Original Research Article

VARIETAL RESPONSE OF SUGARCANE TO DIFFERENT IRRIGATION REGIMES UNDER AGRO-CLIMATIC CONDITIONS OF MAHARASHTRA

ABSTRACT

A field experiment was carried out during the years 2019-20,2020-21 and 2021-22 crop seasons with eight sugarcane varieties and twoIrrigation regimeswere evaluated in the Strip plot design with three replications. The impact of moisture stress on various morphological characters such as plant height, leaf area, leaf area index and tillercount was recorded at 0.3 and 1.0 IW/CPE moisture regime. Drought treatment caused an average reduction of 11.10, 33.47, 29.08, 15.33, 22.14 and 18.78 % in plant height, leaf area index, specific leaf weight, dry matter, root dry matter at 200 DAP and cane yield respectively. CoM 0265 and VSI 08005 transpired less water and showed relatively higher photosynthetic rates with significant improvement in growth attributes, viz., plant height, leaf area index, specific leaf weight, dry matter accumulation and root dry weight as well as single cane weight and cane yield. Yield and its parameters showed remarkable changes due to inadequate water availability during the formative phase. Water stress led to an average reduction in cane and sugar yield to the tune of 18.78% and 18.86% respectively.

Key words: Sugarcane, irrigation regimes, varieties, growth, physiological behavior, cane yield.

Introduction

Drought is the single most important factor limiting the productivity of sugarcane and it affects yield by 50%. The total water requirement of sugarcane varies from 1850 to 2500 mm. It has been estimated that the sugarcane crop consumes about 250 tonnes of water per tonne of cane produced. Nearly 60% of the total sugarcane area suffers from water stress. Water stress especially during summer months coincides with the formative phase of the crop which affects the final yield through a reduction in tiller productivity, number of millable canes, individual cane weight, cane height, cane girth and finally the cane yield and juice quality (Naidu 1987). In view of the increasing demand of sugar production and the scope for further increase in area under sugarcane cultivation being limited and the evolution of ~~drought~~ drought-resistant varieties has become a major research priority. The morphological and physiological responses lead to some adaptations to drought stress and may vary considerably among species (Souza et al. 2004). The degree of tolerance to environmental stress varies not only between species but in different varieties of the same species. The effects of water stress on plants are complex and the plants generally respond with protective adaptations. An understanding of the physiological processes in relation to production is essential for identifying physiological criteria for the evolution of ~~drought~~ drought-resistant varieties (GururajaRao, 1994). Drought is a major abiotic constraint for sugarcane as it is a highly water demanding crop. Superior varieties must hence be selected and evaluated under moisture stress environment wherein the competitive advantage for one cultivar over another is likely to be greater under stress (Hurd, 1976). This study goals to gain an early selection of sugarcane promising

UNDER PEER REVIEW

varieties to provide early knowledge about the promising varieties which could be used in sugarcane breeding programs as well as stable cane productionunder drought tolerance. Thus, eight sugarcane varieties were tested under two water regimes to select~~ion~~ at early stage of growth and development~~s~~.

Materials and methods

The experiment was conducted at the research & development farm (B-16) of Vasantdada Sugar Institute, Manjri, Pune (Latitude: 18.52. Longitude: 73.97). The experimental material consisted of ~~eigtht~~ eightvarieties namely V_1- CoM0265, V_2- VSI 08005, V_3- Co86032, V_4- CoVSI18121and V_5- VSI12003, V_6- CoVSI03102, V_7-CoVSI13020 and V_8- VSI434 and two Irrigation regimes were evaluated in the Strip plot design with three replications. Each variety hada plot size 8.00 m (L) X 5.40 m having 4 rows at 1.35 meters row to row distance. The varieties were planted the second week of February (suru planting) by adopting all recommended agronomical practices. Two budded sets were planted in a single row system. Recommended dose of suru season sugarcane crop were applied i.e., 250: 115: 115 Kg N,P_2O_5 and K_2O/ha. The application nitrogen in four splits & P_2O_5 and K_2O application- 50% at planting and 50% at final earthingup. The nutrient status of soil tested before planting of crop ~~which~~ gives 7.90 pH (slightly saline), 0.33 EC, high Organic Carbon (0.90), low nitrogen (264.10) and very high phosphorus (54.21) and ~~potassiun~~ potassium(628.46) having medium deep black ~~in nature~~. The growth and yield performance and other ~~yield~~ yield-attributed characters were observed as per the schedule and at the time of maturity. The observations taken in the field on plant height, leaf area index, specific leaf weight, dry matter, root dry matter, single cane weight, length of nodes, diameter of cane and yield quintal per hectare and other quality parameters viz. brix percentage, sucrose percentage,CCS percentage and CCS yield tone per hectare. The sugar quality will be analyzed as per the procedure outlined by Spencer and Meade (1963). The data on cane yield and yield parameters were analyzed statistically using analysis of variance and LSD test was applied to discriminate the superiority of the means of different varieties as suggested by Gomez and Gomez (1984)

Results and Discussions

Effect of irrigation levelson growth, yield attributes and quality of sugarcane

Reduction in tiller count, leaf area index, specific leaf weight, dry matter and root dry matter due to drought was found to be significant among irrigation regimes.(Table 1 and 2). ~~Perusal~~ A perusal of data revealed that the significantly highest tiller Count (0.55, 1.31lakh/ha) at 90 & 120 DAP and higher value (1.26 lakh/ha) of tiller was found at 150 DAP in treatment application of irrigation at 1.0 IW/CPE ratio. While~~,~~ any of the treatment does not exert any significant effect on tiller Count at 60 DAP. It indicated that ~~a~~ different irrigation levels manifest their significant effect on leaf area index at 100, 150 and 200 DAP, but it was non-significant at 50 DAP. Among the treatments irrigation at 1.0 IW/CPE ratio recorded significantly the highest (0.64, 1.41, 2.33) leaf area index at 100, 150 & 200 DAP respectively. Hoang et al. 2019 and Gaber et al. 2021 showed that the leaf area was reduced in ~~drought~~ drought-stressed plants compared with the well watered plants so, this trait might be grateful for improving drought tolerance in sugarcane.

UNDER PEER REVIEW

The result showed that ~~a~~ different irrigation levels manifest their significant effect on sp. Leaf wt. at 100, 150 and 200 DAP, but it was non-significant at 50 DAP. Among the treatments irrigation at 1.0 IW/CPE ratio recorded significantly highest (76.86, 126.07, 238.87 g/m^2) sp. Leaf wt. at 100, 150 & 200 DAP respectively. In sugarcane, the inhibited stalk and leaf growth and enhanced deep large roots are the first morphological adaptation after sugarcane plants are exposed to minor or moderate water deficit conditions (Anjum et al., 2017). Likewise, under water deficit conditions roots become clumped and hence the facility of water uptake (Couso and Fernandez, 2012)

The result furnished in ~~table~~ Tables1 and 2 showed that ~~a~~ different irrigation levels manifest their significant effect on dry matter accumulation at 100, 150 and 200 DAP, but it was non-significant at 50 DAP. Among the treatments irrigation at 1.0 IW/CPE ratio recorded significantly highest (14.72, 30.01 & 44.16 t/ha) dry matter accumulation at 100, 150 & 200 DAP respectively. Drought stress hampers plant growth and developmental processes including leaf area, leaves number and dry matter production, due to impaired cells elongation and division by limited turgor (Anjum et al., 2017). These significantly decreases in the shoot weight of drought stressed sugarcane may attribute to that, water deficit reduced the photosynthetic rate comparing to non-stressed plants (Hoang et al., 2019). Because that, water deficit stress is highly affected on sugarcane by the intense growth stage dos Santos et al., (2019). The limited vegetative growth and development by drought stress may be due to water shortage inhibiting cells division and elongation (Anjum et al., 2017). Therefore, Farooq et al., (2009) reported that, water is necessary for plant nutrients uptake and transportation. The different irrigation levels exert their significant effect on root dry weight at 100, 150 and 200 DAP, but it was non-significant at 50 DAP. Among the treatments irrigation at 1.0 IW/CPE ratio recorded significantly highest (17.64, 22.48 & 29.71 g/stool) root dry weight at 100, 150 & 200 DAP respectively.

The mean data on yield attributes like No. of internodes, length of internodes, girth of internodes, millable cane height, total cane height, Numbers of millable cane at 12 MAP, single cane wt., cane yield, juice extraction percentage and quality parameter as influenced by different irrigation levels are presented in Table 3. Among the treatments irrigation at 1.0 IW/CPE ratio recorded significantly highest internode length (12.52cm), girth (11.23 cm), millable cane height (253.58 cm), total cane height (278.20) and single cane wt. (1.67 kg), but no. of internodes found to be non-significant. The results suggested that cane height under drought situation is determined by the length of the internodes rather than the number.

The results of juice quality parameters viz. brix%, sucrose%, CCS% and juice extraction percentage recorded after harvest are indicated that, different irrigation levels failed to exert its significant effect. It opined that a different irrigation level significantly affects the cane yield. Treatment (I_2) application of irrigation water at 1.0 IW/CPE ratio gave significantly the highest cane yield (122.42 t/ha) over application of irrigation water at 0.3 IW/CPE ratio. It is revealed that different irrigation levels positively impacted on CCS yield. Treatment (I_2) application of irrigation water at 1.0 IW/CPE ratio recorded significantly the highest CCS yield (19.83 t/ha).

Effect of varietieson growth, yield attributes and quality of sugarcane

UNDER PEER REVIEW

An examination of data given in table 1 and 2 regarding tiller count, leaf area index, specific leaf weight, dry matter and root dry matter showed significant differences among the varieties. Variety Co 86032 registered significantly higher tiller Count (0.52, 0.70, 1.40 & 1.36 lakh/ha) at 60, 90, 120 & 150 DAP, but more or less at par with CoM 0265, VSI 08005, CoVSI18121 & VSI 12003. Whereas, significantly minimum tiller Count (0.31, 0.39, 1.17 & 1.12 lakh/ha) registered by VSI 434 during 60, 90, 120 & 150 DAP respectively.

The result confirmed that different varieties exert their significant effect on leaf area index at 100, 150 and 200 DAP, but it was non-significant at 50 DAP. Significantly higher leaf area index (0.67, 1.42, and 2.23) was observed under varietyVSI 08005 at 100, 150 & 200 DAP respectively, but remained at par with CoM 0265, Co 86032, CoVSI18121 at 100 & 150 DAP and varietyCoM 0265, Co 86032, CoVSI18121 & CoVSI13020 found at par at 200 DAP. The differences in their ability to maintain leaf area and leaf area index may be associated with drought tolerance through the maintenance of high leaf water potential. Results of the correlation analysis of plant characteristics with yield also indicated that LAI ~~were~~ wassignificantly and positively correlated with yield under drought stress conditions. Hence, the maintenance of better LAI is an indicator of drought tolerance.Continuous water stress decreased the leaf expansion thus suggesting the mechanism of leaf size determination under water stress. This is in confirmation with earlier reports that expansion and growth are severely affected by moisture stress (Vasantha et al. 2003).The result presented in ~~table~~ Table 2 showed that different varieties exert ~~their~~ asignificant effect on sp. leaf wt. at 50, 100, 150 and 200 DAP. varietyCoVSI 03102 recorded maximum value (36.86 g/m^2) at 50 DAP but at 100, 150 & 200 DAP varietyVSI 08005 gained significantly higher values 78.69, 132.21 & 240.70 g/m^2 respectively which was statistically at par with CoM 0265, Co 86032 &CoVSI 18121 at 50 & 100 DAP, with CoVSI 03102 at 150 DAP and at 200 DAP CoM 0265, Co 86032, CoVSI 03102 & CoVSI18121 found at par. Whereas, significantly lower sp. leaf wt. 29.19, 65.67, 103.38 g/m^2 at 50, 100 & 150 DAP respectively was observed under variety VSI 434 but sp. leaf wt. at 200 DAP was found lower 178.36 g/m^2 in the variety VSI 12003.

The result presented in ~~table~~ Table 3 showed that different varieties exert their significant effect on dry matter accumulation at 50, 100, 150 and 200 DAP. Variety COVSI18121 recorded maximum dry matter accumulation (3.31 t/ha) at 50 DAP, while at 150 DAP varietyCoM 0265 received higher (32.71 t/ha) dry matter accumulation, but at 100 & 200 DAP varietyVSI 08005 gained significantly higher dry matter accumulation 15.70 & 47.27 t/ha respectively which was more or less statistically on same line with CoM 0265, VSI 08005, Co 86032 & COVSI18121. Whereas, significantly minimum dry matter accumulation 2.51, 9.04, 20.24 & 32.36 t/ha at 50, 100, 150 & 200 DAP respectively was observed under variety VSI 434.The different varieties exert their significant influence on root dry weight at 50, 100, 150 and 200 DAP. VarietyVSI 08005 recorded significantly higher root dry weight (9.70, 28.60, 33.25 g/stool) at 50, 150 & 200 DAP respectively, while at 100 DAP varietyCoM 0265 received higher (22.12 g/stool) root dry weight. Whereas, significantly minimum root dry weight 5.03, 11.47, 20.03 g/stool at 50, 100 & 200 DAP respectively was observed under variety VSI 434, while varietyCoVSI 13020 registered lower root dry weight 16.27 g/stool at 150 DAP.

In the present study, cane girth and number of internodes did not show appreciable reduction due to drought.The mean data pertaining to No. of internodes, length of internodes, girth of internodes, millable cane height, total cane height, Numbers of

UNDER PEER REVIEW

millablecane at 12 MAP, single cane wt., cane yield, juice extraction percentage and quality parameterare presented in Table 3. Revealed that, No. of internodes and length did not influenced by varieties, but varietyVSI 08005 registered significantly maximum girth (11.90 cm), millable cane height (254.83 cm), total cane height (290.50 cm) & single cane weight (1.97 kg) but statistically not different from CoM 0265, Co 86032, CoVSI18121 &CoVSI 03102. While, variety VSI 434 showed lower cane girth 10.28 cm and single cane wt. 1.17 kg, whereas lower millable cane height 202.83 cm and total cane height 232.17 cm observed under varietyCoVSI 13020. These observations are in accordance with Venkataramana et al. (1986) who have observed a reduction in cane yield and millable cane number due to drought treatment during the formative phase.

Drought is a major limiting factor for sucrose accumulation and stress at the formative phase affects sucrose synthesis (Venkataramana et al. 1986). Brix representing total solids present in juice showed a general mean of 23.30% in control and 22.17% under drought. The mean data on juice quality as influenced by varieties are presented in Table 3. Showed that, any of the variety does not pose any significant effect on juice quality, but the maximum juice extraction percentage (44.53%) noted in VSI 08005 and brix (23.58%), sucrose (22.02%) and CCS (15.80%) was observed under VSI 434. An adequate quantity of water is essential for the formation of sucrose and its transport to the stem. Small changes in the moisture content of green leaves affected the equilibrium between simple sugar and sucrose%. In the present study, under drought treatment, Co86032 recorded the lowest sucrose and purity of 20.53 % and 94.04% and VSI434 recorded the highest sucrose and purity of 22.81% and 95.24 % respectively. This could also be due to the differences in sucrose accumulation and translocation to the storage sink, as water supply determines the translocation efficiency of assimilates. Lower juice sucrose may also be due to greater production of immature internodes and maximum juice weight during maturity following release of moisture stress. ~~Similar~~ A similar reduction in juice quality was observed in sugarcane (Naidu and Venkataramana 1989; GururajaRao and Singh 1989; Vasantha et al. 2005).

An appraisal of data (Table 3) confirmed that, varietyVSI 08005 registered significantly higher cane yield (137.48 t/ha), but in the same line with the CoM 0265 &CoVSI 18121. Variety VSI 434 recorded lower cane yield (81.19 t/ha). However, VSI 08005 and VSI 08005 showed higher cane and sugar yields under both stress and stress free situations which may be attributed to its tolerant nature by way of maintenance of physiological, morphological and biochemical activities even under stress. Similarly, Yadav and Prasad (1988) observed more reductions in cane yield at 25% available soil moisture regime in certain varieties under sub-tropical conditions.The data indicated in Table 3 showed that, varietyVSI 08005 registered significantly maximum CCS yield (21.61 t/ha), but in the same line with the CoM 0265, CoVSI 18121 and Co 86032. ~~Minimum~~ The minimum CCS yield (12.07 t/ha) was registered by variety VSI 434.

Interaction effect~~:~~

According to data furnished in Tables 1 to 3 revealed that, the interaction between irrigation levels and varieties failed to exert its significant effect on growth parameters. A glimpse of data indicated that, the interaction between irrigation levels and varieties on leaf area index and specific leaf weight at 50, 100, 150 & 200 DAP was found non-significant.

UNDER PEER REVIEW

The data given in table 4 revealed that, the interaction between irrigation levels and varietiesss on dry matter accumulation was found to significant at 200 DAP.Treatment Combination of application of irrigation water at 1.0 IW/CPE ratio and varietyVSI 08005 registered significantly maximum (52.01 t/ha) dry matter accumulation, followed by treatment Combination irrigation water at 1.0 IW/CPE ratio and varietyCoM 0265 (50.24 t/ha). Whereas lowest dry matter accumulation (29.36 t/ha) recorded in treatment Combination of application of irrigation water at 0.3 IW/CPE ratio and variety VSI 434. The interaction between irrigation levels and varieties on root dry weight was found to significant at 150 DAP.The treatment Combination combination of application of irrigation water at 1.0 IW/CPE ratio and varietyVSI 08005 registered significantly highest (31.25 g/stool) root dry weight, followed by treatment Combination irrigation water at 1.0 IW/CPE ratio and varietyCoM 0265 (27.86 g/stool). Whereas the least root dry weight (13.31 g/stool) was recorded in treatment Combination of application of irrigation water at 0.3 IW/CPE ratio and varietyCoVSI 03102.

The interaction between different irrigation levels and varieties on juice quality parameters was non-significant.The interaction effect between irrigation levels and varieties was found to be significant as presented in Table 4 revealed that treatment Combination of application of irrigation water at 1.0 IW/CPE ratio and varietyVSI 08005 registered significantly maximum (152.31 t/ha) cane yield, which was remained at par with treatment Combination I_1V_1, I_2V_1, I_2V_3. Whereas lower cane yield (63.31 t/ha) was recorded in treatment Combination combination of application of irrigation water at 0.3 IW/CPE ratio and variety VSI 434.The interaction effect between irrigation levels and varieties was found to be significant that treatment Combination of application of irrigation water at 1.0 IW/CPE ratio and varietyVSI 08005 registered significantly maximum (23.07 t/ha) CCS yield, which was remained on same line with treatment Combination I_1V_1, I_2V_1, I_2V_3. Whereas lower CCS yield (9.08 t/ha) was recorded in treatment Combination of application of irrigation water at 0.3 IW/CPE ratio and variety VSI 434.

Conclusion

On the basis of results obtained from the investigation it can be Concluded concluded that, for maintaining high crop performance (plant population, improved growth attributes, physiological attributes) and securing maximum cane productivity, irrigation should be given at 1.0 IW/CPE ratio and with respect to varietiesCoM 0265, VSI 08005, Co 86032 & CoVSI18121 showed elevated performance under irrigated as well as water deficitConditioncondition.

References

Anjum SA, Ashraf U, Zohaib A, Tanveer M, Naeem M, Ali I, Nazir U, Tabassum T (2017). Growth and developmental responses of crop plants under drought stress: a review. ZemdirbysteAgriculture, 104 (3): 267–276.

Couso LL, Fernández RJ (2012). Phenotypic plasticity as an index of drought tolerance in three Patagonian steppe grasses. Annals of Botany, 110(4):849-857.

Dos Santos CM, Endres L, da Silva ACS (2019). Water Relations and Osmolite Accumulation Related to Sugarcane Yield Under Drought Stress in a Tropical Climate. Int. J. Plant Prod. 13, 227–239.

UNDER PEER REVIEW

Farooq M, Wahid A, Kobayashi N, Fujita D, Basra SMA (2009). Plant Drought Stress: Effects, Mechanisms and Management. In: Lichtfouse E., Navarrete M., Debaeke P., Véronique S., Alberola C. (eds) Sustainable Agriculture. Springer, Dordrecht.https://doi.org/10.1007/978-90-481- 2666-8_12.

Gaber AA, Abou-Hadid AF, El-Gabry YA, Ebid MHM (2021).Morphological and Physiological Study for Sugarcane Early Selection to Drought ecnTreloT. Plant Archives 21(1):1935-1944.

Gomez KA, Gomez AA. Statistics for Agricultural Research (3rd ed.) John Willey and Sons, New York; c1984.p. 142.

GururajaRao PN (1994) Adaptive response of sugarcane genotypes to water stress. Dissertation. Madras University, India.

GururajaRao PN, Singh S (1989). Relationship of growth characteristics with yield and quality in sugarcane (SaccharumofficinarumL.). Indian J. Plant Physiol. 32: 206-211.

Hoang DT, Hiroo T, Yoshinobu K (2019). Nitrogen use efficiency and drought tolerant ability of various sugarcane varieties under drought stress at early growth stage, Plant Production Science, 22:2, 250-261.

Hurd EA (1976) Plant breeding for drought resistance.In. (Kozlowski, T.T.ed.).Water deficit and plant growth.Academic press. New York. Pp. 317-353.

Naidu KM, Venkataramana S (1989) Sugar yield and harvest index in water stressed cane varieties. Sugarcane 6: 5-7.

Salim B.B.M., El-Gabry Y. A. and Ebid M. H. M. (2021). Evaluation of some sugarcane genotypes under drought condition. Scientific Journal of Agricultural Sciences 3 (2): 123-132.

Souza RP, Machado EC, Silva JAB, Lagoa AMM, Silveria AG (2004) Photosynthetic gas exchange, chlorophyll fluorescence and some associated metabolic changes in cowpea during water stress and recovery. Env. Exp. Bot. 51: 45-56.

Spencer GI, Meade GP. Cane Sugar hand book. 9th ed, G. P. Meade, John Wiley and Sons. Inc.New York; c1963. p. 35-80.

Vasantha S, Alarmelu S, Hemeprabha G, Shanthi RM (2005) Evaluation of promising sugarcane genotypes for drought. Sugar Tech. (2& 3): 82-83.

Vasantha S, GururajaRao PN, Ramanujam TR (2003) Effect of moisture stress on sucrose synthesizing enzymes in promising genotypes of sugarcane. J. Plant Bio. 30(1): 15-18.

Yadav RC, Prasad SR (1988) Moisture use characteristics of sugarcane genotypes under different available soil moisture regimes in alluvial entisols. J. Agric. Sci. Camb. 110:5- 11.

Table No: 1 Tiller Count at 60, 90, 120 and 150 DAP and leaf area index and specific leaf wt., at 50 and 100, 150 and 200 DAP as influenced by irrigation levels and varieties.

Treatment details	Tiller Count at 60 DAP	Tiller Count at 90 DAP	Tiller Count at 120 DAP	Tiller Count at 150 DAP	Leaf area index at	Leaf area index at	Leaf area index at	Leaf area index at	Specific leaf wt. at 50	Specific leaf wt. at 100	Specific leaf wt. at 150	Specific leaf wt. at 200

UNDER PEER REVIEW

	(lakh/ha)	(lakh/ha)	(lakh/ha)	(lakh/ha)	50 DAP	100 DAP	150 DAP	200 DAP	DAP (g/m^2)	DAP (g/m^2)	DAP (g/m^2)	DAP (g/m^2)
Irrigation levels												
I_1: 0.3 IW/CPE	0.39	0.48	1.23	1.17	0.20	0.44	1.00	1.55	31.89	70.90	104.95	169.40
I_2: 1.0 IW/CPE	0.41	0.55	1.31	1.26	0.21	0.64	1.41	2.33	32.10	76.86	126.07	238.87
SEm±	0.006	0.010	0.009	0.014	0.002	0.025	0.03	0.10	0.31	0.52	2.03	10.23
C.D. @ 5%	NS	0.06	0.057	0.087	NS	0.15	0.21	0.65	NS	3.18	12.35	62.25
Varieties												
V_1: CoM0265	0.46	0.56	1.38	1.34	0.25	0.60	1.34	2.12	35.13	73.95	125.70	238.53
V_2: VSI 08005	0.43	0.56	1.33	1.25	0.23	0.67	1.42	2.23	33.60	78.69	132.21	240.70
V_3:Co86032	0.52	0.70	1.40	1.36	0.23	0.59	1.21	2.04	34.15	75.24	112.46	208.05
V_4:CoVSI18121	0.46	0.62	1.36	1.33	0.26	0.62	1.27	2.08	35.41	76.91	116.68	212.41
V_5: VSI12003	0.34	0.55	1.30	1.24	0.20	0.52	1.12	1.84	31.19	74.83	117.18	178.36
V_6: CoVSI03102	0.39	0.43	1.16	1.15	0.17	0.53	1.11	1.81	36.86	78.32	118.02	214.65
V_7:CoVSI13020	0.34	0.44	1.16	1.13	0.19	0.50	1.14	1.96	30.49	72.42	113.67	193.29
V_8: VSI434	0.31	0.39	1.17	1.12	0.19	0.45	1.07	1.59	29.19	65.67	103.38	187.82
SEm±	0.03	0.04	0.039	0.045	0.020	0.040	0.07	0.11	0.63	1.26	4.89	13.61
Interaction I×V												
C.D. @ 5%	0.09	0.12	0.11	0.13	NS	0.12	0.22	0.33	1.93	3.74	14.85	41.30
SEm±	0.03	0.07	0.089	0.12	0.021	0.078	0.09	0.21	1.08	1.25	8.19	20.53
C.D. @ 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

UNDER PEER REVIEW

Table No: 2Dry matter accumulation and root dry wt., at 50, 100, 150 and 200 DAP as influenced by irrigation levels and varieties.

Treatment details	Dry matter accumulation at 50 DAP (t/ha)	Dry matter accumulation at 100 DAP (t/ha)	Dry matter accumulation at 150 DAP (t/ha)	Dry matter accumulation at 200 DAP (t/ha)	Root dry weight at 50 DAP (g/stool)	Root dry weight at 100 DAP (g/stool)	Root dry weight at 150 DAP (g/stool)	Root dry weight at 200 DAP (g/stool)
Irrigation levels								
I_1: 0.3 IW/CPE	3.00	11.65	27.53	37.39	7.57	13.85	18.26	23.13
I_2: 1.0 IW/CPE	3.15	14.72	30.01	44.16	7.13	17.64	22.48	29.71
SEm±	0.034	0.18	0.36	0.30	1.08	0.41	0.50	0.68
C.D. @ 5%	NS	1.10	2.24	1.87	NS	2.53	3.05	4.16
Varieties								
V_1: CoM0265	3.23	13.73	32.71	45.72	7.68	22.12	25.97	31.29
V_2: VSI 08005	3.11	15.70	31.82	47.27	9.70	20.57	28.60	33.25
V_3:Co86032	3.18	12.43	28.55	41.52	7.32	16.59	22.41	28.33
V_4:CoVSI18121	3.21	14.00	30.11	38.75	6.24	15.12	21.17	28.63
V_5: VSI12003	2.96	13.24	28.59	36.63	7.77	13.92	19.20	23.66
V_6: CoVSI03102	3.31	14.76	28.67	41.00	7.74	13.29	16.82	24.13
V_7:CoVSI13020	3.07	12.62	29.56	42.99	7.34	12.93	16.27	23.30
V_8: VSI434	2.51	9.04	20.24	32.36	5.03	11.47	16.62	20.03
SEm±	0.064	0.28	0.34	0.47	0.86	0.92	0.87	0.97
C.D. @ 5%	0.19	0.83	1.05	1.45	2.63	2.81	2.64	2.94
Interaction I×V								
SEm±	0.089	0.45	0.49	0.77	1.94	1.10	0.92	1.56
C.D. @ 5%	NS	NS	NS	2.35	NS	NS	2.81	NS

UNDER PEER REVIEW

Treatment details	No. of internodes	Length of internodes (cm)	Girth of internodes (cm)	Millable cane height	Total cane height	Numbers of millablec	Single cane	Cane yield (t/ha)	CCS yield (t/ha)	Juice extraction percentage	Brix (%)	Sucrose (%)	CCS (%)

UNDER PEER REVIEW

Table No: 3 No. of internodes, length of internodes, girth of internodes, millable cane height, total cane height, Numbers of millable cane at 12 MAP, single cane wt., cane yield, juice extraction percentage and quality parameter as influenced by irrigation levels and varieties.

				(cm)	(cm)	ane at 12 MAP	wt. (kg)						
Irrigation levels													
I_1: 0.3 IW/CPE	21.00	12.18	10.61	208.83	239.62	0.82	1.41	94.26	14.07	40.08	21.94	20.66	14.92
I_2: 1.0 IW/CPE	21.83	12.52	11.23	253.58	278.20	0.91	1.67	122.42	19.83	43.49	22.83	21.87	15.89
SEm±	0.27	0.03	0.03	6.43	3.96	0.012	0.020	3.98	0.30	1.70	0.36	0.23	0.16
C.D. @ 5%	NS	0.21	0.18	39.17	24.15	0.076	0.12	24.22	1.88	NS	NS	NS	NS
Varieties													
V_1: CoM0265	21.04	12.31	11.16	236.50	257.33	0.93	1.94	136.45	20.73	41.04	22.10	21.13	15.27
V_2: VSI 08005	21.66	14.04	11.90	254.83	290.50	0.91	1.97	137.48	21.61	44.53	22.30	21.31	15.47
V_3:Co86032	22.00	12.36	11.13	239.50	264.83	0.93	1.66	104.97	18.24	42.91	23.29	21.38	15.26
V_4:CoVSI18121	21.28	13.37	11.18	242.50	270.17	0.90	1.70	110.45	17.05	42.28	22.69	21.39	15.44
V_5: VSI12003	20.73	11.19	10.78	212.50	238.83	0.84	1.47	104.14	16.12	44.18	22.03	21.19	15.42
V_6: CoVSI03102	22.66	12.57	10.91	247.33	275.33	0.82	1.73	100.44	15.71	40.92	22.57	21.49	15.75
V_7:CoVSI13020	20.79	11.12	10.95	202.83	232.17	0.84	1.27	99.64	15.31	39.65	22.51	21.14	15.23
V_8: VSI434	21.16	11.89	10.28	213.67	240.17	0.79	1.17	81.19	12.07	38.81	23.58	22.02	15.80
SEm±	0.63	0.72	0.38	11.09	12.16	0.028	0.15	10.53	1.53	1.84	0.52	0.49	0.39
C.D. @ 5%	NS	NS	1.14	33.63	36.88	0.086	0.47	31.94	4.66	NS	NS	NS	NS
Interaction I×V													
SEm±	1.34	0.62	0.56	13.88	14.37	0.023	0.20	12.35	1.89	2.97	0.98	0.98	0.74
C.D. @ 5%	NS	NS	NS	NS	NS	NS	NS	37.46	5.76	NS	NS	NS	NS

UNDER PEER REVIEW

Table No: 4 Interaction effect of irrigation levels and varieties on dry matter accumulation at 200 DAP (t/ha)

Irrigation levels	I_1: 0.3 IW/CPE	I_2: 1.0 IW/CPE	I_1: 0.3 IW/CPE	I_2: 1.0 IW/CPE	I_1: 0.3 IW/CPE	I_2: 1.0 IW/CPE	I_1: 0.3 IW/CPE	I_2: 1.0 IW/CPE
	Dry matter accumulation at 200 DAP (t/ha)		Root dry weight at 150 DAP (g/stool)		Cane yield (t/ha)		CCS yield (t/ha)	
Varieties								
V_1: CoM0265	41.21	50.24	23.98	27.86	119.28	144.46	17.46	22.97
V_2: VSI 08005	42.53	52.01	25.95	31.25	108.59	152.31	17.15	23.07
V_3:Co86032	38.15	44.88	20.29	24.53	102.61	122.76	15.89	20.12
V_4:CoVSI18121	34.98	42.52	16.97	17.37	99.97	102.28	15.28	15.94
V_5: VSI12003	33.00	40.25	15.11	23.28	87.17	99.69	12.03	16.98
V_6: CoVSI03102	40.07	41.94	13.31	20.32	96.20	100.91	14.80	16.26
V_7:CoVSI13020	39.84	46.14	15.17	17.37	76.99	104.64	11.29	16.52
V_8: VSI434	29.36	35.37	15.37	17.87	63.31	99.07	9.08	15.02
SEm±	0.77		0.92		12.35		1.89	
C.D. @ 5%	2.35		2.81		37.46		5.76	
CV%	3.29		7.88		19.74		19.40	

UNDER PEER REVIEW