International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
DOI: 10.22192/ijarbs Coden: IJARQG(USA) Volume 4, Issue 12 - 2017

Research Article

DOI: http://dx.doi.org/10.22192/ijarbs.2017.04.12.026

Performances Evaluation of Sugarcane Genotypes (Cuba 2012) at Finchaa Sugar Estate

[1]Shitahun A, [2]Feyissa T, [3]Abebech S, [4]Mabrahtom F, [5]Essaya T, [6]Melaku T, [7]Zinawu D. and [8]Dereje S.

[1] Ethiopian Sugar Corporation Research and Development Center, Jawi, Ethiopia
[2, 4, 5, 7 & 8] Ethiopian Sugar Corporation Research and Development Center, Wonji, Ethiopia
[3&6] Ethiopian Sugar Corporation Research and Development Center, Finchaa, Ethiopia

Abstract

The study was conducted at Fincha Sugar Estate to evaluate the performance of eleven introduced in 2012 Cuban sugarcane genotypes for Plant Cane (PC) and first ratoon (R-I). The experimental design used was Randomized Complete Block Design (RCBD), laid out in three replicates. Data were collected for millable stalk, plant height, stalk diameter, single stalk weight, cane yield, brix % juice, pol percent, sugar recovery percent and sugar yield. The differences among the Elven Cuban genotypes and two standard checks were highly significant for all analyzed quantitative traits. Generally, in both plant cane and Ratoon I crop cycles C88-556, C88-356, C90530 and C13281gave higher performances in cane and sugar yield (tons/ha) than the checks B 52-298 and NCO 334. Therefore C 88-556, C 132-81, C 90-530 and C 88356 were recommended for seed increase to use in further verification on large plots sooner as Ratoon II data will be confirmed.

Keywords: Sugarcane, Genotypes, PC, R-I

1. Introduction

Sugarcane (*Saccharum* ssp) is one of the most important crops in tropical and sub-tropical countries, is the first major sugar crop worldwide. The crop belongs to the genus Saccharum and is a grass, like most of the world's grain crops. However, instead of storing starch in seed heads like the grain crops, sugarcane has evolved to store sugar (sucrose) in its stalk. The soft and sweet chewing 'noble canes' belong to the species *Saccharum officinarum*, which appears to have evolved from its wild relatives in Papua-New Guinea (Glyn, 2004).

Sugarcane is a major industrial crop cultivated in tropicaland sub-tropical regions to produce sugar (InmanBamber and Smith 2005).Themajor challenges faced by the crop are lower averageproduction per area and low sugar recovery (Arain *et al.*,2011). The sugar estates has limitedoptions for variance in their sugarcane crop with newimproved sugarcane varieties. Therefore, it is direlyneeded that new sugarcane varieties should be added in the existing varietal pool and the pace of work on the development and release of new sugarcane varieties should be accelerated to the better headway. New sugarcane varieties are usually produced through crossing of parental clones according to the objectives set within the sugarcane improvement programme. In many countries, due to low and poor flowering ability of the sugarcane, breeders very often resort to artificial induction as a means to initiate and promote flowering in non- and

poor flowering clones of interest. The production of inflorescences, especially inthe best varieties and elite clones has to be ensured for asuccessful sugarcane improvement programme. While, the sugarcane variety development in Ethiopia is being carried out through direct introduction and acclimatization of exoticsugarcane varieties, hybrid fuzz imported fromabroad, and locally collected varieties.
Therefore this study were conducted to evaluate the performance of Eleven introduced sugarcane genotypes from Cuba in 2012 for two crop cycles at Finchaa Sugar Estate.

2. Materials and Methods

The study was conducted at Finchaa sugar estate. It is located at about 330 km west of Addis Ababa, 9° 31' to 10°N latitudes and 37° 15' to 37° 30' E longitude with an elevation of between 1350 to 1650 m asl. The areareceives about 1280 mm annual average rainfall with mean maximum and mean minimum temperature of 30.6°C and 14.5°C, respectively.

Eleven Cuban sugarcane genotypes designated as **C32368, C8751, C85102, C88556, C88356, C89147, C98128, C92514, C9226, C90530 and C13281** were evaluated along with standard checks NCO 334 and B 52- 298. The experiment was conducted during October 2014 to June 2017 in plant cane and Rattoon I in Randomized Complete Block Design (RCBD) with three replications. A plot consisted of 6 rows each 6 m long and spaced 1.45 m apart. The spacing between sub-blocks and replications were 1.5 m and 3 m, respectively, and 3 m border was maintained on all sides. Field managements were as per the plantations.
Data was collected from the four central rows for stalk count, stalk length (cm), stalk diameter (mm), single stalk weight, cane yield (tons/ha), brix percent juice, recoverable sugar percent, pol percent and sugar yield.
The quantitative data recorded in this study was subjected to analysis of variance using statistical procedures described by Gomez and Gomez (1984) with the help of statistical analysis software (SAS, 2002). Least significance difference (LSD) mean comparison method at 5% level of significance was used to separate the treatment means.

3. Results and Discussion

The differences among the Elven Cuban varieties introduced in 2012 were highly significant for all analyzed quantitative traits indicating the availability of high genetic variability among the genotypes studied. The differences among crop cycles for these varieties were also significant except for stalk count, single stalk weight and cane yield. The Genotype by Crop cycles interaction was also statistically significant for all traits examined except for stalk diameter and cane length. This indicates the differential response of genotypes over the crop cycles and selection should be based on the average performances for the crop cycles.

The check NCO 334 showed significantly highest for stalk count in both plant cane and Rattoon I. Variety C 32-368 gave significantly higher stalk counts over eleven Cuban varieties including the check B 52-298 in each crop cycles and in average performances.C92514 and C9226 showed significantly higher cane diameter over the check NCO 334 in PC and R I.For first ratoon and average performances eight varieties namely C 85-102, C 88-556, C 88-356, C 98-128, C 92-514, C 92-26, C 90-530 and C 132-81 showed significantly higher stalks diameter for cane diameter over the check NCO 334.

C 87-51 produced significantly longer canes over both checks in Plant Cane and B 52-298 in both crop cycles. The higher performances of C 132-81, C 98-128 and C 32-368 for first ratoon were produced significantly longer canes for average performances over the check B 52-298. Two varieties C 87-51 and C 92-26 in both crop cycles and C 98-128 in plant cane and average performances gave significantly higher single stalk weight over NCO 334.

C 88-556 were showed significantly higher cane yield in tons/ha than the checks B 52-298 and NCO 334 in both crops cycles. C 88-356 and C 132-81 were also showed significantly higher cane yield over the checks in Ratoon I and produced higher average performances than the checks in mean comparisons.

In brix percent juice C 85-102 and C 89-147 showed significantly higher than the checks in plant cane and first ratoon. They also produced higher average brix percentage.

C 89 -147 and C 92-514 in plant cane and C 85-102 in first ratoon produce significantly higher recoverable sucrose percent than the checks. While in average performances C 85-102, C 89-147 and C 92-514 gave higher sugar recovery percent than the checks.

C88-556 showed significantly higher sugar yield over the checks in plant cane and average performances. It also produced higher performances for first ratoon than the checks. In plant cane C88-556, C92514, C9226, C90530 and C13281; in first ratoon C32368,

Table 2 Performances of Cuban 2012 Sugarcane Genotypes at Fincha Sugar Estate

	Stalk Count			Cane Diameter			Cane Length			S. Stalk Weight		
Genotypes	PC	R I	Average	PC	R I	Average	PC	R I	Average	PC	R I	Average
C32368	547^{b}	531^{b}	539^{b}	26.3^{d}	20.5^{cd}	23.40^{c}	248.1^{ab}	250^{abc}	249.07^{ab}	1.2^{cd}	1.2^{cd}	1.2^{abc}
C8751	471^{c}	452^{c}	462^{c}	26.6^{d}	21.9^{bcd}	24.23^{bc}	257.8^{a}	277.1^{a}	267.47^{a}	1.4^{abc}	1.43^{abc}	1.42^{a}
C85102	289^{ef}	292de	291de	31.4^{bc}	23.4^{ab}	27.38^{a}	151.17^{f}	157.7^{g}	154.43^{f}	0.73^{e}	0.867^{e}	0.8^{cd}
C88556	244^{fgh}	253de	248^{def}	30.8^{bc}	24.1^{ab}	27.47^{a}	190.3^{e}	215^{def}	202.63^{e}	1.13^{cd}	1.467^{ab}	1.3^{ab}
C88356	235^{gh}	236^{e}	235^{ef}	30.5^{c}	25.0^{a}	27.74^{a}	199.33^{e}	233.7^{cde}	216.5^{cde}	0.93^{de}	1.567^{a}	1.25^{abc}
C89147	259^{fg}	123^{f}	191^{f}	24.9^{d}	19.4^{d}	22.13^{c}	151.67^{f}	112.1^{h}	131.87^{f}	0.6^{e}	0.333^{f}	0.47^{d}
Nco-334	624^{a}	611^{a}	617^{a}	24.7^{d}	19.6^{d}	22.13^{c}	227.5^{bcd}	248^{abcd}	238.2^{abcd}	0.93^{de}	0.9^{e}	0.92^{bcd}
B52/298	447^{c}	435^{c}	441^{c}	34.2^{a}	24.5^{ab}	29.37^{a}	209de	199.2^{f}	204.12^{e}	1.67^{a}	1.17^{d}	1.42^{a}
C98128	445^{c}	411^{c}	429^{c}	31.4^{bc}	23.3^{abc}	27.34^{a}	239.3^{abc}	244^{bcde}	241.48^{abc}	1.67^{a}	1.17^{d}	1.42^{a}
C92514	320^{e}	315^{d}	317^{d}	33.1^{ab}	24.6^{ab}	28.84^{a}	208.3^{de}	210.5^{ef}	209.43^{de}	1.3^{abc}	1.23^{bcd}	1.28^{ab}
C9226	440^{c}	451^{c}	445^{c}	33.9^{a}	24.5^{ab}	29.20^{a}	203.67^{de}	226^{cdef}	214.78^{cde}	1.60^{ab}	1.43^{abc}	1.52^{a}
C90530	208^{h}	233^{e}	221^{ef}	29.6^{c}	24.9^{a}	27.26^{a}	212.5^{cde}	227^{cdef}	219.7^{bcde}	1.27^{bcd}	1.33^{abcd}	1.3^{ab}
C13281	386^{d}	460^{c}	423^{c}	29.4^{c}	24.6^{ab}	27.0^{ab}	240.5^{abc}	269.7^{ab}	255.12^{a}	1.4^{abc}	1.567^{a}	1.48^{a}
Mean	378	369	374	29.74	23.11	26.42	210.78	220.72	215.75	1.22	1.21	1.21
LSD	50.02	66.3	71.91	2.46	2.81	2.8155	28.21	33.3	29.96	0.383	0.235	0.48
CV	7.85	10.65	9.35	4.9	7.20	6.46	7.94	8.95	8.55	18.62	11.57	16.12

Table 2 continued

	Cane yield			Brix percent			Recoverable sugar %			Sugar Yield		
Genotypes	**PC**	**R I**	**Average**	**PC**	**R I**	**Average**	**PC**	**R I**	**Average**	**PC**	**R I**	**Average**
C32368	144.1^{b}	178.6^{abc}	161.33^{bc}	19.28^{bc}	22.4^{de}	20.8^{cd}	11.5^{abcd}	14.3^{bcde}	12.9^{ab}	16.65^{b}	25.47^{abcd}	21.06^{abc}
C8751	144.5^{b}	187.5^{ab}	166.02^{bc}	17.57^{cd}	23.7^{bc}	20.6^{cd}	9.55f^{g}	14.8^{abcd}	12.18^{ab}	13.78^{b}	27.63^{abc}	20.71^{abc}
C85102	121.6^{b}	96.63^{e}	109.11^{cd}	21.37^{a}	25.3^{a}	23.3^{a}	11.16^{abcde}	15.7^{a}	13.47^{a}	13.56^{b}	15.27^{f}	14.41^{cd}
C88556	261.3^{a}	213.43^{a}	237.39^{a}	17.38^{d}	22.7^{cd}	20.0^{d}	8.52^{g}	14.2^{bcdef}	11.36^{b}	22.26^{a}	30.27^{a}	26.97^{a}
C88356	148.3^{ab}	212.33^{a}	180.31^{ab}	19.14^{bcd}	22.6^{cde}	20.9^{cd}	10.07^{ef}	13.9^{cdef}	11.98^{ab}	14.64^{b}	29.63^{ab}	22.14^{abc}
C89147	111.7^{b}	23.5^{f}	67.59^{d}	21.12^{a}	24.5^{ab}	22.8^{ab}	12.52^{a}	14.9^{abc}	13.71^{a}	13.85^{b}	3.4^{g}	8.63^{d}
Nco-334	165.8^{ab}	157.9^{bcd}	161.87^{bc}	18.76^{cd}	21.8^{de}	20.3^{cd}	10.27^{def}	14.1^{bcdef}	12.20^{ab}	16.97^{b}	22.3^{cde}	19.64^{bc}
B52/298	151.8^{ab}	145.9^{cd}	148.86^{bc}	19.31^{bc}	22.8^{cd}	21.1^{bcd}	10.58^{cdef}	13.7^{def}	12.14^{ab}	15.87^{b}	19.97^{def}	17.92^{bcd}
C98128	165.2^{ab}	137.1^{de}	151.15^{bc}	19.0^{bcd}	22.3^{de}	20.6^{cd}	10.17$_{def}$	13.1^{f}	11.65^{b}	16.70^{b}	17.97^{ef}	17.34^{bcd}
C92514	148.8^{ab}	146.2^{bcd}	147.51^{bc}	20.57^{ab}	23.7^{bc}	22.1^{abc}	12.17^{ab}	15.2^{ab}	13.70^{a}	18.62^{b}	22.2^{cde}	20.41^{abc}
C9226	172^{ab}	183.9^{abc}	177.97^{ab}	19.06^{bcd}	22.1^{de}	20.6^{cd}	10.75^{cdef}	13.6^{ef}	12.18^{ab}	18.57^{b}	24.87^{abcd}	21.72^{abc}
C90530	185.6^{ab}	179.1^{abc}	182.38^{ab}	21.20^{a}	22.2^{de}	21.7^{abcd}	11.82^{abc}	13.3^{ef}	12.56^{ab}	21.84^{ab}	23.9^{bcde}	22.87^{abc}
C13281	183.6^{ab}	207.4^{a}	195.53^{ab}	18.37^{cd}	21.4^{e}	19.9^{d}	10.82^{bcdef}	14.1^{bcdef}	12.46^{ab}	19.68^{b}	29.4^{ab}	24.54^{ab}
Mean	161.9	159.2	160.54	19.39	22.88	21.14	10.76	14.24	12.50	17.69	22.48	20.09
LSD	113.38	41.36	61.93	1.77	1.26	1.8587	1.39	1.155	1.79	9.17	6.27	10.017
CV	31.26	15.41	24.61	5.41	3.28	4.31	7.67	4.81	5.97	30.77	16.55	22.81

C8751, C88556, C88356, C9226, C90530 and C13281 and in the average of the two crop cycles C 32-368, C 87-51, C 88-356 and C 92-514 were gave higher performances than the checks B 52-298 and NCO 334. Worku and Chinawong, 2006 in cane height; Rafiq *et al*, 2006 in number of millable canes and stalks diameter; Bissessur, 2000 in sugar yield also revealed differences among genotypes.

Conclusion and Recommendations

The results showed C 88-556 produced significantly higher mean cane yield and sugar yield than NCO 334 and B 52-298 for both plant cane and first ratoon. In addition, C 132-81, C 90-530 and C 9-226 produced higher mean cane and sugar yield than the checks in both crop cycles.

Therefore, as the genotypes C 88-556, C 132-81, C 90-530 and *C 88356* were found promising in plant cane and Ratoon I for cane and sugar yield under Fincha Sugar Estate, they had been recommended for timely seed increase to use in verification on larger plot verification sooner as Ratoon II data will be confirmed under luvisol soil types of the Sugar Estate.

References

Arain, M. Y., R. N. Panhwar, N. Gujar, M. Chohan, M.A. Rajput, A. F. Soomro and S. Junejo (2011).Evaluation of new candidate sugarcane varietiesfor some qualitative and quantitative traits underThatta agro-climatic conditions. The J. Anim. &Plant Sci., 21(2):226-230.Blackburn, F. 1984. Sugarcane. Longman Inc., New York. Pp 184.

Burton G.W. and Devane E.H. 1953. Estimating heritability in tall Fescue (Festuca arundinacea) from replicated clonal materials. Agronomy Journal 45: 487-488.

Dabholkar, A.R. 1992. Elements of Biometrical Genetics. Concept Publishing Company, New Delhi, India, pp: 431.

Glyn, A. 2004.SugarCane.BlackwellPublishing,Wiley-Blackwell,Oxford,UK, 224p.

Gomez, K.A. and A.A. Gomez, 1984. Statistical procedure for agricultural research (2nd) ed. John Wiley and Sons Inc., New York.

Inman-Bamber NG, Smith DM (2005) Water relations insugarcane and response to water deficits. Field CropsRes., 92:185-202.

Rafiq M., A.A. Chattha, M.R. Mian, M.S. Anwar, Z. Moahmood and J. Iqbal. 2006. Ratooning potential of different sugarcane genotypes under Faisalabad. J. Sugarcane Research Institute, Ayub Agricultural Research Institute, Faisalabad. J. Agric. Res., 44(4): 269-275.

Worku, B. and Chinawong C. 2006. Agronomic Performances and Industrial Characteristics of Sugarcane Varieties Under Finchaa Valley Conditions, Oromiya, East Africa. Kamphaengsaen Acad. J.4(1): 27 – 33.

Appendix 1 Analysis of Variance for Cuban 2012 sugarcane genotypes under Fincha sugar Estate for genotypes (G), crop cycles (C) and their interactions (G x C)

Sources of Variation	Stalk count	Diameter	Cane length	S. Stalk Weight	Cane yield	Brix	Pol	Purity	RSP	Sugar Yield
G	***	***	***	***	***	***	***	***	***	***
C	ns	***	*	ns	ns	***	***	***	***	***
G x C	**	ns	ns	***	*	**	***	**	**	**
Mean	374	26.42	215.75	1.213	163.65	21.1	18.58	87.6	12.5	20.09
CV	9.35	6.46	8.55	16.12	24.61	4.31	4.98	2.3	5.97	22.81

Access this Article in Online	
	Website: www.ijarbs.com
Quick Response Code	Subject: Agricultural Sciences
DOI:10.22192/ijarbs.2017.04.12.026	

How to cite this article:
Shitahun A, Feyissa T, Abebech S, Mabrahtom F, Essaya T, Melaku T, Zinawu D. and Dereje S. (2017). Performances Evaluation of Sugarcane Genotypes (Cuba 2012) at Finchaa Sugar Estate. Int. J. Adv. Res. Biol. Sci. 4(12): 251-256**.**
DOI: http://dx.doi.org/10.22192/ijarbs.2017.04.12.026