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EVALUATION OF EARLY MATURING SUGARCANE CLONES FOR CANE YIELD, ITS COMPONENTS AND JUICE QUALITY PARAMETERS IN PLANT AND RATOON CROPS

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ABSTRACT

The performance of early maturing clones was assessed for cane yield, its components and juice quality parameters in two plant crops and ratoon crop during the year 2010-11 and 2011-12. The experiments were conducted at Agriculture Research Station, Perumallapalle, Chittoor, Andhra Pradesh. Ten sugarcane clones in early maturity group were tested against three standard checks. Two clones viz., 2006T3 and 2006T36 were observed to be significantly superior for cane and commercial cane sugar yield and red rot resistant compared to standards Co 94008, Co 85004 and Co 6907 in the first and second plant crops. In the ratoon crop also 2006T3 and 2006T36 clones were found superior for cane and sugar yields against the standards. Juice quality traits viz., sucrose %, commercial cane sugar % and purity % of new clones viz., 2006T3 and 2006T36 were also be superior over the standard checks. Red rot screening for the clones was done by plug method for three different pathotypes that are prevalent in the zone.

KEY WORDS: Cane yield, Juice Quality, Plant crop, Ratoon, Red Rot. Sugarcane

INTRODUCTION

Sugarcane (*Saccharum spp.* hybrids) is an important commercial crop and occupies an area of 2.0 lakh.ha in the Andhra Pradesh. It has a key role in the economic uplift of sugarcane growing farmers all over the country. To meet the needs of increasing population, crop production per unit area has to be increased as the possibility of increasing area under cultivation is meager. This is possible mainly through development of high yield potential varieties in addition to ideal agronomic practices and plant protection measures (Nair, 2009). Providing optimum soil moisture conditions throughout the crop growing period is therefore of paramount importance to realize higher yields (Sundara, 1998).Two clones viz., 2003V46 and 86V96 in early group are predominant covering about 75-80% of the total area in the south zone of Andhra Pradesh. Moisture stress is one of the major abiotic constraints of cane production in the zone. Among diseases, smut and red rot and borers and sucking pests among insect pests are the important biotic constraints. Cultivation of at least half a dozen clones in a particular sugar factory operational zone is essential so as to increase cane, sugar and jaggery yields and to extend cane crushing duration and to avoid genetic vulnerability. Keeping this in view, concerted and continuous efforts were made at Agricultural Research Station, Perumallapalle to evolve clones with high cane yield, juice sucrose and tolerant to major insect pests and diseases. Superior for cane yield, its components and also for juice quality traits. Through the present investigation an attempt has been made to identify sugarcane clones superior to the currently grown varieties for cane and sugar yields besides tolerance to red rot and smut.

MATERIAL AND METHODS

The present investigation was conducted with 10 clones in early group at Agricultural Research Station, Perumallapalle during 2010-11 and 2011-12 in two plant crops and ratoon crop. Each clone was grown in six rows of 5.0 m length with a spacing of 80 cm between rows. The design adopted was RBD with three replications. Recommended package of practices were followed in raising a healthy crop. Data were recorded on cane yield and juice quality parameters (Spencer and Meade 1963 and Meade and Chen, 1977) at harvest as per the standard procedures. Statistical analysis was carried out as suggested by Panse and Sukhatme (1978). Red rot screening was done by plug method for all the clones (Prasada Rao *et al.,* 1977). About 40 canes were inoculated by boring a hole at 3rd internode from ground level and injected with each pathotype and sealed with cotton. The

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inoculated canes were evaluated for the disease reaction based on the discriminant function value.

RESULTS AND DISCUSSION

Observations recorded on number of millable canes (NMC), cane yield and commercial cane sugar in plant and ratoon crops at harvest are presented in Table 1. Data on juice quality traits viz., brix (%), sucrose (%), purity (%) and CCS (%) recorded at harvest in plant and ratoon crops are given in Table 2. The results obtained are presented as detailed below.

Number of Millable Canes ('000/ha):

Among the test clones 2006T36 (104.0 and 92.7 thousands ha^{-1}) recorded significantly more number of millable canes over the standard Co94008 (85.0 and 72.4 thousands ha^{-1}) in I plant and ratoon crops, respectively (Table 1). However, 2006T8 recorded significantly more number of millable canes (100.8 thousands ha^{-1}) compared to all others test clones and best standard Co6907 (83.3 thousands ha-1) in ratoon crop. None of the test clones were found significantly superior over the standards for NMC in II plant crop.

Cane Yield (t ha^{-1}):

The comparative performance of early maturing sugarcane clones was judged against best standard Co 94008 and popular standard Co 6907. Cane yield ranged from 51.4 t ha^{-1} (2004A75) to 113.3 t ha^{-1} (2006T36) in test clones while standards Co 94008 and Co 6907 have recorded 60.8 and 50.7 t ha^{-1}, respectively in first plant crop (Table-1). In the second plant crop cane yield of test clones ranged from 108.4 t ha^{-1} (2004A75) to 150.2 t ha^{-1} (2006T19). The standard Co 94008 registered a cane yield of 129.3 t ha^{-1} (Table 1). Cane yields ranged from 71.1 t ha^{-1} (2004A75) to 136.6 t ha^{-1} (2006T3) among the test clones while standards Co 94008 and Co 6907 recorded 95.2 and 83.7 t ha^{-1}, respectively in ratoon crop. The clones 2006T3 (103.0 t ha^{-1} and 143.6 t ha^{-1}) and 2006T36 (113.3 t ha^{-1} and 140.8 t ha^{-1}) were found superior over the best standard Co94008 (60.8 and 129.3 t ha^{-1}) in first and second plant crops respectively. In the ratoon crop, 2006T3, 2006T36 and 2004A63 have recorded 136.6 t ha^{-1},135.6 t ha^{-1} and 132.2 t ha^{-1} of cane yields respectively and significantly superior over both standards Co94008 (83.7 t ha^{-1}) and Co6907 (95.2 t ha^{-1}).

Commercial Sugar Yield (t ha^{-1}):

Among the test clones CCS yield ranged from 6.1 (2004A75) to 11.7 t ha^{-1} (2006T36) in the first plant crop; from 12.8 (2004A75) to 18.6 t ha^{-1} (2006T3) in the second plant crop and from 9.1 (2004A75) to 17.0 t ha^{-1} (2006T36) in ratoon crop (Table 1). Between the two standards, Co94008 (7.8, 14.8 and 9.6 t ha^{-1}) was found superior for CCS yield in the first, second plant and ratoon crops, respectively. Two clones 2006T36 (11.7, 18.2 and 17.0 t ha^{-1}) and 2006T3 (11.4, 18.6 and 16.9 t ha^{-1}) recorded significantly higher CCS yields in the first, second plantand ratoon crops over both the standards. In the ratoon crop 2004A63 registered significantly higher CCS yield (over the best standards Co6907 (12.1 t ha^{-1}) in ratoon crop.

Juice Quality Traits:

Data on brix (%), sucrose (%), purity (%) and CCS (%) recorded at harvest in plant crops and ratoon crop are presented in Table 2. Brix percent varied from 19.1 (2006T36) to 21.0 (2004A63) with a mean value of 19.7 % in first plant crop. None of the test clones were found superior over the best standard Co94008 (20.3%). Percent juice sucrose ranged from 15.5(2006T36) to 17.5 (2004A63) in I plant crop compared to standards Co 94008 (18.3%) and Co 6907 (16.6%). The standard Co94008 recorded higher percent juice purity (90.0) and CCS percent (12.8) at harvest in the first plant compared to all the clones tested in the study.

In the second plant crop two clones viz., 2006T36 and 2006T23 (20.4%) recorded percent brix on par with the standard Co 94008 (19.1%). The test clones recorded juice sucrose ranging from 13.1% (2006T8) to 18.5% (2006T36) in the second plant crop. For percent juice sucrose and purity 2006T36 (18.5 and 90.6%) and 2006T3 (18.3 and 92.6%) were found recorded significantly superior to the standard Co94008 (16.7 and 87.4%). The clones 2006T36 (12.9%), 2006T3 (13.0%) and 2006T23 (12.7%) recorded significantly higher CCS values compared to the standard Co94008 (11.5%).

All the test clones except 2006T23 have registered higher mean values for percent brix, sucrose and CCS at harvest in ratoon crop compared to the standard Co94008 but on par with popular standard Co6907. The test clones and standards were found as par with each other for percent purity at harvest. Percent sucrose ranged from 16.8 (2006T23) to 18.5 (2006T36) in the ratoon crop among the test clones.

Table 1. Performance of early maturing sugarcane clones for NMC, cane and CCS yield at harvest

S. No.	Genotype	NMC (000' ha^{-1})			Cane yield (t ha^{-1})			CCS yield (t ha^{-1})		
		I plant	II plant	Ratoon	I plant	II plant	Ratoon	I plant	II plant	Ratoon
1	2006T36	104.0	83.7	92.7	113.3	140.8	135.6	11.7	18.2	17.0
2	2006T3	78.0	83.8	90.6	103.0	143.6	136.6	11.4	18.6	16.9
3	2006T8	81.0	90.5	100.8	77.4	145.3	96.0	9.3	13.1	11.8
4	2004A63	82.0	81.1	92.1	76.6	122.3	132.2	9.0	14.8	16.9
5	2006T23	89.0	88.7	82.6	75.9	127.3	98.0	8.5	16.1	11.4
6	2006T19	78.0	87.6	93.5	72.7	150.2	82.9	8.6	15.1	10.2
7	2004A55	90.0	80.4	83.2	64.6	109.3	92.8	7.5	13.2	11.7
8	Co94008 (S)	85.0	83.0	72.4	60.8	129.3	83.7	7.8	14.8	9.6
9	2004A75	65.0	72.4	51.8	51.4	108.4	71.1	6.1	12.8	9.1
10	Co6907(S)	84.0	-	83.3	50.7	-	95.2	5.7	-	12.1
	Mean	83.5	85.3	84.3	74.6	128.8	102.4	8.6	15.0	12.7
	CD at 5%	10.4	8.5	13.1	12.3	16.0	14.4	1.2	2.2	1.7
	SE m	3.5	2.8	4.4	4.1	5.3	4.8	0.4	0.7	0.6
	CV (%)	7.2	5.8	9.0	9.5	7.2	8.1	8.2	8.4	7.9

Table 2. Performance of early maturing sugarcane clones for juice quality parameters at harvest

S. No.	Genotype	Brix (%)			Sucrose (%)			Purity (%)			CCS (%)		
		I plant	II plant	Ratoon	I plant	II plant	Ratoon	I plant	II plant	Ratoon	I plant	II plant	Ratoon
1	2006T36	19.1	20.4	20.5	15.5	18.5	18.1	81.3	90.6	88.5	10.3	12.9	12.5
2	2006T3	19.5	19.8	20.3	16.4	18.3	17.9	84.0	92.6	88.5	11.1	13.0	12.4
3	2006T8	19.3	15.0	21.2	17.3	13.1	18.1	89.8	87.6	85.2	12.1	9.0	12.3
4	2004A63	21.0	19.9	21.0	17.5	17.6	18.5	83.3	88.4	87.9	11.8	12.2	12.8
5	2006T23	18.2	20.4	18.9	16.2	18.3	16.8	89.2	89.4	88.8	11.2	12.7	11.6
6	2006T19	19.7	18.8	20.2	17.2	15.2	17.8	87.4	80.8	88.3	11.8	10.0	12.3
7	2004A55	19.7	19.6	21.5	17.0	17.4	18.5	86.6	88.8	86.0	11.7	12.1	12.6
8	Co94008 (S)	20.3	19.1	19.2	18.3	16.7	16.7	90.0	87.4	87.4	12.8	11.5	11.5
9	2004A75	20.3	19.5	20.7	17.5	17.1	18.5	86.2	87.6	89.0	11.9	11.8	12.8
10	Co6907(S)	19.7	-	20.4	16.6	-	18.3	84.6	-	89.5	11.3	-	12.7
	Mean	19.7	19.2	20.4	17.0	16.9	17.9	86.2	88.3	87.9	11.6	11.7	12.4
	CD at 5%	1.4	1.2	1.0	1.1	1.3	0.6	NS	3.2	NS	1.0	1.0	0.6
	SE m	0.5	0.4	0.3	0.4	0.4	0.2	1.9	1.1	1.2	0.3	0.3	0.2
	CV (%)	4.2	3.7	2.8	3.8	4.5	2.1	3.8	2.1	2.4	4.8	5.1	2.6

NS: Non significant

Screening against Red rot disease:

Screening for red rot against major pathotypes viz., Cf261, Cf 419, Cf671 both by nodal method and plug methods indicated that the clone 2006T3is resistant against all the pathotypes through nodal method of testing. However, in the plug method 2006T3 showed resistant reaction against Cf 419, Cf671 pathotypes but susceptible reaction 261 pathotype. The clone 2006T36 was found resistant against all the pathotypes under nodal method of testing but resistant against Cf671 isolate and moderately resistant against Cf261 and Cf 419 isolates in plug method.

From the above results it can be concluded that new clones viz., 2006T3 and 2006T36 over found promising in early group. The clone 2006T3 is also resistant to red rot under plug and nodal method of red rot testing. It is also significantly superior for cane yield, per cent juice sucrose and CCS yield in plant and ratoon crops over the standards.

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