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Potash fertilization on Sugarcane as affected by Irrigation

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ABSTRACT

Both individual and combined effect of potassium and irrigation on sugarcane production were studied through field experiments in Ganges River Floodplain soils of Bangladesh at Sugarcane Research Institute (BSRI) farm during 1992-93 and 1993-94 crop seasons. Four levels of potash 100,150, 200 and 250kg K_2O ha^{-1} and one control treatment were tested under rainfed and irrigated condition. Both potassium and irrigation have a positive effect on the yield contributing parameters of sugarcane but no significant increasing trend on yield was found.

INTRODUCTION

Water is the medium from which plants absorbs essential plant nutrients. In dry soil there is less water containing K reaching plants to satisfy transpiration needs. Also, under low moisture conditions the water films around soil particles are thiner and discontinuous, resulting a more tortuous path for movement of K to roots, this slows down the transfer of K to roots by diffusion. High concentration of K solution in dry soil helps to compensate these restrictions in K movement. Potassium availability initially increases after soil flooding because of favourable conditions for nutrient mobility. This increases in K availability enhances K uptake, but ultimately accelerates exhaustion of K supplies (Anon., 1989). Potassium plays and important role in sugarcane nutrition and its function for sugarcane nutrition are many (Humbert, 1968). A crop producing 100 tons of cane per hectare might remove 370 kg potassium (Morachan, 1984). Nutrient requirement of sugarcane varies from place to place according to the soils and climitic conditions (Davidson, 1962). Potassium reaches plant roots by transport in the soil solution and its concentration in the soil solution determines how much K can reach the roots within a given time. It should be recognized that levels of soluable K in the soil solution are only indicators momentary availability. For successful crop procution it is more important that the K concentration in soil solution be maintained at some satisfactory level throughtout the growing season (Anon., 1989).

MATERIALS AND METHODS

A field experiment was conducted during two cropping season 1992-93 and 1993-94 at Bangladesh Sugarcane Research Institute farm, Ishurdi, Pabna, to evaluate the individual and combined effects of potassium with irrigation on sugarcane production. Pre planting soil sample were collected at a depth of 30cm. The soils of the experimental farm belongs to High Ganges River Floodplain (Agro-ecological Zone 11) under Sara series. The soil was sandy clay loam in texture having pH 7.6, organic carbon 0.70%, total nitrogen 0.59%, available P 10ppm, exchangeable K 0.16 me/100g soil and available S

9ppm. Four levels of potash 100, 150, 200, and 250 kg K_2O ha^{-1} and one control treatment were tested in randomized complete block design with four replications, having a plot size 8mx6m. Six weeks old two-budded soil bed settling of variety lsd 16 were transplanted during mid October in both the year. Recommended rate of N 160, P_2O_5 110, S 40 and Zn 3 kg ha^{-1} were also applied in the experiment. The sources of N, P, K, S and Zn were Urea, Triple Super phosphate (TSP), Muriate of Potash (MP), Gypsum and Zine Sulphate respectively. Full doses of P, S, and Zn were applied at the time of transplanting. Nitrogen and potash were applied in two equal instalments at 30 and 120 days after transplanting. Soil texture was determined by hydrometer method, pH by glass electrode pH meter and total nitrogen by Macro kjeldahl method. Available P was determined by unsing 0.5M $NaHCO_3$ extraction and spectrophometer. Exchangeable K (NH_4OAc extractable) was determined by flame photometer and available S was determined by turbidimetric spectrophotometer method (Black, 1965).

RESULTS AND DISCUSSION

Application of potassium and irrigation did not show any significant individual or combined effect on different growth regulationg paramaters of sugarcane in the first year (Table 1). Levels of potash individually increases the tiller, millablecane and yield of cane, but no similler treand was found in the sugarcane yield. However the highest no. of millablecane and yield of cane was found with 150 kg K_2O ha^{-1}. The higher rate of potash 200 and 250 kg K_2O failed to produce additional millablecane and yield of cane compared to 150 kg K_2O ha^{-1}. Etawli and Gascho (1983) reported that higher rate of K (560kg/ha) reduced the sugarcane yield compared to 280kg K ha^{-1}. Similar trend was observed by Alam *et al.* (1995) that higher rates of potassium 200 and 250 kg K_2O ha^{-1} failed to produce more yield compared to 150 kg K_2O ha^{-1}. All the parameter of sugarcane increased by the application of irrigation, but the increment is insignificant. Combined effect of potash and irrigation showed increasing effect on sugarcane yield.

Table 1. Effects of potassium and irrigation on sugarcane (1992-93).

	No. of tiller /ha (000)	No. of Millable cane/ha(000)	Yield of cane (t/ha)	Recovery (%)
Rainfed	271.7	102.6	89.1	9.85
Irrigated	279.6	104.6	93.7	9.96
K_0	252.4	95.8	83.3	9.78
K_{100}	295.3	103.1	91.0	10.17
K_{150}	267.9	111.9	99.6	9.83
K_{200}	274.3	106.3	92.7	9.74
K_{250}	288.3	100.8	90.4	10.01
CD at P =0.05 for				
Potassium (K)	NS	NS	NS	NS
Irrigation(I)	NS	NS	NS	NS
KxI	NS	NS	NS	NS

Table 2. Effects of potassium and irrigation on sugarcane (1993-94).

	No. of tiller /ha (000)	No. of Millable cane/ha(000)	Yield of cane (t/ha)	Recovery (%)
Rainfed	221.2b	119.0 b	105.3a	8.46b
Irrigated	240.5a	130.1a	105.6a	8.99a
K_0	213.3b	117.2b	94.7c	8.23a
K_{100}	237.0a	125.5ab	102.6bc	8.72a
K_{150}	226.9ab	125.5ab	108.6ab	9.01a
K_{200}	238.1a	129.1a	108.4ab	8.91a
K_{250}	238.9a	125.1ab	113.4a	8.74a
CD at p =0.05 for				
Potassium (K)	21.28	8.86	8.17	NS
Irrigation(I)	9.52	3.93	NS	0.52
KxI	NS	NS	NS	NS

In the second year significant (Table 2) individual effect of potash and irrigation was found in tiller and millablecane production, but combined effect of potash and irrigation is insignificant in both the parameters. Potassium shows significant result on sugarcane yield, but combined effect of potash and irrigation was insignificant on sugarcane yield. The highest yield of cane recorded with 250 kg K_2O ha^{-1} was found to be identical with that form, 150 and 200 kg K_2O ha^{-1}. Irrigation did not show any significant result on the yield of cane through the tiller and millablecane production were significantly influenced. In this year irrigation shows significant results on percent recoverable sucrose content of sugarcane. Potassium alone or incombination with irrigation did not show any significant effect on percent recoverable sucrose content of sugarcane in both the years.

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