INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2006/08–2–195–197
http://www.fspublishers.org

Evaluation of Different Promising Sugarcane Varieties for some Quantitative and Qualitative Attributes Under Thatta (Pakistan) Conditions

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ABSTRACT

Experiments were conducted for two consecutive years 2001-2002 and 2002-2003, at National Sugar Crops Research Institute Thatta to evaluate some quantitative and qualitative characteristics of 11 sugarcane varieties. The trials were laid out in randomized complete block design with three replications. Recommended cultural and agronomic practices were followed to raise the crops. Data on different sugarcane traits as brix %, cane thickness (mm), cane height (cm), number of internodes, millable canes/ stool and cane yield (t ha^{-1}) were recorded. Results revealed that check variety Th - 10 performed better in terms of cane yield with more than one yield component followed by Th - 34, AEC – 86 - 347. Correlation coefficient values of different yield characters with cane yield were positive and highly significant. The highest value of correlation with cane yield was exhibited from millable canes (r = 0.726) and plant height (r = 0.538).

Key Words: Sugarcane; Correlation; Interaction; Quantitative traits

INTRODUCTION

Sugarcane (*Saccharum officinirum* L.) is an important industrial and cash crop in Pakistan. Besides sugar production, sugarcane produces numerous valuable byproducts like alcohol used by pharmaceutical industry, ethanol used as a fuel, bagasse used for paper and chip board manufacturing and also burning sugar mills furnaces, and press mud used as a rich source of organic matter and nutrients for crop production.

In Pakistan sugarcane is grown on an area of more than one million hectares with total production of 46.33 million tones (Khan *et al.*, 2003). National average cane yield is about 47 t ha^{-1}, which is for below the existing potential (Zafar *et al.*, 2003). Pakistan occupies 5th position in respect to area under sugar cane crop and almost 15th position in cane production but ranks far below in sugar production. Although crop occupies an important place in cropping pattern of Pakistan and brings large dividends to growers, but its yield and production has become stagnant for the last two decades due to limited resources and other un-avoidable factors. Main reasons for lower cane yield are lack of high-potential varieties, limited irrigation resources and technology (Bahadar *et al.*, 2002). The production of cane in Pakistan is low about 47 tha^{-1} with about 80 tha^{-1} in Cuba, Egypt and a number of other countries. Sugarcane cultivation decreased 12% in Sindh province and production reduced 16% due to shortage of water during last 10 years.

According to Glaz (2000) sugarcane production could never be improve until and unless promising varieties and technologies are adopted on large scale. Similarly, Nazir *et al.* (1997) reported that higher cane yield is the function of higher genetic potential of a variety.

Efforts are made to increase cane production by introducing high yielding varieties and adoption of improved crop production techniques (Gill, 1995). Keeping in view the importance of varietal aspect in sugarcane, the present study was conducted to compare the quantitative and qualitative characteristics of 11 sugarcane varieties being cultivated through out the country with locally evolved commercial variety Th - 10 as a check under the agro-climatic conditions of Thatta.

MATERIALS AND METHODS

A set of 11 sugar cane varieties collected from different research institutes of the country were planted in coordinated varietal trial along with local check (Th - 10) during 2001 - 2002 and 2002 - 2003 at National Sugar Crop Research Institute, Thatta to test their performance and adoptability under Thatta conditions. Plantation was done on (give dates for each year). Each treatment had 5 m long 3 rows at 1 m row spacing. The trial was laid out in randomized complete block design with three replications. The recommended fertilizer dose at 275 – 112 - 175 kg ha^{-1} NPK was applied. All PK and 1/3 N was applied at the time of sowing, remaining N was applied in two splits, one at the completion of germination and the second in the month of June. Recommended cultural practices, insect pest and disease control measures were adopted as and when required both the year. The crop was harvested manually at its physiological maturity (Devaraj & Shanmugasundaram,

1988). Data pertaining to cane height (cm), cane thickness (mm), millable canes ("000"ha^{-1}), cane yield t ha^{-1}, brix % and commercial cane sugar (CCS %) were recorded according to standard procedures. The data were analyzed statistically by using the procedure of Steel and Torrie (1980).

RESULTS AND DISCUSSION

Mean performance of the sugarcane varieties for years 2001 - 2002 and 2002 - 2003 is presented in Table I. Taller plants (260.2 cm) were produced by S – 96 – SF - 574 in the year 2001 - 2002 and NSG - 555 showed tallest plants (291.6 cm) during 2002 - 2003. Highest number of internodes (23.66) produced by Th - 34 and 27.73 by S – 96 – SF - 574 in 2001 - 2002 and 2002 - 2003, respectively. NSG – 555 showed thickness of 26.05 mm and 26.91 mm in the year 2001 - 2002 and 2002 - 2003, respectively whereas, Th - 10 and NSG - 60 showed highest number of millable canes of 143.3 and 188.3, respectively. Cane yield of 122.2 t ha^{-1} was recorded for Th - 34 in 2001 - 2002 and Th - 10 gave cane yield of 146.7 t ha^{-1} in 2002 - 2003. Highest brix% (22.41 & 22.5) was recorded for Th - 10 variety during 2001 - 2002 and 2002 – 2003, respectively.

The analysis of variance exhibited that years are highly significant at 0.05% probability level for all the characters studied (Table II) and all the varieties were highly significant at the same level for all the characters. Interaction of years with environment was highly significant for CCS %, cane height and number of internodes. Cane thickness was significant, millable canes and cane yield were non-significant.

Correlation among phenotypic traits may reflect biological processes that are of considerable evolutionary interest, correlation can be the result of genetic, functional and physiological or developmental characters (Wagner & Schwenk, 2000). Coefficient of correlation of yield components with the cane yield (Table III) showed that cane thickness, cane height, number of internodes and millable cane were positively and highly significant showing that as

Table I. Mean performance of different sugarcane varieties during 2001-2002 and 2002-2003

Varieties	CCS%		Cane Thickness(mm)		Cane Height (cm)		No: of internodes		Millable can '000' ha^{-1}		Cane Yield t ha^{-1}	
	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03
NSG-60	12.95	10.57	22.21	22.03	188.8	221.0	19.33	23.10	121.7	188.3	62.50	126.7
NSG-555	13.06	12.73	26.05	26.91	203.7	291.6	20.77	26.40	83.33	121.7	70.00	109.2
AEC-86-347	13.37	14.99	23.01	24.53	239.7	252.0	20.44	26.43	110.0	158.3	93.33	136.7
TH-34	13.15	11.00	23.09	24.29	216.0	264.0	23.66	20.30	141.7	130.0	122.2	1117.7
S-96-SF-571	12.50	11.25	24.36	24.63	240.3	222.1	21.11	27.20	108.3	123.3	85.83	99.83
S-96-SF-574	12.69	12.60	23.97	25.31	260.2	214.2	20.77	27.73	100.0	123.3	90.83	89.17
S-97-US-183	12.75	12.19	23.09	23.93	243.2	260.7	21.11	23.18	125.0	153.3	90.67	123.2
TH-10	14.04	13.58	22.38	26.21	252.1	278.1	17.33	27.20	143.3	146.7	105.0	146.7
HS-12	12.39	13.84	22.46	25.26	212.7	271.1	18.44	21.17	130.0	138.3	89.00	117.3
HS-4	12.13	11.65	22.12	26.14	188.1	223.2	17.33	20.40	116.7	96.67	58.33	74.16
S-87-US-873	12.30	13.99	22.51	24.35	203.6	268.7	18.22	21.54	113.3	110.0	82.67	85.83
S-88-US-436	12.45	9.79	21.41	22.48	213.4	216.1	17.33	23.40	90.0	135.0	65.67	70.00
LSD0.5%	5.85	5.04	3.369	2.05	55.23	28.34	4.091	3.697	46.23	36.99	35.91	38.94

Table II. Mean squares and their significance from analysis of variance for different parameters of sugarcane varieties during 2001-02 2002-03

Source of variation	D.F	CCS (%)	Cane Thickness (mm)	Cane Height (cm)	No. of internodes	Millable Canes '000' ha^{-1}	Yield (t ha^{-1})
Replication	2	0.441	0.884	909.259	1.349	75.347	669.803
Factor A Year	1	3.925**	56.960**	12850.985**	340.692**	7300.347**	10042.988**
Factor B Variety	11	4.811**	6.885*	20.38.120**	19.901**	1757.923**	2204.708**
A x B	11	3.379**	2.077*	2041.581**	16.086**	1037.468NS	708.01NS
Error	46	0.542	2.760	674.707	5.122	587.304	514.070

*Significant at 5% ; **Highly significant at 5%; NS= non significant.

Table III. Coefficient of correlation for various sugarcane characters with yield during 2001-02 and 2002-03

Independent Variables	Dependent Variables (Yield t ha^{-1})	Coefficient of variability	Standard Error
CCS (%)	0.147NS	5.85	2.797
Cane Thickness (mm)	0.293*	6.94	1.756
Cane Height (cm)	0.538**	11.04	0.087
No. of internodes	0.438**	10.37	0.891
Millable canes (000/h)	0.726**	19.33	0.083

*Significant at 5%; **Highly Significant at 5%; NS= non significant.

the increase in these traits resulted in simultaneously increase in cane yield whereas CCS % was positive but non-significant. Mahmood *et al.* (1990), Ramdoyal (1999), Janmisar (1985) and Afghan *et al.* (1993) also got the highly significant and positive correlation between dependent and independent characters.

The values of correlation of yield components with the cane yield (Table III) provided the selection criteria and among these millable cane had the highest value (r = 0.726) followed by cane height (r = 0.538) showing that selection of cane would be primarily based on these variables. Coefficient of variability (Table III) showed that the variation in the millable cane and plant height 19.33 and 11.04, respectively was due to the environment with the less standard error. Bahadar *et al.* (2002), Glaz (2000), Khan *et al.* (2003) and Zafar *et al.* (2003) got the similar results of dependent and independent variables.

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(Received 10 September 2005; Accepted 20 January 2006)