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EFFECTS OF PHOSPHORUS AND POTASSIUM APPLICATION ON YIELD, JUICE QUALITY AND THEIR CONTENTS IN SUGARCANE

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Sugarcane cv. Co 1148 grown on sandy loam soil deficient in available phosphorus and medium in available potassium, was fertilised with P_2O_5 and K_2O each at 50 and 75 kg ha^{-1} over control. Addition of phosphorus significantly increased the tiller population and yields of cane and sugar without affecting the germination, millable cane and juice quality. Except a significant increase in tiller population, potassium application did not affect the other yield attributes and juice quality characters. The percentage of tillers becoming millable canes decreased with the increased addition of phosphorus and potassium. With the increased addition of phosphorus and Potassium in soil, their contents incrersed though non-significantly in different parts at different stages of growth of sugarcane.

Most of the Indian soils are low in nitrogen, medium in phosphorus and high in potassium. Sugarcane removes 150 kg nitrogen, 63 kg phosphorus and 313 kg potassium per hectare (Mukherjee and Varma, 1950). Therefore, the continuous cropping of sugarcane may leave the soil exhausted in case the removal of nutrients is not replenished Inspite of the heavy removal of nutrients, sugarcane seldom responds to phosphorus and potassium in north Indian soils. The persent study reports the responses of sugarcane to the application of phosphorus and potassium.

MATERIALS AND METHODS

The experiment was conducted on a sandy loam soil having pH (1:2) 8.0, EC (1:2) 0.2 mmhos cm^{-1} Walkley and Black's organic carbon 0.4 per cent, Olsen's phosphours 10kg ha^{-1} and available K_2O 280 kg ha^{-1}. The soil was low in available N and P but medium in available K.

Sugarcane cv. Co. 1148 was planted in the furrows at 90 cm row to row spacing in February 1983 and 1984 and was harvested in January 1984 and 1985, respectively. Phosphorus (as diammonium phosphate) and potassium (as muriate of potash) each at 50 and 75 kg P_2O_5 and K_2O per hectare with a control were added at the time of planting. Nitrogen at 150 kg ha^{-1} as urea was applied uniformly to all the plots in 3 equal splits at planting, second and fourth irrigations. Each treatment was replicated thrice in a randomised block design. Soil samples were analysed before each planting and after harvesting as described by Khanna and Yadav (1979).

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Table 1. Responses of sugarcane to different levels of phosphorus and potassium

Treatments	Germination (%)	Tillers	Millable cane	Yield (q ha^{-1})		Pol	CCS	Purity	Available Nutrient (kg ha^{-1} after harvest	
		Thousands ha^{-1})		Cane	Sugar		(%)		P	k_2O
P_2O_5 (kg ha−1										
Control	40.8	119	89 (75)	648	68.29	16.93	10.54	84.19	9.5	271
50	42.0	139	93 (67)	757	73.72	16.39	9.74	81.86	15.5	260
75	43.0	150	93 (62)	758	75.39	16.28	9.95	81.58	18.0	258
CD (5%)	NS	3.37	NS	55.83	2.39	NS	NS	NS		
K_2O (kg ha^{-1})										
Control	39.0	129	90 (70)	718	72.53	16.60	10.10	82.15	9.1	270
50	40.5	138	91 (66)	728	73.02	16.75	10.14	82.55	8.7	292
75	40.6	142	91 (64)	722	72.10	16.25	9.99	82.93	8.9	305
CD (6%)	NS	3.37	NS	NS	NS	NS	NS	NS		

NS = Non-significant, CCS = Commercial cane sugar. The values in parentheses are the per cent of tillers to millable cane.

Phosphorus and potassium in the digested plant material were estimated with the help of Vanadomolybdophosphoric yellow colour method (Chapman and Pratt, 1961) and Flame Photometer, respectively.

RESULTS AND DISCUSSION

Effect of P and K on yield attributes of cane

Although the application of P and K did not affect the germination and millable canes significantly yet these fertilisers markedly increased the population of tillers. However, the percentage of tillers becoming millable canes decreased with the increased fertilizer dose. Phosphorus at 50 kg P_2O_5 ha^{-1} increased about 109 q cane yield per hectare whereas K application did not have any effect on cane yield. The increase in cane yield due to P application may be ascribed to the better growth of millable canes (Kadian *et al.* 1981). The medium fertility level of K might be responsible for its failure to give responses by the crop. The regression equation, $Y = 647 + 3.64X - 0.029 X^2$ described the relationship between cane yield (Y, q ha^{-1}) and P_2O_5 (X, kg ha^{-1}).

Effect of P and K on juice quality and sugar production

Neither phosphorus nor K addition had a significant effect on the juice quality parameters like pol per cent, CCS and purity coefficient. Similarly Kadian *et al.* (1981) also did not

Table 2. Effect of phosphorus and potassium on their concentration in sugarcane

Treatments	Phosphorus (ppm)				Potassium (%)			
	Sheath	Leaf	Whole plant		Sheath	Leaf	Whole plant	
			Grand growth	Harvest			Grand growth	Harvest
P_2O_5 (kg ha^{-1})								
Control	1050	980	1795	1270	1.70	1.65	1.19	0.69
50	1110	1160	1846	1345	1.76	1.70	1.23	0.72
75	1210	1280	1905	1412	1.86	1.80	1.26	0.74
CD (5%)	NS	NS	NS	NS	NS	NS	NS	NS
K_2O (kg ha^{-1})								
Contro	1070	1000	1795	1270	1.70	1.65	1.19	0.69
50	1080	1070	1820	1309	1 90	1.92	1.60	0.96
75	1100	1090	1835	1330	1.94	1.95	1.80	1.05
CD (5%)	NS	NS	NS	NS	NS	NS	NS	NS

observe any effect of P and K on juice quality.

The sugar production increased with increased application of P like that of Misra *et al.* (1964). The sugar production (Y, q ha^{-1}) may be predicted upon the application of P_2O_5 (X, Kg ha^{-1}) with the help of the regression equation, $Y = 76.04 + 0.11\ X$.

Effect of P and K on their residual soil fertility and contents in cane

The residual soil fertility of P and K after the sugarcane increased with their increased doses of addition. However, in the absence of their application, P and K levels decreased over control.

The increased application of p and K increased though non significantly their concentration in different parts of sugarcane at different stages of sampling (Table 2). This is in general that the content of a nutrient in a crop increases with its increased availability in the growing media.

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