EVALUATION OF VARIOUS SUGARCANE VARIETIES FOR YIELD & SUGAR CONTENT

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ABSTRACTS

In order to assess the various sugarcane varieties an experiment was conducted at Shakarganj Sugar Research Institute farm in a village (Basti Ghazi Shah), District Jhang. Four varieties *viz.* NSG-59, HSF-240, SPF-234 and CPF-246 were tested in Randomized complete design (RCBD) with three replicates. Genotype NSG-59 showed better performance in terms of cane yield, yield contributing traits, sugar recovery percentage cane, sugar yield and net profit under prevailing agro-climatic conditions of Jhang, Pakistan. SPF-234 was best with respect to germination and cane weight while in term of millable cane and cane length this genotype was poor but in case of cane yield, sugar yield and net profit this genotype was next to NSG-59. So, we can say that SPF-234 is also good for farmer point of view.

Key Words: Sugarcane genotypes, Sugar contents, net profit, Sugarcane yield

INTRODUCTION

Sugarcane is one of the major and commercial crop of Pakistan (Mehboob *et al.*, 2000), plays a pivotal role in both agriculture and industry economy of our country. Its share in value added of agriculture and GDP are 3.6 percent and 0.8 percent, respectively. It is estimated that the sugarcane is grown in the area of 943 thousand hectares and production is 49.4 million tons (Anonymous, 2010). It provides the raw material to 84 sugar mills (Rahman, 2009). Although sugarcane plays an leading role in the economy of Pakistan but the average cane yield is much lower due to improper nutrient management (Suggu *et al*, 2010), limited irrigation resources and technology (Bahadar *et al.*, 2002), insect pest management (Abdullah, 2009) and the use of low yielding varieties (Afghan *et al.*, 2010). The major cause of low yield of sugarcane is the growing of old varieties loosing yield potential due to disease infestation (Gill, 1995).

It is evident that Sugarcane production could be improved by the use of promising varieties and technologies which included well land preparation, proper irrigation, good weed control and improvement on other agronomic practices on large scale (Gill, 1995, Glaz, 2000). This crop has long term implications, particularly because of its perennial growth habit. Therefore, cultivar selection is an important decision for sugarcane growers (Posey *et al.*, 2006).

Keeping in view the varietal importance in sugarcane, the present study was conducted to evaluate the newly developed sugarcane genotypes with standard varieties under the agro-climatic conditions of Jhang, Punjab.

MATERIALS AND METHODS

Study area

The research was conducted at Shakarganj Sugar Research Institute farm in a village (Basti Ghazi Shah), District Jhang. The climate of the area is semi-arid with hot summer and cold winter. Agro-ecologically it is a mix-zone, where six major crops i.e., rice, wheat, cotton, sugarcane, maize and potato are grown along the year (Hassan *et al.*, 2004).

Experimental material and layout

The crop was laid out in Randomized complete design (RCBD) with three replicates and four treatments. Seed rate was used recommended @ 70000 double budded sets per hectare on 1st week of March, 2010 and was sown in 120 cm apart, 20 cm deep trenches in half acre plot (30x60 = 1800M2 or 3 kanal 11 marlas) having plot size of 1.3 kanal each. The four treatments included: NSG-59, HSF-240, SPF-234 and CPF-246. Recommended cultural practices, insect pest and disease control measures were the same for all the treatments and adopted as and when required.

Procedures for Recording Data of Individual Parameters for all three trials

Procedures adopted for recording various observations on agronomic, qualitative and economic parameters, as well as data analysis are given below:

1-Germination (%)

A known number of double-budded setts were planted per unit area, and at the completion of germination (45 days after sowing) number of seedlings per unit area was counted. Germination percentage was calculated on the basis of total number of buds per unit area.

2 – No. of Tillers per Plant

Tillers per plant were counted with the help of formula;

$$\text{Tillers/ plant} = \frac{\text{Total Tiller} - \text{Germination Count}}{\text{Germination Count}}$$

3 - Cane Length

Length of ten randomly selected canes from each treatment was measured at harvest averaged.

4 - Stripped-Cane Weight

Ten randomly selected canes from each treatment were weighed together and weight calculated.

5 - Stripped-Cane Yield

All stripped canes of each plot were weighed at harvest and transformed to t ha^{-1}.

6 - Sugar Recovery

Sugar recovery for each treatment was calculated by using the formula given by Anon. 1988 as follows:

Where

S= Sugar 100%

J= Juice purity

M = Molasses purity = 35%

Pol%= Pol % juice (sucrose %)

Juice extraction = 0.65

Boiling house efficiency= 0.98

$$\text{Sugar Recovery (\%)} = \frac{S\,(J-M) \times \text{Pol. \%} \times 0.65 \times 0.98}{J\,(S-M)}$$

7 - Total Sugar

Total sugar ha^{-1} was calculated for each treatment by using the following method:

$$\text{Total sugar (t ha}^{-1}) = \frac{\text{Sugar recov.} \times \text{Stripped cane yield}}{100}$$

RESULTS AND DISCUSSION

Germination

The inherent growth potential of a sugarcane genotype is determined by the germination capacity of its seed cane setts. The data given in the table-1and Fig.1 revealed that there was a significant variation in germination percentage among the different genotypes. The highest germination was observed in V3 (SPF-234) (72%) followed by V1 (NSG-59) (71%) and V4 (CPF-246) (71%) whereas the minimum germination was recorded in V2 (HSF-240) (65%). This might be due to variability in genetic make up of different genotypes for germination as reported by Hapase *et al.*1995, Ahmad *et al.* 2003 and Zafar *et al.* 2003.

Tillers/Plant

Tillers/Plant

Tillering potential of all genotype was significantly different. The results presented in table-1 and Fig.2 indicates that the maximum tillering was recorded in V1 (NSG-59) (2.46 t/p) followed by V2 (HSF-240) (2.32 t/p) and V4 (CPF-246) (2.13 t/p) whereas the minimum tillering was recorded in V3 (SPF-234) (2.01 t/p). Variable tillers/plant for different cane genotypes were claimed by Mishra and Nadiu (1997).

Cane length

It represents the ultimate performance of a genotype as potential and major yield contributing factor. The data presented in table-1and Fig.2 indicates that the highest cane length was observed in V1 (NSG-59) (4.21 m) followed by V4 (CPF-246) (4.01 m) whereas the minimum length was recorded in V2 (HSF-240) (3.74 m) and V3 (SPF-234) (3.35 m).

Millable cane

Millable cane production is an important yield attribute determining the ultimate cane yield in sugarcane. The results showed in table-1 and Fig.1 signifies that the highest millable cane production was recorded in V1 (NSG-59) (110 ha^{-1}) followed by V4 (CPF-246) (106 ha^{-1}) and V2 (HSF-240) (105 ha^{-1}), respectively while the minimum millable cane production was in V3 (SPF-234) (95 ha^{-1}). Similar findings were claimed by Bora *et al.*, (1997).

Cane weight

Cane weight is considered one of the most important yield-contributing factors as it is evident from data table-1 and fig.2. The highest weight was recorded in V3 (SPF-234) treatment (1.45 kg) followed by V1 (NSG-59) (1.41 kg) and V4 (CPF-246) (1.23 kg) whereas the minimum weight was recorded in V2 (HSF-240) (0.95 kg).

Cane yield

The final crop yield is the ultimate goal of each and every grower. The data illustrated in table-1and Fig.1 indicates that the maximum Cane yield was recorded in V1 (NSG-59) treatment (155 t/ha) followed by V3 (SPF-234) (137 t/ha) and V4 (CPF-246) (130 t/ha) whereas the minimum Cane yield was recorded in V2 (HSF-240) (100 t/ha). The reason could be attributed higher value of yield components, viz., individual cane length, number of millable cane and individual cane weight. Similar results were also reported by Bashir *et al.*, (2005).

Sugar recovery % cane

Sugar recovery % cane is an actual estimation of sugar content in sugarcane. The results showed in table-1 and fig.3 describes that the maximum Sugar recovery % cane was recorded in V1 (NSG-59) treatment (12.46 %) followed by V4 (CPF-246) (11.51 %) and V3 (SPF-234) (10.72 %) whereas the minimum Sugar recovery % cane was recorded in V2 (HSF-240) (10.23 %). The different level of Sugar recovery % was also found by Baloch *et al.*, (2004).

Sugar yield

Sugar yield is the outcome of the cane yield and sugar recovery. The data presented in table-1and Fig.3 reveals that the highest sugar yield was recorded in V1 (NSG-59) treatment (19.31 t/ha) whereas V4 (CPF-246) and V3 (SPF-234) showed similar results 15 t/ha and 14.76 t/ha, respectively. The minimum sugar yield was recorded in V2 (HSF-240) (10.2 t/ha). This explanation is in agreement with Kapur and Kanwar (1991).

Economic Benefits

The economics of different sugarcane genotypes worked out in terms of gross income, cost of production and net income in given table-2 & fig. 4.The data showed that the highest gross income of Rs. 484,375/ha has been calculated for sugarcane genotype NSG-59 followed by the SPF-234 (Rs.428,125/ha) and CPF-246 Rs.406,250/ha. Net profit was also greater in NSG-59 (Rs. 354,731/ha) followed by the SPF-234 (Rs. 305,343/ha) and CPF-246 (Rs. 286,137/ha) for sugarcane genotypes.

CONCLUSION

On the basis of overall performance, it was concluded that the genotypes V1 (NSG-59) (NSG-59) exhibited better performance in terms of cane yield, yield contributing traits, sugar recovery percentage cane, sugar yield and net profit under prevailing agro-climatic conditions of Jhang, Pakistan. SPF-234 was best with respect to germination and cane weight while in term of millable cane and cane length, this genotype was poor but in case of cane yield, sugar yield and net profit this genotype was next to NSG-59. So, we can say that SPF-234 is also good for farmer point of view.

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Fig.1 Comparison of Agronomic and qualitative characteristics of sugarcane genotypes

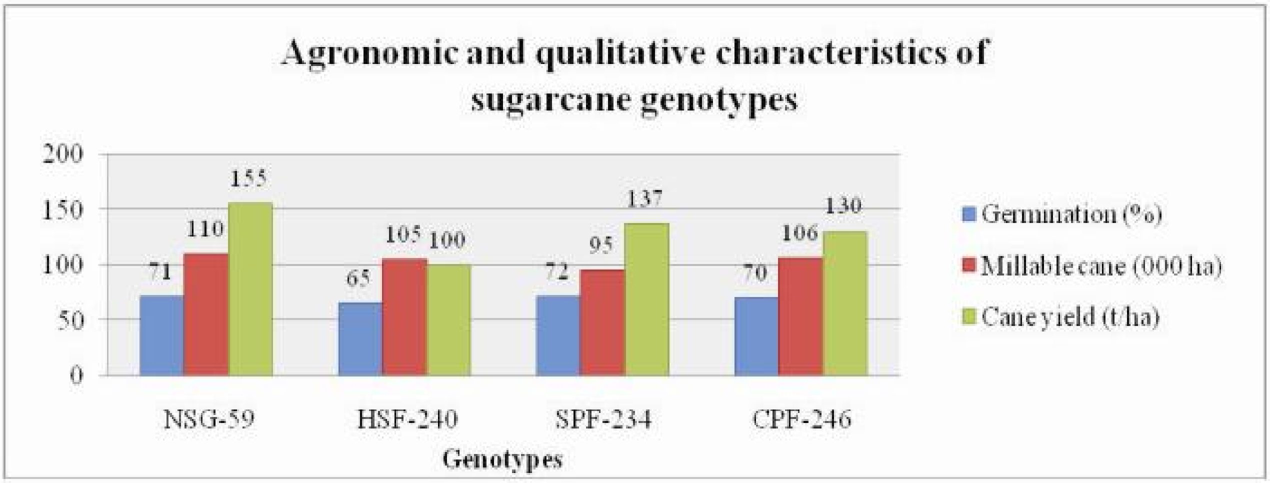

Fig. 2 Comparison of Agronomic and qualitative characteristics of sugarcane genotypes

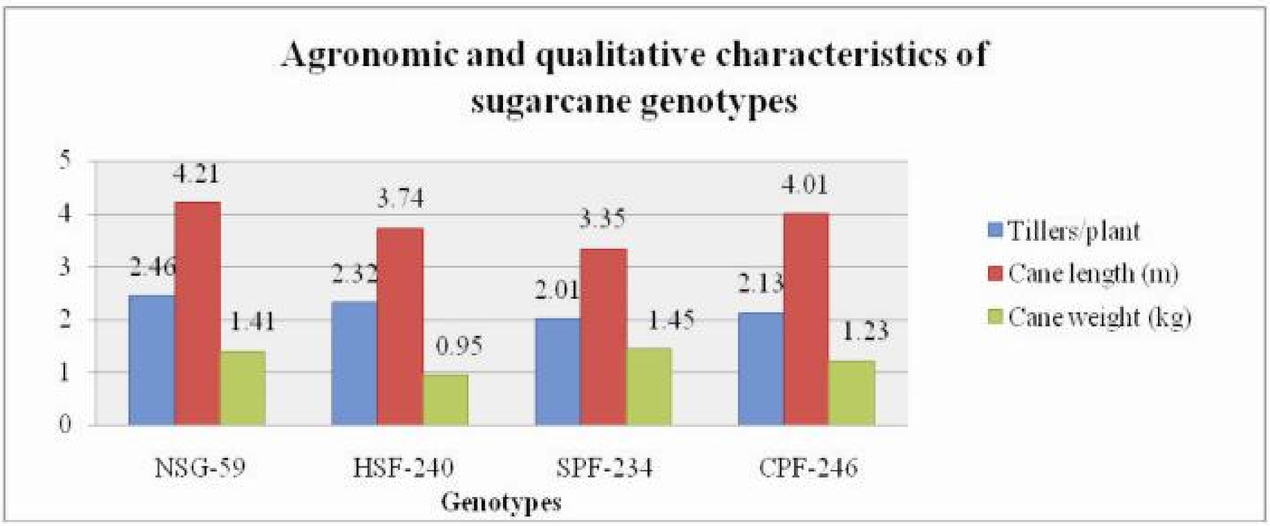

Fig. 3 Comparison of Agronomic and qualitative characteristics of sugarcane genotypes

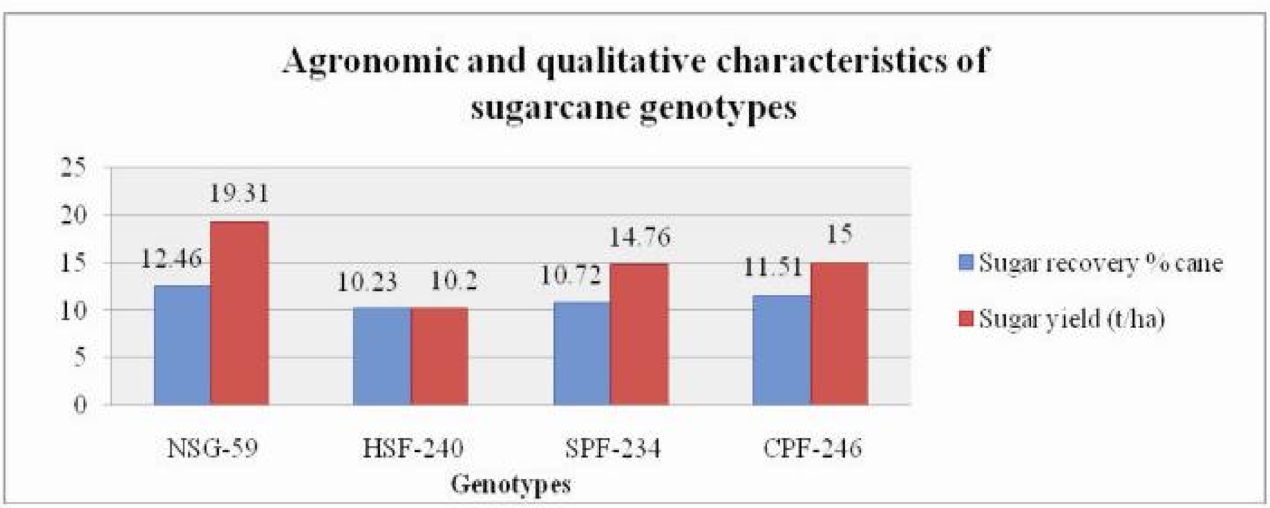

Fig. 4 Comparison of economic analysis of sugarcane genotypes

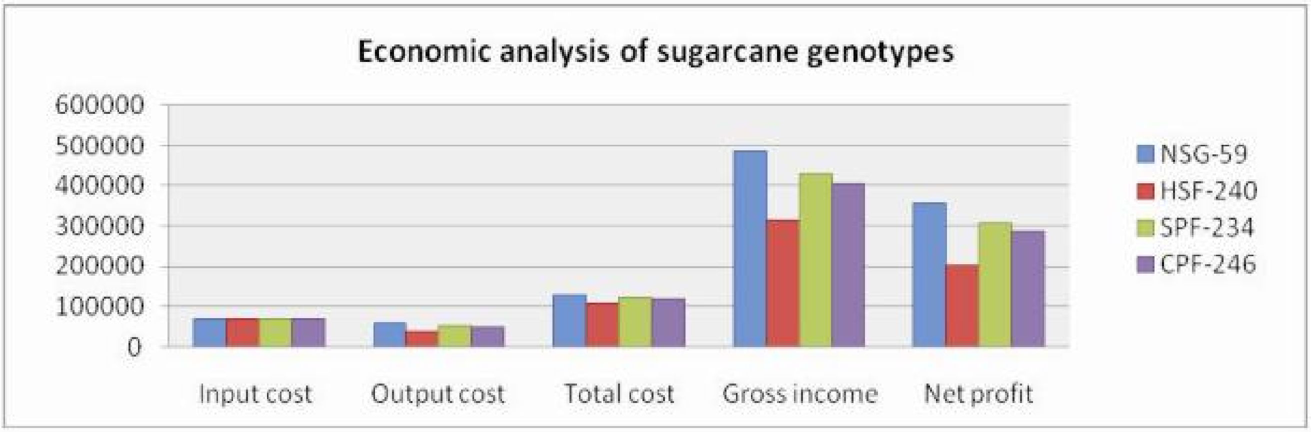

Table-1 Agronomic and qualitative characteristics of sugarcane genotypes

Genotypes	Germination (%)	Tillers/ plant	Cane length (m)	Millable cane (000 ha)	Cane weight (kg)	Cane yield (t/ha)	Sugar recovery % cane	Sugar yield (t/ha)
NSG-59	71	2.46	4.21	110	1.41	155	12.46	19.31
HSF-240	65	2.32	3.74	105	0.95	100	10.23	10.2
SPF-234	72	2.01	3.35	95	1.45	137	10.72	14.76
CPF-246	70	2.13	4.01	106	1.23	130	11.51	15

Table-2 Economic analysis of sugarcane genotypes

Genotypes	Input cost	Output cost	Total cost	Gross income	Net profit
NSG-59	70550	59093	129643	484375	354731
HSF-240	70550	38125	108675	312500	203825
SPF-234	70550	52231	122781	428125	305343
CPF-246	70550	49562	120112	406250	286137