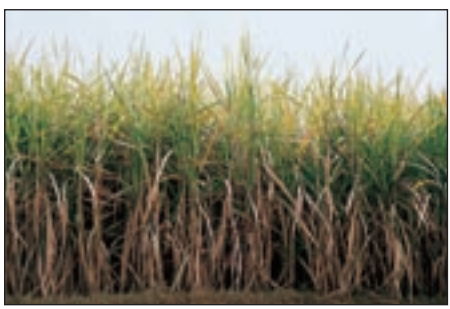
Effect of Different Levels and Sources of Potassium on Growth, Yield, and Quality of Sugarcane

By Tallat Masud Khosa

Sugarcane is an important cash and industrial crop of Pakistan, occupying about 1 million ha with an average yield of about 50 t/ha...much lower than the world average of 60 t/ha. This research shows significantly higher cane yield and quality can be achieved by adequate and balanced fertilization. Results indicate an increase of 30 percent due to the application of potassium (K).

In Pakistan, K fertilizer use is less than 1 kg/ha and is essentially insignificant when compared with the national average of 85 kg of nitrogen (N) and 21 kg of phosphorus (P) per hectare. Because soils in Pakistan are developed from micacious alluvium, they are generally considered to be well supplied with K. However, crops are becoming more responsive to K fertilization with the introduction of high yielding varieties and the continuation of intensive cropping practices.

Potassium deficiency exerts a negative effect on photosynthesis and carbohydrate transport in sugarcane and high rates of K are required for maximum economic cane yield. In order to study the effect of balanced fertilization on the yield and quality of sugarcane, a project was designed to determine both the appropriate rate as well as the economic effect of using different sources of K.



Balanced fertilization including K resulted in higher yield and improved quality of sugarcane in Pakistan research.

The effect of different sources and levels of K on growth, yield, and quality of sugarcane was investigated on sandy clay loam soil under the agroclimatic conditions of Faisalabad, Pakistan. Available soil K at the site was 174 parts per million (ppm). The test crop was ratooned sugarcane cv. Co-1148. Muriate of potash (MOP) and sulfate of potash (SOP) were used as K sources. The experiment used a split plot design with four replicates with sources of K in main plots and four levels of K (i.e., 0, 100, 150, and 200 kg K_2O/ha) in sub plots. Uniform rates of N and P were applied at 200 kg N/ha and 150 kg P_2O_5/ha, respectively.

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Source of K had no effect on growth, yield, or quality of ratoon

Table 1. Summarized data of sugarcane response to potash, Faisalabad, Pakistan.

K_2O levels, kg/ha	Yield parameters						
	Length, m	Diameter, cm	Inter-nodal length, cm	Stripped cane, kg	CCS, %	Sucrose, %	Yield, t/ha
0	2.21	2.31	10.2	0.90	9.6	14.6	77.2
100	2.34	2.35	10.4	1.12	10.2	15.2	97.5
150	2.40	2.36	10.7	1.20	10.7	15.8	98.2
200	2.49	2.36	10.8	1.23	11.2	16.5	100.8

sugarcane, as both sources were equally effective. However, as described below, K application rate significantly influenced growth, yield, and quality (**Table 1**).

Number of millable canes per unit area, cane diameter, and length of internodes increased with increasing rates of K fertilizer. Application of 200 kg K_2O/ha produced the longest canes (2.5 m). Maximum weight per stripped cane (1.23 kg) was attained in plots treated with either 150 or 200 kg K_2O/ha and decreased to 1.12 kg for canes harvested from the plots treated with 100 kg K_2O/ha. Maximum stripped cane yield (101 t/ha) was obtained from the plots treated with 200 kg K_2O/ha. Minimum stripped cane yield (77 t/ha) was harvested from the control plots.

Sucrose in the cane juice obtained from control plots was 14.6 percent against the significantly higher sucrose content of 16.5 percent found in plots treated with 200 kg K_2O/ha. Commercial cane sugar (CCS) percentage exhibited the same response trend to increasing K rates as sucrose content. Minimum CCS (9.6 percent) was found in the cane juice from control plots and significantly higher CCS (11.2 percent) was measured in the cane juice obtained from plots supplied with 200 kg K_2O/ha.

Conclusions

Both the sources of K (MOP and SOP) are equally effective in promoting growth, yield, and quality of ratoon sugarcane. Results showed that 100 kg K_2O/ha applied in combination with 200-150 kg N-P_2O_5/ha provided a large improvement in the sugarcane yield and quality parameters compared to the NP treatment. However, given the application rates selected for this study, it can be concluded that higher K application rates provided steady improvements in both yield and quality. The N-P_2O_5-K_2O combination of 200-150-200 produced superior results, but it appears that the yield curve was not broken. The question needs to be asked whether yield and quality benefits can be accrued with higher, or perhaps better timed, fertilizer application rates on these sandy clay loam soils of Faisalabad, Pakistan. **BCI**

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