Mycopath (2012) 10(1)**:** 21-23 **Research Article**

Performance of autumn planted sugarcane at varied fertilizer levels

Ghulam M. Wains[1], Muhammad A. Mudassir[1], Abdul Ghaffar[1], *Naeem Fiaz[1], Muhammad A. Sarwar[1], Zulfiqar Ali[1] and Malik F. H. Ferdosi[2]

[1]Sugarcane Research Institute, Ayub Agricultural Research Institute Faisalabad, Pakistan. [2]Institute of Agricultural Sciences, University of the Punjab Lahore, Pakistan.
[*]Corresponding author's email: naeem_1732@yahoo.com

Abstract

Field experiments were conducted at Sugarcane Research Institute Faisalabad, Punjab, Pakistan during September, 2009 to find out the promising sugarcane clones at suitable NPK rate. The trial was laid out in RCBD with split plot arrangement keeping fertilizers rates i.e. F_1 (136-75-75 NPK kg ha^{-1}), F_2 (168-112-112 NPK kg ha^{-1}) and F_3 (200-150-150 NPK kg ha^{-1}) in main plots with three sugarcane varieties/clones viz. HSF 240, S2003-US-633 and S2003-US-694 in sub plots. Data regarding germination (%), tillers per plants, millable cane (000 ha^{-1}), cane and sugar yield (t ha^{-1}) was recorded. The influence of NKP rates was non-significant on germination (%), tillers per plans and sugar yield. However, fertilizer dose of 68-112-112 NPK kg ha^{-1} was found effective to increase number of millable canes and cane yield as compared to rest of doses. Amongst three varieties, S2003-US-694 showed the best performance due to NPK amendments. It is concluded that incorporation of NPK @ 68-112-112 NPK kg ha^{-1} could be applied to increase cane yield of S2003-US-694.

Key words: Cane and sugar yield, fertilizer rates, sugarcane, varieties.

Introduction

Sugarcane (*Saccharum officinarum* L.) is the 2nd main cash crop in Pakistan that provides employment to more than 4.0 (M) people in the country. Sugarcane serves as main stay to sugar industry and raw material to many allied industries for alcohol and chip board manufacturing. It is planted on 1.001 million hectares with a total annual stripped cane production of 61.00 million tonnes, with an average of 55.49 t ha^{-1} (Anonymous, 2012). The yield is markedly lower than the average stripped cane yield of some major sugarcane yielding countries such as India (69.25 t ha^{-1}), China (66.52 t ha^{-1}), USA (75.48 t ha^{-1}), Brazil (76.45 t ha^{-1}) and Australia (81.73 t ha^{-1}) (FAO Stats, 2011).

Sugarcane is long duration exhaustive crop requires high quantity of nutrients, while continuous planting in the same field depletes the soil nutrients heavily (Ghaffar, 2009). Higher productivity of the cane and sugar depends on the interactive effects of genetic potential of the cultivars and proper crop husbandry practices including application of fertilizer at appropriate rate and time (Ghaffar, 2009, Ghaffar *et al*., 2010). Fertilizer is considered the foremost important and too expensive input in any agricultural production system. Use of balanced fertilizer contributes to enhance crop yield, the increase may varies from 30 to 60 percent. One kg of fertilizer nutrient produces about 114 kg of stripped sugarcane (Anonymous, 2012). A crop having yield of 100 tons per hectare uptakes 207 kg N, 30 kg P_2O_5 and 233 kg K_2O from the soil (Jagtap *et al.,* 2006). Therefore, these elements must be added in adequate quantities in the root zone of the crop for obtaining higher yield (Ghaffar, 2009).

Sugarcane Research Institute, Faisalabad has been working for last four decades on the development of new sugarcane varieties suitable for all agro-ecological zones of the Punjab and improved production technology for newly approved sugarcane varieties. Keeping in view the above mandate, the present study was designed to investigate the best performing promising sugarcane clones viz: HSF 240, S2003-US-633 and S2003-US-694 at different rates of NPK fertilizer.

Materials and Methods

The experiment was carried out at farm area of Sugarcane Research Institute, Faisalabad in RCBD with split plot arrangement during September, 2009 with three repeats having net plot size of 9.6 m × 6 m. Three fertilizer doses viz. F_1 (136-75-75 NPK kg ha^{-1}), F_2 (168-112-112 NPK

kg ha^{-1}) and F_3 (200-150-150 NPK kg ha^{-1}) were kept in main plots, while three variety/clones namely HSF 240, S2003-US-633 and S2003-US-694 in sub-plots. The data on germination percentage and tillers per plant were recorded at 45 and 90 days after planting, respectively. While number of millable canes (000 ha^{-1}) and cane yield (t ha^{-1}) at final harvest and later sugar yield (t ha^{-1}) was calculated.

All the data were subjected to Fisher's Analysis of Variance followed by LSD test to compare the treatment means at P≤0.05 (Steel *et al.,* 1997).

Results and Discussion

Effect of fertilizers on germination

The data showed non-significant effect of fertilizer as well as its interaction with sugarcane clones on germination percentage. The varieties differed significantly with relation to the parameter under study and the maximum germination (49.97%) was observed in S2003-US-694, while HSF 240 & S2003-US-633 was statistically at par with each other (Table 1). Chattha (2002) in his findings also reported non-significant effect of fertilizers on germination. These finding shows the inherent germination potential of cane setts (Sarwar *et al.,* 2009).

Effect of fertilizers on tillers plant^{-1}

The data pertaining to tillers plant^{-1} also depicted non-significant effect of fertilizer rates along with its interaction with sugarcane clones on tillers plant^{-1}. However, there was significant difference amongst three varieties with significantly highest number of tillers plant^{-1} (2.18) by S2003-US-633, and the lowest (1.55) by HSF 240 (Table 1). These results are in accordance with Afzal *et al.* (2003) and Mishra *et al.* (2004), who reported non-significant effect of varied doses of NPK on number of tillers per plant. On contrary, Majeedano *et al.* (2003) reported significant differences in tillering due to fertilizer treatments.

Effect of fertilizers on number of millable canes (000 ha^{-1})

Overall, there was significant difference amongst the rates of fertilizers, sugarcane varieties and the interactive effect of these parameters on number of millable cane. Highly significant number of millable canes (87.64) were recorded due to fertilizer rate of F_2 (200-150-150 NPK kg ha^{-1}) in S2003-US-694 (Table 1). These findings were confirmed by Raskar and Bhoi (2003) and Sinha *et al*. (2005).

Effect of fertilizers on cane yield

Generally, difference was highly significant amongst three NPK doses, three sugarcane varieties and their interactions. The highest cane yield (110.87 t ha^{-1}) was observed at fertilizer rate of F_2 (200-150-150 NPK kg ha^{-1}) in clone S2003-US-694 and the lowest (75.47 t ha^{-1}) was recorded at fertilizer rate F_1 (136-75-75 NPK kg ha^{-1}) by HSF 240. Over all, cane yield increased positively and linearly with increasing fertilizer dose. The varieties respond differently to fertilizer doses. HSF 240 exhibited sharp increase in cane yield as compared to the other both clones (Tale 1). These results are endorsed by the findings of Sinha *et al*. (2005), Jagtap *et al*. (2006) and Usmanikhail *et al*. (2007)

Effect of fertilizers on sugar yield

Sugar yield was not significantly affected due three fertilizers doses on, but difference was significant amongst three sugarcane clones/varieties along with its interaction with fertilizer doses. The maximum sugar yield (12.38 t ha^{-1}) was produced by S2003-US-694 at fertilizer rate F_2 (168-112-112 NPK kg ha^{-1}), while the minimum was given by HSF 240 at F_1 (136-75-75 NPK kg ha^{-1}). It was also noted from the studies that the sugar yield produced by S2003-US-694 surpassed other varieties at all fertilizer rates (Table 1).

Conclusion

Recommended dose of 168-112-112 NPK kg ha^{-1} has proved itself as balance dose of nutrients therefore could be utilized to increase millable canes and cane yield.

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Table 1: Effect of different fertilizer rates and varieties on yield and quality parameters of sugarcane.

Treatments	Germination (%)	Tillers per plant	Millable Canes (000 ha^{-1})	Cane Yield (t ha^{-1})	Sugar Yield (t ha^{-1})
A: Fertilizer rates (NPK kg ha^{-1})					
F_1=136-75-75	46.81	1.77	73.35 c	88.46 b	10.44
F_2=168-112-112	45.65	1.90	87.64 a	99.21 a	11.24
F_3=200-150-150	45.75	1.94	82.76 b	102.58 a	11.22
LSD at 0.05	N.S.	N.S.	3.783	7.070	NS
B: Varieties					
V_1=HSF 240	43.23 b	1.55 c	72.02 c	86.70 c	9.67 c
V_2=S2003-US-633	45.02 b	2.18 a	83.23 b	96.33 b	11.17 b
V_3=S2003-US-694	49.97 a	1.88 b	89.50 a	107.22 a	12.07 a
LSD at 0.05	3.097	0.178	3.629	2.918	0.326
Interactions					
F_1 V_1	44.98	1.37	65.61 e	75.47 e	7.97 e
F_1 V_2	45.14	2.10	70.98 e	86.77 d	11.41 b
F_1 V_3	50.30	1.84	83.45 c	103.14 bc	11.95 ab
F_2 V_1	41.90	1.69	72.97 b	84.95 d	10.12 d
F_2 V_2	47.22	2.11	93.88 ab	101.81 c	11.22 c
F_2 V_3	47.84	1.90	96.08 a	110.87 a	12.38 a
F_3 V_1	42.82	1.59	74.49 d	99.69 c	10.91 c
F_3 V_2	42.67	2.34	84.82 c	100.41 c	10.87 c
F_3 V_3	51.77	1.92	88.98 bc	107.64 ab	11.89 ab
LSD at 0.05	N.S.	N.S.	6.286	5.054	0.565

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