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PERFORMANCE OF SOME NEWLY DEVELOPED SUGARCANE GENOTYPES FOR SOME QUANTITATIVE AND QUALITATIVE TRAITS UNDER THATTA CONDITIONS

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ABSTRACT

Investigations were carried out at National Sugar Crops Research Institute (NSCRI), Thatta to assess the performance of different sugarcane genotypes under agro-climatic condition of Thatta during 2006-07. Twelve sugarcane genotypes developed from exotic fuzz (true seed) of USA origin along with one local check as standard variety Thatta-10 were evaluated for their cane yield, yield components and quality performance subsequently in 4th cycle. The behavior of the genotypes with regard to cane yield, yield components and quality remained variable during the study. The data indicated that the genotypes HoTh-610, HoTh-607 and check variety Thatta-10 remained superior by producing maximum average cane yield of 112.66, 106.66 and 106.00 t ha^{-1}, respectively. While, the genotypes HoTh-640, HoTh-641 and HoTh-642 were ranked next to check variety on account of producing average cane yield of 103.0, 100.0 and 100.0 t ha^{-1}, respectively. Moreover, the genotypes HoTh-614, HoTh-612, HoTh-633 and HoTh-618 occupied intermediate position by producing average cane yield of 94.0, 93.00, 89.66 and 82.0 t ha^{-1}, respectively. While, in case of commercial cane sugar percentage, the data indicated that the genotypes HoTh-642 and HoTh-641were identified as high sugar containing on account of producing maximum CCS of 13.43% and 12.99%, respectively. Moreover, the genotypes HoTh-607, HoTh-606, HoTh-640, HoTh-610 and HoTh-618 also appeared to be the good sugar containing with CCS of 12.72, 12.42, 12.40, 12.36 and 12.35%, respectively, against Thatta-10 (11.56% CCS). All the genotypes along with Thatta-10 were also less susceptible to borer complex infestation.

Key Words: Cane yield, genotypes, sugar cane, yield components.

INTRODUCTION

Sugarcane (*Sccharum officinarum,* L.) is the major valuable cash crop in Pakistan and improves the socio economic conditions in various aspects. It is the main source of sugar production and meets the 75% requirements of sugar industry, which builds up the over all national economy through excise duty and also saves precious foreign exchange (Bahadar, *et al.* 2007). Besides sugar production, it creates wider industrial base, providing several by-products like molasses, filter cakes, baggass etc. for the further utilization in other sectors and green fodder/concentrates for cattle. In this way employment is created on farm, industry and trade level. Despite the fact, sugarcane plays an important role in the economy of Pakistan, the cane yield and sugar recovery percent per unit area is low as compared to other sugarcane growing countries of the world. High yielding varieties has a decisive role in getting self sufficiency in local sugar consumption as well as to make surplus sugar to export. However, the crop production is faced by several limitations like non-availability of suitable/promising genotypes and technology, which hampers the situation particularly in Sindh. In Pakistan the national average cane yield is about 47 t ha^{-1}, which is less than existing potential because of impaired production technology and low yielding varieties (Zafar *et al.* 2003).

This crop has a great potential if the high yielding improved varieties are evolved with proper agronomic operations through research and experimentation. Bahadar *et al.* (2004) suggested that introduction of new standard sugarcane varieties on large scale would surely change the existing position. Chattha *et al.* (2001) reported the average cane yield of Punjab as 43-47 t ha^{-1} as compared with the average cane yield of improved varieties (90-100 t ha^{-1}) and its potential yield of 105-154 t ha^{-1}. This reflects the wide scope and role of new sugarcane varieties under the existing resources.

The continuous efforts made by the sugarcane breeders to develop high cane and sugar yielding varieties during the last few years have changed the situation of cane production in Pakistan much better than before. Yet it is direly required to enhance cane and sugar yields per hectare through genetic means (Panhwar and Memon, 2004). The increase in cane production is possible with improvement in sugarcane by adopting hybridization techniques. In Pakistan the basic facilities for hybrid seed production and variety development are lacking. Though the coastal belt in Sindh, is endowed with specific climatic conditions where sugarcane plants flower. But at local spots where plants flower, non synchronization in genotypes for cane flowering reduces the possibility of

hybridization (Hussain *et al.* 2001). Therefore, sugarcane variety development in Pakistan is mainly based on import of germplasm from the cane breeding stations abroad and also through exotic or locally collected fuzz (Kaloi, *et al.*, 2007). In most of the cane breeding programs large number of seedlings are grown from fuzz (ture seed), selections are made in subsequent generations to obtain superior clones/genotypes for release as new varieties (Keerio, 2000). Estimation of stability of a new genotype for yield and quality traits is prerequisite in plant breeding program prior to its release for its commercial planting. Productivity of a genotype in favorable environment does not indicate its adaptability and stability, whereas performance of a genotype in diverse environments is some how a true evaluation practice of its inherent potential for adoptiveness (Kang and Miller, 1984). Therefore, varietal trials are normally conducted over various locations and different years, after achieving meaning full results before deciding the release of new cultivars in a particular region.

Considering the importance of the study, present investigations were carried out to asses the performance of various yield and yield traits of newly developed sugarcane genotypes under agro climatic conditions of Thatta, Sindh.

MATERIALS AND METHODS

The field experiment was laid out in randomized complete block design (RCBD) with three replications, having net plot size of 8x3 meter (24 m^2) at National Sugar Crops Research Institute (NSCRI), Thatta during 2006-2007. Twelve sugarcane genotypes viz. HoTh-603, HoTh-606, HoTh-607, HoTh-610, HoTh-612, HoTh-614, HoTh-618, HoTh-633, HoTh-640, HoTh-641, HoTh-642 a local standard variety (Thatta-10) as check. The planting was done during autumn seasons. The other agronomic practices were followed after Junejo *et al*. (2009).

RESULTS AND DISCUSSION

The results of the study presented in Table-1 revealed that there were highly significant differences in the mean values for cane yield and yield components. Maximum average cane thickness (28.24 mm) was exhibited in check variety Thatta-10 followed by HoTh-612, HoTh-642 and HoTh-610, with average cane thickness of 26.96, 25.72, and 25.27 mm, respectively. While, minimum average cane thickness (19.17 and 19.25 mm) was recorded in HoTh-603 and HoTh-640, respectively, against the check variety. However, the genotypes HoTh-607, HoTh-641 and HoTh-614 displayed intermediate performance with average cane thickness of 24.69, 24.35 and 22.21 mm, respectively, but could not surpass the check variety. The results regarding number of internodes per plant revealed that the sugarcane genotype HoTh-618 remained on top (28.66 internodes per plant) followed by Thatta-10 and HoTh-633 with 24.0 and 22.33 average internodes per plant respectively. Moreover, rest of the genotypes produced comparatively less average number of internodes per plant against the check variety. In case of average cane height, the genotypes HoTh-642, HoTh-641 and HoTh-612 were on top with 241.0, 228.0 and 224.0 cm cane height. While, the genotypes HoTh-610, HoTh-607 and HoTh-618 produced average cane height of 212.0, 202.0 and 200.0 cm respectively, but could not exceeded the check variety Thatta-10 (213.0 cm cane height). In contrast, the genotypes HoTh-606 and HoTh-603 produced minimum (128.66 and 134.00 cm) average cane height, respectively, against the check variety (Table-1).

As regards the millable canes, maximum average millable canes per hectare (125000 and 111666) were exhibited in genotypes HoTh-618 and HoTh-610, respectively. Moreover, check variety Thatta-10 and HoTh-607 exhibited alike results with 106666 average millable canes per hectare. While, the genotypes HoTh-642 produced 100000 average millable canes per hectare, but could not surpass the check variety in terms of this trait. On the contrary, rest of the genotypes produced comparatively less average millable canes than that of check variety. The data regarding average cane yield presented in Table-1 revealed that genotype HoTh-610 remained on top (112.66 t ha^{-1} cane yield) followed by HoTh-607 and Thatta-10, with average cane yield of 106.66 and 106.00 t ha^{-1}, respectively. While the sugarcane genotypes HoTh-640, HoTh-641 and HoTh-642 displayed average cane yield of 103.0, 1100.0 and 100.0 t ha^{-1} respectively, but could not out yielded the check variety. Moreover, rest of the genotypes produced minimum average cane yield as compared to check variety.

It is well known that sugarcane varieties are greatly affected by genetic make up (El-Geddaway, *et al.* 2002). The variation in cane yield and yield components among the varieties may be attributed due to their differences in genetic make up (Varghese *et al.*, 1985 and Mali and Singh, 1995). Memon *et al.* (2005) and Panhwar, *et al*. (2008) reported great variability among the sugarcane genotypes for cane yield and yield components when tested in 4th cycle under agro-climatic conditions of Thatta. Maximum mean CCS (13.43%) was obtained from HoTh-642, followed by HoTh-641, HoTh-607, HoTh-606, HoTh-640, HoTh-610, HoTh-618, HoTh-612 and HoTh-614 with mean CCS of 12.99, 12.72, 12.42, 12.40, 12.36, 12.35, 11.93 and 11.92%, respectively, against check variety Thatta-10 (11.56%). In contrast, the genotypes HoTh-633 and HoTh-603 produced minimum CCS of 11.15 and 11.29%,

respectively, against the check variety. The borer complex infestation data in Table-2 revealed that all the genotypes including check variety Thatta-10 were less susceptible to borer complex infestation.

Table-1: Performance of different sugarcane genotypes for yield and yield components in 4th cycle at NSCRI, farm Thatta during 2006-07.

Genotypes	Cane Thickness (mm)	Cane height (cm)	Number of Internodes Plant^{-1}	Millable Canes ha^{-1}	Cane yield (t ha^{-1})
HoTh-603	19.17^{g}	134.00^{d}	18.33^{f}	70000^{e}	68.66^{b}
HoTh-606	20.27^{fg}	128.66^{d}	19.66^{de}	83000^{d}	76.66^{b}
HoTh-607	24.69^{cd}	202.00^{ab}	21.66^{c}	106666^{b}	106.66^{ab}
HoTh-610	25.27^{cd}	212.00^{ab}	20.00^{d}	111666^{b}	112.66^{a}
HoTh-612	26.96^{b}	224.00^{a}	21.00^{cd}	88333^{cd}	93.66^{ab}
HoTh-614	22.21^{e}	192.00^{b}	21.66^{c}	86666^{cd}	94.00^{ab}
HoTh-618	21.60^{ef}	200.00^{ab}	28.66^{a}	125000^{a}	82.00^{b}
HoTh-633	20.63^{f}	186..00^{bc}	22.33^{c}	88333^{cd}	89.66^{b}
HoTh-640	19.25^{g}	199.00^{ab}	16.33^{g}	93333^{c}	103.00^{ab}
HoTh-641	24.35^{d}	228.00^{a}	21.00^{cd}	93333^{c}	100.00^{ab}
HoTh-642	25.72^{c}	241.00^{a}	21.00^{cd}	100000^{bc}	100.00^{ab}
Thatta-10	28.24^{a}	213.00^{ab}	24.00^{b}	106666^{b}	106.00^{ab}
CV%	3.32	7.91	3.65	15.46	13.81
LSD 5%	1.23	25.82	1.28	7786.0	21.58
LSD 1%	1.65	34.65	1.72	10450.0	28.96

Means followed by the same letters do not differ significantly at 5 and 1% level of probability.

Table-2: Infestation% of different sugarcane genotypes by borer complex in 4th cycle at NSCRI, Farm Thatta during 2006-07.

Genotypes	Infestation %					
	Top Borer	Stem Borer	Root Borer	Gurdas-pur Borer	Mean Infes-tation %	Remarks
HoTh-603	5.62	9.37	3.12	00	4.52	LS
HoTh-606	6.62	5.96	4.63	00	4.30	LS
HoTh-607	3.33	5.55	2.22	00	2.77	LS
HoTh-610	3.07	5.76	2.69	00	3.64	LS
HoTh-612	3.33	5.33	2.00	00	2.66	LS
HoTh-614	15.71	12.85	7.14	00	8.77	LS
HoTh-618	3.57	3.21	2.14	00	2.23	LS
HoTh-633	6.25	8.75	5.00	00	5.00	LS
HoTh-640	7.89	6.84	4.73	00	4.86	LS
HoTh-641	4.60	7.89	3.94	00	4.10	LS
HoTh-642	5.00	6.25	4.73	00	3.90	LS
Thatta-10	3.63	10.00	7.27	00	5.22	LS

LS= Less susceptible (Above 8.00-9.00%), MS= Moderately susceptible (Above 9.01-10.00%), S = Susceptible (Above 10.01-11.00%), HS= Highly susceptible (Above 11%)

CONCLUSION

On the basis of over all performance, it was concluded that genotypes viz HoTh-607, HoTh-610, HoTh-640, HoTh-641 and HoTh-642 exhibited better performance in terms of cane yield, yield contributing traits and commercial cane sugar percentage. Hence, it was suggested that the selected sugarcane genotypes should be further tested under potential area for identification as best cultivars for general cultivation.

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