RATOON PERFORMANCE OF ELITE SUGARCANE CLONES UNDER SOUTHERN PUNJAB CONDITIONS

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ABSTRACT

A field experiment to investigate ratooning potential of ten sugarcane clones was carried during 2013-2014 at Sugarcane Research Station, Khanpur under hot dry conditions of Southern Punjab. The genotypes under investigation were S2003US.114, S2003US.165, S2003US.824, S2006SP.18, S2006SP.25, S2006US.469, S2006US.658, S2006US.832, S2006US.834 and CPF.246 (Standard). The results revealed that new promising sugarcane clone S2006US.658 on account of best stubble sprouting plant^{-1} (2.79), highest 100-cane weight (103.67 kg) coupled with good millable cane count (104.64 thousand ha^{-1}) gave maximum stripped cane yield of 107.63 tons ha^{-1} . It was matchingly followed by S2003US.114 and CPF.246. The top yielder is also good in quality and as such it fetched maximum sugar yield of 12.86 tons ha^{-1} followed by S2003US.114 (12.05 tons ha^{-1}). The promising sugarcane clone S2006US.658 owing to 7.45 and 0.96 % more ratoon cane and sugar yield, respectively over standard variety is capable of replacing it and can make gigantic strides in sugarcane production for sweet revolution. However, its wide scale testing in various agro ecological zones is invited for regional adoptability.

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

INTRODUCTION

Ratoon keeping is a very common practice among sugarcane growers as 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.,* 2003).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 (Yadava, 1991). Ratoon occupies 35-50 % of the total sugarcane area in Pakistan (Malik and Gurmani, 2005).Afzal et al., 1990 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. El-Geddawy *et al.,* 2002 elucidated that sugarcane variety GIT.54-9 significantly superseded the other sugarcane varieties in respect of stalk height, diameter and weight in both ratoon crops.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.,* 2005 carried out two years field experiment to investigate ratooning potential of 10 sugarcane varieties and concluded that CPF-234 and HSF-240 gave significantly more ratoon yield during both years of study primarily due to better sprouting of subterranean buds and cane formation. Bashir *et al.,* 2007 undertook a field study on ratooning ability of spring planted sugarcane varieties and observed that maximum cane yield was produced by CPF.237 and HSF.242 of ratoon crop. Jamil et al, 200evaluated the ratooning behavior of 22 candidate sugarcane varieties under NUYT programme. Findings of theier study revealed that promising sugarcane varieties S95HS.185, S97US.183, S96SP.302, CPHS.35, NSG.311 and Malakand-16 were better ratooners. Khan *et al.,* 2007 indicated that sugarcane variety S96SP.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.,* 2011 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 CSS of 12.74% against the check variety SPF-234, produced the highest sugar yield of 13.74 tons ha^{-1}. Aslam *et al.,* 2013 conducted a field study to explore ratooning potential of eight sugarcane varieties and disclosed that S2003US.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 CPF.246 under southern Punjab agro climatic conditions.

MATERIALS AND METHODS

The field experiment was conducted under irrigated conditions during spring season to evaluate the ratooning potential of ten elite sugarcane genomes during 2013-2014 at Sugarcane Research Station, Khanpur. The experiment was started during 2013 when the spring crop was harvested in the first week of February and kept as ratoon. The varieties included in the study were S2003US.114, S2003US.165, S2003US.824, S2006SP.18, S2006SP.25, S2006US.469, S2006US.658, S2006US.832, S2006US.834 and CPF.246 (Standard). The experiment was laid out in Randomized Complete Block Design with three replications. The sugarcane genotypes were sown by dry method in 120cm apart trenches with a net plot size of 3.6 × 10 m using a seed rate of 75000 double 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, uneven stubbles were cut manually with the help of hand chopper. Then interculture was given to control weeds, loosen the soil to help root development and thus facilitate sprouting. Afterwards, whole of P, K and 1/3 of N 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 December 2013. The data thus recorded were analysed 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, 1984).

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 subterrain 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 there were significant differences in the number of sprouts per plant given out by the tested sugarcane clones. The promising sugarcane genotype S2003US.658 produced the highest number of sprouts plant^{-1} (2.79). It was matchingly followed by S2003US.469.The lowest number of sprouts has been recorded for S2006US.832 in this study. These differences in the number of sprouts plant^{-1} may be attributed to the varied inherent ratooning potential of the sugarcane varieties (Rafique *et al.,* 2005).

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 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 S2006US.658 produced the heaviest canes (103.67 kg per 100 canes). It was non-significantly followed by S2006US.114 and CPF.246.The lowest 100-cane weight of 77.67 kg was recorded for S2006US.832 preceded by S2006SP.18.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.,* 2011 and Aslam *et al.,* 2013.

Cane Density

Plant population per unit area is a vital yield component and directly affects the final harvest of the crop. The establishment of millable canes is a reflection of stubbles sprouts in ratoon crop of sugarcane. The data compiled in table-1 evince that the final cane stand established by tested varieties varied significantly. The highest number of millable canes were produced by S2006US.832 (112.70 thousand ha^{-1}) closely followed by S2006SP.25 (109.60 thousand ha^{-1}) and S2006US.658 (104.64 thousand ha^{-1}).The thinnest stand of 82.21 thousand canes ha^{-1} was recorded for S2006US.834.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.,* 2011 and Aslam *et al.,* 2013.

Stripped cane Yield

High 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- 1 that the tested strains differed substantially in final ratoon cane yield. The promising sugarcane variety S2006US.658 gave significantly highest ratoon cane yield of 107.63 tons ha^{-1}. It was comparably followed by S2003US.114 and CPF.246 with a final tonnage of 101.37 and 100.17 per hectare, respectively. The lowest cane yield of 74.66 tons ha^{-1} has been recorded for S2006US.834 preceded by S2006SP.18.These differences in the final cane yield of different sugarcane genotypes may probably be due to their varied genetic makeup. Rafique *et al.,* 2005, Jamil *et al.,* 2007, Khan *et al.,* 2007 and Aslam *et al.,* 2011 have also reported the varied tonnage of ratoon stripped canes for different genotypes in their investigations.

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- 1 indicated that all the sugarcane clones under study behaved differently from one another for the production of sugar yield per unit area. The highest sugar yield of 12.86 tons ha^{-1} was produced by the promising strain S2006US.658 closely followed by S2003US.114 (12.05 tons ha^{-1}). The least amount of white sugar (8.35 tons ha^{-1}) was recorded for S2006US.834.This differential behaviour of Sugarcane varieties/clones to produce sugar yield may be attributed to the variability in their genetic makeup to explore the environment to which they were exposed. Bashir *et al.,* 2007, Aslam *et al.,* 2011 and Aslam *et al.,* 2013 have also reported the similar results.

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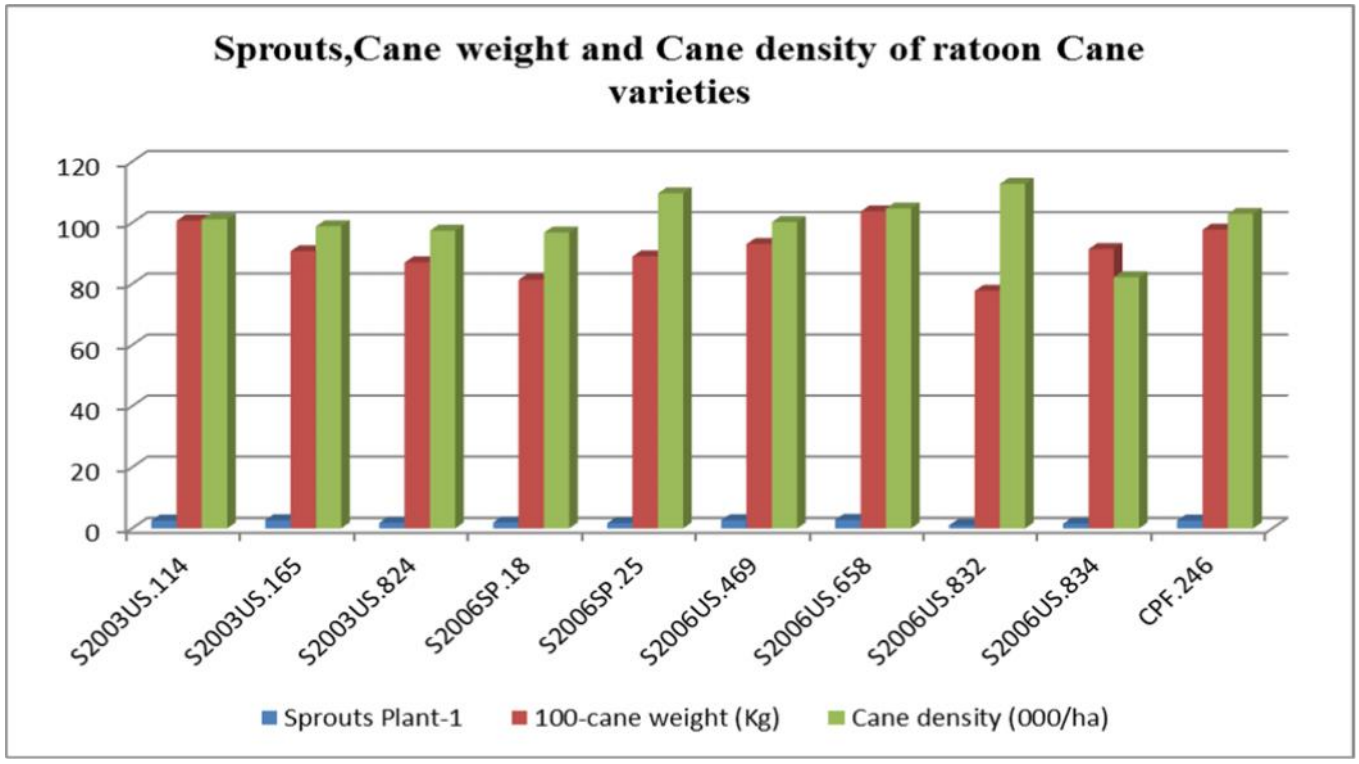
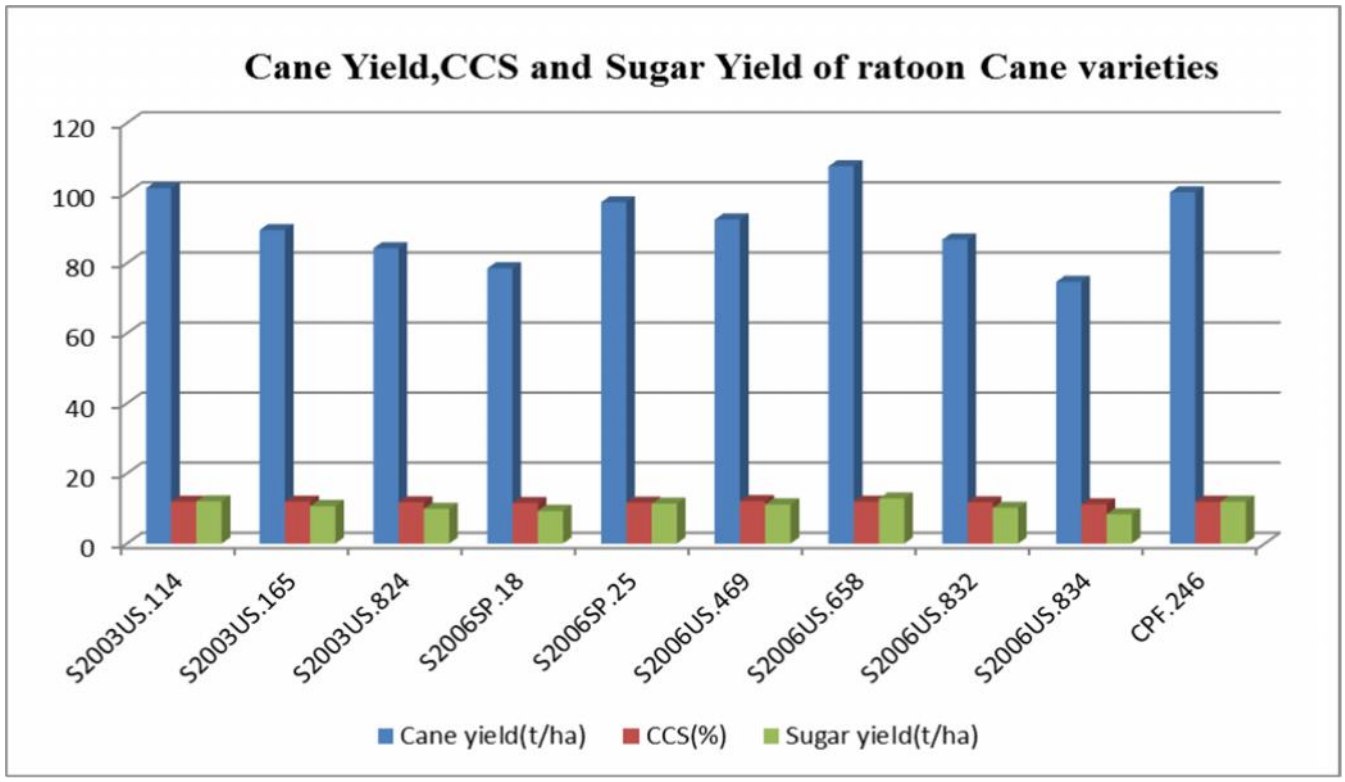
Table-1 Ratoon performance of sugarcane varieties under southern Punjab conditions

Sr. No	Variety	Sprouts Plant $^{-1}$	100-cane weight (Kg)	Cane density 000/ha	Cane yield (t/ha)	CCS %	Sugar yield (t/ha)
1	S2003US.114	2.53a	100.67ab	101.09ab	101.37ab	11.89	12.05
2	S2003US.165	2.68a	90.67abc	98.81ab	89.45cdef	11.95	10.68
3	S2003US.824	1.84b	87.00abc	97.40ab	84.29efg	11.73	9.89
4	S2006SP.18	1.94b	81.33bc	96.74ab	78.51fg	11.58	9.30
5	S2006SP.25	1.67b	89.00abc	109.60a	97.34abcd	11.66	11.35
6	S2006US.469	2.61a	93.00abc	100.20ab	92.44bcde	12.07	11.15
7	S2006US.658	2.79a	103.67a	104.64ab	107.63a	11.95	12.86
8	S2006US.832	1.04c	77.67c	112.70a	86.71def	11.72	10.16
9	S2006US.834	1.56b	91.33abc	82.21b	74.66g	11.19	8.35
10	CPF.246	2.59a	97.67abc	102.89ab	100.17abc	11.88	11.90
LSD 0.05		0.39	21.54	22.97	11.07	--	--

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


Sprouts,Cane weight and Cane density of ratoon Cane varieties
120
100
80
60
40
20
0
S2003US.114
S2003US.165
S2003US.824
S2006SP.18
S2006SP.25
S2006US.469
S2006US.658
S2006US.832
S2006US.834
CPF.246
Sprouts Plant-1
100-cane weight (Kg)
Cane density (000/ha)


Cane Yield,CCS and Sugar Yield of ratoon Cane varieties
120
100
80
60
40
20
0
S2003US.114
S2003US.165
S2003US.824
S2006SP.18
S2006SP.25
S2006US.469
S2006US.658
S2006US.832
S2006US.834
CPF.246
Cane yield(t/ha)
CCS(%)
Sugar yield(t/ha)