# RESPONSE OF PROMISING SUGARCANE CLONES/VARIETIES UNDER AGRO ECOLOGICAL CONDITIONS OF FAISALABAD.

**By**
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## ABSTRACT

A field experiment was conducted to evaluate the response of 14 sugarcane varieties / promising clones to compare their yield and quality in autumn season during 2010-2011 at the sugarcane Research Institute, Faisalabad, under National Uniform Varietal Yield Trial. The genotypes under investigation were S2006-SP-18, S2006-SP-30, S2006-US-641, S2006-US-658, S2006-US-832, HoTh-508, HoTh-550, S2003-HOSG-25 ,S2003-HOSG-104, S2003-CPSG-437, S2003-HOSG-1257, S-2004-HOSG-2875, S2004-CPSG-2923, and HSF-240 (check).The experiment was laid out in Randomized Complete Block Design with four replications having net plot size of 4.80 m x 5.0 m. Different genotypes behaved differently for the quantitative and qualitative characters investigated. The variety S2006-US-832 gave significantly higher cane yield of 128.40 t $ha^{-1}$ followed by S2006-US-658 (126.20 t $ha^{-1}$), while the minimum cane yield was recorded in S2003-HOSG-1257 (88.43 t $ha^{-1}$). The promising line S2006-US-832 remained at the top by producing the highest tonnage of sugar i.e. 16.64 t $ha^{-1}$ followed by HSF-240 (15.74 t $ha^{-1}$) during 2010-11, whereas the minimum sugar yield was produced by HoTh-550 (9.71 t $ha^{-1}$).

Key words: Evaluate, yield potential, promising clones, management tonnage.

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# INTRODUCTION

The sugarcane (*Saccharum officinarum* L.) is an important cash crop of the country. It plays vital role in economic uplift of the farmers and survival of ever expanding sugar industry in Punjab. Thus evolution of new high yielding sugarcane varieties and improved production technology is the need of the time for betterment of sugarcane growers and the mill owners to feed the ever increasing population of the country. Keeping in view this theme the promising sugarcane varieties collected from all over the country, were tested at Sugarcane Research Institute farm Faisalabad. The sugarcane area under cultivation in Punjab during 2010-2011 was 672.17 thousand ha and its production was 37.48 million tonnes, where as its yield was 55.80 t $ha^{-1}$ (G.O.P 2011) against the area and production of 672.1 (000 ha), 25.00 (million tonnes) and average cane yield of 37.82 t $ha^{-1}$ during 1999-2000, respectively.

In sugarcane (*Saccharum officinarum* L.) crop variety plays a major role in the cane yield and sugar recovery. Selection of a proper variety of sugarcane to be sown in a particular agro-ecological zone is primary requisite to explore its sugar yield potential. Leaf area index differs greatly with varieties. Generally, the variety having high population density possesses more LAI (Yadava, 1981). Early maturing varieties like CPF-237, HSF-240, HSF-242, CP 77-400, CP 72-2086 and CP 43-33 attain maximum LAI earlier than late or medium late maturing varieties like SPF-213, SPF-234 and SPF-245 (Chattha, 2006 and Rafiq et al. 2007). Their LAI, during initial growth stages is also higher than late varieties (Suba Rao, 1960). Early maturing varieties start accumulating dry matter immediately after germination. These attain the peak of dry matter accumulation earlier in the season in comparison with late and mid late varieties which accumulate dry matter at a slow rate but continue to accumulate it till harvest. Yadava (1980) reported that mid late varieties like CoJ-67 continue to absorb inorganic materials to synthesize carbohydrates till their harvest while early maturing varieties like CoJ-64 stop to do so after grand growth phase (195 days). Hence, dry matter accumulation by early varieties after grand growth stage is negligible.

Early formed tillers grow into well developed quality stalks with rich juice (Raheja, 1948) and a variety with early maturing characteristic ends its tillering phase earlier as compared with late maturing variety (Chattha, 2006). It has been reported that yield of sugarcane can be enhanced by adopting the improved package of technology and growing high yielding varieties (Heinz, 1987). Zafar et al. (2005) reported a variable behavior of different sugarcane promising clones for growth performance, brix percentage, sprouts and lodging under Faisalabad conditions. Ricaud and Domarinague (1991) reported variable behavior of different varieties (M 1658/78, M 3035 / 66, R 570 and M 695/69) for adaptability and final stripped cane yield. Atta et al. (1991) evaluated five new sugarcane varieties under Faisalabad conditions and compared them with BL-4. They recorded germination, tillering, cane stand, cane yield CCS % and cane yield and reported the best performance of BF-162 and CP 43-33. Rafiq et al. (2007) have reported variable behavior of different autumn planted sugarcane clones for germination (18.4 – 52%), tillers plant$^{-1}$ (0.8 – 2.2), millable canes (73500-137400 ha$^{-1}$), cane yield (84-118 t ha$^{-1}$) and sugar yield (7.73-17.0 t ha$^{-1}$) under Faisalabad conditions.

## MATERIALS AND METHODS

Different promising clones of sugarcane were studied for their performance at the research area of Sugarcane Research Institute, Faisalabad during the year 2010-2011. The experiment was laid out in randomized complete block design with four replications. The crop was sown in 120 cm a part trenches in plots measuring 5.0 m x 4.80 m. For the purpose of sowing, seed rate was used at 75,000 double budded setts ha$^{-1}$ placing setts end to end in a paired row system in trenches. The planting was done on 4$^{th}$ October during 2010-2011. The phosphorus and potash fertilizers (each @ 112 kg ha$^{-1}$) were applied at planting. The seed setts were covered with about 2.5 – 3 cm of soil manually and light irrigation was applied. Nitrogen @ 168 kg ha$^{-1}$ was applied in three equal installments viz., 45 days after planting, in February and at earthing up in March. Four inter-row cultivations were given to the crop in addition to the application of Gesapax combi @ 2.50 kg ha$^{-1}$ for weed control. Data on germination were recorded 45 days after planting, whereas, tillering was recorded 90 days after planting. The number of millable canes and stripped cane yield were recorded at harvest on plot basis and then converted

into hectares. At final harvest, twenty canes were randomly selected from the bulk produce in each plot for juice analysis. The canes were crushed by the crusher and their juice was analyzed in the laboratory for the assessment of commercial cane sugar % (CCS %) by using the formula (Anonymous, 1970).

$$CCS\% = \frac{3}{2} P \left(1 - \frac{F + 5}{100}\right) - \frac{B}{2} \left(1 - \frac{F + 3}{100}\right)$$

Where

P = Pol percent of first expressed juice
B = Brix percent of first expressed juice
F = Fibre percent cane (it was kep at 12% for all the genotypes investigated)

The data recorded were statistically analyzed by using Fisher's analysis of variance technique and the least significant difference (LSD) test at 5% probability was used to compare the treatments means (Steel and Torrie, 1997).

## RESULTS AND DISCUSSION

The data (Table) showed significant differences in germination % produced by different sugarcane clones. The maximum germination % was shown by S2006-US-832 (56.01), Which was statistically at par with S2006-US-658 (54.20), where as minimum germination was shown by clone S2003-HOSG- 1257 (36.95).

The data indicated significant differences in tillers per plant produced by different sugarcane varieties under study. Sugarcane clone S2006-SP-30 produced significantly maximum number of tillers per plant (4.65), where as minimum number of tillers per plant (1.82) were produced by S2003-HOSG- 1257.

The number of millable canes, one of the major yield contributing factors, was significantly affected by different genotypes during the year of study. The variety, S2006-US-832 produced significantly the highest number of canes during the year 2010-11 (Table-1) with an average number of 119.40 thousand $ha^{-1}$ followed by S2006-US-658 (115.20 thousand $ha^{-1}$). The promising line S2003-HOSG- 1257 produced the lowest number (80.80 000 $ha^{-1}$) of millable canes $ha^{-1}$ was due to poor germination. The higher

number of millable canes in a variety / promising clone is dependent upon the timely and profusely tillering of the variety with minimum mortality of the tillers as has been reported by Zafar et al. (2005), Ahmed et al. (2003), Raheja (1948) and Atta et al. (1991).

The cane diameter is also very important yield contributing parameter in sugarcane. The canes of significantly greater diameter (3.24 cm) were observed in S2006-US-832 followed by S2006-US-658 (3.17 cm), whereas, the canes of least thickness (2.25cm) were found in S2003-HOSG-1257.

The cane height is very important yield contributing parameter in sugarcane. The data indicate that significantly the longest canes (265.60 cm) were produced by S2006-US-832, and the canes of shortest length (160.70 cm) were found in S2003-HOSG-1257.

The stripped cane yield is the outcome of the interaction between genetic and environmental factors. The variety S2006-US-832 produced significantly higher cane yield of 128.40 t $ha^{-1}$ followed by S2006-US-658 (126.20 t $ha^{-1}$). The S2003-HOSG-1257 produced the lowest stripped cane yield of 88.43.00 t $ha^{-1.}$ Variable behaviour of different genotypes of sugarcane for stripped cane yield may be attributed to their genetic make up to explore the soil and the environment in which they grow. Yadava (1991) and Suba Rao (1960) have reported variable behavior of different sugarcane genotypes for the exploitation of environment.

The highest sugar recovery (12.96), was indicated by variety S2006-US-832, whereas the lowest sugar recovery (9.46) was shown by variety HoTh-550.

The data revealed that S2006-US-832 showed the best performance with sugar yield of 16.64t $ha^{-1}$ which was statistically at par with HSF-240 (15.74), whereas HoTh-550 was the poorest performer with 9.71 tonnes of sugar yield per hectare. The variations in qualitative characters is in accordance with the findings of Zafar et al. (2005).

## CONCLUSION

The promising clone S2006-US-832 may be promoted in the field for general cultivation due to having more cane and sugar yield potential.

# LITERATURE CITED.


1. Anonymous. 1970. Laboratory manual for Queensland Sugar Mills. 5th Ed. Division of mill technology, Bureau of Sugar Experiment Station, Brisbane, Queensland (Australia).

2. Atta, M., M. Hamid, K. H. Hussaini and K. B. Malik. 1991. Evaluation of new sugarcane varieties under Faisalabad conditions (1987-89). Pak. Sugar J. 5 (2): 1-5. (Field Crop Absts. 46 (7): 4626, 1993).

3. Chattha, A. Ali. 2006. Personal communications with the Director, Sugarcane Research Institute, Faisalabad.

4. Govt. of Pakistan. 2011. Agricultural Statistics of Pakistan, 2010-11. Ministry of Food, Agriculture and Livestock (Economic Wing), Islamabad, Pakistan.

5. Heinz, D. J. 1987. Sugarcane Improvement : Current productivity and future opportunities. Copersucar International sugarcane proceeding work.

6. Rafiq, M., A. A. Chattha, A. Sattar, Z. Mahmud and M. A. Nadeem. 2007. Comparative performance of autumn planted sugarcane promising clones under Faisalabad conditions. Pak. Sugar J. XXII (01): 50-55.

7. Raheja, P.C. 1948. Growth studies in *Saccharum officinarum L. II.* Irrigation series. Indian J. Agric. Sci. 18 (2): 95-111.

8. Ricaud, C. and R. Domainour. 1991. Agronomic performance of sugarcane cultivars at the final stage of selection. Performance des varieties de canne a sucre aux stades finals de la selection. Revue Agricole et sucriere de I'lle Maurice. 70 (1-2): 6-25. (Field Crop Absts. 46(7): 4622, 1993).

9. Steel, R.G.D., J.H. Torrie and D.A. Dickey, 1997. Principles and procedures of statistics. A biometrical approach, 3rd edition. McGraw Hill Book Int. Co. New York pp: 172-177.

10. Suba Rao, M. S. and R.B. Prasad. 1960. Studies in India on germination of sugarcane – A review. Indian J. Plant Physiol. 32 (3): 181-194.

11. Yadava, R. L. 1981. Agro-technology for enhancing sugarcane production and sustaining it at higher level with low production cost. *In:* Lectures for young scientists (1981). Indian National Science Academy, New Delhi.

12. Yadava, R. L. 1991. Sugarcane production technology, Constraints & potentialities. Oxford & IBH Publishing Co. Pvt. Ltd., Bombay.

13. Yadava, R. L. and R.K. Sharma. 1980. Dry matter and N accumulation pattern of early, mid late and late varieties of sugarcane as influenced by rate of N application. Indian J. Agron. 25 (2): 201-208.

14. Zafar, M., M. A. Grawal, M. A. Munir, F. Hussain & A. A. Chattha. 2005. Selection of American origin sugarcane clones at primary nursery stage on the growth, quality and disease response basis. Pak. Sugar J. XX (2): 8-12.

## Quantitative/qualitative characters of autumn planted sugarcane varieties 2010-11

| Varieties | Germination | Tillers/ Plant | No. of millable canes | Cane diameter | Cane height | Cane yield | Sugar recovery | Sugar yield |
|---|---|---|---|---|---|---|---|---|
| | (%age) | | (000/ha) | (cm) | (cm) | (t/ha) | (%) | (t/ha) |
| S2006-SP-18 | 42.14 FGH | 2.62 AB | 96.21 J | 2.57 J | 192.60 CDEF | 104.80 J | 11.58 E | 12.141 |
| S2006-SP-30 | 46.05 DEF | 4.65A | 103.20 G | 2.82 G | 228.40 ABCDE | 113.20 G | 10.251 | 11.60 J |
| S2006-US-641 | 51.67 ABC | 3.13 AB | 110.30 D | 3.04 D | 255.20 AB | 120.60 D | 11.02 H | 13.29 E |
| S2006-US-658 | 54.20 A | 3.43 AB | 115.20 B | 3.17 B | 260.90 AB | 126.20 B | 12.29 C | 15.50 C |
| S2006-US-832 | 56.01 A | 3.49 AB | 119.40 A | 3.24 A | 265.60 A | 128.40 A | 12.96 A | 16.64 A |
| HoTh-508 | 44.44 DEFG | 2.85 AB | 100.50 H | 2.75 H | 217.30 ABCDEF | 111.00 H | 11.26 G | 12.49 G |
| HoTh-550 | 41.08 FGHI | 2.51 AB | 92.63 K | 2.50 K | 181.10 DEF | 102.70 K | 9.460 J | 9.71 L |
| S2003-HOSG-25 | 48.69 BCD | 3.02 AB | 108.20 E | 3.00 E | 252.40 DEF | 117.30 E | 11.66 E | 13.68 D |
| S2003-HOSG-104 | 47.38 CDE | 2.95 AB | 106.10 F | 2.90 F | 238.40 ABCD | 115.30 F | 11.18 G | 12.90 F |
| S2003-CPSG-437 | 43.49 EFGH | 2.74 AB | 98.21 I | 2.65 I | 203.60 BCDEF | 108.30 J | 11.41 F | 12.36 H |
| S2003-HOSG-1257 | 36.95 I | 1.82 B | 80.80 N | 2.25 N | 160.70 F | 88.43 N | 12.33 C | 10.91 K |
| S2004-HOSG-2875 | 38.46 HI | 2.07 B | 84.19 M | 2.31 M | 165.60 F | 95.51 M | 12.76 B | 12.18 I |
| S2004-CPSG-2923 | 40.10 GHI | 2.31 B | 88.56 L | 2.40 L | 171.60 EF | 100.30 L | 12.06 D | 12.09 I |
| HSF-240 | 52.75 AB | 3.33 AB | 112.20 C | 3.11 C | 258.10 AB | 124.20 C | 12.81 B | 15.74 B |
| **LSD 0.05** | **5.11** | **2.15** | **1.80** | **0.03** | **60.25** | **1.50** | **0.10** | **0.12** |