

Quantitative and Qualitative Parameters of Sugarcane Varieties of Other Province with the Locally Evolved Commercial Variety Gulabi-95

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ABSTRACT

The field experiment was conducted at Sugarcane Section, Agriculture Research Institute, TandoJam, Pakistan, during the year 2001-2002 for parameters of sugarcane varieties of other province with the locally evolved commercial variety Gulabi-95. The collection sources were, NARC Islamabad, SRI Faisalabad, SCRI Mardan, PARC Thatta and A.R.I. Tandojam. Among the tested varieties (CP-88/1165, SPF-213, ML-7, FAC-81-745, Thatta-10 and Gulabi-95). The local evolved commercial Gulabi-95 recorded maximum germination percentage, lengthy canes, more internode number, millable canes and cane yield. However, the qualitative parameters i.e. Brix and C.C.S which are important for evolving variety were found higher in the ML-7 sugarcane variety. It is recommended that further research should be performed on ML-7 and Thatta-10 as both varieties seems to be better in qualitative parameters.

Key words: Sugarcane, varieties, qualitative and quantitative parameters

INTRODUCTION

Sugarcane is a giant perennial grass belonging to the family graminas and the tribe *Andropogonae*. Its generic and specific name is *Saccharum officinarum*. Under genus there are other 4 distinct species: *S. robustum*, *S. barberi*, *S. sinense* and *S. Spontaneum*. According to Babu (1990), the species of *spontaneum* and *robustum* are called wild canes, which do not possess any sugar content. The *Saccharum officinarum*, the noble cane is sweet and used in food. The species *barberi* and *sinense* appeared to be intermediate between the wild and the noble species and probably evolved from natural hybridization between them. Yadava (1991) mentioned that tropical noble canes indigenous to New Guinea. It is believed that they were originated as a result of natural hybridization of *S. robustum* with related genera *E. maximum* or *S. Fusca*. These include commercial and chewing canes like Bourbon, Cheribon, Creole, Caledonia, Leathera and Tana. They are soft, large barreled canes; high cane yield, high sucrose, low fiber, resistant to smut, susceptible to frost, drought, highly susceptible to red rot and mosaic.

Sugarcane being the fifth largest and second most important cash crop of Pakistan occupies about 4% of the total cropped area. Its share in the value-added crops averages around 16%. Sugarcane farming is the main source of raw material for the sugar industry and provides valuable by products viz. Molasses and fodder for livestock. The number of sugar mills has increased from 39 (1998-99) to 75 (1999-2000) with 31 in Sindh, 37 in Punjab and 7 in NWFP. Total area under sugarcane in Pakistan is 1.135 million ha with total cane product of 52.439 million tons and average yield of 52 tons ha⁻¹. The refined sugar production from cane during 2000-2001 in Sindh province was 971,158 tons and 208,386 tons raw sugar was imported and processed in Sindh sugar mills, which accumulated a total of 1,179,545 tons sugar production in Sindh. The sugar production from domestic source was reduced by 2.53%, while in the year 1999-2000 the sugarcane in Sindh was cultivated on an area of 230 thousand ha which produced 14900 thousand metric tones of cane with yield of about 62 metric tones ha⁻¹, this decrease might have association with shortage of irrigation water, which ultimately resulted in reduced total cane production (Anonymous, 2001).

In sugarcane, improved, high yielding varieties has been the basic requirement for getting self sufficiency in local sugar consumption as well as to make surplus sugar to export. At present Sindh province cannot afford further shifting of area of other main crops towards sugarcane. Hence, it is need of the time to plant high yielding and high sucrose content varieties to obtain maximum cane yield and sugar unit⁻¹ area. In Sindh province, though conditions for development of breeding programme are favorable, but due to non-availability of basic facilities i.e. laboratories, green house, photo period chamber etc. development of new sugarcane varieties has become difficult. Thus,

introduction or development of varieties through selection from the available germplasm collected within the country and from abroad is continued. Keeping in view the importance of varietal aspect in sugarcane, the present research was conducted to compare quantitative and qualitative parameters of sugarcane varieties of other province with the locally evolved commercial variety Gulabi-95.

MATERIALS AND METHODS

The field experiment was laid out in a three-replicated randomized complete block design in the experimental fields of Sugarcane Section, Agriculture Research Institute, Tandojam, Pakistan, during the year 2001-2002. The details of treatments and cultural practices are as under:

Treatments = Varieties (6)	Variety
Source	CP-88/1165
NARC Islamabad	SPF-213
SRI Faisalabad	ML-7
SCRI Mardan	FAC-81-745
PARC Thatta	Thatta-10
A.R.I. Tandojam	Gulabi-95 (Check)

Land Preparation and Seed Sowing

Deep and crosswise gobble plow was followed by leveling and crosswise cultivator. Well rotten F.Y.M. at the rate of 40 cartloads ha^{-1} was incorporated in the soil one month before planting to increase microbial activity of soil organisms and to increase organic matter for the improvement of soil fertility status. After land leveling operation, the ridges and furrows were prepared at the distance of 100 cm. The seed sets were placed in the furrows at 6-8 inches depth. The obtained sets were the age of eight months, treated with Vitavax @ 120 g 100^{-1} l water against the attack of seed borne sugarcane diseases like whip smut. After covering, the field was irrigated. The sowing was completed unto 20th September 2001. Forty thousand having two to three budded sets acre^{-1} with end to end arrangement were planted in single row system.

Irrigation

The irrigation was applied at 7-10 days interval in summer (April- August) and 10-15 days interval in winter (November-March).

Fertilizer

The NPK Fertilizers were applied at the recommended dose for lower Sindh (110-45-70 kg ac^{-1}) in four split applications at different crop growth stages.

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 1-1/2 kg ac^{-1} within a period of 3 months after planting. Weedicide was applied in moist conditions to get good results.

Harvesting

The harvesting of sugarcane crop was done when the 1/3 leaves of the basal portions 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.

Data Analysis

The data collected were analyzed statistically for analysis of variance and LSD test to discriminate the superiority of the means of different varieties as suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Germination Percentage

Local commercial variety Gulabi-95 recorded significantly higher germination (53.15%) followed by Thatta-10 (46.20%). However, the minimum germination (35.20%) was observed in case of variety FAC-81/745. The higher germination percentage in Gulabi-95, followed by Thatta-10 might be the genetic characteristics of the parental materials of these varieties. Results reported by Said-Rehman *et al.* (1991) have also indicated significantly different response of sugarcane cultivars they examined for germination.

Cane Length

Sugarcane variety Gulabi-95 which was included in the study as check variety significantly produced highest cane length (224.03 cm) as compared to other varieties studied. The results further exhibit that statistically the differences between SPF-213, ML-7, FAC-81/745 and Thatta-10 were non-significant for cane length. The trend of effectiveness revealed a genetic similarity in case of this parameter in these varieties. However, variety SPF-213 ranked second with 196.47 cm cane length, followed by ML-7 and Thatta-10 having average cane length of 195.20 cm and 192.84 cm respectively, while the minimum cane length (145.46 cm) was recorded in case of variety CP-88/1165. These results partially supported by the findings of Said-Rehman *et al.* (1991) and Day *et al.* (1994) who have reported different response of growth and yield components in different sugarcane cultivars.

Number of Internodes

The results for number of internodes exhibits that variety Gulabi-95 produced significantly maximum number of internodes (25.01), followed by varieties SPF-213, ML-7 and FAC-81/745 having 20.49, 20.12 and 20.10 respectively. In variety Thatta-10 that is a promising and upcoming cultivar, 18.97 internodes were recorded, while the lowest numbers of internodes (14.72) were recorded in case of variety CP-88/1165. These higher values for number of internodes cane⁻¹ in Gulabi-95 might be due to their genetic characteristics, which they received from their parental materials. These results partially supported by the findings of Said-Rehman *et al.* (1991), Day *et al.* (1994) and Goswami and Singh (1996) who examined a number of sugarcane varieties for their response to different growth and yield components and reported varied behavior for different sugarcane varieties.

Cane Yield

Gulabi-95 (check) sugarcane variety proved its superiority over rest of varieties by recording cane yield of 103.24 tones ha⁻¹, followed by an upcoming variety ML-7 that produced cane yield of 98.63 tones ha⁻¹. Variety FAC-81/745 also produced good results with cane yield of 93.59 tones ha⁻¹, while Thatta-10 and SPF-213 varieties had cane yield of 88.58 and 80.00 tones ha⁻¹ respectively. The lowest cane yield of 63.96 tones ha⁻¹ was produced by variety CP-88/1165. This higher cane yield ha⁻¹ in local commercial variety Gulabi-95 was mainly associated with higher germination percentage, greater cane length and internodes. Moreover, Gulabi-95 has better morphological characters as compared to the rest varieties, thus higher yield was obtained. These results are further supported by the findings of Baljit-Singh *et al.* (1994), Goswami and Singh (1996), Saxena *et al.* (1996), Das *et al.* (1996) and Singh and Singh (2000) who carried out a number of studies on different sugarcane varieties and found different trend for cane yield unit⁻¹ area.

Brix Percentage

The total fibres solids in the extracted cane juice are considered brix content. It can be seen from the results that there was quite a different trend in case of brix content observed as was in the case of quantitative components. The highest brix content (27.27%) was obtained in case of upcoming variety ML-7, followed by Thatta-10 and Gulabi-95 (25.45 and 24.48%) respectively. Variety SPF-213 and CP-88/1165 recorded brix content of 21.14 and 19.16%, respectively while the lowest brix content (19.07%) was recorded in FAC-81/745. These results are in agreement with those of Das *et al.* (1996) and Singh and Singh (2000) who studied a number of sugarcane varieties and found different levels of brix content.

It can further be observed that results for qualitative character brix content are quite different as compared to the quantitative characters of all the varieties under study. Local commercial variety Gulabi-95 which was on top for all the quantitative characters, ranked third for this qualitative character (brix), while ML-7 which was well behind the Gulabi-95 jumped to first position for brix. Similar position was noted for Thatta-10, which was little inferior to Gulabi-95 for quantitative characters, proved better in brix than the check variety. The trend of effectiveness lead to mention that ML-7 and Thatta-10 could be most promising varieties for Sindh province.

Table 1: Sugarcane varietal characters

Variety	Germination (%)	Cane Length (cm)	Internode number	Millable canes per stool	Cane Yield ha ⁻¹ (tones)	Brix (%)	C.C.S (%)
CP-88/1165	38.54c	145.46c	14.72d	4.30bc	63.96f	19.16e	10.22e
SPF-213	38.61c	196.47b	20.49b	4.69abc	80.00e	21.14d	11.24d
ML-7	39.07c	195.20b	20.12bc	4.20c	98.63b	27.27a	14.51a
FAC-81/745	35.20d	191.34b	20.10bc	4.93abc	93.59c	19.07e	10.14e
Thatta-10	46.20b	192.84b	18.97c	4.97ab	88.58d	25.45b	13.54b
Gulabi-95	53.14a	224.03a	25.01a	5.19a	103.24a	24.48c	13.02c
S.E. ±	0.447	1.569	0.249	0.129	0.621	0.111	0.057
LSD 0.05	1.880	6.593	1.046	0.542	2.611	0.466	0.242
LSD 0.01	2.576	9.033	1.433	0.743	3.577	0.639	0.332

C.C.S. Percentage

The C.C.S. abbreviates the Commercial Cane Sugar, which is always an ultimate objective of a researcher while working on sugarcane varieties. The trend of effectiveness for C.C.S. percentage is well in similarity to the effects observed in case of brix content. The results further revealed that ML-7 variety from NWFP proved its merit by recording maximum C.C.S. content and Thatta-10 ranked second after ML-7. Local commercial variety Gulabi-95 (check) which was on top for all the quantitative characters, ranked third for this qualitative character (C.C.S. %), while ML-7 which was well behind the Gulabi-95 jumped to first position for C.C.S. Similar position was noted for Thatta-10. These results are fully supported by Das *et al.* (1996) and Singh and Singh (2000) who studied a number of sugarcane varieties and found different levels of C.C.S. percentage. This shows that ML-7 and Thatta-10 could be promising varieties for Sindh province in future for general cultivation. However, further studies are required to confirm these results.

The comparative analysis of quantitative and qualitative characters of six sugarcane varieties leads to draw conclusion that upcoming varieties ML-7 and Thatta-10 could be the future varieties for general cultivation in Sindh province, because quantitatively these varieties were satisfactory and qualitatively both of these varieties left local commercial variety Gulabi-95 well behind. Further studies are suggested to confirm these results.

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