



Comparative evaluation of ratooning potential of sugarcane clones

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Abstract

The varieties with good ratooning potential is attractive to farmer of Punjab province. In this experiment, performance of thirteen promising candidate sugarcane clones along with two check varieties; HSF-240 and CPF-246 were tested for their ratooning ability at Sugarcane Research Institute, Faisalabad during 2016. It has been observed that one of the tested clones; S2008-FD-19 surpassed both the check varieties in terms of cane yield and S2009-SA-8 (12.90%) surpassed the sugar recovery potential of one of the check variety; HSF-240 (12%) in terms of commercial cane sugar percentage or sugar recovery percentage. The results of the ratoon crop sprouts revealed that varieties; S2008-FD-19 (117.43 thousand tons ha⁻¹), SL-96-175 (115.83 thousand tons ha⁻¹) had no significant difference regarding the number of sprouts with a check variety HSF-240 (120.20 thousand tons ha⁻¹). The findings of the current study also revealed that S2009-SA-8 has significant potential of enhancing sugar recovery through breeding programs and by refining production techniques.

Keywords: sugarcane, screening, varietal difference, ratoon crop, commercial cane sugar (CCS)

1. Introduction

The sugarcane is an important cash crop of Pakistan used for the production of refined sugar and jaggery (*Gur*). Globally Pakistan ranked 5th largest in sugarcane area, production and cane sugar manufacturing. National sugarcane production is 81,102 thousand tons per hectare with 7.4% increase in production while average national yield stands at 61,768 kgs per hectare with a decline of 0.3% as compared to the previous year 2016-17 [4]. Numerous factors are held responsible for lower sugarcane yield and the planting of low yielding varieties is the prime accused factor in this case. It is dire need of the hour to introduce new high yielding varieties with good ratooning ability [3]. Variety is the main factor which is considered as responsible in increasing as well as decreasing per unit area sugar yield [10]. The solution to the problem of low sugarcane yield and sugar recovery can be resolved to some extent by planting improved sugarcane varieties [3]. Significant efforts are being made to increase the cane production by introducing high yielding varieties and adoption of improved crop production techniques [5].

Ratoon crop is cost-effective for the farming communities of Pakistan because making cost is 30% less than plant crop with saving of seed material as an extra benefit. Though, it is necessary to use 25% more nitrogenous fertilizer above the endorsed dose of nitrogen for ratoon crop [8].

The inherent yield potential of a variety in plant and ratoon crops is of prime importance for sustaining high productivity. Vast acceptance of a variety now depends very much on its ratooning potential. Thus, sugarcane varieties, which show good performance in plant and ratoon crops should be promoted for commercial cultivation.

The objective of the present study is to evaluate the ratoon cane yield and quality performance of some new candidate sugarcane varieties sown in Sugarcane Research Institute, Ayub Agricultural Research Institute, Faisalabad.

2. Materials and Methods

2.1 Study Area

The study was piloted at the Farm area of Sugarcane Research Institute, Faisalabad during crop season 2015-16. It is sited at the Latitude of 31° 25' N and Longitude of 73° 09' E. The soil is loamy with pH of 7.8, EC (0.36 dsm⁻¹) and organic matter of 0.90 (%).

2.2 Establishment of Experiment

The experiment was arranged in randomized complete block design with three replications & plot size of 4 x 6 m. Thirteen candidate sugarcane varieties, viz; S2008-FD-17, S2008-FD-19, S2008-FD-22, S2008-M-34, S-2008-M-55, S-2008-AUS-107, S2008-AUS-134, S2009-SA-8, S2009-SA-79, S2011-SL-62, SL96-175, VMC-87-599, VMC-88-354 and two approved varieties; HSF-240, CPF-246 were obtained from Sugarcane Research Institute (SRI), Ayub Agricultural Research Institute (AARI), Faisalabad (FSD) and sown at farm area of SRI, Faisalabad in February, 20, 2016. All the standard agronomic practices and other farm operations were carried out as and when required.

Crop was sown in 120 cm apart trenches at a seed rate of 75000 double budded setts per hectare. The fertilizer was applied @ 168-112-112 kg NPK per hectare to fresh crop and 30% more NPK was given to ratoon crop.

2.3 Data Recording and Statistical Analysis

Harvesting was completed in 10, December, 2017 and data of 1st ratoon crop was recorded for different parameters which include number of sprouts and cane count. Obtained data was statistically analyzed and Least Significant Difference (LSD) was performed. Final harvesting was completed in January, 20, 2018 and data regarding cane yield and sugar recovery was recorded.

Ten haphazardly selected canes were taken to the laboratory

for qualitative analysis and were crushed in a power cane crusher for juice extraction. Brix readings were documented by brix hydrometer standardized at 20°C. Sucrose percentage was determined by Horn’s dry lead sub-acetate method of sucrose analysis [13]. The commercial cane sugar (CCS %) was recorded in the laboratory using the below formula:

$$CCS\% = 3P/2 \{1-(F+5)/100\} - B/2 \{1-(F+3)/100\}$$

Where

P stands for pol percentage (sucrose percentage), F for fiber percentage and B for Brix percentage [13]. The data was analyzed statistically. The treatment means was compared by Fisher’s analysis of variance techniques and least significant difference test [12].

3. Results and Discussion

3.1 Tiller/Sprouts Population

Tillering is the most desirable character of sugarcane from farmers’ point of view. Good tillering ensures good yields and better ratooning ability of sugarcane crop [6]. Observed data presented in Table 1 shows that there is significant difference among no of spouts. Maximum number of tillers (120.20) were observed in HSF-240. But, this variety showed no significant difference with S2008-FD-19 (117.43) and SL 96-175 (115.83). S2008-M-34 showed minimum number of sprouts (62.33) but it did not express significant difference with S2011-SL-62 which showed sprouts at second last minimum level (65.30).

Table 1: Parameters representing ratooning ability of different varieties

Sr. No.	Variety	Sprouts (000 ha ⁻¹)	Cane count/ Millable canes (000 ha ⁻¹)	Cane Yield (t ha ⁻¹)	Sugar recovery (%)
1	S2008-FD-17	81.10e	74.73def	56.67ef	10.07de
2	S2008-FD-19	117.43a	96.17a	80.87a	10.98bcd
3	S2008-FD-22	112.47abc	83.57bcd	73.77abc	10.29cde
4	S2008-M-34	62.33f	53.13h	45.10g	9.81de
5	S2008-M-55	100.13cd	69.60efg	63.60de	9.12e
6	S2008-AUS-107	98.43d	85.40bc	64.37cde	11.74abc
7	S2008-AUS-134	82.27e	64.13g	55.03ef	11.25bcd
8	S2009-SA-8	84.17e	65.20fg	53.07fg	12.90a
9	S2009-SA-79	111.07abc	80.63bcd	71.50abcd	10.37cde
10	S2011-SL-62	65.30f	60.73gh	47.67fg	10.85bcd
11	SL96-175	115.83a	86.60abc	75.63ab	9.10e
12	VMC 87-599	109.97abcd	83.10bcd	75.17ab	10.74bcd
13	VMC 88-354	102.43bcd	78.53cde	68.57bcd	10.53bcde
14	HSF-240	120.20a	89.43ab	80.17a	12.00ab
15	CPF-246	113.73ab	86.73abc	77.70ab	12.96a

3.2 Cane Count/ Millable Canes

Junejo *et al.* [7] claimed that millable canes is an important yield contributing factor. Observations recorded in this study reveal (Table 1) that maximum number of cane count (96.17) were observed in S2008-FD-19. This variety showed significant difference from all the other varieties and no variety represented number of millable canes up to the number represented by S2008-FD-19. Minimum number of millable canes (53.13) were observed in S2008-M-34.

Behavior of S2008-M-34 in the number of millable canes was similar to the behavior expressed by S2008-FD-19 as it showed significant difference in number of canes and no variety was coinciding with the number represented by it. Maximum number of millable canes in case of S2008-FD-19 might be due to the higher number of sprout presence as compared to other varieties. This has also been claimed by Matin *et al.* [9] and Alam *et al.* [1].

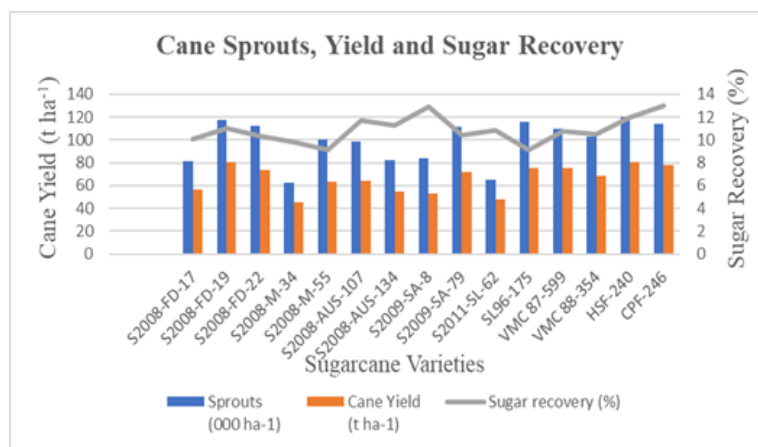


Fig 1: Comparison between cane sprouts, yield and sugar recovery

3.3 Cane Yield

All the breeding programs, ever-evolving production technologies, development of newer technologies are aimed at enhancing the crop yield. This prime focus has enabled

human being to pave the way for food security. From the observed data (Table 1), it is evident that maximum cane yield was observed in S2008-FD-19 (80.87 t ha⁻¹) but it showed no significant difference with HSF-240 which

represented 80.17 t ha⁻¹ yield. It is noteworthy to mention that there was no significant difference in the number of sprouts among both varieties but there was significant difference in terms of cane count/ number of millable canes. Minimum cane yield was obtained in case of S2008-M-34 (45.10 t ha⁻¹). However, from Table 1, it can be admitted that this variety represented minimum number of sprouts (62.33 000 ha⁻¹) and cane count/ millable canes (45.10 t ha⁻¹). But, this variety expressed significant difference from other tested varieties in terms of number of millable canes.

3.4 Sugar Recovery (%)

Total soluble solid or brix (%) is the percent amount of sugars and minerals dissolved in water. Different chemicals can be considered as responsible factors for the fluctuation in the brix reading (MO *et al.*, 2018). Maximum sugar recovery (12.96%) was observed in CPF-246 while minimum (9.10 %) was found in SL-96-175. It can be admitted that all the three evaluated parameters contributed to different levels for having significantly different Sugar recovery percentage.

4. Conclusion

From above discussion, it is evident that number of sprouts are an important considerable factor for the yield and sugar recovery. But, it can also be admitted that in some situations, this trend is was not found in case of CPF-246 which stood at fourth number in case of number of sprouts, third in case of yield of sugarcane but it gave maximum sugar recovery (12.96%) as compared to other 14 tested sugarcane varieties. It can be inferred that all the factors are important and good agronomic practices also contribute in enhancement of yield and sugar recovery.

5. Acknowledgment

I am thankful to the Dr. Naeem Ahmad, Director Sugarcane Research Institute, Faisalabad for their administrative support to accomplish the project. I am also grateful to My Father, Ch. Khadim Hussain, Principal Government High School Chishtian and My Brother Engineer Abdul Malik (Late) for their Moral support to encourage me to write and publish research work in paper format.

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