



ASSESSMENT OF RATOONING POTENTIAL IN VARIOUS PROMISING STRAINS OF SUGARCANE UNDER SOUTH PUNJAB CONDITIONS

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ABSTRACT

The present study aimed to assess the ratooning potential of various sugarcane strains at the Sugarcane Research Station Khanpur during the 2019-20 period. The selected promising sugarcane genotypes, including S2013-US-917, S2014-SL-1359, S2014-SL-2200, PSR-07-45, S2015-SL-89, S2015-SL-289, S2015-SL-404, S2015-SL-444, CPF-253, and HSF-240 (check), were subjected to experimentation. The research followed a Randomized Complete Block Design (RCBD) with three replications. Significant variations in ratooning performance were observed among the studied genotypes. Notably, the strain S2015-SL-444 emerged as the most promising, exhibiting the highest cane yield at 119.80 tons per hectare and excellent stubble sprouting with 1.64 sprouts per plant. Additionally, this top-performing strain demonstrated good quality, registering a field brix of 19.55%. Although the highest field brix (21.65%) was recorded in S2013-US-917, S2015-SL-89 closely followed with a field brix of 21.24%. S2015-SL-444, the standout sugarcane clone, outperformed the check by producing 14.02 tons more ratoon cane yield per hectare. Therefore, it is recommended that the genotype S2015-SL-444, with its exceptional ratooning potential, be cultivated in the agro-ecological climatic conditions of South Punjab for ratoon crop cultivation.

Keywords: Ratoon; Sugarcane strains; Sugar recovery; Brix; Cane yield.

INTRODUCTION

Due to the increase in prices of inputs and higher cost of production, farmers have keen interest in ratoon-keeping; as it is common practice among sugarcane growers, along with its additional advantages of being relatively easy and cost effectiveness. This practice reduces the number of irrigations, having no need of land preparation, seed purchase and planting expenses (Akhtar, Ashraf, & Akhtar, 2003). Ratoon keeping occupies an area of about 35-50 percent of the total sugarcane cultivated area of Pakistan due to the better cane and sugar production (Malik & Gurmani, 2005). Field survey of central Punjab had shown that the ratoon cane crop had given more net income than fresh crop and cost benefit ratio was 1.6 and 1.4, Hassan *et al.*,. The quality of ratoon sugarcane crop was better in juice production than the plant crop in terms of Brix and sugar recovery even in case of same

variety planted in the similar environmental conditions. Hunsigi and Krishna (1998) worked on sugarcane ratoon and reported that one ton of ratoon sugarcane crop requires 89 million calories whereas for plant-crop a huge amount of 204 million calories are required till maturity. Even, a sugarcane plant crop of twelve months in irrigated conditions require 482 man days upto maturity while in ratoon crop for the same period require only 295 man days. Afzal, Bashir, and Khan (1990) studied the ratoon potential of 6 sugarcane strains and results showed that CP-43-33 performed better with cane yield of 75.55 tons per hectare and maximum sugar yield. Moreover, ratoon crop attained its maturity earlier as compared to the plant-crop. El-Geddawy, Darweish, El-Sherbiny, and El-Hady (2002) reported that the sugarcane variety GIT-54-9 performed better for cane height, girth and weight than other sugarcane strains when grown for

two consecutive years as ratoon. Rafiq *et al.* (2006) reported that CPF-243 produced the highest ratoon cane and sugar yield owing to better millable cane formation. Bashir, Chattha, Afzal, Iqbal, and Khan (2007) noted the highest cane yield in CPF-237 and HSF-242 when ratooned. Jamil, Afghan, Majid, and Rasool (2007) evaluated twenty two sugarcane varieties under National Uniform Yield Trial program. Amongst them; CPHS-35, S95-HS-185, S96-SP-302, S97-US-183, Malakand-16 and SG-311 had shown the best ratooning potential. Sugarcane clone S96-SP-302 gave the highest ratoon yield of 79.39 tons per hectare as compared to NSG-311 that produced 41.94 tons per hectare (Khan, Rasool, Aunjam, Masood, & Bakhsh, 2007). In another related study amongst thirteen sugarcane varieties; ratoon ability of CPF-246 was reported higher due to better number of sprouts per plant (1.57), 100-cane weight of 95.67 kg, number of canes of 112.69 thousand per hectare, stripped cane yield of 107.90 tons per hectare, commercial cane sugar (CCS) percentage of 12.74 and sugar yield of 13.74 tons per hectare (Aslam, Tauseef, Zahid, & Anwar, 2011). Further, ratooning ability of 8 sugarcane clones was studied which revealed that S2004-US-114 had produced significantly higher cane yield of 108.05 tons per hectare, better bud sprouting tendency, better cane weight and more quantity of stripped cane. While, commercial sugarcane variety; CPF-246 produced the maximum sugar yield of 13.41 tons per hectare (Aslam, Ahmad, Naseem, & Zahid, 2013). In a nutshell, the present research experiment was executed with an objective to test the ratooning performance of 9 promising sugarcane strains in comparison with the commercially cultivated variety; HSF-240 as standard in the hot tropical & humid climatic conditions of South Punjab's district Rahim yar Khan.

MATERIALS AND METHODS

Experimental location

Present research was performed in the irrigated conditions of district Rahimyar Khan at research area of Sugar cane research station tehsil, Khanpur. The research trial was sown in the second week of February-2019 and left it for ratoon purpose.

Planting material and experimental design

The sugarcane strains under investigation were S2013-US-917, S2014-SL-1359, S2014-SL-2200, PSR-07-45, S2015-SL-89, S2015-SL-289, S2015-SL-404, S2015-SL-444, CPF-253 and HSF-240 (Standard). The research trial was laid out according

to RCBD having three replications. The sugarcane clones were sown by using 120 cm apart double row trenches. The plot size was kept 3.6 x 10 meter. The seed was used @ 50000 triple budded sets per hectare.

Treatments

The balanced fertilizer use was adopted according to the recommendations of thirty percent increased dose for ratoon *i.e* 218-146-146 kg N:P:K per hectare, respectively. When the plant crop was harvested, stubble shaver was applied to promote the sprouting of underground buds and shaving of diseased parts of left over stubbles. For the removal of weeds two times inter-culture practices were carried out that resulted in softening of the soil upper layer and best root establishment to enhance the number of sprouts per plant. All of the Phosphorus, Potash fertilizer along with 1/3 dose of Nitrogenous fertilizer was given at the initial sprouting time. The crop was irrigated according to requirement. The remaining 2/3 of Nitrogen was applied equally with the interval of 45 days. The pesticides were applied in three splits *i.e* at the start of ratooning, 45 days after the first application and 45 days after the second application followed by earthing up.

Parameters studied

During this period sprouts data were noted. Plant density, crop yield and field brix data were recorded at the maturity of the crop.

Statistical analysis

The recorded data were statistically analyzed by using Analysis of Variance (ANOVA) and Least Significance Difference test was used to compare the means of all treatments at 5 percent level of probability (Steel & Torrie, 1984).

Results and Discussion

Number of sprouts per plant

The number of sprouts per plant is an important component in sugarcane ratoon crop because final cane yield depends upon the number of effective tillers. Final millable cane stand depends upon the sprouting capability of subterranean buds on the underground stubbles. The sprouting of underground buds is largely affected by a number of factors including climatic conditions, plant stand, soil moisture, soil type and plant vigor of the last year crop. The data shown in the Table-1 has depicted that the sugarcane varieties under investigation differ significantly from one another for the number of sprouting per plant. The highest and lowest number of sprouts per plant ranged between 1.64 and 0.84. Sugarcane strain S2015-SL-444 had maximum

number of sprouts per plant (1.64) that were significantly higher than S2014-SL-1359 (1.61). Moreover, minimum number of sprouts per plant were recorded in sugarcane strain; S2015-SL-404 (0.84) (Figure 1, Table 1). The variance in the number of sprouts per plant resulted from varied ratoon potential of studied strains and it was inherent in nature. These results are quite similar to those which were reported by Rafiq *et al.* (2006) and Aslam *et al.* (2013).

Millable cane density

Sugarcane yield largely depends upon the number of plants in unit area which determines the final cane yield of sugarcane crop. The production of millable canes depends upon the sprouting performance of subterranean buds that emerges out of the soil and develops into the final millable canes. Healthy

millable cane density enhances the production per unit area and increases yield. The millable cane density among all the genotypes ranged from 130.51 to 87.31 thousand canes per hectare. Even, the maximum number of millable canes (130.51) thousand per hectare was recorded in the commercial sugarcane variety; CPF-253 followed by S2015-SL-89, S2014-SL-1359 & S2015-SL-444 with 122.19, 119.93 and 117.81 thousand canes per hectare, respectively. While, minimum millable cane density of 87.31 thousand canes per hectare was produced in S2014-SL-2200 (Figure 2, Table 1). Hence, variation in millable cane density of the sugarcane genotypes under ratooning investigation shown genetic basis. These findings are in agreement with results presented by Aslam *et al.* (2013) and Rafiq *et al.* (2006).

Table 1. Sprouts per plant, number of millable cane, cane yield and field brix of Ratoon Sugarcane strains under South Punjab Conditions.

Sr. No.	Variety	Sprouts plant ¹	Millable Canes (000 ha ¹)	Field brix %	Cane Yield (tons ha ⁻¹)
1	S2014SL-1359	1.61 a	119.93 ab	21.02 abc	87.50 bc
2	PSR 07-45	1.47 ab	112.70 abcd	20.02 bcde	101.15 ab
3	S2015SL-289	1.18 ab	115.80 abc	20.79 abcd	85.15 bc
4	S2015SL-444	1.64 a	117.81 ab	19.55 cde	119.80 a
5	S2015SL-404	0.84 b	93.29 cde	21.13 abc	65.79 c
6	S2013US-917	1.01 ab	89.49 de	21.65 a	82.83 bc
7	S2014SL-2200	1.39 ab	87.31 e	19.35 de	88.42 abc
8	S2015SL-89	1.27 ab	122.19 ab	21.24 ab	83.18 bc
9	CPF-253	1.53 a	130.51 a	21.02 abc	104.01 ab
10	HSF-240	1.60 a	114.88 abc	20.34 abcde	105.82 ab
LSD 0.05		0.64	23.85	1.61	32.08

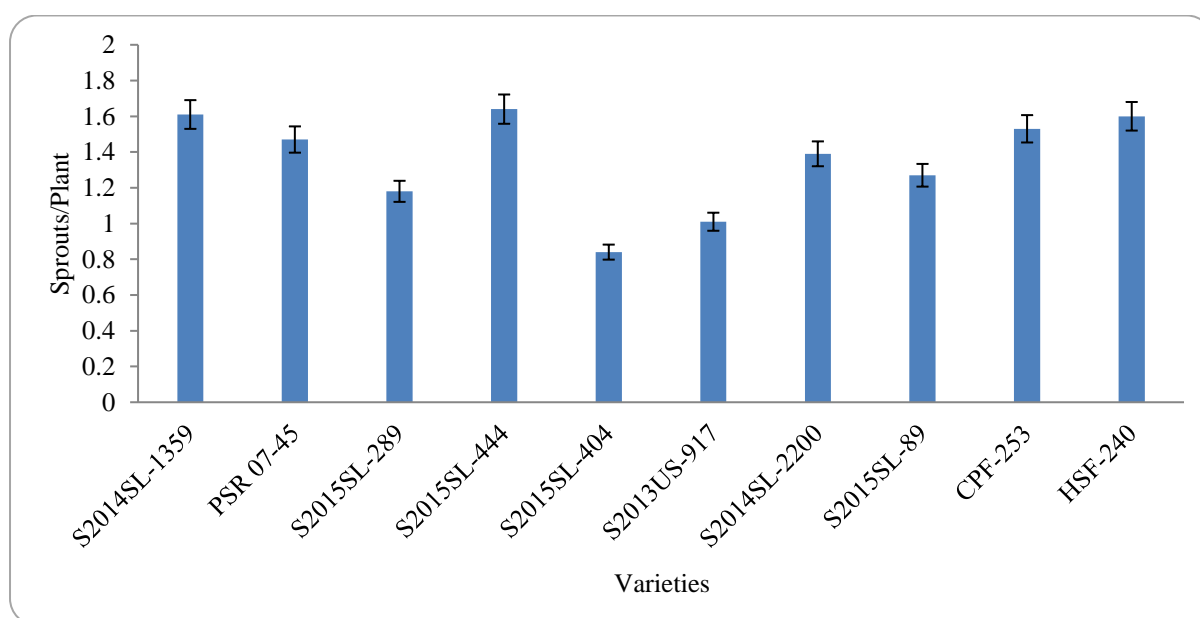


Figure 1. Sprouts per plant of ratoon sugarcane strains under South Punjab conditions.

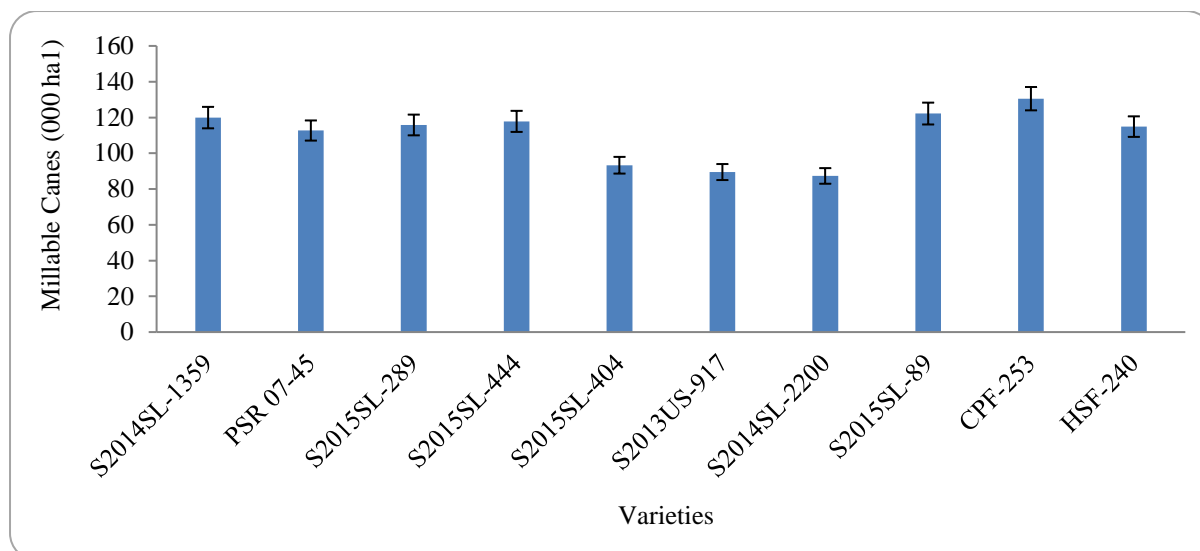


Figure 2. Millable cane density of ratoon sugarcane strains under South Punjab conditions.

Field brix (%)/ sugar recovery

The results of this research trial established that field brix percentage or sugar recovery of ratoon sugarcane crop is higher than plant sugarcane crop. Higher Cane yield is desired by growers while cane milling operation has interest in varieties with better sugar recovery/field brix %. The wide differential behaviour in field brix percentage or sugar recovery for various sugarcane strains was observed. The highest field brix of 21.65 % was produced by the sugarcane strain S2013-US-917 followed by S2015-SL-89 in which the field brix was recorded as 21.24% (Figure 3, Table 1). This suggests minimal variation between plant cane and 2nd ratoon crops for the most promising varieties, aligning with findings by El-Hinnawy and Masri (2009). Chapman, Ferraris, and Ludlow (1988) observed that older crops typically mature earlier than younger ones, yet the ultimate brix concentration is

generally only marginally influenced by the age of the crop.

Stripped cane yield

Present study revealed that clone of S2015-SL-444 produced the maximum stripped cane yield of 119.80 tons per hectare that represents its best ability to utilize the environmental resources as it gained 14.02 tons per hectare higher yield than HSF-253. While, the minimum cane yield of 65.79 tons per hectare was produced by the clone S2015-SL-404 (Figure 4, Table 1). The present research experiment revealed that there was a huge difference among the sugarcane strains for their stripped ratoon cane yield and it was because of the varied genetic ability of sugarcane strains to utilize available resources. Similar results have been reported in the experimental study of Aslam *et al.* (2011); Jamil *et al.* (2007) and Khan *et al.* (2007).

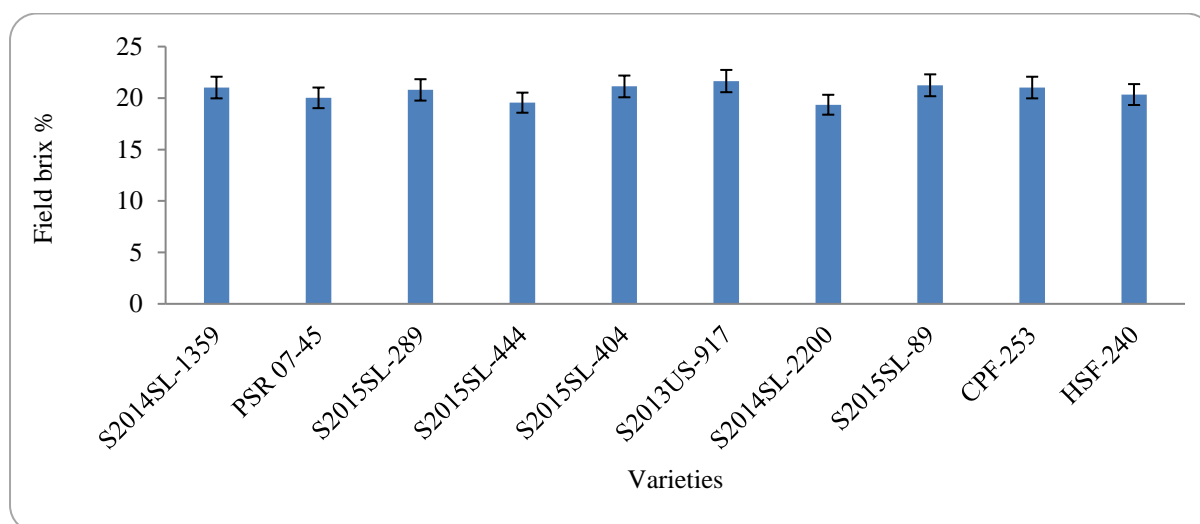


Figure 3. Field brix (%)/ sugar recovery of ratoon sugarcane strains under South Punjab conditions.

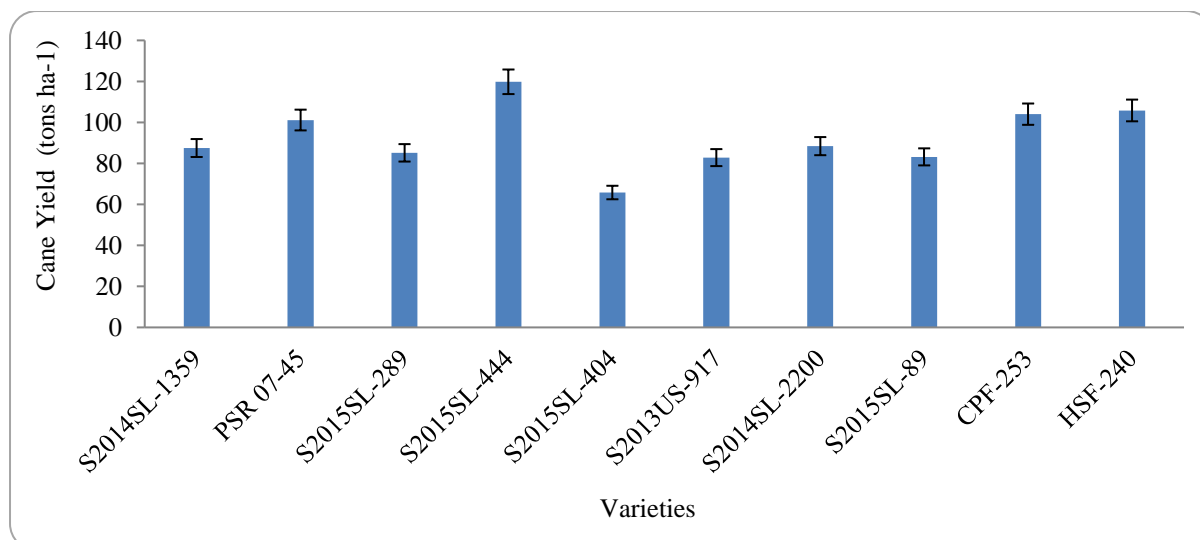


Figure 4. Stripped cane yield of ratoon sugarcane strains under South Punjab conditions.

Sugar recovery in the sugarcane genotype is the major genetic parameter which is mainly desired by all the growers and millers. Even, ratoon crop results in higher sugar recovery/brix %, healthy canes and reduced cost of production. Final ratoon cane production critically depends on the sprouting of underground stubbles, development of cane stalks, height of cane stalk, diameter of the cane and cane weight of a single plant. In Toto, as ratoon crop, S2015-SL-444 produced 14.02 tons ha⁻¹ more yield as compared to check. Therefore, it is recommended that genotype S2015-SL-444 with maximum ratooning potential should be grown in agro-ecological climatic conditions of South Punjab as ratoon crop to get more sugar recover and millable cane.

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