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Response of sugarcane to some commercial fertilizers

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Abstract

Fertilizers play a vital role in increasing cane and sugar yield in sugarcane (*Saccharum officinarum* L.) crop. A field study was planned to explore the role of six different commercial fertilizers viz: My K-30, Dharti Abad, Mr. Zinc, Gold Star, pH Master and Earth blood were applied on sugarcane through fertigation method. Germination percentage, tillers per plants, cane count, sugar yield, cane yield, commercial cane sugar (CCS) and sugar recovery percentage, brix, pol and purity percentages were examined under different fertilizer amendments. The results showed non-significant influence of fertilizers on percentage germination, brix, cane and yield. Whereas, percentages of sugar yield, pol, purity, CCS and sugar recovery was significantly increased due to incorporation of Mr. Zinc. Therefore Mr. Zinc can be applied to sugarcane through fertigation to increase its juice quality.

Keywords: Fertilizers, sugarcane, sugar, yield

Introduction

Sugar cane is major crop of Pakistan with very low average yield (Khan *et al*., 2005). Incorporation of different type of fertilizers and micronutrients can improve soil fertility and can increase cane yield and sugar recovery (Sarwar *et al.,* 2009; Chattha *et al*., 2010). It has been stated that incorporation of balanced fertilizers like NKP can help to increase potential yield 165.176 t/ha (Khan *et al*., 2002). Malik (1990), estimated potential cane yields is 150-200 t/ha for Sindh, 100-150 t/ha for Punjab and 75-100 t/ha for NWFP. Kudachikar *et al.* (1992) found a considerable difference in sugar cane yield due to addition of some liquid micronutrients. They also found an increase in crop yield by 39.93% and sugar yield by 52.96%. Ali *et al.* (1997) recorded an increase in pol and Commercial Cane Sugar percentages, due to nitrogen addition in solid and liquid forms. Chattha *et al.* (2001) recorded increased yield by 34.50% due to utilization of press mud and other fertilizers.

Further, adequate fertilization is necessary in sugarcane to save foreign exchange spent on sugar import. Karstens *et al*. (1992), documented imbalance and inappropriate use of fertilizer for sugarcane cultivation in Pakistan. Hence, proper use of fertilizers occupies a vital management tool in sugarcane production (Hussain *et al.,* 2010). Sarwar *et al.* (2011) recorded non-significant effect of solid and liquid fertilizers on qualitative traits but significant effect on agronomic traits in sugarcane, except germination.

There are many different fertilizers available in the Pakistani market for sugarcane cultivation like Talc Lumps, Fluorspar, Calcium Carbonate Lumps/Powder, Calcium Flurite, Gypsum, Phosphate, Manganese, Chromite, Zinc, Gold star, pH Master etc. Present study was designed to ascertain the role of some commercial fertilizers on growth, yield and quality of sugarcane.

Materials and Methods

A field experiment was conducted at Farm of Sugarcane Research Institute, Faisalabad under semi-arid climate conditions. Sugarcane variety CPF 246 was planted as test crop in randomized complete block design arrangement in seven treatments replicated thrice. Seven different treatments/fertilizers included viz. My K-30, Dharti Abad, Mr. Zinc, Gold Star, pH Master and Earth blood. While, soil amended with FYM was served as control. The crop was planted in deep trenches made at 1.2 m apart from each other at seed rate of 50,000 Triple Budded Settts/ha during the month of February and harvested in same month next year. All the recommended agronomic and plant protection measures were adopted as and

when required during the whole course of study except fertilizers. Germination and tillering data were collected 45 and 90 days after planting while rest of parameters was recorded at time of harvest. The qualitative analysis was performed according to the procedure described by Meade and Chen (1998). The soil of experimental site was sampled at 0-15 cm, 15-30 cm and 30-45 cm, respectively for its physico-chemical characteristics (Table 1).

Results and Discussion

Germination percentage, cane count, brix percentage and cane yield

Results showed there was non-significant difference on germination, cane count and brix percentage due to incorporation of different fertilizers treatments as compared to control (NPK). Cane yield is the product of all agronomic parameters including germination, tillering and cane count. It was observed that addition of different fertilizers non-significantly influenced the cane yield (Table 2).

Tillers per plant

Tillering potential of cane determines the ultimate crop stand and it makes up deficiencies in germination (Sarwar *et al*., 2011). Highly significant numbers of tillers per plant were observed due to incorporation of My K-30 (2.40), Dharti Abad (2.37) and Earth blood (2.33), while the lowest numbers of tillers per plant were recorded in Mr. Zinc (1.97) as compared to control. The results coincide with Majeedano *et al*. (2003), who claimed significant differences for tillering among fertilizer treatments.

Sugar yield, pol, purity, CCS and sugar recovery percentages

Sugar yield is the product of cane yield and CCS. Maximum sugar yield was obtained due to Mr. Zinc (18.18 t ha^{-1}) and was statistically at par with My K-30 (17.78 t ha^{-1}) and Dharti Abad (17.46 t ha^{-1}). Likewise, the highest value of pol was recorded due to incorporation of Mr. Zinc (20.98%) followed by My K-30 (20.52%) and it was statistically at par with Dharti Abad (20.26%). Purity percentage is the ratio of pol and brix. Maximum purity was recorded in Mr. Zinc (91.07%) and the lowest was recorded due to NPK (82.54%). Sugar recovery is calculated from CCS by multiplying it with a constant factor of 0.94. The real cane quality is reflected by its CCS% and it stands the factor of prime importance both from miller"s and breeder's point of view. High recovery of sugar at a given stage determines cane maturity (Sarwar *et al*., 2011). The results revealed a significant difference among treatments for CCS and sugar recovery percentages. The maximum CCS (16.23%) and sugar recovery (15.25%) were obtained with Mr. Zinc (Table 2).

Rashid and Rafique (1998) reported zinc deficiency as the third most severe crop nutrition disorder in the country after nitrogen (N) and phosphorus (P). Increase in sugar yield, pol and purity percentage due Zinc based fertilizers is attributed to essentiality of Zn for growth of sugar cane. Zn is known to act as precursor of indole acetic acid (IAA), and play importance role in structural and functional integrity of number of proteins required for detoxification of reactive oxygen species (Filho *et al*., 2001).

Conclusions

It is concluded from the study that Mr. Zinc could be applied through fertigation to improve its juice quality and ultimately sugar yield and sugar recovery percentage.

Table 1: Physico-chemical properties of soil.

Parameters	Concentration at different soil depths		
	0-15 cm	15-30 cm	30-45 cm
N (%)	0.036	0.03	0.020
P (mg kg^{-1})	6.87	6.10	5.13
K (mg kg^{-1})	105	95	95
pH	7.7	7.8	7.7
$EC_{(e)}$ (dSm^{-1})	0.68	0.69	0.54
O.M (%)	0.72	0.55	0.41
O.C (%)	0.42	0.32	0.24
Sand (%)	42	40	40
Silt (%)	38	36	36
Clay (%)	20	24	24
Texture	Loam	Loam	Loam
SP (%)	36	34	36

Table 2. Response of sugarcane to some commercial fertilizers.

Treatments	Germ. (%)	Tillers per plant	Cane count (000 ha^{-1})	Cane yield (t ha^{-1})	Sugar yield (t ha^{-1})	Brix (%)	Pol (%)	Purity (%)	CCS (%)	Sugar Recovery (%)
NPK	52.60	2.013 bc	125.950	112.900	14.95 e	22.15	18.26 f	82.54 c	13.24 f	12.44 f
pH Master	52.75	1.990 c	125.980	112.000	15.63 de	22.25	18.87 e	84.89 bc	13.96 f	13.12 ef
My K-30	52.86	2.400 a	126.630	113.150	17.77 a	22.94	20.52 b	89.50 ab	15.71 ab	14.76 ab
Dharti Abad	53.22	2.370 a	126.770	113.180	17.46 ab	22.84	20.26 b	88.73 ab	15.43 bc	14.50 bc
Mr. Zinc	52.91	1.970 c	127.100	111.990	18.17 a	23.04	20.98 a	91.07 a	16.23 a	15.25 a
Earth blood	53.19	2.330 ab	127.120	113.210	16.73 bc	22.55	18.64 c	87.18 abc	14.78 cd	13.89 cd
Gold Star	53.34	2.150 abc	126.550	112.980	16.19 cd	22.35	19.21 d	86.00 abc	14.33 de	13.14 cd
LSD	**N.S**	**0.3182**	**N.S**	**N.S**	**0.8191**	**N.S**	**0.292**	**5.130**	**0.775**	**0.675**

In column values, with different letters show significant difference (P≤0.05) as determined by Duncan's Multiple Range Test (Steel *et al*., 1997).

References

Ali SA, Afridi MMRK, Singh RG, 1997. Comparative efficiency of soil and foliar applied nitrogen in sugarcane. *Indian J. Plant. Physiol.*, **2**: 75-78.

Chattha AA, Grewal MA, Ali FG, Ali Z, 2001. Exploitation of cane yield potential of sugarcane varieties. *Pak. Sugar J.*, **16**: 51-55.

Chattha MB, Maqsood M, Chattha AA, Muddasir MA, 2010. Effect of earthing up and fertilizer levels on growth and yield of spring planted sugarcane (*Saccharum officinarum* L.). *J. Agric. Res.* **48**: 327-334.

Hussain F, Sarwar MA, Ali MA, Fiaz N, Ghaffar A, Chattha AA, 2010. Impact of balanced fertilization along with time of phosphorous and potassium application on yield and quality of sugarcane. *Int. J. Agric. Appl. Sci.*, **2**: 95-100.

Karstens SM, Ross P, Luedders and Krauss A, 1992. Nutritive status of sugarcane in Punjab, Pakistan. *Pak. J. Agric. Res*., **13**: 327-333.

Khan IA, Khatri A, Nizamani GH, Siddiqui MA, Raza S, Dahar N, 2005. Effect of NPK fertilizers on the growth of sugarcane clone aec86-347 developed at Nia, Tando Jam, Pakistan. *Pak. J. Bot*., **37**: 355-360.

Kudachikar VB, Panchal YC, Chetti MB, Basarkar PW, 1992. Effect of micro nutrient spray on growth and yield in sugarcane. *Ann. Plant Physiol.*, **6**: 297-300.

Kumar V, Verma KS, Kumar V, 2001. Effect of N, P, K and Zn fertilizers and organic manures on plant and ratoon crops of sugarcane and soil fertility under continuous cropping. Proc. 63rd Annual Convention of Sugar Technologist Association of India. pp. 135-145.

Majeedano HI, Minhas YJ, Jarwar AD, Tunio SD, Puno HK, 2003. Effect of potash levels and methods of application on sugarcane yield. *Pak. Sugar J.*, **18**: 17-19.

Malik KB, 1990. Sugarcane production problems and research strategies for improvement. Dept. of Agric. Punjab. Pakistan.

Meade GP, Chen JCP, 1998. Cane Sugar Hand Book. 10th ed. A Wilay Inter Science Publication. Johan Willey and sons. New York. USA.

Sarwar MA, Hussain F, Ghaffar A, Nadeem MA, 2011. Effect of some newly introduced fertilizers in sugarcane. *Pak. Sugar J.*, **26**: 2-9.

Sarwar MA, Hussain F, Umer M, Bilal M, Nadeem A, Chattha AA, 2009. Comparative efficiency of solid and liquid fertilizers in sugarcane. *Pak. Sugar J.*, **24**:6-9.

Steel RGD, Torrie JH, Dickey DA, 1997. Principles and procedures of statistics. A biometrical approach. 3rd Ed. McGraw Hill Book Co., Inc. New York, USA.

Filho OJ, Rossetto R, Casagrande AA, 2001. Sugarcane. In: Ferreira, ME; Cruz, MCP; Raij, B.; Abreu, CA (editors) Microelements and toxicity in agriculture Jaboticabal, CNPq / FAPESP / POTAFOS, pp. 355-69.

Rashid A, Rafiq E, 1998. Micronutrients in Pakistani Agriculture: Significance and Use, Technical Brochure. Pak Agric Res Council, Islamabad, Pak. pp: 8.