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PERFORMANCE OF DIFFERENT SUGARCANE VARIETIES UNDER DIFFERENT HARVESTING PERIODS IN PRE-SEASONAL SUGARCANE

D.S. Thorave[1]*, R.L. Bhilare[2] and S.K. Ghodke[3]

Central Sugarcane Research Station, Padegaon - 415 521, Tal Phaltan, Dist. Satara, Maharashtra, India.

*Corresponding author E-mail : dsthorave@gmail.com

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ABSTRACT

An experiment was conducted at Central Sugarcane Research Station, Padegaon (Maharashtra) in preseasonal sugarcane in three plant cane during 2018-19 to 2020-21 with an object to test the performance of the different sugarcane varieties under different harvesting periods in preseasonal sugarcane. The six sugarcane varieties in main plots *viz.*, CoM 0265, Co 86032, MS 10001, VSI 08005, CoM 09057 and PDN 15006 and three harvesting periods in sub plots *viz.*, 12-, 14- and 16-month harvesting period, respectively. The pooled results revealed that sugarcane variety CoM 0265 produced significantly higher cane and sugar yield of 161.53 and 22.66 t ha^{-1}, respectively than all other sugarcane varieties except variety PDN 15006 for cane yield and variety Co 86032 for sugar yield, where it was found at par with each other. The sugarcane harvested at 16 months age gave significantly higher cane yield of 149.75 t ha^{-1} and sugar yield of 20.97 t ha^{-1} than all harvesting periods, however, sugar yield was at par with sugarcane harvested at 14 months.

Key words : Evaluation, Sugarcane varieties, Harvesting period.

Introduction

Sugarcane (*Saccharum* spp. *hybrids*) 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). Sugarcane is a sun-loving plant that can be grown up to 1600 meters above sea level near the equator and up to 600 meters above sea level between 35° N and S latitudes under a variety of soil and climatic conditions.

Age of harvest is one of the most significant factors affecting sugarcane production (Sundara, 2000). 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). Harvesting of sugarcane at a proper time by adopting the right age is necessary to realize the maximum weight of the millable canes produced with the least possible field losses under the given growing environment (Muchow *et al*., 1998). Harvesting time is one of the most important factors affects productivity and varietal differences in growth and maturity rates (Donaldson *et al*., 2008), Sundara (2000) and Verma (2004) classified varieties to early, mid and late maturing based on the time taken for maturity. Harvesting cane either underaged or overaged at the improper time results in a loss of cane production, sugar recovery and low juice consistency (Khandagave and Patil, 2007).

Some varieties of sugarcane have relatively high concentrations of sucrose in the early season and are defined as early maturation, while others are known as late maturation (Calderon *et al*., 1996). The crop season also ranges from 20 to 24 months in Hawaii, 13 to 19 months in Jamaica, 12 to 18 months in India, 16 months in Mauritius and 15 months in Queensland, Australia (Abu-Ellail *et al*., 2020). Other factors such as varieties, weather conditions, and soil type may have a more direct bearing on the real maturity of canes than the crop age. However, the percentage of quality of cane juice mainly depends on various factors such as the sugarcane variety,

the maturity of the sugarcane in the case of plant cane, weather and harvesting conditions (Liu and Bull, 2001).

On the other hand, harvesting either under-aged or over-aged cane with the improper time of harvest leads to a loss in cane yield, sugar recovery, poor juice quality and problems in milling (Khandagave and Patil, 2007). Cane and sugar yield is determined by the age of harvesting at which the cane matures (Verma, 2004), basically, sugarcane varieties differ inherently in their time of maturity. Some cane is harvested before achieving maximum sucrose levels due to an increase of cane supply in early-season milling operations (Miller and James, 1977).

However very limited work has been reported in this field under the Indian situation. Keeping this in view, present study was conducted to know the performance of the different sugarcane varieties under different harvesting periods in preseasonal sugarcane

Materials and Methods

The experiment was conducted at Central Sugarcane Research Station, Padegaon, Taluka Phaltan, District Satara, Maharashtra in autumn sugarcane during 2018-19 to 2020-21. The experiment was laid out in a split plot design keeping combinations of six sugarcane varieties in main plot factor *viz.*; V_1- CoM 0265, V_2- Co 86032, V_3- MS 10001, V_4- VSI 08005, V_5- CoM 09057 and V_6 - PDN 15006 and harvesting periods in sub plot factors *viz*. H_1:12 month harvesting period, H_2:14 month harvesting period, H_3:16 month harvesting period replicated in thrice. The soil of 5 the experimental site was inceptisol. In this field study different sugarcane genotypes were planted in *preseason* and harvesting of plant cane was done as per treatments of harvesting period and observation of plant crop was noted. The plant crops were fertilized with 340:170:170 Kg of NPK ha^{-1}. The application of nitrogen in four splits and P_2O_5 and K_2O application-50% at planting and 50% at final earthing up. All recommended practices of preseasonal sugarcane crop were followed during field experimentation. Growth, yield attributing and quality parameters were recorded systematically. The cane yield per hectare was calculated from the total weight of all millable canes per plot and converted to tons per hectare. The CCS yield t ha^{-1} was estimated by using the formula, CCS yield (t ha^{-1}) = Cane yield (t ha^{-1}) x CCS % in cane/100 at harvest. The CCS % was computed as per the formula CCS % = (1.022 x Sucrose %) - (0.292 x Brix %) as cited by Sundara (2000). The observations were recorded and statistically analyzed the methods of Gomez and Gomez (1984), pooled analysis of three years plant crop is presented here for interpretation of result of the experiment.

Results and Discussion

Cane and Sugar yield

Effect of sugarcane varieties

The pooled data of preseasonal sugarcane crops were summarized in Table 1 reported that the sugarcane variety CoM 0265 being at par with variety PDN 15006 registered statistically more cane yield (161.53 t ha^{-1}) than all other sugarcane varieties. The sugar yield (22.66 t ha^{-1}) also gave statistically more by same variety CoM 0265 among the other varieties except variety Co 86032, where, it was found at par. The increase in sugar yield may be due to increase in sucrose %, sugar recovery % which reflected on sugar yield as a final product. These results are in agreement with those obtained by Nevase *et al.* (2004), Gilbert *et al.* (2006), Hagos *et al.* (2014) and Endris *et al.* (2016), who reported that there is a significant increase in cane yield with an increase in harvest age from 12 to 14 months. These results are in line with those obtained by Ahmed *et al.* (2008). Ongin and Olweny (2011), Abo El-Hamd *et al.* (2013) and Yousif *et al.* (2015), who found that significant differences among tested sugarcane varieties in cane yield.

Effect of harvesting period

Perusal of pooled data indicated in Table 1 showed that sugarcane harvested at 16 period age noticed significantly higher cane yield of 149.75 t $ha^{-1}$and sugar yield of 20.97 t ha^{-1} than all harvesting periods, however, sugar yield was at par with sugarcane harvested at 14 months age (20.64 t ha^{-1}). These results are in agreement with those obtained by Nevase *et al.* (2004), Gilbert *et al.* (2006), Hagos *et al.* (2014) and Endris *et al.* (2016) who reported that there is a significant increase in cane and sugar yield with an increase in harvest age from 12 to 14 months.

Yield attributes

The pooled data in respect of yield attributes are presented in Table 1.

Effect of sugarcane varieties

The sugarcane variety CoM 0265 noticed significantly more average cane weight (1.98 kg) than all other sugarcane varieties. The same variety also produced significantly higher number of internodes per cane (26.82) than VSI 08005, whereas, at par with all other remaining varieties under study. The sugarcane variety CoM 0265 showed its significant superiority for number of millable cane per hectare (83530) and millable cane height (248.99 cm) than all other varieties except Co 86032 and PDN

Table 1 : Cane, sugar and yield attributes of sugarcane as influenced by sugarcane varieties and harvesting period (Pooled data).

Treatments	Cane, sugar and yield attributes of sugarcane						
	Cane yield (t ha^{-1})	Sugar yield (tha^{-1})	Average cane weight (kg)	No of internodes per cane	Number of millable cane ha^{-1}	Millable cane height (cm)	Cane girth (cm)
Main plot: Sugarcane variety							
V_1: CoM 0265	161.53	22.66	1.98	26.82	83530	248.99	10.74
V_2: Co 86032	148.01	20.94	1.70	25.46	81207	230.26	10.64
V_3: MS 10001	123.56	17.53	1.60	25.02	75244	233.11	10.05
V_4: VSI 08005	129.82	18.90	1.72	24.16	73366	229.33	10.54
V_5: CoM 09057	136.36	19.55	1.71	24.93	73201	246.59	10.54
V_6: PDN 15006	149.70	20.25	1.73	25.98	81577	244.30	10.57
S.E. ±	**4.02**	**0.61**	**0.05**	**0.66**	**889**	**4.51**	**0.15**
C.D. at 5%	**12.67**	**1.93**	**0.18**	**1.94**	**2797**	**14.12**	**0.39**
Sub plot: Harvesting period							
H_1: 12 Month	132.57	18.24	1.57	22.67	78541	221.32	10.15
H_2: 14 Month	142.17	20.64	1.78	25.49	78014	240.69	10.45
H_3: 16 Month	149.75	20.97	1.85	27.90	77505	254.45	10.93
S.E. ±	**2.54**	**0.32**	**0.03**	**0.33**	**483**	**2.31**	**0.06**
C.D. at 5%	**7.36**	**0.93**	**0.08**	**0.96**	**NS**	**6.73**	**NS**
Interaction							
S.E. ±	**9.87**	**0.78**	**0.07**	**0.80**	**1591**	**5.65**	**0.14**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
General Mean	**141.50**	**19.97**	**1.72**	**25.41**	**78020**	**238.71**	**8.63**

15006 for number of millable cane and variety CoM 09057 and PDN 15006 for cane height, where, it was found at par. The maximum and significantly more cane girth of 10.74 cm was found with variety CoM 0265 than MS 10001 and it was found at par with all other remaining varieties. These differences could be attributed to the genetic structure of the varieties assessed for cane yield. Sohu *et al.* (2008) and Abu-Ellail *et al.* (2018), pointed out that the significant variance between the sugarcane varieties in stalk height in three plant seasons.

Effect of harvesting period

The harvesting of sugarcane at 16 months age recorded statistically more average cane weight (1.85 kg) than 12 months harvesting period and at par with 14 months, whereas, same harvesting period (16 months) showed its significant superiority for number of internodes (27.90). The number of millable canes per hectare was numerically maximum with 12 months (78541). Whereas, cane height (254.45 cm) and cane girth (10.93 cm) were found significantly higher at 16 months than remaining harvesting periods.

Effect of interaction

The interaction between sugarcane varieties and harvesting periods did not show any significant effect on yield attributes.

Juice quality parameters

The pooled data in respect of juice quality parameters are presented in Table 2.

Effect of sugarcane varieties

The pooled results of juice quality parameters of sugarcane differed significantly due to varieties for CCS % only and remaining parameters were found non-significant. The sugarcane variety VSI 08005 recorded significantly higher CCS % than CoM 0265, however it was at par with each other. Varietal differences in this trait were also found by El-Shafai and Ismail (2006), El-Geddawy *et al.* (2015) and Mehareb *et al.* (2016) they found that sugarcane varieties differed significantly in sugar recovery percentage.

Effect of harvesting period

The juice quality parameters of sugarcane did not differ significantly due to harvesting period.

Effect of interaction

The juice quality parameters of sugarcane were found to be non-significant.

Table 2 : Juice quality parameters of sugarcane as influenced by sugarcane varieties and harvesting period (Pooled data).

Treatments	Juice quality parameters of sugarcane			
	Brix (%)	Sucrose (%)	CCS (%)	Purity (%)
Main plot: Sugarcane variety				
V_1: CoM 0265	21.13	19.46	13.58	91.27
V_2: Co 86032	21.70	19.67	14.20	92.01
V_3: MS 10001	21.51	19.85	14.10	91.51
V_4: VSI 08005	22.11	20.32	14.55	91.60
V_5: CoM 09057	21.93	20.11	14.36	91.71
V_6: PDN 15006	21.10	19.36	13.82	91.52
S.E. ±	**0.86**	**0.73**	**0.51**	**0.54**
C.D. at 5%	**NS**	**NS**	**0.76**	**NS**
Sub plot: Harvesting period				
H_1: 12 Month	21.27	19.39	13.80	90.45
H_2: 14 Month	21.82	20.23	14.52	92.53
H_3: 16 Month	21.65	19.77	14.04	91.92
S.E. ±	**0.90**	**0.82**	**0.44**	**0.38**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
Interaction				
S.E. ±	**2.20**	**2.02**	**1.45**	**0.94**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General Mean	**21.58**	**19.79**	**14.12**	**90.03**

Conclusion

Under the conditions of the present work, the results suggest that the best harvesting age for the studied cane varieties could be 14 months to obtain the best quality parameters as well as the maximum cane and sugar yield. The dominant sugarcane variety CoM 0265 showed superiority over the other varieties in cane yield and Co 86032 for sugar yield per hectare.

References

Abo El-Hamd, A.S., Bekheet M.A. and Gadalla A.F.I. (2013). Effect of chemical ripeness on juice quality, yield and yield components of some sugarcane varieties under the Conditions of Sohag Governorate. *American- Eurasian J. Agric. & Environ. Sci*., **13 (11)**, 1458-1464.

Abu-Ellail, F.F.B., Gadallah A.F.I. and El-Gamal I.S.H. (2020). Genetic variance and performance of five sugarcane varieties for physiological, yield and quality traits influenced by various harvest age. *J. Plant Prod., Mansoura Univ.*, **11(5)**, 429–438.

Abu-Ellail, F.F.B., Masri M.I. and El-Taib A.B.A. (2018). Performance of some new sugarcane clones for yield and its components at two different crop cycles. *Indian J. Sugarcane Technol*., **33(01)**, 27–34.

Ahmed, A.Z., Osman M.S.H. and Ahmed A.M. (2008). Effect of excessive nitrogen application on yield and quality of three sugar cane varieties. Proc. 3rd Inter. Conf. IS- Sinai Univ., Al Arish, Egypt, p. 34-39.

Calderon, H., Besosa R., Amaya R. and Luna A. (1996). Evaluation of sugarcane varieties suitable for early harvesting under tropical conditions. *Proc. Int. Soc. Sugar Cane Technologists*, **22**, 239–297.

Donaldson, R.A., Rdshaw K.A., Rhodes R. and Van Antwerpen R. (2008). Season effects on productivity of some commercial South African sugarcane cultivars. I: Biomass and Radiation use efficiency. *Proc South Afr. Sugar Technologists Association*, **81**, 517–527.

Endris, Y., Wolde Z., Getaneh A. and Negi T. (2016). Determination of optimum harvesting age for the existing sugarcane varieties at amibara/middle awash agricultural development enterprise, Ethiopia. *J. Resources Develop. Manage*., **25**, 24–30.

El-Shafai, A.M.A. and Ismail A.M.A. (2006): Effect of row spacing on yield and quality of some promising sugarcane varieties. *Egypt J. Appl. Sci*., **21 (11)**, 32-46.

El-Geddawy, Dalia I.H., Makhlouf B.S.I. and Bekheet M.A. (2015). Performance of some sugar cane promising varieties under different seed sett rates and potassium fertilization. *Int. J. Curr. Microbiol. App. Sci*., **4 (11)**, 92-110.

Gilbert, R.A., Shine Jr J.M., Miller J.D., Rice R.W. and Rainbolt C.R. (2006). The effect of genotype, environment and time of harvest on sugarcane yields in Florida, USA. *Field Crop Res*., **95**, 156–170.

Gomez, K.A. and Gomez A.A. (1984). *Statistics for Agricultural Research.* John Willey and Sons. New York. p. 180

Hagos, H., Mengistu L. and Mequanint Y. (2014). Determining opti-mum harvest age of sugarcane varieties on the newly establish-ing sugar project in the tropical areas of Tendaho, Ethiopia. *Adv. Crop Sci. Technol*., **2(5)**.

Hoang, N.V. (2017). Analysis of Genes Controlling Biomass Traits in the Genome of Sugarcane (*Saccharum* spp. Hybrids), [*Ph.D. thesis*], University of Queensland Library.

Khandagave, R.B. and Patil B.H. (2007). Manipulation of cutting age, varieties and planting time to improve sugar and cane yield. *Int. Soc. Sugar Cane Technologists (ISSCT)*, **26**, 212–220.

Liu, D.L. and Bull T.A. (2001). Simulation of biomass and sugar accumulation in sugarcane using a process-based model. *Ecological Modelling*, **44(2–3)**, 181–211.

Miller, J.D. and James N.I. (1977) Maturity of six sugarcane varieties in Florida. *Proceeding American Society of Sugar Cane Technologists*, **2**, 107–111.

Mehareb, E.M., Abou Elwafa S.F. and Galal M.O.A. (2016). Mean performance and ratooning ability of sugar cane promising genotypes at the early clonal selection. *American-Eurasian J. Agric. Environ. Sci*., **16 (1)**, 20-27.

Muchow, R.C., Higgins A.J., Rudd A.V. and Ford A.W. (1998).

Optimizing harvest age in sugar production: a study for the Mossman mill region in Australia: II Sensitivity to crop age and crop class distribution. *Field Crops Res.*, **57**, 243–251.

Nevase, V.B., Thorat S.T., Dixit A.J., Chavan S.A. and Powar M.S. (2004). Cane yield and juice quality of ratoon sugarcane as influenced by varieties, dates of planting, climatic parameters and harvesting. *J. Agrometeorolo.*, **6 (Special Issue)**, 92-94.

Onginjo, E. and Olweny C.O. (2011). Determination of optimum harvesting age for sugarcane ratoon crop at the Kenyan Coast. *Microbiol Biotech. Res*., **1 (2)**, 113-118.

Sohu, I.A., Memon A.H. and Abro B.A. (2008). Performance of sugarcane varieties in comparison with commercial varieties. *L. S. I. J*., **2 (3)**, 760-764.

Sundara, B. (2000). *Sugarcane Cultivation.* Vikas Publishing House. New Delhi.p.292.

Verma, R.S. (2004). *Sugarcane projection technology in India*. Inter. Book Distributing Co., Lucknow, India.

Yousif, E.M.M., Ibrahim M.M., El-Aref Kh. A.O. and Ahamed A.Z. (2015). Management of nitrogen fertilization for sugar cane on a sandy Soil: I yield and its components. *Egypt. J. Appl. Sci*., **30(11)**, 498-511.