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RESEARCH ARTICLE

INFLUENCE OF DIFFERENT HARVESTING DATES ON YIELD AND QUALITY OF SUGARCANE RATOON

Abhinandan Patil*[1] and Ganesh Pawar[2]

Vasantdada Sugar Institute, Manjari, Pune, Maharashtra 412307

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ABSTRACT

The field trial was initiated at R&D farm, Vasantdada Sugar Institute, Pune during 2020 to assess the effect of different harvesting period on ratoon productivity of different sugarcane varieties. The experiment was laid out in a split plot design, comprising three harvesting periods in main plot (10 months, 12 months and 14 months) and ten sugarcane varieties in sub plots (early maturing MS10001, CoM 9057, Co 09004, CoC 671, VSI434 and midlate maturing VSI 08005, CoVSI18121, VSI12003, CoM 0265, Co 86032). The analysis indicated that, harvesting of sugarcane at periods does not affect the production potential and quality of successive ratoon. But varieties differ in their abilities to produce yield and quality. Variety CoM 0265 gave maximum ratoon yield (115.24 t/ha) & CCS (17.29 t/ha) yield and Superior juice quality was found in VSI 434.

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INTRODUCTION

Sugarcane (*Saccharum officinarum*) is a major industrial source of raw materials for sugar and ethanol production that is cultivated in tropical and subtropical areas around the world (Hoang, 2017). Because of its economic impact on renewable energy production, global interest in sugarcane has increased significantly. Cane quality is one of the most important aspects of sugarcane postharvest management, as it deteriorates in the field due to factors such as ambient temperature, humidity, cane variety, storage time of soluble invertases in cane, and maturity status (Reddy and Madhuri, 2014). Age of harvest is one of the most significant factors affecting sugarcane production as well as ratoon productivity. Improper harvest age is a chronic issue of preharvest cultural practices, which has a negative impact on cane quality and yield. In addition to this, environmental conditions, management practices, and pest pressure also affect the optimum harvest age of sugarcane and their qualities components (Hagos *et al*., 2014). Thus, sugarcane must be harvested at the right time, i.e., at peak maturity, in order to achieve the maximum yield with least amount of field losses possible. In Maharashtra Sugar plantations have a wide range of harvest seasons for all sugar cane varieties, ranging from 12 to 18 months. Deciding the proper harvesting age of sugarcane varieties is utmost important factor for better ratoon productivity. So, in this context the experiment was initiated.

MATERIAL AND METHODS

The field experiment was conducted at R&D farm, Vasantdada Sugar Institute, Pune during 2020 to assess the effect of different harvesting period on ratoon productivity of different sugarcane varieties.

Corresponding author: Abhinandan Patil
Vasantdada Sugar Institute, Manjari, Pune, Maharashtra 412307

The soil of experimental site was well drained, medium black soil with more or less neutral in reaction (pH 7.6). The estimated values of experimental soil for organic carbon, available nitrogen, available phosphorus and available potassium were 0.25%, 225.79 kg/ha, 51.05 kg/ha and 519.68 kg/ha respectively. The experiment was laid out in a split plot design with three replications having individual plot size of 6.50 m × 5.48 m at a row spacing of 135 cm× 30 cm. the experiment comprised of three harvesting dates in main plot (10 months, 12 months and 14 months), ten sugarcane varieties in subplots (early maturing MS10001, CoM 9057, Co 09004, CoC 671, VSI434 and midlate maturing VSI 08005, CoVSI18121, VSI12003, CoM 0265, Co 86032). All the recommended agronomical practices were followed to raise a healthy crop (B. Sundara, 1998). The shoot count were taken at 30 days after ratoon initiation. The data on yield component traits viz., tillers at 120 days ('000/ha), number of millable canes (NMC) at harvest was recorded and presented in '000/ha. The data on other yield components viz., single cane weight (Kg), cane diameter (cm), no. of internodes and cane height (cm) was estimated from randomly selected five canes from each plot. Plot yield at harvest was recorded by actual weighing the cane samples from net plot and extrapolated to cane yield t/ha. Cane juice at harvest was extracted using power operated crusher and clarified using lead acetate. The juice quality parameters viz., juice brix 0^0, juice sucrose % and commercial cane sugar (CCS) % was worked out as per Chen and Chou (1993). The analysis of variance (ANOVA) for the data collected was analyzed as per Panse and Sukhatme (1978) and tested at 5 per cent level of significance to interpret the treatment differences.

RESULTS AND DISCUSSIONS

Plant population: The data in Table 1 point out those only varieties had noteworthy influence on the cane population at 120 days after ratooning and at harvest.

Table 1. Stool count, tiller count and number of millable cane of ratoon as influenced by different harvesting period and varieties

Treatment	Stool count (Lakh/ha)	Tiller count at 120 DARI (000'/ha)	Millable cane count at harvest (000'/ha)
Factor A: Harvesting period			
H1: 10 months	0.15	92.43	68.50
H2: 12 months	0.15	92.03	66.70
H3: 14 months	0.14	91.37	67.43
Sem±	0.007	7.67	0.90
C.D. @ 5%	NS	NS	NS
Factor B: Varieties			
V1: MS 10001	0.15	103.44	73.67
V2: CoM 09057	0.14	95.67	67.22
V3: Co 9004	0.15	69.00	55.44
V4: CoC 671	0.14	81.44	56.56
V5: VSI 434	0.14	79.89	56.11
V6: VSI 08005	0.16	103.89	75.78
V7: CoVSI 18121	0.14	82.78	61.56
V8: VSI 12003	0.15	91.22	75.67
V9: CoM 0265	0.15	107.44	78.33
V10: Co 86032	0.15	104.67	75.11
Sem±	0.004	4.96	3.49
C.D. @ 5%	NS	14.09	9.89
Interaction H×V			
Sem±	0.008	8.60	6.04
C.D. @ 5%	NS	NS	NS

Table 2. Yield attributes and cane yield of ratoon as influenced by different harvesting period and varieties

Treatment	No. of internodes	Girth of internode (cm)	Total cane height (cm)	Single cane weight (kg)	Cane yield (t/ha)
Factor A: Harvesting period					
H1: 10 months	24.62	9.54	238.24	1.35	94.79
H2: 12 months	24.16	9.75	236.55	1.31	93.79
H3: 14 months	24.95	9.43	236.09	1.27	87.12
Sem±	0.77	0.33	6.50	0.07	3.59
C.D. @ 5%	NS	NS	NS	NS	NS
Factor B: Varieties					
V1: MS 10001	26.66	9.70	260.22	1.60	107.05
V2: CoM 09057	26.92	9.03	205.07	1.00	82.56
V3: Co 9004	23.63	9.94	249.18	1.27	80.51
V4: CoC 671	23.66	9.25	221.15	1.08	70.50
V5: VSI 434	23.96	8.81	222.11	1.04	67.67
V6: VSI 08005	24.44	9.46	241.81	1.42	108.53
V7: CoVSI 18121	23.51	10.33	229.33	1.42	98.37
V8: VSI 12003	22.03	9.55	227.55	1.30	91.10
V9: CoM 0265	26.03	10.29	285.07	1.71	115.24
V10: Co 86032	24.92	9.35	228.11	1.28	97.45
Sem±	1.07	0.19	9.69	0.07	5.12
C.D. @ 5%	3.06	0.56	27.48	0.20	14.52
Interaction H×V					
Sem±	1.87	0.34	16.78	0.12	8.87
C.D. @ 5%	NS	NS	NS	NS	NS

The variety CoM 0265 made higher number of tillers and millable canes at harvest (107.44 & 78.33 thousand/ha respectively). The variations between CoM 0265 and MS 10001, VSO 08005 and Co 86032 were insignificant. The lowest numbers of millable canes were noted in Co 09004 with (55.44 thousand/ha). The fluctuating response of sugarcane varieties was ascribed to genetic potential under the prevalent environmental conditions (Bhatnagar *et al*., 2003), EL-Geddeay *et al*. (2002).

Yield attributes: The result on yield attributes are presented in Table 2 and found non significant for different harvesting periods. However, there was significant variation in yield attributes due to varieties. Variety CoM 09057 showed maximum no. of internodes (26.92) and higher cane girth (10.33 cm) was observed in CoVSI 18121. The result pointed out that CoVSI 18121 variety characterized with the thickest millable cane and this character might be controlled by genetic makeup. Also, the data in the same table showed that, significantly higher cane height (285.07 cm) and cane weigh (1.71 kg) was recorded by variety CoM 0265. This might be due to the genetic differences among varieties in their ability of the formation of internodes and determination of their height and cane weight. This result was in line with those obtained by Sohu, *et al*. 2008 and Yousif, *et al*. 2015.

Yields (t/ha): The data in Table 2&3 revealed that, the response of the varieties to ratoon yield and sugar yield was significant. As about sugarcane varieties, higher ratoon and CCS yield was documented for CoM 0265 (115.24 and 17.29 t/ha respectively) but insignificant with varieties MS 10001 and VSI 08005.The diverse tonnage of ratoon for different varieties could be due to their dissimilar genetic make-up and potential for the taking advantage of edaphic and aerial factors of crop production (Bashir *et al*. (2012). An increase in CCS yield was attributed to highest cane production and CCS % in the relevant varieties. These results are in line with the outcomes of Bashir *et al*. (2013).

Cane quality parameters: Data in the Table 3 show that sucrose and CCS percentage was found non significant for different harvesting periods but it was significantly affected by cane varieties.

Table 3. CCS yield and quality parameters of ratoon as influenced by different harvesting period and varieties

Treatment	Brix (0^0)	Sucrose (%)	CCS (%)	CCS (t/ha)
Factor A: Harvesting period				
H1: 10 months	22.36	20.75	14.88	14.09
H2: 12 months	22.66	21.04	15.09	14.17
H3: 14 months	22.46	20.44	14.53	12.68
Sem±	0.14	0.35	0.33	0.74
C.D. @ 5%	NS	NS	NS	NS
Factor B: Varieties				
V1: MS 10001	22.70	21.12	15.16	16.22
V2: CoM 09057	22.22	20.11	14.26	11.82
V3: Co 9004	22.43	20.65	14.75	11.99
V4: CoC 671	23.02	21.13	15.08	10.63
V5: VSI 434	23.17	21.63	15.55	10.46
V6: VSI 08005	22.65	21.00	15.05	16.46
V7: CoVSI 18121	22.24	20.60	14.75	14.56
V8: VSI 12003	22.29	20.35	14.48	13.28
V9: CoM 0265	22.39	20.93	15.06	17.29
V10: Co 86032	21.83	19.94	14.20	13.77
Sem±	2.28	0.34	0.28	0.79
C.D. @ 5%	NS	0.98	0.81	2.24
Interaction H×V				
Sem±	0.49	0.60	0.49	1.36
C.D. @ 5%	NS	NS	NS	NS

Generally, sucrose and CCS percentage (21.63 % & 15.55% respectively) in cane variety VSI 434 was higher than other varieties in ratoon crop. The differences among varieties in sucrose percentage depend on the interaction between varieties and environmental factors during growth, sucrose formation and storage periods. The differences among sugar cane varieties obtained by Kumara and Bandara (2002); Ahmed, *et al*. (2011) and Mehareb, *et al*. (2016) they found that significant differences among evaluated cane varieties for sucrose percentage.

CONCLUSION

It can be concluded from present study that harvesting of sugarcane at 10, 12 and 14 months after planting does not affect the production potential and quality of successive ratoon. But varieties differ in their abilities to produce yield and quality. Variety CoM 0265 gave maximum ratoon yield (115.24 t/ha) & CCS (17.29 t/ha) yield and Superior juice quality was found in VSI 434.

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