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Performance of Elite Sugarcane Genotypes in North Coastal Zone of Andhra Pradesh

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Abstract

A study was conducted at RARS, Anakapalle to evaluate the performance of promising early sugarcane genotypes during 2016-17 under AICRP on Sugarcane. Among different elite clones CoA 12322 (2006 A 102) which is developed from 88 R 13 GC performed better and this genotype was tested against the popular checks Co 6907, Co C 01061 and Co A 92081 along with other zonal varieties Co A 12321, CoA12323, Co Or 12346 and Co V 12356. Co A 12322 (2006 A 102) recorded highest cane yield of 89.8 t ha^{-1} as compared to standards, Co 6907 (86.1 t ha^{-1}), Co C 01061 (84.1 t ha^{-1}) and Co A 92081 (77.8 t ha^{-1}) and also highest CCS yield of 9.7 t ha^{-1} as compared to standards, Co 6907(9.3 t ha^{-1}), CoC 01061 (8.8 t ha^{-1}) and CoA 92081(9.0 t ha^{-1}). Per cent juice sucrose and commercial cane sugar per cent in Co A 12322 (18.0 and 11.1) was on par with Co 6907(17.2 and 10.85) CoC 01061 (17.7 and 10.44) and Co A 92081 (16.7 and 11.63) when tested in Anakapalle of East coast zone. It is resistant to all three pathotypes of red rot both under natural, cotton swab method and artificially inoculated conditions (Plug method). It was resistant to wilt, susceptible to smut and moderately resistant to Yellow Leaf Disease. The clone can be distinguished by chrome yellow with purple tinge cane, green foliage without any waxy coating on leaf sheath and easily trashable.

Keywords: 2006A102, early pre released clone, sugarcane

1. Introduction

Sugarcane is an important cash crop in India both sociologically and economically. It is the main sugar-producing crop (Junejo et al., 2010) accounting for approximately 80% of sugar production in the world (Islam et al, 2018; Sharma and Chandra, 2018). Sugarcane is cultivated in many of the world countries with Brazil is major producer followed by India, Chaina, Pakistan, Thailand and Mexico (FAO, 2010). Sugarcane occupies approximately 4% of the total cropped area in India with a productivity of 60 t ha^{-1}. To meet the needs of increasing population, productivity per unit area need to be increased as there is very little scope for horizontal expansion. This is possible mainly through development of high yielding clones, adoption of ideal agronomic practices and plant protection measures. According to Glaz and Gilbert (2000), sugarcane production can only be improved through the adoption of promising

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varieties and technologies Sugarcane breeding and better agronomic practices have contributed to a huge increase in sugarcane yield in the last 30 years (Abdul and Muhammad, 2018). The cane and sugar yield of sugarcane crop can be improved with high yielding varieties and better agronomic practices (Heinz, 1987). There are number of reasons for lower cane yield and one of those is the planting of low yielding varieties. Therefore, it is need of the time to introduce new high yielding varieties with good ratoon ability in the country (Chattha and Ehsanullah, 2003). Variety plays a key role in both increasing and decreasing per unit area sugar yield, while use of unapproved, inferior quality cane varieties affect sugarcane production negatively as situation prevails today (Mian, 2006). According to Sundara (2000), in order to enhance productivity and profitability of commercial scale sugarcane cultivation, adoption of high yielding varieties and improved production packages are highly demanding. High sugar production depends primarily on the varieties cultivated; improved varieties possessing good adaptability, insect and disease resistance and high response to inputs constitutes a key element in increasing sugarcane and sugar yield unit-1 area (Santana et al., 2000; Mercado, 1984). Suarez and Bernal (2002) estimated that the use of superior varieties is responsible for 50% of the overall increase in sugarcane yields over the last two decades. In reviewing many years of work around the world, Marín and Velasquez (1997) pointed out that high productivity in sugarcane fields demands a rational use of recommended varieties, taking into consideration their characteristics of adaptation, maturity and resistance to insect and disease attack. The viability of a sugar estate is in part dependent on high yielding sugarcane varieties, to produce more sugar per unit area. It is of increasing economic importance to select the best varieties for specific environmental conditions (Isyagi and Whitbread, 2002) and the best harvesting cycle (Redshaw and Nuss, 2001; Zhou, 1998). The use of new superior varieties well adapted to specific locations constitutes one of the main tools for increasing yield potential and reducing the negative impact of variety fatigue over time. Hence, there is need to develop and evaluate new early varieties which perform better than the existing popular varieties such as 87A 298 (CoA 92081) along with resistance to diseases like red rot disease which is endemic in the coastal belt of Andhra Pradesh.

2. Materials and Methods

The promising early sugarcane genotypes CoA12321, CoA12322,CoA 12323, CoOr12346, CoV 12356 along with zonal checks Co 6907, Co C 01061 and CoA 92081 were planted at 120 cm spacing during first week of March, 2016 at Regional Agricultural Research Station, Anakapalle (latitude 17.38'N, longitude 83.01E), Andhra Pradesh, India . The experiment was laid out in RBD with three replications. Soil of the experimental site is sandy loam, neutral in pH (7.46), normal in EC (0.18 dSm^{-1}) low in organic carbon (0.56%), low in available nitrogen (241 kg N /ha), medium in available phosphorus (66.5 kg ha^{-1}), high in available potassium (242 kg / K_2O /ha). All the recommended package of practices are adapted for raising a good and healthy crop. All other agronomic practices like hand weeding, earthing up, trash twist propping etc., were carried out as per recommendation. Yield attributing parameters like number of millable canes, cane length were recorded at the time of harvest. Cane yield was recorded after stripping the leaves and detopping. juice quality were determined as per the standard procedure (Meade and Chen, 1971). Cane yield was recorded at harvest on plot basis and expressed in t ha^{-1}, sugar yield was computed based on cane yield and CCS percent. Reaction to diseases viz., red rot, smut and wilt under natural and artificial conditions was recorded against three pathotypes (Cf 419, Cf 671 and Cf 997) of red rot in Andhra Pradesh. Statistical analysis of data was carried out as per Panse and Sukhatme (1985).

3. Results and Discussion

The data on cane yield, yield components, juice quality parameters, and reaction to red rot, wilt, smut and yellow leaf disease and chief morphological characteristics are furnished in table 1, 2 and 3 respectively.

3.1. Number of milliable canes

Number of millable canes at harvest varied significantly among different sugarcane genotypes (Table 1). At harvest Co A 12322 (2006 A 102) genotype recorded significantly higher number of millable canes of 76.67 ha^{-1}as compared to all other zonal clones and check varieties Co C 01061 (74.8 thousands ha^{-1}), Co A 92081(73.9 thousands ha^{-1}) and Co 6907 (74.4 thousands ha^{-1}) but found on par with Co V 12356 (75.6 thousands ha^{-1}). Mahmood *et al*. (1990) and Afghan *et al*. (1993)reported that cane yield was positively and highly significantly correlated with number of millable canes m^{-2}.

3.2. Cane yield (t ha^{-1}):

Cane yield per plot was recorded at harvest and expressed in t ha^{-1} and presented in Table 1. Cane yield of new early sugarcane genotypes under irrigated conditions varied significantly. The promising clone CoA12322(2006A 102) gave significantly higher cane yield of 89.8 t ha^{-1} as compared to the other new sugarcane genotypes and also check varieties viz., Co 6907(86.1 t ha^{-1}), Co C 01061 (84.1 t ha^{-1}) and Co A 92081(77.8 t ha^{-1}) but found on par with Co V 12356 (87.1 t ha^{-1}). Javed et al. (2001) and Katia et al. (2012) reported that cane yield was strongly and positively correlated with cane girth, number of millable canes and weight/stool

3.3. Juice sucrose (%)

Per cent juice sucrose in CoA12322 (18.0) was on par with Co 6907(17.2) Co C 01061 (17.7) and Co A 92081 (16.7). Significant differences in juice sucrose (%) were not observed among the different new early genotypes.

3.4. Commercial cane sugar (%)

Commercial cane sugar per cent in 2006A 102 (11.1) was on

Table 1: Performance of elite sugarcane genotypes during 2016-17

Treatment	Germination (%)	Shoot population at 180 DAP	NMC ha^{-1}	Cane yield (t ha^{-1})	Juice sucrose (%)	CCS (%)	Sugar yield (t ha^{-1})
Varieties							
CoA12321 (2006 A 64)	79.8	1,19,791	75,000	85.8	16.3	10.13	8.7
CoA12322 (2006 A 102)	77.4	1,05,902	76,667	89.8	18.0	11.1	9.7
CoA12323 (2006 A 223)	82.2	86,954	76,112	86.9	18.4	11.67	10.4
Co or 12346	89.5	1,28,093	70,833	76.9	16.2	10.43	8.0
CoV12356	75.6	1,23,031	75,556	87.1	17.1	10.43	9.0
Co 6907	86.1	1,27,546	74,800	86.1	17.2	10.85	9.3
CoC01061	76.3	1,21,643	73,890	84.1	17.7	10.44	8.8
Co A92081	82.2	96,065	70,445	77.8	16.7	11.63	9.0
SEm±	4.4	5658	544.0	0.95	0.60	-	-
CD (p=0.05)	NS	17159	1650	2.9	NS	NS	-

par with Co 6907(10.85) Co C 01061 (10.44) and Co A 92081 (11.63).

3.5. Sugar yield (t ha^{-1})

Sugar yield was calculated based on CCS% and cane yield. Sugar yield in Co A 12322(9.7) was on par with Co 6907(9.0), Co C 01061 (8.8) and Co A 92081 (9.0).

3.6. Reaction to diseases

Reaction of 2006A 102 along with other zonal varieties and checks for red rot, wilt, smut and YLD was studied under artificially inoculated conditions. The Clone Co A 12322 (2006A 102) was found resistant to all three pathotypes of red rot both under natural and artificially inoculated conditions (cotton swab method) and under plug method it was resistant to two pathotypes cf 04 and cf 05 and moderately resistant to one pathotype (cf 06). It is resistant to wilt, susceptible to smut and moderately resistant to Yellow Leaf Disease. The clone Co Or 12346 was highly susceptible to red rot, susceptible to wilt and yellow leaf disease and resistant to smut. Check varieties Co C 01061 and Co A 92081were resistant to red rot, highly susceptible to smut and susceptible to yellow leaf disease . Co 6907 was highly susceptible to red rot and susceptible to smut, wilt and yellow leaf disease (Table 2 and 3).

Table 2: Reaction of promising early sugarcane genotypes against major diseases

Sl. No	Variety	Red rot						Smut	Wilt	YLD
		Plug Method			Cotton swab Method					
		CF 04	CF 06	CF05	CF 04	CF 06	CF 05			
1.	CoA 12322	R	MR	R	R	R	R	S	R	MR
2.	Co Or 12346	HS	HS	HS	HS	HS	HS	R	S	S
3.	Co 6907	HS	HS	HS	R	HS	R	S	S	S
4.	CoC 01061	R	R	R	R	R	R	HS	MR	S
5.	Co A 92081	R	R	R	R	R	R	HS	MS	S

Table 3: Description of morphological characters of best performing clone Co A 12322(2006A 102)

Sl. No.	Name of the description		Descriptor status	Sl. No.	Name of the description		Descriptor status
1.	Clone number	:	2006A 102 (CoA12322)	5.	Ivory marks	:	Absent
2.	Parentage	:	88 R 13 GC	6.	Weather marks (Corky patches)	:	Absent
2.	Stool habit	:	Erect				
	Tillering	:	Medium (5-7)	7.	Interned shape	:	Cylindrical
3.	Stem colour (exposed)	:	Purple	8.	Internode alignment	:	Straight
4.	Stem colour (undexposed)	:	Chrome yellow with purple tinge	9.	Pithiness	:	Absent
				10.	Split on internode	:	Absent

Table 3: Continue...

Sl. No.	Name of the description		Descriptor status
11.	Wax on internode	:	Absent
12.	Node swelling	:	Present
13.	Bud size	:	Medium
14.	Bud shape	:	Oval
15.	Bud cushion	:	Absent
16.	Bud grove	:	Absent
17.	Growth ring colour	:	Pink (exposed)
18.	Leaf length	:	Medium
19.	Leaf width	:	Medium
20.	Lamina colour	:	Green
21.	Leaf carriage shape	:	Open erect
22.	Leaf sheath colour	:	Green
23.	Leaf sheath waxiness	:	Absent
24.	Leaf sheath spines	:	Absent
25.	Leaf sheath clasping	:	Loose
26.	Dewlap colour	:	Yellowish green
27.	Presence / absence of ligular process	:	Present
28.	Shape of the ligule	:	Strap
29.	Percent flowering	:	Absent

4. Conclusion

Among, five new early genotypes under test Co A 12322 (2006A 102) proved superior (89.8 t ha^{-1}) as compared to other genotypes but found on par with Co V 12356 and Co A 12323. The promising pre released early sugarcane genotype Co A 12322 (2006A 102) with erect growth habit, desirable morphological characters, higher cane and sugar yield with resistance to red rot can be recommended for commercial cultivation in North Coastal Andhra Pradesh under different sugar factory operational areas.

5. References

Afghan, S., Nasir, N.M., Qureshi, S.A., 1993. Performance of SPSG-26, a newly developed variety. Proceedings of the Annual Convention of Pakistan Society of Sugar Technologists, (ACPSST`93), Shakarganj Sugar Mills Research Institute, Jhang, 140–153.

Chattha, M.U., Ehsanullah, E., 2003.Agro-quantitative and qualitative performance of different cultivars and strains of sugarcane (*Saccharum officinarum* L.). Pakistan Sugar Journal 18(06), 2–5.

Glaz, B., Gilbert, R.A., 2000. Sugarcane variety census: Florida Sugar y Azucar 95(12), 22–29.

Heinz, D.J., 1987. Sugarcane Improvement Through Breeding. Current productivity and future opportunities Volume 11 1st Edition.

Islam, M.S., Yang, X.P., Sood, S., Comstoc, J.C., Wang, J.P., 2018. Molecular characterization of genetic basis of sugarcane Yellow Leaf Virus (SCYLV) resistance in *Saccharum* spp. Hybrid. Plant Breeding 137, 598–604.

Isyagi, M.M., Whitbread, M.W., 2002, Proceedings of South African Sugarcane Association yield performance of south african sugarcane varieties in plant cane trials at Nchalo Sugar Estate, Malawi. Proceedings of South African Sugarcane Technologists Association 76, 207–211.

Javed, M.A., Khatri, A., Khan, I.A., Ansari, R., Siddiqi, M.A., 2001. Comparative performance of elite sugarcane clones for yield and quality characters. Pakistan. Sugarcane Journal 14, 71–75.

Junejo, S., Kaloi, G.M., Panhwar, R.N., Chohan, M., Soomro, A.F., 2010. Performance of some newly developed sugarcane genotypes for quantitative and qualitative traits in Thatta conditions. Journal of animal and Plant Science 20(1), 40–43

Katia, C.S., Silvana, C., Tercilio, C.J., Mauro, A.X., Marcos, G.A., Antonio, F., Vagner, A.B., 2012. Challenges, Opportunities and Recent Advances in Sugarcane Breeding, In: Plant Breeding, Dr. Ibrokhim Abdurakhmonov (Ed.), InTechnical Rijeka, 267–296.

Mahmood, T., Nazir, M.S., Ashfaq, M., Ahmad, C.N., 1990. Correlation studies in sugarcane. Journal of Agriculture Research 28, 359–363.

Marin, S.R.M., Velazquez, Z.G., 1997. Variedades de cana de azucar. II Curso-Taller Variedades de cana de azucar, CIAV; C., Cytcana, ITA 18 U. Galvan & FCBA-UV-Córdoba, Veracruz, Mexico, 21–40.

Meade, G.P., Chen, J.C.P., 1971. Cane hand book 10th edition John wiley and sons. New Yark.

Mercado, R.E., 1984. Evaluación Agroindustrial de once variedades de cana de azucar (*Saccharum officinarum*) en el area de influencia del ingenio La Providencia, Veracruz. Tesis profesional. UACH. Chapingo, Mexico, 1–97.

Mian, A.M., 2006. Sugarcane variety composition in Pakistan. Proceedings of Seminars on Agriculture. Organized by Pakistan Society of Sugar Technologists held at Faisalabad on 19th June 2006, 107–121.

Milanes, N.N.R., Enriquez, V.R., Bello Caredo, M., Barahona, P.O., Jorge, I., Sarquis, Herrera Solano, A., 2010. Environmental Effects on Yield and Quality in Three Sugarcane Varieties Grown in Veracruz, Mexico Environmental Stress Management, 198–203.

Panse, V.G, Sukhatme, P.V., 1985. Statistical methods for agricultural workers New Delhi : Indian council of

Agricultural Research, 4th edition. Indian council of Agricultural Research, New Delhi. of some newly developed sugarcane genotypes for some quantitative and qualitative traits under Thatta conditions. Journal of Animal and Plant Sciences 20(1), 40−43

Redshaw, K.A., Nuss, K.J., 2001. Yield and quality differences between irrigated sugarcane varieties. Proceedings of South African Sugarcane Technologists Association 75, 160−164.

Sharma, A., Chandra, A., 2018. Identification of new leuconostoc species responsible for post harvest sucrose losses in sugarcane. Sugar Tech 20, 492−496.

Santana, I., Jorge, H., Jorge, I., Santana, O., Gonzalez, R., 2000. Manejo y explotación de las variedades de cana de azucar en Cuba, Ciclo 1999-2000. Cuba & Cana. INICA, Cuba, 26−28.

Suarez, H., Bernal, L., 2002. Normas y procedimientos del programa de mejoramiento genetico de la cana de azucar enCuba. Boletín No.1. Cuba & Cana-INICA, Cuba, 8.

Sundra, B., 2000. Sugarcane cultivation. Vikas Publishing House Pvt. Ltd. New Delhi. India.

Zhou, M., 1998. Trends in yield, sucrose, stalk population and smut tolerance over 20 years of sugarcane selection in Zimbabwe. Proceedings of South African Sugarcane Technologists Association 72, 47−50.