

# QUALITATIVE AND QUANTATIVE PARAMETERS OF SUGARCANE CROP UNDER DIFFERENT SOURCES OF FERTILIZERS

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## ABSTRACT

The field study was conducted to evaluate the effect of different fertilizer sources on the growth, cane yield and quality parameters of sugarcane at Sugarcane Section, Agriculture Research Institute, Tandojam during the year 2003-2004. The treatments included four different sources of crop fertilization i.e. T1= NPK @ 225-112-168 kg ha<sup>-1</sup>, T2= EM prepared material, T3=FYM @ 25 t ha<sup>-1</sup> and T4=Press mud @ 25 t ha<sup>-1</sup>. The results revealed that chemical source of fertilizer (NPK) at the rate of 225-112-168 kg ha<sup>-1</sup> proved to be more effective to produce significantly. The sugarcane crop when fertilized with 225-112-168 NPK kg ha<sup>-1</sup>, it produced better germination (62.15%), more cane length (211.3 cm), better cane girth (2.61 cm), satisfactory tiller production (6.50 per stool), maximum cane yield (89.35 t ha<sup>-1</sup>), brix (20.41%) and sugar recovery (10.38%). EM prepared material ranked second and produced germination 58.06%, cane length 181.3 cm, cane girth 2.34 cm, number of tillers 5.56 per stool, cane yield 74.53 t ha<sup>-1</sup>, brix 20.31% and sugar recovery 10.31%. The crop when fertilized with FYM @ 25 t ha<sup>-1</sup>, it produced germination 56.88%, cane length 158.8 cm, cane girth 2.21 cm, number of tillers 5.38 per stool, cane yield 68.96 t ha<sup>-1</sup>, brix 20.51% and sugar recovery 10.20%. The sugarcane when received fertilizer in the form of Press mud @ 25 t ha<sup>-1</sup>, it produced germination 56.06%, cane length 157.5 cm, cane girth 2.19 cm, number of tillers 5.19 per stool, cane yield 64.96 t ha<sup>-1</sup>, brix 20.14 percent and sugar recovery 10.15%. It was observed that NPK source of fertilizers was more effective for almost all the quantitative and qualitative characters studied as compared to EM prepared material, FYM and Press mud.

**Key Words:** Sugarcane, fertilizers, sources, germination, girth, tillers, sugar recovery, brix, yield.

## INTRODUCTION

Sugarcane is one of the major cash crops of Pakistan and plays a vital role in providing raw material to 2<sup>nd</sup> largest (sugar) industry after textile in Pakistan. The national average remained about 47 tonnes per hectare during 2002-2003, which is far below to the world average of 63.70 tonnes per hectare. Pakistan is considerably behind (8.33%) the world average for sugar recovery (10.6%). In the Punjab province of Pakistan, sugarcane was cultivated over an area of 735.3 thousand hectares, producing 33168.6 thousand tones of cane with an average cane yield of 45 tonnes per hectare. In Sindh province, sugarcane during 2002-2003 was cultivated on an area of 258.6 thousand hectares with a total production of 13797.6 thousand tonnes averaging 53 tonnes per hectare. Likewise, in NWFP sugarcane was cultivated over an area of 104.9 thousand hectares, producing 5049.0 thousand tones with average yield of 48 tonnes per hectare. There is no infrastructure for commercial sugarcane processing in Balochistan province because sugarcane is not cultivated there on commercial scale due to unfavorable climate (GOP, 2004).

The situation in Sindh province was significantly remarkable by highest yield per hectare (62 tonnes) in the year 1999-2000. Due to shortage of irrigation water, yield per hectare declined to the tune of 50 tonnes in the year 2000-2001 and 47 tonnes in the year 2001-2002. In the year 2002-2003, the situation has been improved relatively and yield per hectare was increased to 53 tonnes

per hectare (GOP, 2004). The situation demands a comprehensive study to reorganize the planning elements that remained ineffective and resulted decline in yield per hectare due to various factors including shortage of irrigation water or low precipitation. The cane yield and sugar recovery obtained in our country is still less than the other developed cane growing countries of the world. This is mainly caused due to the fact that our farmer does not have bigger options regarding high yielding and high sucrose varieties as well as vitality of the use of chemical fertilizers for producing high yielding and recovery in sugarcane. Generally, our soils are deficient in essentially required nutrient elements and soil deficiency is removed by different means. There are several organic and inorganic sources of soil fertility improvement like green manuring, use of farm yard manure, use of pressmud, effective microorganism technology (E.M. Technology) Although, the application of chemical fertilizers is of vital importance, but use of organic fertilizers is also getting popularity and are being used as a source for improving soil fertility and getting higher yields of sugarcane. Keeping in view the importance of fertilizers in sugarcane production, a comparative study was carried out to investigate the effect of different sources of fertilizers (organic and inorganic) on the growth, cane yield and sugar recovery of commercial sugarcane.

## MATERIALS AND METHODS

The experiment was conducted at the experimental fields of Sugarcane Section, Agriculture Research Institute, Tandojam during the year 2003-2004. The experiment was laid out in a four replicated randomized complete block design having treatments as: T1=225-112-168 kg NPK ha<sup>-1</sup>, T2=E.M. prepared material, T3= F.Y.M. 25 tons ha<sup>-1</sup> and T4=Press mud 25 tons ha<sup>-1</sup>.

**Land Preparation:** Fully pulverized seedbed was prepared. The experimental land was prepared well before sowing on off-season. After deep plowing, crosswise goble plough, followed by precise leveling and crosswise ploughing with cultivator were given. Deep plowing was done particularly to break the hard pan of the experimental soil.

**Sowing:** The planting of setts was done by dry method with the overlapping arrangement. After the proper land preparation, the ridges/ furrows were prepared at the distance of 100 cm. The setts were placed in the furrows at 6-8 inches depth of furrow. After covering, the field was irrigated. Forty thousand two-budded setts per acre with end-to-end arrangement were planted in single row system.

**Seed selection and treatment:** The cane seed was obtained from the crop, which was not more than eight months in age (nursery seed used); upper 2/3 portion of stalk of the cane of fresh/plant sugarcane crop was used for seed purpose. Seed sets were treated with Vitavax @ 120 g/100 litre water against the attack of seed borne sugarcane diseases.

**Irrigation:** Overall 23 irrigations were applied.

**Weeding:** Weeds were removed from young crop, until the crop became in such height to shed the weeds. The weeds were controlled with the use of Gezapex Combi at the rate of 1 to 1½ kg per acre within a period of 3 months after planting. Weedicide was applied in moist conditions to get good results. First light earthing was done after 3-1/2 months of planting and second after 1½ month of first earthing.

**Harvesting:** The harvesting of sugarcane crop was done when the 1/3<sup>rd</sup> leaves of the basal portion of the cane became dry and show the tendency of dropping on the ground. Scientifically, the crop becomes mature when the brix is above 20% irrespective of any variety. The quantitative parameters of the experimental crop were measured at the field, while for the qualitative parameters the cane samples from field were brought to the laboratory.

Finally the data so collected were analyzed statistically using analysis of variance, and LSD test was applied to discriminate the superiority of the means of different treatments as suggested by Gomez and Gomez (1984).

## **RESULTS AND DISCUSSION**

### **Germination**

The results were statistically significant ( $P < 0.01$ ) due to fertilizer sources. Germination percentage indicates the establishment of proper plant population maintained for getting a standard crop harvest. If the seed germination percentage is not upto required level, even better tillering and other yield contributing characters could not bridge the gap. The germination percentage was higher under NPK treated plots which had main association with the balanced quantities and ratios of all essentially required nutrient elements for making a seedbed optimally fertile. The results of the present investigation have also been supported by Leyva and Pohlen (1995) and Pande *et al.*, (1995) who were of the opinion that due to quite balanced ratios of NPK, chemical fertilizers yet give superior results as compared to the fertilizers of organic nature.

### **Cane length (m)**

The differences in cane length were statistically highly significant under different fertilizer sources. Length of cane has always found affecting the yield per unit area linearly and considered as yield influencing parameter in sugarcane crop. Similar results have also been reported by Shukla *et al.*, (1995) who found N fertilizer more balanced than FYM, while Kumar *et al.*, (1996) recorded greater cane length under chemical sources of fertilizers in sugarcane.

### **Cane girth (cm)**

The results were statistically highly significant cane girth was maximum under NPK fertilizer source. Cane girth is a genetic parameter and has straight effect on cane yield of a variety and keeps vital importance when morphology is considered. This higher cane girth under NPK treated sugarcane was due to good crop stand, which produced more cane length and obviously positive effects on cane girth. The present results are in agreement to those of Kumar *et al.*, (1996) reported that increased cane girth (diameter) was recorded from NPK treatments as compared to organic fertilizers i.e. FYM and Press mud.

### **Number of tillers per stool**

The results for number of tillers per stool were also statistically highly significant and NPK source of fertilizer showed its superiority by producing greater number of tillers per stool over other sources. Number of tillers is a character of prime importance and increase or decrease in the tillers per stool depends upon genetics of variety or level of soil fertility. This higher number of tillers per stool under inorganic source of fertilizer (NPK) might have associated with improved soil fertility and that might be in more adequate amounts under NPK source as compared to other fertilizer sources. These results are partially supported by Uddin *et al.*, (1996) who have reported better performance of NPK fertilizers as compared to green manuring or any other organic source of fertilization.

### **Cane yield**

The results for yield per hectare under different fertilizer sources were statistically highly significant. Yield per unit area has always been character of ultimate importance and any achievement in crop growth could not be considered until the yield per unit area is not upto the desired criteria level. The higher cane yield per hectare under NPK source was mainly associated with cane length, cane girth, number of tillers per stool and 10 canes weight. Yadav *et al.*, (1996),

Uddin *et al.*, (1996) and Lara *et al.*, (1996) reported that the cane yield per hectare was significantly greater when NPK fertilizers were applied as compared to other organic sources.

### Brix (%)

The results for brix percentage under different fertilizer sources were statistically highly significant. Brix percentage in the cane juice represents the total solids available in the liquid, which contains further sugars, glucose and other solid materials. It was observed that the results for brix percentage were quite changed as was in the case of other crop growth and cane yield contributing characters. These results are confirmation Dey *et al.*, (1996), who reported that more brix percentage was obtained under inorganic sources as compared to organic sources of fertilizers.

### Sugar recovery (%)

The results for sugar recovery were statistically non-significant ( $P>0.05$ ) under different fertilizer sources. In quality characters, sugar recovery possesses prime importance as possessed by cane yield in the quantity characters. It was observed that the results for sugar recovery were little different to those obtained for brix percentage. These results are further by those of Kumar *et al.*, (1996), who also have reported non-significant variation in sugar content in organic and inorganic fertilizer sources.

## CONCLUSIONS

It was concluded from the present study that NPK source of fertilizers was more effective for almost all the quantitative and qualitative characters studied as compared to EM prepared material, FYM and Press mud. Further studies are needed to evaluate the comparative potential of EM, FYM and press mud as sources of fertilizers in comparison with inorganic source of NPK.

**Table-1 Sugarcane growth, quantitative and qualitative characters as affected by different fertilizer sources**

Fertilizer Source	Germination (%)	Cane length (cm)	Cane girth (cm)	Tiller Stool <sup>-1</sup>	Cane yield (t ha <sup>-1</sup> )	Brix (%)	Sugar Rec. (%)
225-112-168 NPK kg ha <sup>-1</sup>	62.15 a	211.30 a	2.61 a	6.50 a	89.35 a	20.31	10.38
EM prepared material	58.06 b	181.30 b	2.34 b	5.56 b	74.53 b	20.31	10.31
FYM 25 tons ha <sup>-1</sup>	56.88 b	158.8 c	2.21 b	5.38 b	68.96 bc	20.51	10.20
Press mud 25 tons ha <sup>-1</sup>	56.06 b	157.5 c	2.19 b	5.19	64.96 c	20.14	10.15
SE	0.68	5.404	0.056	0.225	1.379	0.231	0.054
LSD(5%)	2.041	16.20	0.17	0.69	4.13	-	-
LSD(1%)	2.81	22.30	0.23	0.95	5.69	-	-

Values followed by similar letters do not differ significantly at 0.05 probability level.

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