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SUITABILITY OF EARLY MATURING SUGARCANE GENOTYPES FOR DELAYED HARVESTING

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ABSTRACT

An experiment in sugarcane was conducted during 2021-22 to 2023-24 in strip-plot design with three replications at Sugarcane Research Station, Vuyyuru. Sugarcane clones viz., 2012 V 67, 2012 V 123, 2013 V 126 and 2003 V 46 were tested for delayed harvesting. Significantly more number of tillers per hectare were recorded by check variety 2003 V 46 (1,03,085) which was statistically at par with 2012 V 67 (97,154) and 2013 V 126 (94,316) at 90, 180 and 240 days after planting. Millable canes were also significantly higher with 2003 V 46. Significantly higher yield was recorded by 2003 V 46 (105.06 t/ha) followed by 2012 V 67 (96.42 t/ha) and 2013 V 126 (91.24 t/ha). Significantly more sucrose percent was recorded with 2003 V 46 (20.15%) which was followed by 2012 V 123 (20.05%), 2012 V 67 (19.32%) and 2013 V 126 (19.18%).The variety 2003 V 46 recorded significantly more commercial cane sugar (14.5 %) which was statistically at par with 2012 V 123 (14.4%).The study clearly revealed that, the higher cane yield, per cent sucrose and commercial cane sugar were obtained with check variety 2003 V 46 over other new genotypes tested in this study.

Keywords: Commercial cane sugar, Delayed harvesting, Early maturing sugarcane, Genotypes, Juice quality, Sucrose percent.

INTRODUCTION

Sugarcane, an important commercial crop after cotton, accounts for 75 % of the world sugar production (Wang *et al.,* 2010) and is becoming a promising source of biofuel production (Oliveira *et al.,* 2005). In India, sugarcane is grown in several states having varied agro-ecological conditions in tropical (Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Gujarat) and subtropical (Uttar Pradesh, Bihar, Haryana, Punjab, Uttarakhand) conditions. Regardless of vast development in sugarcane research, low productivity is being recorded in the Indian sub-continent (Kulkarni *et al.,* 2010) due to distinct and varied nature of sugarcane cultivation. Lack of early maturing variety, delayed harvesting during the fag end of the crushing season is leading to low recovery of sugar. Cultivation of early maturing high yielding varieties with more sucrose content, resistant to major pests and diseases and adaptability to different agro-ecological situation is viewed as viable solution to enhance the sugarcane production in the

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area. Hence, this study was initiated at Sugarcane Research Station, Vuyyuru to identify high yielding and high sucrose variety for delayed harvesting.

MATERIAL AND METHODS

Three clones viz., 2012 V 67, 2012 V 123 and 2013 V 126 along with one check viz., 2003 V 46 and three monthly intervals harvesting times at 10th, 11th and 12th months after planting (sub plots) were assessed for the study. The experiment was conducted from 2021-22 to 2023-24 in strip- plot design with three replications at Sugarcane Research Station, Vuyyuru of Andhra Pradesh. All the recommended package practices were followed to raise a healthy crop. The germination count was taken at 35 days after planting the setts. The data on yield components viz., tillers at 90, 180, 240 days ('000/ha), millable canes (NMC) at harvest were recorded and presented in '000/ ha. The data on yield components viz., single cane weight (kg), girth (cm) and length of millable cane (cm) were taken from randomly selected five plants of each genotype from each replication. Cane yield at harvest was recorded and presented in t/ha. Cane juice at harvest was extracted using power operated crusher and was clarified using lead acetate. The quality parameters *viz.*, juice brix %, sucrose %, commercial cane sugar (CCS) and purity percent were worked out as per Chen and Chou (1993) methodology. The Aalysis of Variance (ANOVA) for the collected data was pooled and was statistically analysed using OPSTAT programme (HAU OPSTAT, 14,139.232.166/ opstat/ default.asp).

RESULTS AND DISCUSSION

Perceptible variation was noticed (Pooled data) among the genotypes with regard to germination percentage. Among the genotypes, 2013 V 126 (57.2%) and 2003 V 46 (57.1%) recorded significantly more germination percentage (Table 1). The germination of the setts will be usually 60-80 percentage in tropical conditions (Jain *et al.* 2006). Similarly, variations were observed among the genotypes with regard to number of tillers at 90, 180, 240 days after planting as well as millable canes at harvest. Significantly more number of tillers per hectare were recorded in 2003 V 46 (1,03,085) which were statistically at par with the number of tillers recorded in 2012 V 67 (97,154) and 2013 V 126(94,316) at 90 days after planting and 180, 240 days after planting and the millable canes were also significantly higher in 2003 V 46 (94,792; 80,096 and 75,340 respectively). However it is comparable with new genotypes 2012 V 67 (91,195) and 2013 V 126 (89,078) at 180 days and with 2012 V 67 (76,211) at 240 days after planting. With reference to time of harvesting, tiller count decreased with delay in harvesting and higher was at 10 months and lesser number was in 12 month after planting (Table 1 and 2).

Significantly higher cane yield was recorded by 2003 V 46 (105.06 t/ha) which was followed by 2012 V 67 (96.42 t/ha) and 2013 V 126 (91.24 t/ha). With regard to time of harvesting early harvested crop (10 months) recorded significantly more cane yield (98.65 t/ha) which was followed by 11 (93.29 t/ha) and 12 months (88.27 t/ha) harvested crop (Table 2).With regard to length, girth and single cane weight there was no such significant differences among the genotypes and time of harvesting (Table 3).

Significantly highest per cent sucrose was recorded in 2003 V 46 (20.15) which was followed by 2012 V 123 (20.05), 2012 V 67 (19.32) and 2013 V 126 (19.18). These results reveal that the early varieties are more efficient in partitioning the dry mater into sucrose during the initial part of the crop cycle as also noticed by Nayamuth *et al.,* during 1999 (Table 4).

Table 1. Effect of genotypes and harvesting times on germination percentage at 35 DAP, number of tillers at 90 DAP and number of shoots at 180 DAP in sugarcane (Pooled analysis of 2021-22 to 2023-24) (Two Plant and One Ratoon Crop)

Varieties (Replace with the word Genotype) (Factor A)	Germination percent at 35 DAP				Number of tillers at 90 DAP				Number of shoots at 180 DAP			
	H-Time of harvesting (Months) (Factor B)				H-Time of harvesting (Months) (Factor B)				H-Time of harvesting (Months) (Factor B)			
	10^{th}	11^{th}	12^{th}	Mean	10^{th}	11^{th}	12^{th}	Mean	10^{th}	11^{th}	12^{th}	Mean
V_1: 2003 V46 (C)	56.3	57.3	57.7	57.1	103305	102970	102979	103085	94061	92882	97433	94792
V_2: 2012 V 67	54.0	52.3	51.3	52.6	107685	93865	89912	97154	96077	88002	89504	91195
V_3: 2012 V 123	48.0	46.7	47.0	47.2	85807	81737	79080	82208	80698	74610	72750	76019
V_4: 2013 V 126	56.3	57.0	58.3	57.2	102899	89977	90073	94316	98363	84703	84167	89078
Mean	53.7	53.3	53.6		99,924	92137	90511		92300	85049	85963	
	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A
CD (p=0.05)	6.9	NS	NS	NS	11695	6901	8813	8203	11888	NS	8635	7609
CV %	10.80	-	-		9.72	6.56	3.13		11.63	-	2.94	

Table 2. Effect of genotypes and harvesting times on number of stalks at 240 DAP, millable canes and cane yield (t/ha) in sugarcane (Pooled analysis of 2021-22 to 2023-24)

Varieties (Factor A)	Number of stalks at 240 DAP				Number of millable canes				Cane yield (t/ha)			
	H-Time of harvesting (Months) (Factor B)				H-Time of harvesting (Months) (Factor B)				H-Time of harvesting (Months) (Factor B)			
	10th	11th	12th	Mean	10th	11th	12th	Mean	10th	11th	12th	Mean
V_1: 2003 V46 (C)	78,930	79,451	81,908	80,096	77,290	73,945	74,785	75,340	105.63	104.78	104.77	105.06
V_2: 2012 V 67	77,846	73,984	76,804	76,211	70,286	68,123	67,125	68,511	98.35	96.69	94.23	96.42
V_3: 2012 V 123	65,320	63,337	59,062	62,573	61,183	57,663	54,430	57,759	93.56	81.42	67.79	80.92
V_4: 2013 V 126	74,728	70,751	70,171	71,883	68,429	64,772	64,427	65,876	97.09	90.30	86.32	91.24
Mean	74,206	71,881	71,986		69,297	66,125	65,191		98.65	93.29	88.27	
	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A
CD (p=0.05)	6,835	NS	5117	3482	6061	3029	4895	4250	8.63	5.78	4.57	4.27
CV %	8.07	-	2.3		7.78	4.02	2.912		8.48	5.14	2.93	

Table 3. Effect of genotypes and harvesting times on length of millable cane (cm), girth of millable cane (cm) and single cane weight (kg) in sugarcane (Pooled analysis of 2021-22 to 2023-24)

Varieties (Factor A)	Length of millable cane (cm)				Girth of millable cane (cm)				Single cane weight (kg)			
	H-Time of harvesting (Months) (Factor B)				H-Time of harvesting (Months) (Factor B)				H-Time of harvesting (Months) (Factor B)			
	10th	11th	12th	Mean	10th	11th	12th	Mean	10th	11th	12th	Mean
V_1: 2003 V46 (C)	264	269	250	293	2.62	2.53	2.63	2.59	1.41	1.42	1.36	1.40
V_2: 2012 V 67	265	282	252	300	2.46	2.54	2.49	2.50	1.40	1.44	1.38	1.41
V_3: 2012 V 123	266	267	263	251	2.45	2.40	2.39	2.41	1.28	1.28	1.24	1.27
V_4: 2013 V 126	263	257	256	292	2.45	2.47	2.42	2.45	1.42	1.39	1.34	1.38
Mean	265	269	255		2.49	2.48	2.49		1.38	1.38	1.33	
	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CV %	-	-	-		-	-	-		-	-	-	

Table 4. Effect of genotypes and harvesting times on sucrose (%), commercial cane sugar and purity (%) in sugarcane (Pooled analysis of 2021-22 to 2023-24)

Varieties (Factor A)	Sucrose (%)				CCS (%)				Purity (%)			
	H-Time of harvesting (Months) (Factor B)				H-Time of harvesting (Months) (Factor B)				H-Time of harvesting (Months) (Factor B)			
	10th	11th	12th	Mean	10th	11th	12th	Mean	10th	11th	12th	Mean
V1: 2003 V46 (C)	20.13	20.33	19.98	20.15	14.6	14.6	14.3	14.5	97.89	95.71	95.97	96.52
V2: 2012 V 67	19.43	19.19	19.34	19.32	14.2	13.9	14.0	14.0	96.59	96.47	96.07	96.38
V3: 2012 V 123	20.04	20.04	20.08	20.05	14.4	14.2	14.5	14.4	96.64	94.83	96.42	95.96
V4: 2013 V 126	19.12	19.21	19.20	19.18	13.8	13.9	13.9	13.9	97.42	96.20	97.24	96.95
Mean	19.68	19.69	19.65		14.2	14.2	14.2		97.14	95.80	96.43	
	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A	Varieties	Harvesting Time	Factor A at same level of B	Factor B at same level of A
CD (p=0.05)	0.18	NS	NS	NS	0.14	NS	NS	NS	NS	NS	NS	NS
CV %	1.81	-	-		1.83	-	-		-	-	-	

The variety 2003 V 46 has recorded significantly more commercial cane sugar % of 14.5 which is statistically at par with 2012 V 123 (14.4) (Table 4). Similar observations of the significant differences among the promising sugarcane varieties for cane yield and quality characters was also reported by Prabhakar *et al.* (2012). The purity % did not vary among the various genotypes and times of harvesting. The genotype 2012 V 67 could able to maintain yield on delayed harvesting but the genotypes 2012 V 132 and 2013 V 126 fail to maintain yield on delayed harvesting.

CONCLUSION

The study revealed that, the higher yield and sucrose and commercial cane sugar % were obtained in 2003 V 46 over other genotypes tested. The new pre release genotypes tested in the study did not perform well when compared with the check variety and also are not able to maintain yield but the quality (sucrose) was not affected with delay in harvesting among the clones.

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