

# SCREENING OF SOME SUGARCANE (*SACCARUM OFFICINARUM* L.) VARIETIES FOR DIFFERENT AGRONOMIC TRAITS UNDER AGRO-CLIMATIC CONDITIONS OF UPPER SINDH PROVINCE

Bashir Ahmed Abro\* and Pervaiz Ahmed Baloch\*\*

\* Quaid-e-awam Agricultural Research Institute, Larkana, Sindh

\*\* Coastal Agricultural Research Station, PARC, Karachi, Sindh

## ABSTRACT

A field experiment was conducted to evaluate the performance of nineteen Sugarcane varieties for their different agronomic traits and yield characters in an experimental field of Quaid-e-Awam Agricultural Research Institute, Larkana, Sindh during the years 2006-07 and 2007-08. The results revealed that during the first year 2006-07 maximum cane yield of 192.47 tons ha<sup>-1</sup> was recorded for the variety HoTH-300 followed by the variety LRK-2004 having cane yield of 181.37 tons ha<sup>-1</sup>. The results for the second year 2007-08 revealed that the maximum cane yield of 207.52 tons ha<sup>-1</sup> was recorded in variety LRK-2004 followed by the variety HoTH-300 having the cane yield of 168.61 tons ha<sup>-1</sup>. The varieties LRK-2003, CP NIA-82-1026 SC-P5 and HoTH-127 also performed better for the cane yield parameter. It is concluded that these varieties could be promising varieties for general cultivation in farmers' fields of upper Sindh province.

**Keywords:** Sugarcane, National Uniform Varietal Yield Trial, Cane brix %, Cane yield and Upper Sindh.

## INTRODUCTION

The Sugarcane is the major crop of Pakistan. About 99% of sugar is being made from this crop. It provides molasses, baggass and is playing an important role in economy of the country. Its share in value added of agriculture and gross domestic product (GDP) are 4.5 and 0.9 percent respectively (Sattar, *et al.*, 2010). The average per hectare yield (50.28 t ha<sup>-1</sup>) in Pakistan is less than other major cane growing countries of the world (Sohu, *et al.*, 2008). One and major reason for that, is our farmers do not have options regarding high yielding varieties (Majeedano, *et al.*, 2004) therefore, low yielding varieties needs to be replaced with new high yielding varieties through evolution / selection for getting self sufficiency and filling up the gap in the per hectare yield between Pakistan and other cane growing countries of the world (Nazir, *et al.*, 1990).

This crop is cultivated on more than one million hectares (Akhtar and Akhtar, 2002). It is therefore, worthwhile to test and evaluate Sugarcane cultivars for high yield potential and for other commercial traits. The scientific data collected through such studies would provide a sound base for selection of suitable varieties and would also help in carrying out the genetic analysis for further breeding programme. The development of a superior cultivar through introduction accomplishes the same purpose as the evaluation of superior variety through breeding. The newly introduced varieties may excel the already cultivated ones in yield and quality (Bahadar, *et al.*, 2000).

Considering the importance of issue and need of the time Pakistan Agricultural Research Council extended full cooperation / coordination to all the provinces of Pakistan including Sindh in providing funds, manpower, seed of new varieties and fuzz for testing and evolution / selection of new high yielding varieties to increase per hectare yield so that the cane growers could maximize their income and make the country beneficial.

Accordingly National Uniform Varietal Yield Trial (NUVYT) consisting of 19 varieties all over the provinces was conducted at Quaid-e-Awam Agricultural Research Institute Larkana, Sindh during the years 2006-07 and 2007-08 with the aim to select the high yielding Sugarcane varieties suitable for cultivation under agro climatic conditions of upper Sindh province.

## **MATERIALS AND METHODS**

The present investigations pertaining to evaluation and selection of high yielding varieties of Sugarcane (*Saccharum officinarum*, L.) were conducted in an experimental field of Quaid-e-Awam Agricultural Research Institute Larkana, Sindh during the years 2006-07 and 2007-08. The experiments were laid out in Randomized Complete Block Design comprised of 19 varieties with three replications having plot size (experimental unit) of 3x9 (27 m<sup>2</sup>). The ridges were prepared at the distance of 100 cm. The crop was planted on 18.9.2006 during the first year and on 25-10-2007 during the second year. The NPK fertilizers were applied at the rate of 275-150-150 kg ha<sup>-1</sup>. 1/3 dose of N + full dose of P & K were applied at the time of planting, remaining 2<sup>nd</sup> and 3<sup>rd</sup> doses of N were applied at 1<sup>st</sup> and 2<sup>nd</sup> earthing. For weed control hand weeding, interculturing and weedicide Gezapex combi were used at the rate of 1 kg per acre. Two applications of Furadon 3G were applied in the months of April and May to control all kinds of borers. All the approved agronomic practices like hoeing, interculturing, irrigation and fertilizer application etc as recommended for the region were followed uniformly throughout the growing periods in both years. The observations were recorded on different parameters such a Germination percentage (%), Cane height (cm), Number of tillers plant<sup>-1</sup>, Internodes cane<sup>-1</sup>, Cane brix % and Cane yield in tons ha<sup>-1</sup>.

## **RESULTS AND DISCUSSION**

The data presented in Table 1 reveal that among the nineteen Sugarcane varieties the variety S.2000-CPSG-449 gave the highest germination % of 65.33 followed by the varieties HoTH-300 and G-T-11 having 61.00 and 59.33 germination % respectively. The lowest germination % 39.66 was recorded in variety CP-NIA-82-1026 SC-P5 during the year 2006-07. While, highest germination % of 47.33 during the year 2007-08 was recorded of the variety S.2002-US-640 followed by the varieties LRK-2003, HoTH-326 and S.2002-US-637 with germination % of 43.67, 42.67 and 42.37% respectively. The lowest value of 06.00 regarding germination % was recorded for the variety S.2002-US-560 (Table 2). The results were supported with the findings of Sattar, *et al.*, (2010) who found differences in germination of different Sugarcane varieties due to their genetic makeup transferred from their parents.

The variety LRK-2004 during the year 2006-07 gave maximum cane height of 3.80 meters followed by the variety HoTH-300 having cane height of 3.19 meters. The lowest cane height was recorded for the variety Ganj Bakhsh having 1.88 meters (Table 1). During the year 2007-2008 HoTH-300 gave maximum cane height of 2.93 meters followed by the varieties

LRK-2004 and CPD-01-335 having cane heights of 2.49 meters. The lowest cane height was recorded in the variety S.2002-US-560 with 1.52 meters (Table 2). The possible reason for these results could be the genetic makeup and combination of different genes that became active and produced taller plants than other varieties. The results are in line with those reported by Baloch, *et al.*, (2004).

During the year 2006-07 variety HoTH-300 gave maximum number of 9.0 tillers plant<sup>-1</sup> followed by the varieties LRK-2004 & CP-85-1491 having 8.0 tillers plant<sup>-1</sup> respectively. The lowest number 4.0 tillers plant<sup>-1</sup> was recorded in variety Gang Bakhsh (Table 1). The variety HoTH-300 gave maximum number 8.67 tillers plant<sup>-1</sup> followed by the varieties LRK-2004 and LRK-2003 having 8.33 and 6.33 tillers plant<sup>-1</sup> respectively. The lowest number 3.67 tillers plant<sup>-1</sup> was recorded in variety S-2002-US-560 during the second year 2007-08 (Table 2). The difference in number of tillers plant<sup>-1</sup> between the varieties might be due to their different genetic potential. Significant differences among the varieties for number of tillers plant<sup>-1</sup> have been reported by Nadeem, *et al.*, (2009). These results are further supported by the findings of Singh and Singh (2004) who studied considerable numbers of sugarcane varieties and found significantly varying trend of effectiveness in all varieties, regarding number of tillers plant<sup>-1</sup>.

The varieties S-2002-US-560, LRK-2004 and HoTH-300 had maximum 27.0 internodes cane<sup>-1</sup> respectively followed by the variety HoTH-127 having 26.0 internodes / cane<sup>-1</sup>. The lowest number 19.0 internodes cane<sup>-1</sup> was recorded in variety LRK-2003 during the first year (Table 1). While, during the second year variety HoTH-300 had maximum 30.33 internodes cane<sup>-1</sup> followed by the variety LRK-2004 having 29.67 internodes cane<sup>-1</sup>. The lowest number of internodes cane<sup>-1</sup> 12.67 was recorded in variety S.2002-US-560 during the year 2007-08 (Table 2). These results are in line with Khan, *et al.*, (2003) who pointed out that different varieties had different trend for number of internodes cane<sup>-1</sup>.

The variety CPD-01-335 gave maximum cane girth of 2.12 cm followed by the variety G-T-11 having cane girth of 2.09 cm. The lowest cane girth in cm 1.51 was recorded for the variety S-12 CPSG-449 (Table 1). The variety Ganj Bakhsh gave maximum cane girth of 2.44 cm followed by the variety LRK-2004 having cane girth of 2.34 cm. The lowest cane girth in cm 1.73 was recorded in variety S.2002-US-560 (Table 2). The results are in line with the findings of Atta, *et al.*, (1991) who reported variety CP-72/34 with higher cane girth as against check BL-4 in Faisalabad.

The highest cane brix % of 22.77 was recorded in variety CPD-01-245 followed by the varieties S-2-2002-US-560 and CP-85-1491 having 21.22 and 20.47 cane brix % respectively. While, the lowest cane brix % of 15.28 was recorded in variety CP-NIA-82-1026 SCP5 during the year 2006-07. During the second year 2007-08 the highest cane brix % of 23.00 was recorded in variety CPD-01-354 followed by the variety CP NIA-82-223 having 21.22 cane brix %. While, the lowest cane brix % of 18.00 was recorded in variety CPD-01-335. The higher cane brix % in CPD-01-245, S-2-2002-US-560 and CP-85-1491 was mainly associated with the genetic makeup of the parental material of these varieties. These results agree with the findings of Ali, *et al.*, (1999) who recommended new sugarcane variety CP-77/400, which exhibited higher cane brix % as compared to variety Co-1148 in Punjab province.

The results for the year 2006-07 in (Table 1) revealed that the maximum cane yield of 192.47 tons ha<sup>-1</sup> was recorded for the variety HoTH-300 followed by the variety LRK-2004 having the cane yield of 181.37 tons ha<sup>-1</sup>. The varieties CP NIA-82-223 and HoTH-127 produced

cane yield of 144.36 and 138.80 tons ha<sup>-1</sup> respectively. The minimum cane yield of 75.75 tons ha<sup>-1</sup> was recorded in variety S-2002-US-560. The results for the year 2007-08 (Table 2) revealed that the maximum cane yield of 207.52 tons ha<sup>-1</sup> was recorded of the variety LRK-2004 followed by the variety HoTH-300 having the cane yield of 168.61 tons ha<sup>-1</sup>. The varieties LRK-2003 and CP NIA-82-1026 SC-P5 produced cane yield of 154.90 and 149.34 tons ha<sup>-1</sup> respectively. The minimum cane yield of 75.75 tons ha<sup>-1</sup> was recorded for the variety S-2002-US-560. The improvement in yield component is directly associated with weight of individual cane, cane height, cane girth and number of cane internodes. Naich, *et al.*, (2006), recommended LRK-2001 and M-17 varieties of Sugarcane for general cultivation in upper Sindh as these proved good response for cane yield. Rahman, *et al.*, (2006) obtained the highest cane yield in variety Isd 32 and the lowest in Isd 31. Sohu, *et al.*, (2008) reported variety LRK-2004 with higher cane yield as against of other varieties in Larkana, Sindh.

**Table-1 Growth and yield parameters of new high yielding Sugarcane (*Saccharum officinarum* L.) varieties under agro-climatic conditions of upper Sindh during the year 2006-07**

Sr. No.	Varieties	Germination %	Cane height (m)	Tillers Plant <sup>-1</sup>	Internodes cane <sup>-1</sup>	Cane girth (cm)	Cane brix %	Cane yield (t ha <sup>-1</sup> )
01.	CP-85-1491	57.33	2.44	8.00	24.00	1.55	20.47	125.84
02.	CP-80-1827	55.00	2.37	6.00	24.00	1.89	17.14	128.06
03.	S.2002-US-560	49.00	2.06	5.00	27.00	1.64	21.22	75.75
04.	S.2002-US-637	58.30	2.48	7.00	22.00	2.50	16.24	98.90
05.	S.2002-US-640	52.00	2.14	5.00	21.00	1.75	19.77	105.49
06.	S2000CPSG-449	65.33	2.16	6.00	21.00	1.51	20.27	112.23
07.	S.2000-CPSG-1550	51.66	2.56	6.00	22.00	1.87	20.22	133.25
08.	LRK-2003	57.00	2.10	5.00	19.00	1.66	20.12	106.60
09.	LRK-2004	54.66	3.80	8.00	27.00	1.85	17.44	181.37
10.	Ganj Bakhsh	51.33	1.88	4.00	21.00	1.83	20.20	98.09
11.	G-T-11	59.33	2.26	5.00	22.00	2.90	16.58	96.23
12.	CP NIA-82-223	41.33	2.35	6.00	23.00	2.10	15.44	144.36
13.	CPNIA82-1026	39.66	2.48	5.00	21.00	1.96	15.28	96.23
14.	HoTH-127	41.66	2.49	5.00	26.00	1.97	19.27	138.80
15.	HoTH-300	61.00	3.19	9.00	27.00	1.90	17.28	192.47
16.	HoTH-326	52.33	2.48	5.00	21.00	1.54	17.49	105.49
17.	CPD-01-245	54.33	2.47	5.00	20.00	2.60	22.77	110.04
18.	CPD-01-354	54.66	2.49	6.00	21.00	1.90	19.77	103.63
19.	CPD-01-335	53.33	2.45	6.00	24.00	2.12	17.78	118.44
	Minimum	<b>39.66</b>	<b>1.88</b>	<b>4.00</b>	<b>19.00</b>	<b>1.51</b>	<b>15.28</b>	<b>75.75</b>
	Maximum	<b>65.33</b>	<b>3.80</b>	<b>9.00</b>	<b>27.00</b>	<b>2.90</b>	<b>22.77</b>	<b>192.47</b>
	Average	<b>44.57</b>	<b>2.46</b>	<b>5.89</b>	<b>22.79</b>	<b>1.95</b>	<b>18.67</b>	<b>119.54</b>

**Table-2 Growth and yield parameters of new high yielding Sugarcane (*Saccharum officinarum* L.,) varieties under agro-climatic conditions of upper Sindh during the year 2007-08**

Sr. No.	Varieties	Germination %	Cane height (m)	No. of tillers Plant <sup>-1</sup>	Internodes cane <sup>-1</sup>	Cane girth (cm)	Cane brix %	Cane yield (t ha <sup>-1</sup> )
01.	CP-85-1491	40.33	2.15	5.67	25.33	2.02	20.00	142.67
02.	CP-80-1827	40.00	2.27	5.33	25.33	1.96	19.20	131.55
03.	S.2002-US-560	06.00	1.52	3.67	12.67	1.73	19.20	100.05
04.	S.2002-US-637	42.37	2.26	5.67	25.00	2.01	22.00	142.67
05.	S.2002-US-640	47.33	2.19	4.33	20.33	1.90	18.60	83.01
06.	S.2000-CPSG-449	25.67	2.31	5.67	22.67	1.96	19.00	111.17
07.	S.2000-CPSG-1550	36.33	2.27	4.67	25.00	2.08	21.00	146.37
08.	LRK-2003	43.67	2.21	6.33	20.33	2.09	22.00	154.90
09.	LRK-2004	39.67	2.49	8.33	29.67	2.34	21.00	207.52
10.	Ganj Bakhsh	20.00	1.75	4.67	18.33	2.44	21.00	127.85
11.	G-T-11	28.00	1.85	4.67	20.67	2.25	20.00	108.21
12.	CP NIA-82-223	33.33	2.28	5.67	23.33	2.05	22.20	146.37
13.	CPNIA82-1026	34.00	2.30	5.33	23.33	1.95	22.00	149.34
14.	HoTH-127	23.00	2.18	5.00	27.67	1.96	20.00	143.41
15.	HoTH-300	21.33	2.93	8.67	30.33	2.30	21.20	168.61
16.	HoTH-326	42.67	2.12	4.67	25.00	1.98	22.00	135.26
17.	CPD-01-245	31.33	2.33	5.33	20.67	2.01	22.00	89.31
18.	CPD-01-354	41.00	2.44	5.00	23.00	2.21	23.00	130.07
19.	CPD-01-335	32.33	2.49	4.33	24.67	2.19	18.00	143.41
	Minimum	<b>06.00</b>	<b>1.52</b>	<b>3.67</b>	<b>12.67</b>	<b>1.73</b>	<b>18.00</b>	<b>83.01</b>
	Maximum	<b>47.33</b>	<b>2.93</b>	<b>8.67</b>	<b>30.33</b>	<b>2.44</b>	<b>23.00</b>	<b>207.52</b>
	Average	<b>33.07</b>	<b>2.29</b>	<b>5.42</b>	<b>23.33</b>	<b>2.08</b>	<b>20.71</b>	<b>134.83</b>

## REFERENCES

1. Akhtar, M and M. E. Akhtar. (2002). Effect of different levels of Potassium on agronomic traits, productivity and quality of Sugarcane (*Saccharum officinarum*, L.). Asian Journal of Plant Sciences. Vol. 1(4) Pp: 349-351.
2. Ali, F. G., M. A. Iqbal and A. A. Chattha. (1999) Performance of some Sugarcane varieties in western Punjab. Pak. Sugar. J., 14: Pp: 6-7.
3. Annual Progress Report, Cooperative Research Programme (Sugarcane) 2006-07.
4. Atta, M., A. R. Zahid, K. H. Hasani and M. A. Bajwa. (1991). Quantitative and Qualitative performance of early maturing Sugarcane varieties at Faisalabad. Pak. Sugar. J., 5: Pp: 6-11.
5. Bahadar, K., M. Jama, M. S. Baloch, H. Azim and k. Nawab (2000). Quantitative and Qualitative attributes of Sugarcane as affected by distinct genotypes. Pakistan Journal of Biological Sciences. 3(7): Pp: 1170-1171.
6. Baloch, F. M, N. A. Soomro, S. A. Ali, T. J. A. Buriro and M. U. Usmanikhail. 2004. Comparison of quantitative and qualitative parameters of local sugarcane varieties with varieties of other provinces. Indus Journal of Plant Sciences, 3(3): 303-307.
7. Imdad, A. S., A. M. Khaskehli, P. A. Baloch and B.A. Abro (2008). "Evaluation of Yield and Yield Contributing Parameters of Different Sugarcane (*Saccharum officinarum*, L.) Varieties under National Uniform Varietal Trial". Pak. Sugar J., XXIII (01) Pp: 7-10.
8. Khan, M. A. H. k. Keerio, S. Junejo, R. N. Panhwar, M. A. Kaput and B. R. Qazi. 2003. Evaluation of new sugarcane genotypes developed through fuzz correlation of cane yield and yield components. Pak. J. Applied Sci., 3(4): 270-273.
9. Majeedano, H. I, F. M. Baloch, S. D. Tunio and A. D. Jarwar (2003). Yield response of different sugarcane varieties in agro-ecological conditions of Tando Jam. Pak. Sugar J., 18(1): Pp: 20-23.
10. Nadeem, M. A., M. A. Sarwar., F. Ahmad., F. Hussaiun, A. Ghaffar and A. A. Chattha (2009). Evaluation of some Sugarcane clones at Faisalabad. Pak. Sugar J., XXI (02) Pp: 2-5.
11. Naich, A. N., P. A. Baloch and B. A. Abro (2006). "Evaluation of growth and Yield Parameters of Different Sugarcane (*Saccharum officinarum*, L.) Varieties under National Uniform Varietal Trial". Pak. Sugar J., XXIV (03) Pp: 7-11.
12. Nazir, M., M. B. Gill., T. Mehmood and R. Ahmed (1990). Studies on pit versus flat planting of Sugarcane. Pakistan Society of Sugar Technologists. Silver Jubilee Convention Proc. 21-23 July 1990. Rawalpindi. Vol. 2S. Pp: 210-214.
13. Rahman, M. S (2006). Performance of some newly released Sugarcane varieties in Rajshahi Sugar Mills growers field under high Barind tract of Bangladesh. International Journal of Sustainable Agricultural Technology. 2 (4) Pp: 69-71.
14. Sattar, R. S., M. Ansar., M. Mehdi., F. Sheeraz and Z. Hassan (2010). Effect of management strategies and crop establishment of Sugarcane under agro climatic conditions of Jhang. Pak. Sugar J., XXV (01) Pp: 17-21.
15. Singh, R. K and D. N. Singh. 2004. Evaluation of early sugarcane varieties for sustaining high sugar recovery in Uttar Pradesh. Cooperative sugar. 31(10): 797-804.
16. Sohu, I. A., A.M. Khaskehli., P. A. Baloch and B.A. Abro (2008). "Evaluation of Yield and Yield Contributing Parameters of Different Sugarcane (*Saccharum officinarum*, L.) Varieties under National Uniform Varietal Trial". Pakistan Sugar Journal XXIII (01) Pp: 7-10.