RATOONING POTENTIAL OF DIFFERENT SUGARCANE CLONES UNDER SOUTHERN PUNJAB CONDITIONS

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ABSTRACT

The field investigation entitled “ratooning potential of different sugarcane clones under southern Punjab conditions” was carried out during 2017-18 at Sugarcane Research Station, Khanpur under hot dry agro-climatic conditions of Southern Punjab. The genotypes under investigation were S2008-FD-19, S2008-M-42, S2006-SP-93, S2006-US-321, S2006-US-658, S2008-AUS-133, S2008-AUS-134, S2008-AUS-138, CPF-247 and SPF-234 (Standard). The statistical analysis of the data revealed that new promising sugarcane clone S2008-AUS-133 on account of highest 100-cane weight (105.67 kg), coupled with good stubble sprouting and satisfactory millable cane count, gave maximum stripped cane yield of 104.96 tons ha^{-1}. The top yielder surpassed in quality and as such it fetched maximum sugar yield of 14.33 tons ha^{-1} followed by SPF-234 (11.76 tons ha^{-1}). The promising sugarcane clone S2008-AUS-133 owing to 11.02 and 21.85 percent more ratoon cane and sugar yield, respectively over the standard variety, is capable of replacing SPF-234. However, its wide scale testing in various agro ecological zones is invited for regional adoptability.

Keywords: Sugarcane, Clones, Ratoon, Sugar, Millable Canes, Yield.

INTRODUCTION

Ratoon keeping is a very common practice among sugarcane growers as it is cheaper to grow by about 30-40% due to saving in soaking irrigation, land preparation, cost of seed and sowing operations (Akhtar *et al.,* 2). Hassan *et al*., (7) carried a farmer’s survey in the central Punjab and reported that ratoon sugarcane gave more net revenue than the fresh crop with a net benefit cost ratio of 1.6 and 1.4, respectively. Ratoons have an additional advantage in giving better juice quality and sugar recovery in comparison to the plant crop of same variety under similar conditions. Ratoon occupies 35-50 % of the total sugarcane area in Pakistan (Malik and Gurmani, 11). Afzal *et al*., (1) studied the ratoon performance of six sugarcane varieties and recorded maximum average cane yield of 75.55 tons ha^{-1} for CP 43-33. The same variety surpassed in sugar yield. Hunsigi and Krishna (8) found that one ton of ratoon sugarcane crop requires 89 million calories while plant crop needs 204 million calories. They reported that a 12-month irrigated plant crop requires 482 days for its maturity compared with 295 in ratoon. El-Geddawy *et al.,* (6) elucidated that sugarcane variety GIT-54-9 significantly superseded the other sugarcane varieties in respect of stalk height, diameter and weight in both ratoon crops. Rafique *et al.,* (12) carried out two years field experiment to investigate ratooning potential of 10 sugarcane varieties under field conditions and concluded that CPF-243 gave significantly more ratoon cane and sugar yield during both years of study primarily due to better cane formation. Bashir *et al.,* (5) undertook a field study on ratooning ability of spring planted sugarcane varieties and observed that maximum ratoon cane yield was produced by CPF-237 and HSF-242. Jamil *et al*, (9) evaluated the ratooning behavior of 22 candidate sugarcane varieties under NUYT Programme. Findings of their study revealed that promising sugarcane varieties S95-HS-

185, S97-US-183, S96-SP-302, CPHS-35, NSG-311 and Malakand-16 were better ratooners. Khan *et al.,* (10) indicated that sugarcane variety S96-SP-302 produced significantly maximum ratoon cane yield of 79.39 tons ha^{-1} against the lowest cane yield of 41.94 tons ha^{-1} recorded for NSG-311. The higher cane yield was mainly associated with high number of millable canes, cane height and cane girth. Aslam *et al.,* (3) studied the ratoon performance of 13 sugarcane varieties and found that CPF-246 on account of higher number of sprouts/plant (1.57), significantly higher 100-cane weight of 95.67 kg, highest millable cane count of 112.69 thousand ha^{-1}, maximum cane yield of 107.90 tons ha^{-1} and comparable CCS of 12.74%, produced the highest sugar yield of 13.74 tons ha^{-1}. Aslam *et al.,* (4) conducted a field study to explore ratooning potential of eight sugarcane varieties and disclosed that S2003-US-114 gave significantly higher cane yield of 108.05 tons ha^{-1} owing to good stubbles sprouting, higher cane weight and reasonably good millable cane count. The top yielder was also good in quality and produced highest sugar yield of 13.41 tons ha^{-1}. Therefore, the present study was planned to assess the ratooning performance of nine elite sugarcane clones in comparison to commercial sugarcane variety SPF-234 under southern Punjab agro climatic conditions.

MATERIALS AND METHODS

The field experiment was conducted under irrigated conditions during 2017-18. The objective of the study was to evaluate the ratooning potential of ten promising sugarcane genomes at Sugarcane Research Station, Khanpur. The experiment was started during 2017 when the spring crop was harvested in the first week of February and kept as ratoon. The clones included in the study were S2008-FD-19, S2008-M-42, S2006-SP-93, S2006-US-321, S2006-US-658, S2008-AUS-133, S2008-AUS-134, S2008-AUS-138, CPF-247 and SPF-234 (Standard). The experiment was laid out in Randomized Complete Block Design with three replications. The sugarcane genotypes were planted by dry method in 120 cm apart trenches with a net plot size of 3.6 × 10m using a seed rate of 50000 triple budded setts per hectare. The ratoon crop was fertilized at the rate of 218-146-146 kg NPK per hectare, respectively. After harvesting the plant crop, stubble shaver was run to stimulate the uniform sprouting of the subterranean buds. Then interculture was given twice to control weeds, loosen the soil to help root development and thus facilitate sprouting. Afterwards, whole of Phosphorus, Potash and 1/3 of Nitrogen was applied to the crop followed by irrigation. The remaining 2/3 N was given in two equal splits, 1/3 at completing sprouts (60 days after harvesting of plant crop) and 1/3 during the second fortnight of May when crop was earthed up. Meanwhile data on number of sprouts per plant were recorded. The data on cane density, weight, yield and quality were recorded at the harvest during the last week of January. The data thus recorded were analyzed using Analysis of Variance techniques and Least Significance Difference test was applied to compare the treatment means at five percent level of probability (Steel and Torrie, 13).

RESULTS AND DISCUSSION

Sprouts per plant

The sprouting of underground buds predicts the final millable cane stand of ratoon sugarcane crop to a large extent. The sprouting of subterranean stubble eyes is mainly affected by climatic conditions, soil moisture, plant stand and vigor of previous sugarcane crop. The data presented in table-1 depict that the tested sugarcane clones varied significantly from one another in the number of sprouts per hectare. The sprouting ranged from 148.41 to 118.65 sprouts per hectare. The data depict that promising sugarcane genotype S2008-M-42 produced the highest number of sprouts $hectare^{-1}$. It was matchingly followed by S2006-SP-93. The lowest number of sprouts has been recorded for S2008-AUS-138 in this study. These differences in the number of sprouts $hectare^{-1}$ may be attributed to the varied inherent ratooning potential of the sugarcane varieties (Rafique *et al.,* 12 and Aslam *et al*.,3,4).

Cane Weight

Cane weight is one of the most important yield determining characters which directly affects the final sweep of sugarcane and is very much genetic in nature. However, the management practices also affect cane girth, height and weight. It is evident from the respective data embodied in table-1 that the tested sugarcane clones behaved differently with respect to individual stalk weight. The new emerging sugarcane genome S2008-AUS-133 topped the list of the investigated entries by producing the heaviest canes (105.67 kg per 100 canes). It was non-significantly followed by S2008-AUS-138 and SPF-234. The lowest 100-cane weight of 70.33 kg was recorded for S2008-FD-19 preceded by S2008-M-42. These differences in the stalk weight were probably due to the differences in the genetic potential of tested sugarcane genotypes. The results are quite in line with the findings of Aslam *et al.,* (3, 4).

Cane Density

Plant population per unit area is a vital Cane yield component and directly affects the final harvest of the crop. The establishment of millable canes is a reflection of stubbles sprout in ratoon crop of sugarcane. The data compiled in table-1 evince that the final cane stand established by tested clones varied non significantly and ranged from 117.36 to 99.60 thousand ha^{-1}. The highest number of millable canes were produced by S2008-M-42 matchingly followed by S2008-FD-19 and CPF-247 which established a millable cane density of 116.67 and 114.88 thousand cane sticks ha^{-1}, respectively. The thinnest stand of 99.60 thousand canes ha^{-1} was recorded for S2008-AUS-133. The differential behaviour of sugarcane genotypes for the production of variable number of millable canes may be attributed to the varying inherent potential of different genotypes to explore environmental resources. Similar results have also been reported by Aslam *et al.,* (3, 4) and Rafique *et al.,* 12.

Stripped Cane Yield

The final cane yield is the ultimate target of every grower which is the happy blend of the ecosystem and the genetic potential of a variety. Different varietal traits like stubble sprouting, cane formation, cane height, girth and per cane weight have direct effect on the final ratoon cane yield. It is evident from the data presented in table-2 that the tested strains differed substantially in final ratoon cane yield. The promising sugarcane variety S2008-AUS-133 proved itself the most efficient utilizer of the available resources and gave significantly highest ratoon cane yield of 104.96 tons ha^{-1} which 11.02 percent higher than SPF-234, the commercial variety of the region. It was comparably followed by S2008-AUS-138 with a final tonnage of 99.50 t/ha. The lowest cane yield of 77.48 tons ha^{-1} has been recorded for S2006-US-321 preceded by S2008-FD-19. These differences in the final cane yield of different sugarcane genotypes may probably be due to their varied genetic makeup to utilize the available resources. Rafique *et al.,* (12), Jamil *et al.,* (9), Khan *et al.,* (10) and Aslam *et al.,(3)* have also reported the varied tonnage of ratoon stripped canes for different genotypes in their investigations.

Sugar Recovery

Sugar recovery is an important feature of sugarcane crop which is highly related to the genetics of the clones. A Cane variety with high sugar recovery is the key requirement of both the growers and the millers. It is evident from the data presented in the table-2 that the tested strains differed substantially in final ratoon sugar recovery. Maximum sugar recovery of 13.65 percent was recorded for the sugarcane genotype S2008-AUS-133 followed by S2008-M-42 and CPF-247.

Sugar Yield

The ultimate aim of all the efforts being carried out by a researcher, grower or miller is the

attainment of higher tonnage of sweet sugar which is actually produced in the field and extracted in the factory. The scientific data embodied in table-2 elucidate that all the sugarcane clones under study behaved differently from one another for the production of sugar yield per unit area. The highest average sugar yield of 14.33 t/ha was produced by the promising strain S2008-AUS-133 closely followed by SPF-234 (11.76 t/ha) and S2006-US-658 (11.45 t/ha). The least amount of white sugar (9.36 tons ha^{-1}) was recorded for S2006-US-321. This differential behaviour of Sugarcane clones to produce sugar yield may be attributed to the variability in their genetic constitution to explore the environment and soil resources to which they were exposed. Bashir *et al.,* (5), Rafique *et al.,* 12 and Aslam *et al.,* (3,4) have also reported the similar results.

Table-1 Sprouts per Hectare, 100-Cane Weight and Cane Density of Ratoon Sugarcane Varieties under Southern Punjab Conditions

S. No.	Variety	Sprouts 000/ha	100-cane weight (Kg)	Cane stand 000/ha
1	S2008-FD-19	134.13*bc*	70.33*d*	116.67
2	S2008-M-42	148.41*a*	72.67*cd*	117.36
3	S2006-SP-93	138.89*ab*	85.00*bc*	110.22
4	S2006-US-321	119.44*d*	77.33*cd*	100.40
5	S2006-US-658	120.63*d*	84.67*bc*	113.29
6	S2008-AUS-133	122.22*d*	105.67*a*	99.60
7	S2008-AUS-134	126.59*cd*	93.00*ab*	102.88
8	S2008-AUS-138	118.65*d*	99.33*a*	100.40
9	CPF-247	134.13*bc*	74.67*cd*	114.88
10	SPF-234	126.98*cd*	95.33*ab*	99.80
LSD 0.05		11.16	13.75	N.S

Values with different letter(s) differ significantly (P=0.05)

Table-2 Cane Yield, CCS% and Sugar Yield of Ratoon Sugarcane Varieties under Southern Punjab Conditions

S.No	Variety	Cane Yield t/ha	CCS %	CCS (t/ha)
1	S2008-FD-19	81.65*cd*	12.25	10.00
2	S2008-M-42	84.62*c*	12.79	10.82
3	S2006-SP-93	93.65*b*	11.61	10.87
4	S2006-US-321	77.48*d*	12.08	9.36
5	S2006-US-658	95.73*b*	11.96	11.45
6	S2008-AUS-133	104.96*a*	13.65	14.33
7	S2008-AUS-134	95.24*b*	11.27	10.73
8	S2008-AUS-138	99.50*ab*	11.39	11.33
9	CPF-247	85.32*c*	12.67	10.81
10	SPF-234	94.54*b*	12.44	11.76
LSD 0.05		6.21	--	--

Values with different letter(s) differ significantly (P=0.05)

Figure-1 Sprouts per Hectare, 100-Cane Weight and Cane Density of Ratoon Sugarcane Varieties under Southern Punjab Conditions

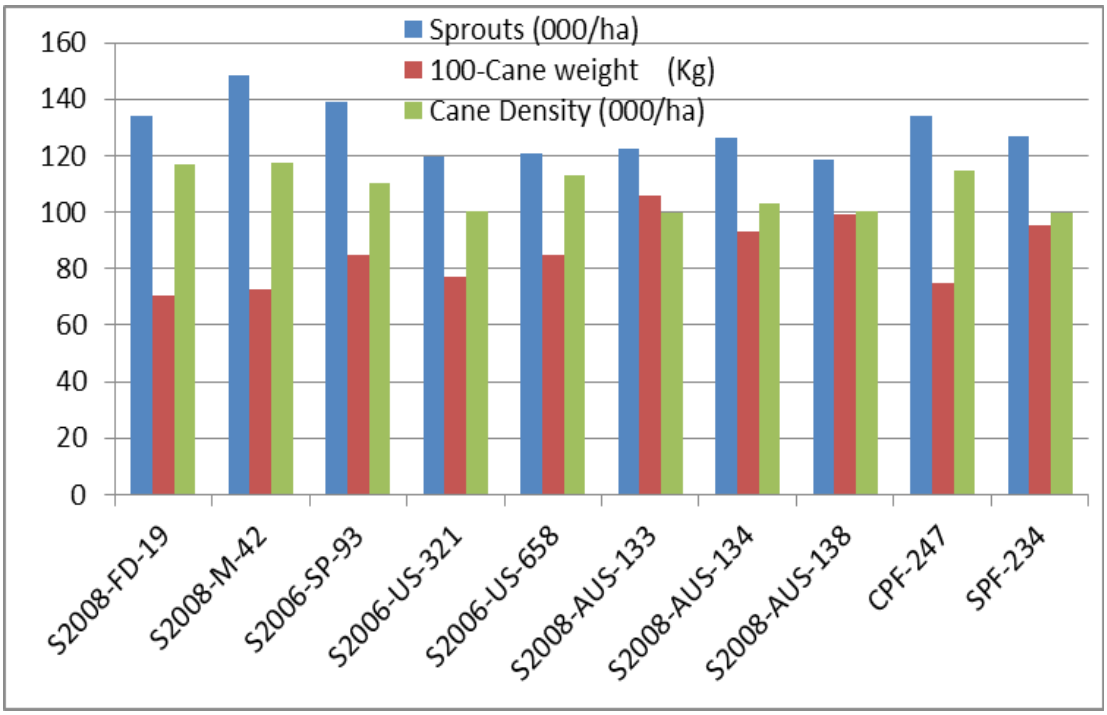
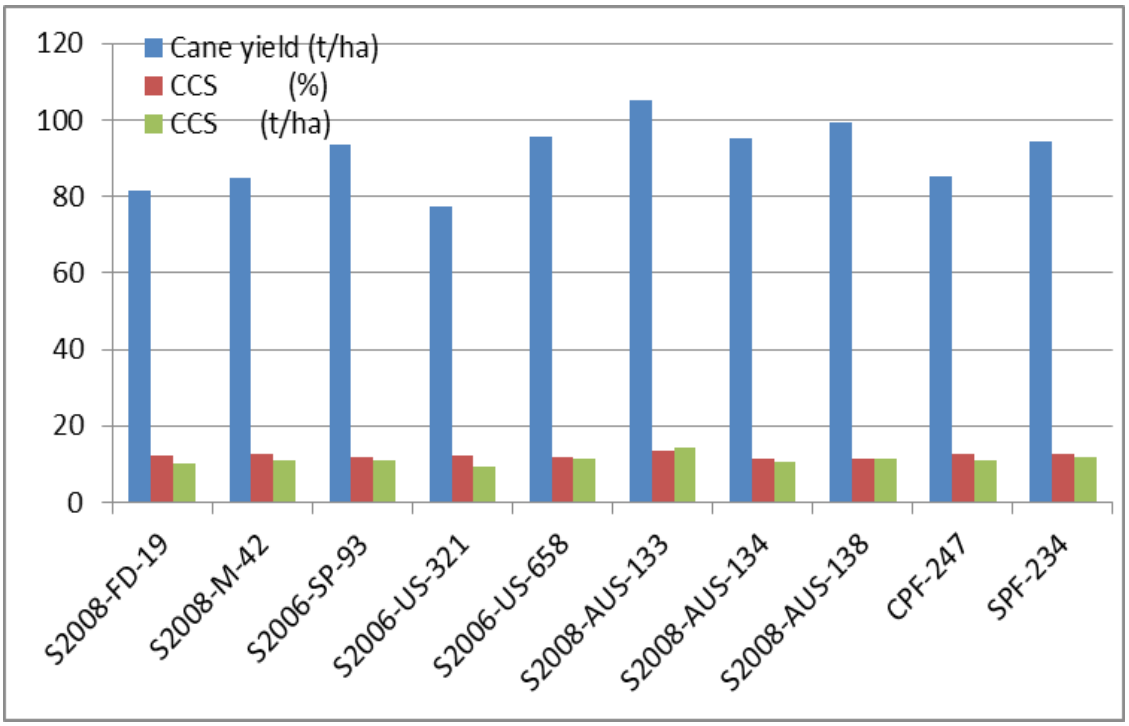


Figure-1 Cane Yield, CCS% and Sugar Yield of Ratoon Sugarcane Varieties under Southern Punjab Conditions



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