

conditions, moisture stress occurs during early stage of crop and hence both C_4 and C_3 plants close their stomata partially. However, for the same amount of stomatal opening, uptake of carbon dioxide might be higher in C_4 weeds than C_3 rice. This might be another reason for higher weed-growth rate.

The relative growth rate (RGR) of crop in unweeded plots was negative at reproductive stage in both the years (Table 1). In 1986, the RGR of the crop was negative even at maturity. The RGR of weeds in unweeded control was positive and higher than the RGR of crop in both the years except with maturity stage of crop where RGR was negative in 1987.

During 60–90 days after sowing of crop, RGR of weeds was higher than crop except

with thiobencarb in 1986. However, RGR of weeds was less from 90 days onwards in all the chemically weeded plots (Table 1). In 1987 RGR of weeds was higher at 60–90 days in all herbicide-applied plots, except with 2, 4-D ethyl ester (1 day after sowing). However, the RGR of weeds was negative and less than crop at maturity.

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Effect of sulphur-bearing fertilizer in conjunction with farmyard manure on the growth, productivity and nutrient uptake of rice (*Oryza sativa*)

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Sulphur is an important essential element for normal growth and development of plant. Sulphur deficiencies can be corrected through the application of S-bearing fertilizers along with organic manure or matter under intensive cropping (Jayaram *et al.*, 1990). Hence an experiment was conducted to study the effect of integrated nutrient management with S-bearing fertilizer, farmyard manure and crop residue on the growth and yield of rice

(*Oryza sativa* L.) during the rainy (*kharij*) season.

The field experiment was carried out at Kalyani during the wet seasons of successive years on sandy clay-loam soil, having 0.067% total N, 15.4 kg/ha available P_2O_5 and 229 kg/ha K_2O , with 8 fertilizer-management treatments (Table 1). Randomized block design was used for evaluating the yield potentiality of 'MW 10' rice. The

Table 1. Effect of different fertilizer combinations with farmyard manure on yield components, yield, essential nutrients, net profit and nutrient uptake (during rainy season, data of 2 years pooled)

Treatment	Effective tillers/m ²	Filled grains/particle	1000 grain weight (g)	Grain yield (q/ha)	Net profit/ha (Rs)	N	P	K	S
T ₁ , 100% N, P (SSP) + K to rice (60 : 30 : 30)	295	76	24.3	32.7	4,512	65.6	18.1	96.6	13.8
T ₂ , 100% N, P (DAP) + K to rice	272	71	24.0	28.3	4,408	54.2	15.4	83.6	9.6
T ₃ , 75% N, P (SSP) + K to rice	247	60	22.8	25.2	3,651	50.0	13.2	77.2	10.1
T ₄ , 75% N, P (DAP) + K to rice	237	58	22.6	24.5	3,551	44.8	11.6	63.3	8.2
T ₅ , as T ₃ + FYM @ 10 tonnes/ha to rice	305	82	24.7	33.7	3,786	61.9	17.2	92.9	13.7
T ₆ , as T ₄ + FYM @ 10 tonnes/ha to rice	262	66	23.3	27.5	4,096	50.4	12.7	70.3	9.3
T ₇ , as T ₃ + crop residues incorporation	288	67	23.7	30.0	4,656	52.5	13.4	73.5	11.6
T ₈ , as T ₄ + crop residues incorporation	238	59	22.8	25.0	3,495	42.4	10.7	54.6	8.5
CD (P = 0.05)	17.8	6.6	0.4	1.5					

SSP, Single superphosphate; DAP, diammonium phosphate; FYM, farmyard manure

recommended dose of fertilizer was kg 600 kg N, 30 kg P_2O_5 and 30 kg K_2O /ha through urea, single superphosphate or diammonium phosphate and muriate of potash respectively. Farmyard manure (10 tonnes/ha) and chopped greengram-crop residue (4 tonnes/ha) were incorporated into the soil thoroughly 15 days before final land preparation.

The pooled analysis revealed that dry-matter production, yield components (number of effective tillers, filled grains/panicle and 1,000-grain weight) and yield of rice improved significantly when the rice crop was fertilized with 75% of the recommended dose of N, P (through single superphosphate, content 12% S) and K along with farmyard manure @ 10 tonnes/ha (Table 1). The level of productivity of crop in the treatment was as good as the productivity obtained in the treatment receiving 100% of the recommended dose of N, P (through single superphosphate) and K as chemical fertilizers only. The maximum uptake of nutrients (N, P, K and S) was recorded in the treatment receiving 100% of the recommended dose of N, P (through single superphosphate) and K.

Fertilizer management with single superphosphate or farmyard manure showed higher positive sulphur balance in rice soil. The maximum net production value was recorded in the treatment receiving 75% of the recommended dose of N, P (through single superphosphate) and K along with farmyard manure @ 10 tonnes/ha or crop residue. Application of organic manure or matter in conjunction with reduced recommended dose (75% N, P and K) of fertilizer appeared more remunerative than 100% of recommended dose of N, P and K through chemical fertilizers only. It might be due to the fact that organic matter increased the efficiency of applied chemical fertilizers. Sulphur present in single superphosphate might enhanced the productivity and efficiency of nutrients and supplied sufficient sulphate-sulphur for optimum plant growth.

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Effect of weed-control method and nitrogen on rice (*Oryza sativa*) under mid-upland situation of north-east Bihar

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Weed control and application of optimum dose of nitrogen affect the yield of rice (*Oryza sativa* L.) favourably. Since no work has so far

been done on these aspects under the condition of the north-east alluvial plains (Kosi region) of Bihar, an experiment was