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Effect of split application of potassium with FYM on rice (*Oryza sativa*)

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ABSTRACT

A field experiment was conducted during 1993 and 1994 on light textured inceptisols at Raigarh under rainfed condition to study the influence of split application of K with FYM. Application of 30 and 45 kg K_2O/ha with FYM significantly increased panicle weight in 1994 while number of grains/panicle, test weight, straw yield, K-content and uptake were significantly increased over control in both the years. Split application of K did not affect yield over basal application. However, K-content and uptake were higher in split application of 45 kg K_2O/ha with 5 t FYM /ha over basal application in both the years.

Key words: Rice, Potassium, FYM

Potassium is the major limiting nutrient in crop production. The deficiency of K in light textured soils is one of the major causes to reduce vigour and disease resistance in plant, strength in straw and stalks of plants and ultimately yield of the crop. Fertilizer use efficiency of K is low because of its fixation in soil and losses through leaching etc. Split application of K may increase its efficiency in light textured soils of high rainfall areas. The combined application of K with FYM may also help in increasing productivity of crops. Therefore, an attempt was made to study the effect of split application of potassium on yield and K uptake compared with basal application in light textured inceptisols of eastern part of central India.

MATERIALS AND METHODS

A field experiment was conducted at Raigarh (M.P.) during *kharif* 1993 and 1994 in a randomized block design replicated thrice with 7 treatments viz. T_1 - control (no K), T_2-30 kg K_2O/ha at transplanting (basal), T_3-30 kg K_2O/ha in two equal splits at transplanting and tillering, T_4-30 kg K_2O/ha in three splits, 1/2 at transplanting + 1/4 at tillering and 1/4 at panicle initiation stages, T_5 - 45 kg K_2O/ha at transplanting, T_6-45 kg K_2O/ha in two equal splits at transplanting and tillering and T_7-45 kg K_2O/ha in three splits, 1/2 at transplanting +1/4 at tillering + 1/4 at panicle initiation. Each treatment was combined with 5 t FYM/ha except control. Twenty five days old seedlings were transplanted using three seedlings/hill in third week of July with a spacing of 20 × 10 cm. The soil of experimental site was Ustic inceptisol, sandy loam in texture with pH 6.2 and contained 0.64% organic carbon and

240.0, 8.0 and 280.0 kg/ha available N, P_2O_5 and K_2O, respectively.

RESULTS AND DISCUSSION

Yield attributes and yield

The number of grains/panicle, test weight, grain and straw yields were significantly higher with basal and split application of 30 and 45 kg K_2O/ha with 5 t FYM/ha over control in both the years (Table 1). However, panicle weight was significantly higher only in 1994. Roy *et al.* (1978) reported that application of potassium probably caused higher mobilization of nutrients in soil and plant, enhanced enzymatic activities and translocation of photosynthates in plant system, and ultimately increased the grain yield. Kurmi and Das (1993) reported that grain yield, dry matter production, number of panicles/m^2 and panicle weight increased at higher level of K, however, significant differences were observed in panicle weight and dry matter production only.

Application of 30 and 45 kg K_2O/ha in 2 and 3 splits i.e. 1/2 as basal + 1/2 at tillering, and 1/2 as basal + 1/4 at tillering +1/4 at panicle initiation, respectively with FYM failed to influence the yield attributes and yield as compared with basal application of 30 and 45 kg K_2O/ha with FYM (Table 1). Similar findings were also reported by Tandon and Sekhon (1988) and Thakur (1992).

K-content and uptake in rice

The higher K-content in plant was observed at initial stage as compared with panicle initiation, panicle emergence and maturity stages irrespective of the treatments (Table 2). Singh *et al.* (1994) also reported higher K-content at 30 DAS compared with 60 and 90 DAS. In general, 30 and 45 kg K_2O/ha in 3 splits with 5 t FYM significantly increased K-content over basal application of K. Potassium applied as basal did not cause significant difference in K-content and uptake, whereas split application of 45 kg K_2O/ha with FYM showed significant increase in K-content over split application of 30 kg K_2O/ha with FYM. K-uptake in grain, straw and total uptake significantly increased with 30 and 45 kg K_2O/ha with FYM over control (Table 2). Application of 45 kg K_2O/ha in 2 or 3 splits with FYM showed significant increase in K-uptake

Table 1. Effect of split application of potassium with FYM on yield attributes and yield of rice

Treatment	Panicle weight (g)		Grains/ panicle		1,000 grain weight (g)		Straw yield (q/ha)		Grain yield (q/ha)		
	1993	1994	1993	1994	1993	1994	1993	1994	1993	1994	Mean
T_1	1.92	2.65	66.7	79.8	19.2	17.5	38.9	49.0	31.5	45.9	38.7
T_2	1.93	2.92	77.0	86.2	23.1	19.3	42.4	61.8	42.1	50.8	46.4
T_3	2.02	2.93	73.2	89.8	23.6	19.3	46.3	60.6	41.1	50.4	45.5
T_4	1.98	3.02	78.0	90.2	24.1	19.7	48.6	62.2	43.4	51.7	47.2
T_5	2.0	2.93	79.9	92.3	23.4	19.5	42.8	61.6	41.8	50.7	46.3
T_6	2.4	3.03	80.0	94.8	24.2	20.7	45.5	65.5	43.4	52.9	48.1
T_7	2.1	3.27	84.1	95.6	24.8	20.8	49.0	71.4	44.5	53.4	48.1
CD (P = 0.05)	NS	0.18	5.15	3.64	2.84	1.48	6.20	9.49	5.76	3.26	5.48

Table 2. Effect of split application of potassium with FYM on K-content and uptake in rice

Treatment	K-content (%)					K-uptake (kg/ha)			Relative K-uptake (%)	Balance K in soil (kg/ha)
	Tillering	Panicle initiation	Panicle emergence	Grain	Straw	Grain	Straw	Total		
T_1	1.48	1.14	1.05	0.78	0.86	35.8	42.1	77.9	–	115.0
T_2	2.46	1.76	1.51	1.10	1.15	56.0	71.1	127.1	423.7	66.0
T_3	2.10	1.50	1.39	0.96	1.02	49.4	67.2	116.6	388.6	84.0
T_4	2.58	1.88	1.57	1.18	1.20	60.9	74.2	135.2	450.5	58.0
T_5	2.32	1.66	1.49	1.06	1.10	53.8	67.2	121.0	268.0	72.0
T_6	2.18	2.20	1.79	1.34	1.38	70.8	90.5	161.3	358.5	42.0
T_7	3.12	2.30	1.87	1.37	1.42	73.1	101.3	174.4	387.5	35.0
CD (P = 0.05)	0.22	0.31	0.12	0.15	0.18	8.47	14.26	15.59		

compared with basal application of same dose of K and FYM. The highest and the lowest relative K-uptake values were recorded with 30 kg K_2O/ha in 3 splits with FYM and 45 kg K_2O/ha in 3 splits with FYM, respectively. In general, the decreasing trend of balance of K in soil was observed with increasing levels of K and split application of K with FYM indicating better utilization of applied K by rice crop.

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