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Determination of Optimum Level of Potash and its Effects on Yield and Quality of Ratoon 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 milable cane at harvest m^{-2}, cane length (m), cane diameter, number of internodes per cane, internodal 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 101.83 t ha^{-1} was obtained with 150 kg K_2O ha^{-1}.

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

Introduction

Sugarcane is important cash crop of Pakistan and 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 the 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). This study was designed to determine the optimum level of potash and its effect on yield and quality of ratoon sugarcane.

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 number of authors (Zambello and Orlando, 1980 and Sundara, 1985) who reported non significant effect on 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 four replications. The net plot size was 3.6 X 8 m. Genotype SPSG-394 was used for this study. Potash treatments included in this study was 0, 50, 100, 150 and 200 kg ha^{-1}. The N and P_2O_5 was applied at constant rates i.e., 200 and 150 kg ha^{-1}, respectively. All P_2O_5 and 1/3 N were applied at sowing and 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 time crop growing season.

Results and Discussion

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) and Sundara (1985) and contradiction with findings of Korndorfer (1990) and Bajwa (1995). This may be due to initial high K level in soil and different types of soil in which these experiment was conducted.

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 150 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 200 kg ha^{-1} to known the optimum range of potash. As the results showed that application of K had non significant effect on the sugarcane yield but the application of potassium to sugarcane is still profitable. Depending upon the resources of farmer, he may have to consider the opportunity cost of capital and consider the different alternatives before investing in K application in sugarcane.

The no. of millable canes was not affected by different levels of potash (Table 1). These results are in agreement with Ahmad *et al*. (1993). Cane length 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 no. of internodes,

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

	Treatments K_2O t ha^{-1}				
	0	50	100	150	200
Stripped cane yield t ha^{-1}	87.5^{NS}	93.5^{NS}	93.6^{NS}	101.8^{NS}	90.9^{NS}
No. of millable canes at harvest (m^{-2})	16.3^{NS}	16.4^{NS}	16.6^{NS}	16.7^{NS}	16.4^{NS}
Cane length (m)	2.0^{NS}	2.1^{NS}	2.2^{NS}	2.2^{NS}	2.2^{NS}
No. of internodes/cane	17.8^{NS}	19.1^{NS}	20.5^{NS}	20.2^{NS}	20.4^{NS}
Internodal length (cm)	10.9^{NS}	11.1^{NS}	11.0^{NS}	11.1^{NS}	10.8^{NS}
Cane diameter (cm)	5.2^{NS}	5.2^{NS}	5.3^{NS}	5.2^{NS}	5.34^{NS}
Weight per stripped cane (kg)	0.54^{NS}	0.57^{NS}	0.56^{NS}	0.61^{NS}	0.58^{NS}

^{Ns} = Non Significant

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

K_2O applied (kg ha^{-1})	Yield obtained	Total product due to K_2O	Average product	Marginal product	Inverse price ratio
0	87500.0	-	-	-	25.14
50	93489.6	5989.60	119.80	119.80	25.14
100	93576.4	6076.40	60.76	1.74	25.14
150	101822.9	14322.90	95.49	164.90	25.14
200	90885.4	3385.42	16.93	,218.75	25.14

Price of sugarcane kg^{-1} = 0.875 Rs Price of fertilizer kg^{-1} = 22 Rs

Table 3: Effect of Levels of Potash on Sugarcane quality

	Treatments K_2O ha^{-1}				
	0	50	100	150	200
Sucrose contents (%)	16.90	17.11	17.28	17.73	17.78
Commercial cane Sugar (%)	11.40	11.66	12.20	11.85	12.04

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).

Sucrose peraentage and commercial cane sugar are quality parameters for sugarcane. Maximum Sucrose contents and C.C.S. were obtained as 17.78 percent and 12.20 percent from the treatments 200 kg ha^{-1} 100 kg K_2O ha^{-1} respectively. The results were not significantly different (Table 3). These results are in agreement with Sundara (1985), but are not agreement with Bajwa (1995).

The present recommendation of Punjab Agriculture Department at the rate of 150 kg ha^{-1} of K_2O needs further investigation. Depending upon the opportunity cost of capital if the farmers choose not to apply potassium to sugarcane, he may save up to Rs. 3300 ha^{-1} and as a result the cost of cultivation may be reduced. Further there is a need for research for efficient application of K such as application in the form of spray etc.

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