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Determination of Optimum Level of Potash and its Effect Son Yield and Quality of Sugarcane

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Abstract: The results showed that the potash levels did not influence significantly the yield and yield components like the number of mailable cane at harvest m^{-2}, cane length (m), cane diameter, number of internodes per cane, intemodal length and weight per stripped cane. Similarly quality parameters like sucrose contents and commercial cane sugar showed non significant response to potassium. The highest stripped cane yield of 1000.83 t ha^{-1} was obtained with 180 kg K_2O ha^{-1}.

Key words: Level, Potash, quality, sugarcane, yield

Introduction

The demand of sugarcane is increasing because of increasing population. Potash is important plant nutrient and it improves the quality of sugarcane with increased yield and also play an important role in many physiological processes of plants. Sugarcane have high yielding potential. The average stripped cane yield of 50.3 t ha^{-1} is for below than the major sugarcane growing countries of the world (Anonymous, 1999). Further and cost of cultivation of sugarcane in Pakistan is high. The law of diminishing returns may be used in deciding the most profitable level of any input like fertilizer. The most profitable level of input depends upon marginal product and the prices of input or change in the technology affecting the values of marginal product (Sharma and Sharma, 1981).

In the literature there is lot of controversy over the application of potash. Many authors respond positive effect of k on sugarcane yield and quality. However, there are no. of authors (Sundara, 1985; Ranjha, 1988) who reported non significant effect of sugarcane yield and quality. At present Punjab Agricultural Department is recommending K at the rate of 150 kg ha^{-1}. In order to solve the controversy the following study was conducted.

Materials and Methods

The study was conducted at the Agronomic Research Area, University of Agriculture Faisalabad. The experiment was laid out in a randomized complete block design with three replications. The net plot size was 3.6 x 10 m. Sugarcane variety CO-1148 was used for this study. Potash treatments included in this study were 0, 60, 120, 180 and 240 kg ha^{-1}.

The N and P_2O_5 and 1/3 N were applied at sowing a remaining doses of N were applied at 1st and 2nd irrigation. All other agronomic practices were kept normal and uniform for all treatments. Data collected were statistically analyzed by analysis of variance technique at 5% level of probability (Steel and Torrie, 1981). The law of diminishing return was used to determine the optimum level of potash by equating the inverse price ratio with marginal product (Sharma and Sharma, 1981). At the time of harvest, climatic data of crop growing seasons were taken, which were compared with last 5 year crop growing season.

Results and Discussion

Stripped cane yield: Non significant results were obtained in case of stripped cane yield. The maximum stripped cane yield of 101.83 t ha^{-1} was obtained from the plots given potassium at 150 kg ha^{-1} but did not significantly differ from control treatment (Table 1). These results are supported by Ranjha (1988), Sundara (1985) and Rehman *et al*. (1990) contradiction with findings of Korndorfer (1990) and Degade (1976). This may be due to initial high K level in soil and different types of soil in which these experiment was conducted.

Optimum level: Optimum level of potash was determined by equating the inverse price ratio with marginal product (Table 2) which indicated that it was profitable to apply 180 Kg K_2O ha^{-1}, because inverse price ratio and marginal product did not match with each other. It indicated that further experiments should be conducted in which potash should be applied below 240 kg ha^{-1} to known the optimum range of potash. As the

Table 1: Effects of levels of potash on sugarcane yield and yield components

	Treatments k_2O t ha^{-1}				
	0	60	120	180	240
Stripped cans yield t ha^{-1} No. of mailable	88.3^{NS}	90.09^{NS}	91.01^{NS}	100.8^{NS}	96.36^{NS}
Canes it harvest (m^{-2})	10.49^{NS}	10.58^{NS}	10.60^{NS}	16.61^{NS}	10.50^{NS}
Cane langth (m)	2.38^{NS}	2.49^{NS}	2.55^{NS}	2.66^{NS}	2.45^{NS}
No. of intemodes/cane	23.78^{NS}	23.80^{NS}	24.20^{NS}	24.25^{NS}	24.06^{NS}
Internodal length (cm)	10.07^{NS}	10.46^{NS}	10.53^{NS}	11.09^{NS}	10.19^{NS}
Cane diameter (cm)	5.02^{NS}	5.37^{NS}	5.15^{NS}	5.27^{NS}	5.21^{NS}
Weight par stripped cane (kg)	0.84^{NS}	0.85^{NS}	0.87^{NS}	0.95^{NS}	0.91^{NS}

Table 2: Average Marginal product and inverse price ratio at different levels of potassium Application

K_2O applied (Kg Ha^{-1})	Yield obtained (kg ha^{-1})	Total product due to K_2O	Average product	Marginal product	Inverse price ratio
0	88330	-	-	-	25.14
60	90080	1700	29.33	29.33	25.14
120	91010	2680	22.33	15.33	26.14
180	100830	12600	69.44	163.65	26.14
240	95360	7030	29.29	91.66	25.14

Price of sugarcane kg^{-1} = 0.876 Rs. Price of fertilizer kg^{-1} = 22 Rs

Table 3: Enact of Levels of Potash on sugarcane quality

	Treatments k_2O t ha^{-1}				
	0	80	120	180	240
Suresnes Contents (%)	15.75	15.95	15.91	16.09	16.00
Commercial Cene super (%)	11.96	12.01	11.94	12.09	12.04

results showed that application of K has non significant effect on the sugarcans yield but the application of potassium to sugarcane ia still profitable. Depending upon the resoureses of farmar, he may have to consider the opportunity cost of capital and consider the different alternatives before investing in K application in sugaroane.

Yield components: The number of mailable canoe was not affected by different levels of potash (Table 1). These results are in agreement with Ahmad *et al*. (1993). Cane lerigth did not respond to potash. These results are in agreement with Sundara (1985). Cane diameter was not influenced by different levels of potash (Table 1). Similarly number of intanodes, internodal length and cane weight was not significantly influenced by the different levels of potash (Table 1). These results are also agreement with Yadav and Prasad (1986).

Quality parameters: Sucrose percentage and commercial cane sugar and quality parameters for sugeroane Maximum Sucrose contents and C.C.S. were Olat4ned as 16.07 and 12.09 % from the trasimarits 180 kg ha^{-1}, respectively.. The results was not significantly different (Table 3). These result and are in agreement with Elvali and Gascho (1983) and Sundara (1885) and against Degade (1976).

The present recommendation of Punjab Agriculture Departmara at the rate of 150 kg ha of K_2O needs further investigation. Depending upon the opportunity cost of capita it this fanners choose not to apply potassium to sugarcane, he may save up to Re. 3300 par hectare and ea a result the cost of cultivation rosy be reduced.

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