–90	1988–89	1989–90	1988–89	1989–90
Sowing date									
25 Oct	127	54.1	54.9	15.5	11.7	69.6	66.6	10,500	7,200
5 Nov	119	28.8	47.8	13.4	10.6	42.2	58.5	8,900	6,180
15 Nov	114	27.7	31.4	11.2	9.7	38.4	41.2	6,700	5,280
25 Nov	107	26.6	31.4	10.9	6.6	37.5	38.0	6,400	2,090
5 Dec	101	26.5	31.1	9.1	5.8	35.6	36.8	4,600	1.290
15 Dec	96	25.6	25.5	6.6	5.0	32.2	30.5	2,100	560
CD (P = 0.05)		5.97	5.94	1.85	1.04	5.75	5.04		
Variety									
'R 17 (Local check)	119	29.9	35.5	8.9	7.1	38.8	42.6	4,400	2,630
'Jawahar 23'	125	32.1	35.9	11.4	8.4	43.5	44.3	6,900	3,930
'R 552'	119	32.7	39.2	13.1	9.2	45.8	48.4	8,600	4,760
CD (P = 0.05)		NS	NS	1.3	1.12	NS	3.11		

in 'R 552' and lowest in 'R 17'. The variety 'Jawahar 23' showed an intermediate response with these parameters.

Net return

The crop sown on 25 October proved the best on the basis of economics, net return being Rs 10,500 and 7,200/ha during 1988–89 and 1989–90 respectively (Table 2). The diminished net return was up to Rs 5,280 – 6,700/ha in the crop sown on 15 November, but the drastic reduction (Rs 2,090 – 6,400/ha) was obtained in the crop sown on 25 November. Under the shelter of double-cropping system, so much net return from linseed can be acceptable by the linseed-growers of Tawa command Area. Sowing of linseed beyond 15 November may be discouraged, as it is less remunerative in this area.

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