CENTRAL SUGARCANE RESEARCH
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AGRONOMY AND SOIL SCIENCE (AICRP)

CENTRAL SUGARCANE RESEARCH STATION, PADEGAON

SUGARCANE AGRONOMY (AICRP)

STAFF POSITION

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I N D E X

1. INTRODUCTION

Sugarcane is the most important cash crop in the state of Maharashtra. Sugar industry plays a pivotal role in the socio-economic and educational development in the rural areas of the state. In general, since last 3 years the rainfall situation in Maharashtra was satisfactory which resulted in the increase in area under sugarcane. Therefore, during 2010-11, the area of sugarcane is at the highest peak level in the state i.e. 10.22 lakh hectares with 802.15 lakh ton Sugarcane production and 78.48 t/ha average productivity and 11.31 % average sugar recovery. The sugar industry is facing the problem of crushing excess cane during 2010-11. Therefore, it is the need of hour to increase the production and decrease the area and cost of production.

The sugarcane productivity has declined from 83.3 t /ha during 2000-01 to 74.10 t /ha during 2008-09. However, it increases during the year 2009-10 (83.0 t/ha) and again slightly decreases during the year 2010-11 (78.48 t/ha). For higher returns from the sugarcane crop, the productivity as well as quality of the sugarcane needs to be improved with adoption of the advanced technologies *viz.*, use of high yielding and high sugar varieties, improved planting methods, better water management, trash recycling, INM and IPM, use of improved management techniques and use of quality seed.

For providing the high yielding and high sugar varieties and new techniques for increasing yield, the Central Sugarcane Research Station, Padegaon is conducting research on varietal improvement along with development of new techniques especially planting systems, paired row planting, intercropping, ratoon management, IPM and INM, water management, drought and salinity management, sugarcane based farming system and cropping system. The need based future research strategies are development of extra early sugarcane varieties maturing at 10 –11 months, development of sugarcane varieties for better juice quality, identification of varieties for specific characteristics i.e. flood tolerance / drought and salt tolerance, woolly aphid tolerance/resistance, higher production of fiber for co-generation, higher percentage of brix in early age of crop for higher ethanol production. The efforts are also being made to develop non-flowering/ sparse flowering varieties with higher cane yield, CCS yield and sugar recovery. Similarly, the attention will be given for development of anti-inversion varieties to withstand the delayed

crushing. Special emphasis will be given for varietal development considering the global warming and the climate change.

Table. 1.) In Maharashtra State, there are five major sub-ecological zones for sugarcane viz.

Sr.No.	Sub-ecological zone	Particulars/Remarks
1.	**South Western Maharashtra State**	**Adequate resources-high recovery zone**
2.	**Central Western Maharashtra State**	**Adequate resources-medium recovery zone**
3.	**North Western Maharashtra State**	**Insufficient irrigation and other resources. low recovery zone**
4.	**East middle Maharashtra State**	
5.	**East Maharashtra State**	

Table.2) : The area, production, productivity, sugar production and sugarcane recovery in Maharashtra from 2001 to 2012.

Year	**Area ('000' ha)**	**Sugarcane production (Lakh ton)**	**Sugarcane productivity (t /ha)**	**Sugar production (Lakh ton)**	**Sugar recovery (%)**
2000-01	595	495.89	83.3	67.05	11.64
2001-02	578	451.40	78.1	56.13	11.60
2002-03	599	370.15	61.8	65.19	11.66
2003-04	548	290.66	51.0	30.39	10.91
2004-05	320	204.00	63.0	22.62	11.45
2005-06	415	388.14	68.22	51.98	11.68
2006-07	840	626.00	76.00	90.95	11.40
2007-08	1046	735.69	70.33	87.63	11.91
2008-09	770	410	74.10	46.00	11.46
2009-10	756	641.59	83.00	70.66	11.54
2010-11	1022	802.15	78.48	90.52	11.31
2011-12*	1008	77.87	78.03	89.50	11.55

*** :** Estimated.

2. CLIMATE AND CROP GROWTH

Season and Climate (2010-2012)

The Central Sugarcane Research Station, Padegaon is located in sub tropical zone, geographically at an elevation of 556 m above mean sea level on 18^{o}-12''N latitude and 74^{o}-10''E longitude.

The total rainfall received during July, 2010 to March, 2012 (21 months) was 1002.4 mm in 69 rainy days as against the normal rainfall of 1087.0 mm (21 months) indicating that the rainfall received during the season was 7.8 % less than normal. The data on climatic parameters during the crop season (July, 2010 to March, 2012) along with averages based on last 79 years (1932-33 to 2010-11) recorded at the meteorological observatory located at this research station are presented in Table 1 and graphically shown in Fig.1. The effect of the season on sugarcane at various growth phases has been elucidated below.

1) Germination phase for *Adsali* crop (Jul. to Sept., 2010)

The rainfall received during germination phase was 320.6 mm in 24 rainy days as against the normal of 301.6 mm. The average maximum temperature during this period was 29.5 ^{o}C and minimum temperature was 21.7 ^{o}C. The average relative humidity (morning) during this phase was 98 % which was 11 % more than the normal.

Evenly distributed rainfall and high humidity resulted in good germination of *Adsali* crop of sugarcane.

2) Tillering phase (Oct-Dec., 2010) for *Adsali*/Germination phase for Preseason crop:

Total rainfall received during tillering phase was 240.1 mm which was 58 % more than the normal of last 79 years. The average maximum and minimum temperatures during this phase were 29.2 ^{o}C and 17.7 ^{o}C respectively. The morning humidity was 98 % as against the normal 86 %. High humidity and high rainfall was favourable for the tillering of *Adsali* sugarcane. High humidity was also favourable for good germination of preseasonal sugarcane.

3) Early growth (*Adsali*)/Tillering (Preseason) and Germination phase (*Suru*) (Jan-Mar.2011)

During this phase the average maximum temperature was 31.5 ^{o}C which was slightly less than the normal i.e 32.4 ^{o}C. The average minimum temperature was 13.0 ^{o}C, which was more than the normal i.e 12.6 ^{o}C. These temperatures were favourable for *Adsali* crop growth.

Due to higher humidity (97 %) than the average (78 %), tillering of preseasonal sugarcane and germination/tillering of *Suru* sugarcane was also satisfactory.

4) Desiccation phase (April to May, 2011)

The mean maximum temperature was lower (37.0 ^{o}C) than the normal (39.9^{o}C) while the mean minimum temperature (22.0 ^{o}C) was more than the normal (21.2^{o}C). The total rainfall received during this phase was 28.5 mm in 2 rainy days.

5) Grand growth (*Adsali*)/Early growth phase (Preseason and *Suru*) (June to Sept., 2011)

During this phase, the average maximum and minimum temperatures were 29.9 ^{o}C and 22.9 ^{o}C respectively i.e. optimum for crop growth. The total rainfall received during this phase was 362.4 mm in 28 rainy days as against the normal rainfall of 371.9 mm. The grand growth of *Adsali*, preseasonal and *Suru* sugarcane was satisfactory due to good rains coupled with high humidity.

6) Flowering and Maturity (*Adsali* and Preseason)/Grand growth phase (*Suru*) (Oct-Dec., 2011)

During this phase, the mean maximum and minimum temperatures were 31.5 ^{o}C and 16.3 ^{o}C respectively. Total rainfall received during this phase was 50.8 mm in 2 rainy days as against 165.5 mm average of last 79 years. The high humidity and optimum temperatures favoured early and profuse flowering for all season planted crop.

During Jan 2012 to March 2012, the mean maximum and minimum temperatures were 32.4 ^{o}C and 13.1 ^{o}C respectively. The high humidity and optimum temperatures favoured maturity of sugarcane crop.

At maturity of *Adsali*, preseasonal and *Suru* sugarcane, the minimum temperature was more (16.3 ^{o}C) than average (15.5 ^{o}C) which affected sugarcane maturity and accumulation of sugar resulting in low recovery. The overall crop growth during this year was satisfactory due to favourable climate. However, due to temperature fluctuations there was effect on cane yield. However, due to more number of cooler days, the sugar recovery was satisfactory.

The incidence of pests and diseases, in general, was as under.

1) Incidence of insect pests on sugarcane during 2011-12

Sr.No.	Name of pest	Extent of incidence (%)
1	Early shoot borer	**16 to 18**
2	Internode borer	**18 to 20**
3	Top shoot borer	**0 to 2**
4	Mealy bugs	**20 to 30**
5	Wooly aphids	**Traces to Low**
6	Scale insect	**0 to 2**
7	White fly	**1 to 2.5**

2) Incidence of diseases on sugarcane during 2011-12

Sr.No.	Name of disease	Extent of incidence (%)
1	Rust	**1.0 to 30.0**
2	G.S.D	**1.0 to 12.00**
3	Smut	**1.0 to 48.00**
4	Ring spot	**4.0 to 15.0**
5	Pokka boeng	**1.0 to 18.0**
6	Eye spot	**2.0**

Table 1. Average weather parameters at CSRS, Padegaon during June 10 to March 12

Sr. No.	Temperature (^{o}C)		Humidity (%)		Sunshine Hrs.	Rainfall (mm)	Rainy days
	Max.	Min.	Mor.	Eve.			
June 10	32.5	22.8	97	75	06.1	222.3	8
1. Germination phase for *Adsali* crop (Jul. to Sept., 2010)							
July 10	28.8	22.2	98	89	02.9	093.9	9
Aug 10	29.6	21.7	98	90	03.6	077.0	8
Sept 10	30.1	21.3	98	88	05.3	149.7	7
Average	**29.5**	**21.7**	**98**	**89**	**03.9**	**320.6**	**24**
Last 79 yrs avg	**29.2**	**21.8**	**88**	**64**	**4.9**	**301.6**	**--**
2. Tillering phase (Oct-Dec., 2010) for *Adsali*/Germination phase for Preseason crop							
Oct 10	30.7	20.2	98	83	07.1	193.0	7
Nov 10	29.5	19.9	98	74	06.4	047.1	5
Dec 10	27.5	12.9	97	60	07.8	--	--
Average	**29.2**	**17.7**	**98**	**72**	**07.1**	**240.1**	**12**
Last 79 yrs avg	**31.6**	**15.5**	**86**	**40**	**09.6**	**151.8**	**--**
3. Early growth (*Adsali*)/Tillering (Preseason) and Germination phase (*Suru*) (Jan-Mar.2011)							
Jan 11	28.7	10.3	96	62	07.9	--	--
Feb 11	30.7	12.6	97	74	08.9	--	--
Mar 11	35.2	16.2	98	65	08.3	--	--
Average	**31.5**	**13.0**	**97**	**67**	**08.4**	**--**	**--**
Last 79 yrs avg	**32.4**	**12.6**	**78**	**28**	**10.0**	**13.1**	**--**
4. Desiccation phase (April to May, 2011)							
April 11	36.9	21.0	94	51	07.3	--	--
May 11	37.1	22.9	93	59	07.9	028.5	3
Average	**37.0**	**22.0**	**94**	**55**	**07.6**	**28.5**	**3**
Last 79 yrs avg	**39.9**	**21.2**	**69**	**26**	**11.6**	**69.9**	**--**
5. Grand growth (*Adsali*)/Early growth phase (Preseason and *Suru*) (June to Sept., 2011)							
June 11	30.6	24.2	95	85	07.5	106.6	7
July 11	29.6	23.4	97	89	03.3	098.3	8
Aug 11	29.3	22.8	97	80	03.0	040.2	7
Sept 11	30.0	21.0	98	77	05.2	117.3	6
Average	**29.9**	**22.9**	**97**	**83**	**04.8**	**362.4**	**28**
Last 79 yrs avg	**30.9**	**22.0**	**87**	**61**	**05.3**	**371.9**	**--**
6. Flowering and Maturity (*Adsali* and Preseason)/Grand growth phase (*Suru*) (Oct-Dec., 2011)							
Oct 11	31.1	20.9	98	72	06.3	050.8	2
Nov 11	30.3	15.8	98	74	08.0	--	--
Dec 11	33.0	12.1	98	75	08.1	--	--
Average	**31.5**	**16.3**	**98**	**74**	**07.5**	**050.8**	**2**
Last 79 yrs avg	**31.6**	**15.5**	**86**	**40**	**09.6**	**165.5**	**--**
Jan 12	29.1	11.1	97	85	08.5	--	--
Feb 12	32.5	12.9	97	51	08.6	--	--
Mar 12	35.6	15.2	93	51	07.4	--	--
Average	**32.4**	**13.1**	**96**	**62**	**08.2**	**--**	**--**
Last 80 yrs avg	**32.4**	**12.6**	**78**	**28**	**10.0**	**12.9**	**--**

Central Sugarcane Research Station, Padegaon.

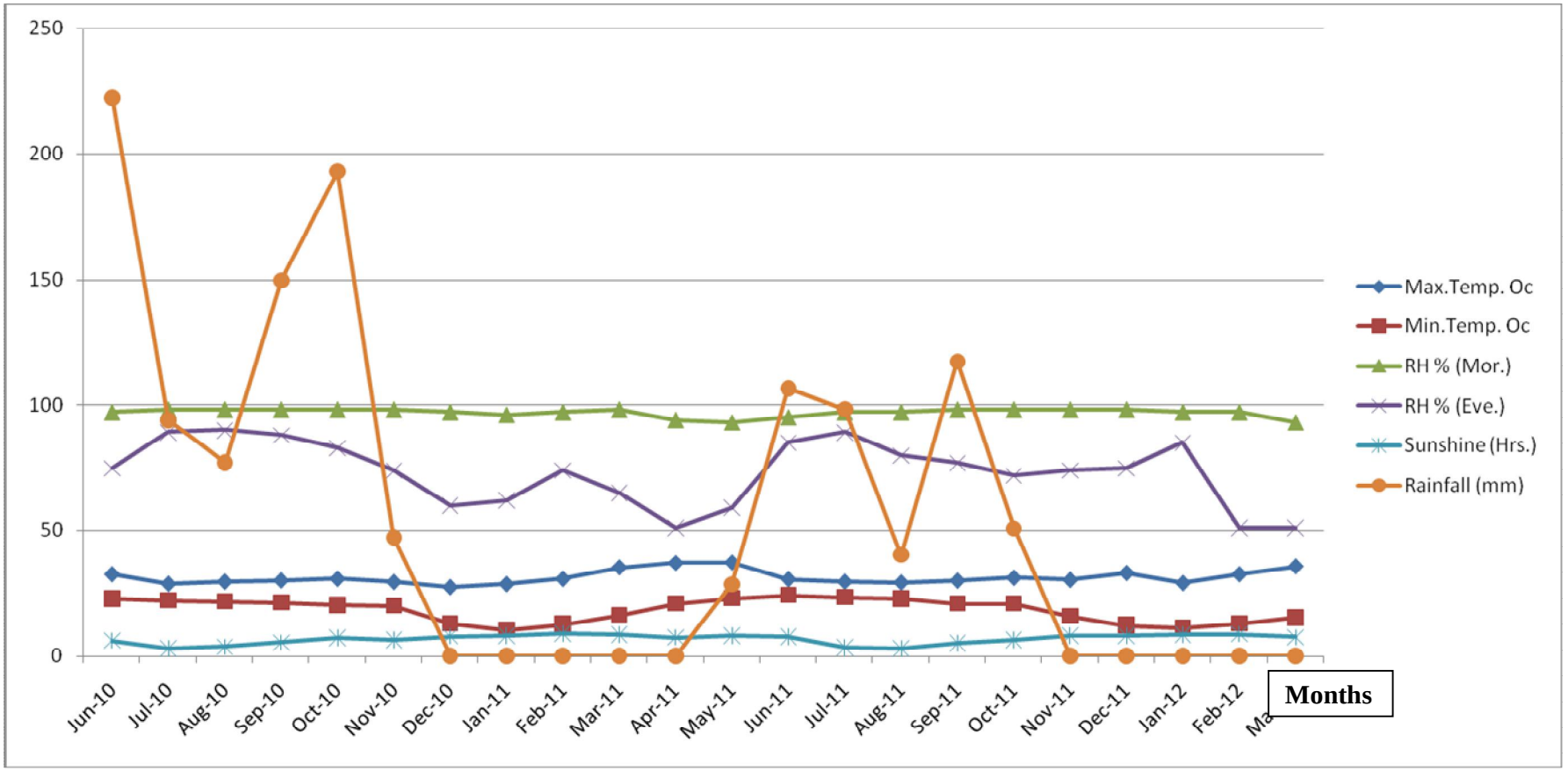

Figure 1: Weather parameters 2010 - 2012

Agronomy

Research Highlight

A) On going experiment

Title 1: Agronomic evaluation of promising new sugarcane genotypes (Autumn planting)

The genotypes CoM 05082 and CoSnk 5104 recorded significantly higher cane and CCS yields than the other genotypes. The application of 125 % recommended dose of nitrogen produced significantly higher cane and CCS yields followed by 100 % recommended N.

Title 2 : Agronomic evaluation of promising new sugarcane genotypes (Spring planting)

The genotype CoM 05082 was the most superior for cane and CCS yields than the other genotypes followed by CoSnk 5104. The application of 125 % recommended N produced significantly higher cane and CCS yields followed by 100 % recommended N.

Title 3 : Optimizing irrigation scheduling in sugarcane under different planting methods.

Conventional planting at 90 cm row spacing recorded significantly highest cane and CCS yields (122.58and 16.57 t ha^{-1}). Irrigation at 1.2 IW/CPE ratio recorded significantly higher cane and CCS yields (122.96 and 16.90 t ha^{-1}). Conventional planting at 90 cm row spacing with 0.6 IW/CPE ratio recorded higher WUE (10.17 g/ha.cm). The maximum water saving was observed in paired row planting and paired cum trench planting at 30-150 cm row spacing with 0.6 IW/CPE ratio (39.83%).

Title 4: Management of binding weeds in sugarcane.

The management of binding weeds by Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP recorded maximum weed control efficiency (76.71%) with significantly higher cane and CCS yields (129.06 and 17.41 t/ha), gross monetary returns (Rs. 2,38,761/ha), net monetary returns (Rs. 97,935/ha) and the B:C ratio (1.70). The treatment T3 i.e. Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP was the next superior.

Title 5: Plant geometry in relation to mechanization in sugarcane.

The row spacing of 120 cm recorded the highest cane (120.43 t ha^{-1}) and CCS yield (16.79 t ha^{-1}). However, it was at par with the row spacing of 100 cm for both cane (118.28 t ha^{-1}) and CCS yields (16.64 t ha^{-1}). Significantly highest cane (134.73 t ha^{-1}) and CCS (18.51 t ha^{-1}) yields were recorded in the genotype CoM 0265 followed by Co 86032 (119.70 and 16.60 t ha^{-1}). CoC 671 was found to be the most superior with respect to juice quality.

Completed experiment

Title 1 : Optimizing irrigation scheduling in sugarcane under different planting methods.

Conventional planting at 90 cm row spacing recorded significantly highest cane and CCS yields (117.86 and 15.95 t ha^{-1}). Irrigation at 1.2 IW/CPE ratio recorded significantly higher cane and CCS yields (119.95 and 16.41 t ha^{-1}). Conventional planting at 90 cm row spacing with 0.6 IW/CPE ratio recorded higher WUE (10.24 g/ha.cm). The maximum water saving was observed in paired row planting and paired cum trench planting at 30-150 cm row spacing with 0.6 IW/CPE ratio (38.38%).

Title 2 : Management of binding weeds in Sugarcane.

The management of binding weeds by Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP recorded maximum weed control efficiency (75 to 85 %) with significantly higher cane and CCS yields (119.78 and 17.91 t/ha), gross monetary returns (Rs. 2,31,528/ha), net monetary returns (Rs. 1,04,245/ha) and the B:C ratio (1.81). The treatments, T_3 and T_5 were the next economical ones.

Soil science

RECOMMENDATION

Title 1 : Optimizing irrigation scheduling in sugarcane under different planting methods.

Recommendation:-

The planting of sugarcane variety CoM 0265 in *suru* season at 90 cm row spacing with irrigation at 1.2 IW/CPE ratio (66.67 mm CPE) is recommended for Western Maharashtra to get higher cane and CCS yield with higher water use efficiency.

Title 2 : Management of binding weeds in Sugarcane.

Recommendation:-

Application of atrazine @ 2 kg a.i./ha as a pre-emergence spray after planting, hoeing at 30 days after planting and post-emergence spray of 2,4-D @ 1 kg a.i./ha at 75 days after planting is recommended for management of binding weeds in suru sugarcane.

Project No. AS – 42

Title 1: Agronomic evaluation of promising new sugarcane genotypes (Autumn planting)

Objective: To work out agronomy of sugarcane genotypes from advanced varietal trial (AVT)

Experimental Details :

CSRS, Padegaon, Split plot, 3/15, 10 x 6 m^2, 8 x 4 m^2, 340:170:170 kg N, P_2O_5, K_2O ha^{-1}, Date of planting- 09/12/2010, Date of harvesting- 11/02/2012, irrigated, medium black soil.

Treatment details :

A) Main plot treatments –Genotypes -5

V_1 Cosnk 5103
V_2 CoM 05082
V_3 Cosnk 5104
V_4 Co 99004
V_5 CoC 671

B) Sub plot treatments – N levels – 3

F_1 75% RD of N
F_2 100% RD of N
F_3 125% RD of N

Results:

This is the first year of the experiment**.** The data on cane and CCS yields, growth observations and quality parameters are presented in Table 1 to 3.

Effect of genotypes:

Data presented in Table 1 revealed that the genotype CoM 05082 recorded the highest cane (137.01 t ha^{-1}) and CCS yield (18.38 t ha^{-1}). However, it was at par with CoSnk 5104 in respect of CCS yield (17.82 t ha^{-1}).

Effect of nitrogen levels:

The N levels had a significant effect on both cane and CCS yields. The highest cane (136.65 t ha^{-1}) and CCS (18.50 t ha^{-1}) yields were recorded with application of 125% recommended dose of N. However, the 100 % recommended N (131.26 and 17.76 t ha^{-1}) was at par with 125 % recommended dose of N for both cane and CCS yield.

Effect of interactions:

The interactions between genotypes and fertilizer levels were found to be non significant for both cane and CCS yields.

Growth and yield attributes:

The data regarding growth and yield attributes are presented in Table 2.

Effect of genotypes:

The data presented in Table 2 revealed that the effect of genotypes was significant for all the parameters except no. of millable canes and average cane weight. The genotype, CoM 05082 recorded the highest germination (73.23 %), tillering ratio (1.85), millable height (299 cm), cane girth (9.9 cm), no. of internodes per cane (26), millable canes per hectare (96550 ha^{-1}) and weight per cane (1.42 kg). However, it was at par with CoSnk 5104 in respect of germination, cane girth and no. of internodes per cane.

Effect of nitrogen levels:

Effect of N levels was significant only for the millable height, no. of internodes per cane and average cane weight. Application of 125% recommended N recorded the highest millable height (291 cm), no. of internodes per cane (26.0) and the average cane weight (1.42 kg) and was significantly superior to other levels. It was closely followed by 100 % recommended N in all these parameters.

Effect of interactions:

The interactions between genotypes and N levels in respect of all the parameter were found to be non significant.

Quality parameters:

The genotypes, N levels and their interactions did not have significant influence on juice quality parameters (Table 3).

Conclusion:

The genotypes CoM 05082 and CoSnk 5104 recorded significantly higher cane and CCS yields than the other genotypes. The application of 125 percent recommended dose of nitrogen produced significantly higher cane and CCS yields followed by 100 % recommended N.

Table 1. Cane and CCS yield of sugarcane genotypes at varying N levels (Autumn planting)

Treatments	Cane yield ($t\ ha^{-1}$)	CCS yield ($t\ ha^{-1}$)
A) Genotypes		
V_1– CoSnk 5103	131.13	17.46
V_2 – CoM 05082	137.01	18.38
V_3– CoSnk 5104	132.10	17.82
V_4 – Co 99004	128.27	17.39
V_5 – CoC 671	124.53	17.07
SE±	**0.43**	**0.23**
C.D. at 5%	**1.43**	**0.75**
B) N levels		
F_1 - 75% N	123.92	16.64
F_2 - 100% N	131.26	17.76
F_3 – 125 % N	136.65	18.50
SE±	**2.02**	**0.32**
C.D. at 5%	**5.97**	**0.95**
C) Interactions		
SE±	**4.52**	**0.32**
C.D. at 5%	**NS**	**NS**
C.V. %	**6.00**	**7.06**
General Mean	**130.61**	**17.63**

Table 2. Growth and yield attributes of sugarcane genotypes at varying N levels

Treatments	Germination (%)	Tillering ratio	Height (cm)	Girth (cm)	No of internodes $cane^{-1}$	Millable canes ($000\ ha^{-1}$)	Avg. cane wt. (kg)
A) Genotypes							
V_1– CoSnk 5103	69.37	1.71	285	9.5	25	94.67	1.39
V_2 – CoM 05082	73.23	1.85	299	9.9	26	96.55	1.42
V_3– CoSnk 5104	72.37	1.76	287	9.7	26	94.74	1.39
V_4 – Co 99004	68.4	1.65	281	9.3	24	94.6	1.36
V_5 – CoC 671	66.86	1.57	268	9.2	23	94.79	1.32
SE±	**0.75**	**0.004**	**0.98**	**0.07**	**0.09**	**1.41**	**0.02**
C.D. at 5%	**2.44**	**0.013**	**3.21**	**0.23**	**0.3**	**NS**	**NS**
B) N levels							
F_1 - 75% N	67.98	1.66	277.00	9.20	23.00	93.59	1.33
F_2 - 100% N	70.00	1.71	284.00	9.50	25.00	95.32	1.38
F_3 – 125 % N	72.16	1.75	291.00	9.90	26.00	96.29	1.42
SE±	**1.98**	**0.02**	**2.19**	**0.20**	**0.22**	**1.95**	**0.01**
C.D. at 5%	**NS**	**NS**	**6.47**	**NS**	**0.64**	**NS**	**0.03**

C) Interactions							
SE±	**4.43**	**0.04**	**4.90**	**0.45**	**0.49**	**4.35**	**0.02**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
General Mean	**70.05**	**1.71**	**284.00**	**9.50**	**25.00**	**95.06**	**1.38**

Table 3. Quality parameters of sugarcane genotypes at varying N levels

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
A) Genotypes	22.96	15.59	85.65	13.32
V_1– CoSnk 5103	22.52	19.49	86.88	13.41
V_2 – CoM 05082	22.07	19.73	89.44	13.49
V_3– CoSnk 5104	22.3	19.63	88.25	13.55
V_4 – Co 99004	21.79	19.43	89.2	13.71
V_5 – CoC 671	0.32	0.17	1.38	0.19
SE±	**NS**	**NS**	**NS**	**NS**
C.D. at 5%	**22.96**	**15.59**	**85.65**	**13.32**
B) N levels				
F_1 - 75% N	22.36	19.64	88.03	13.43
F_2 - 100% N	22.06	19.54	88.76	13.53
F_3 – 125 % N	22.56	19.54	86.86	13.54
SE±	**0.28**	**0.10**	**0.93**	**0.09**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
C) Interactions				
SE±	**0.63**	**0.22**	**0.80**	**0.19**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General Mean	**22.33**	**19.57**	**87.89**	**13.50**

Table 4. Soil properties at harvest in different genotypes at varying N levels

Treatments	pH	EC (dsm^{-1})	O.C.%	Available nutrient status (kg ha^{-1})		
				N	P_2O_5	K_2O
A) Genotypes						
V_1– CoSnk 5103	8.09	0.35	0.62	187	17.2	264
V_2 – CoM 05082	8.10	0.35	0.60	183	16.0	246
V_3– CoSnk 5104	8.06	0.34	0.63	184	16.8	256
V_4 – Co 99004	8.07	0.37	0.58	189	17.8	270
V_5 – CoC 671	8.07	0.39	0.59	195	18.9	278
B) N levels						
F_1 - 75% N	8.06	0.35	0.61	183	18.2	271
F_2 - 100% N	8.07	0.35	0.61	187	17.3	265
F_3 – 125 % N	8.10	0.37	0.59	195	16.4	253
General Mean	**8.08**	**0.36**	**0.60**	**188**	**17.3**	**263**
Initial	**8.14**	**0.39**	**0.68**	**264**	**18.3**	**317**

Project No. AS – 42

Title 2 : Agronomic evaluation of promising new sugarcane genotypes (Spring planting)

Objective: To work out agronomy of sugarcane genotypes from advanced varietal trial (AVT)

Experimental Details :

CSRS, Padegaon, Split plot, 3/15, 10 x 6 m^2, 8 x 4 m^2, 340:170:170 kg N, P_2O_5, K_2O ha^{-1}, Date of planting- 19/01/2011, Date of harvesting- 13/02/2012, irrigated, medium black soil.

Treatment details :

B) Main plot treatments –Genotypes -5

V_1 Cosnk 5103
V_2 CoM0 5082
V_3 Cosnk 5104
V_4 Co 99004
V_5 CoC 671

B) Sub plot treatments – N levels – 3

F_1 75% RD of N
F_2 100% RD of N
F_3 125% RD of N

Results:

This is the first year of the experiment**.** The data on cane and CCS yields, growth observations and quality parameters are presented in Table 1 to 3.

Effect of genotypes:

Data presented in Table 1 revealed that the genotype CoM 05082 recorded the highest cane (121.60 t ha^{-1}) and CCS yield (16.15 t ha^{-1}) and was significantly superior to all other genotypes. It was followed by CoSnk 5104 (115.67 t ha^{-1} cane and 15.47 t ha^{-1} CCS).

Effect of nitrogen levels:

The N levels had a significant effect on both cane and CCS yields. Significantly highest cane (123.55 t ha^{-1}) and CCS (16.57 t ha^{-1}) yields were recorded with application of 125% recommended dose of N. It was followed by 100 % recommended N (114.02 and 15.19 t ha^{-1}).

Effect of interactions:

The interactions between genotypes and fertilizer levels were found to be non significant for both cane and CCS yields.

Growth and yield attributes:

The data regarding growth and yield attributes are presented in Table 2.

Effect of genotypes:

The data presented in Table 2 revealed that the effect of genotypes was significant for all the parameters except germination % and millable cane height. The genotype, CoM 05082 recorded the highest germination (72.30 %), tillering ratio (1.65), cane girth (9.8 cm), no. of internodes per cane (23), millable canes per hectare (1,02,420 ha^{-1}) and weight per cane (1.18 kg). However, it was at par with CoSnk 5104 in respect of cane girth, no. of internodes and average weight per cane.

Effect of nitrogen levels:

Effect of N levels was significant only for the tillering ratio, no. of internodes per cane, NMC and average cane weight. Application of 125% recommended N recorded the highest tillering ratio (1.65), no. of internodes per cane (23), NMC (1,02,240 ha^{-1}) and average cane weight (1.20 kg $cane^{-1}$). The 100 % recommended N was at par with 125 % N in respect of tillering ratio, no. of internodes per cane and the average cane weight.

Effect of interactions:

The interactions between genotypes and N levels in respect of all the parameter were found to be non significant.

Quality parameters:

The genotypes, N levels and their interactions did not have any significant influence on juice quality parameters (Table 3).

Conclusion:

The genotype CoM 05082 was themost superior for cane and CCS yields than the other genotypes followed by CoSnk 5104. The application of 125 % recommended N produced significantly higher cane and CCS yields followed by 100 % recommended N.

Table 1. Cane and CCS yield of sugarcane genotypes at varying N levels (Spring planting)

Treatments	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
A) Genotypes		
V_1– CoSnk 5103	113.00	14.91
V_2 – CoM 05082	121.60	16.15
V_3– CoSnk 5104	115.67	15.47
V_4 – Co 99004	110.24	14.85
V_5 – CoC 671	107.54	14.50
SE±	**0.37**	**0.13**
C.D. at 5%	**1.23**	**0.43**
B) N levels		
F_1 - 75% N	103.25	13.77
F_2 - 100% N	114.02	15.19
F_3 – 125 % N	123.55	16.57
SE±	**2.16**	**0.32**
C.D. at 5%	**6.39**	**0.94**
C) Interactions		
SE±	**4.84**	**0.71**
C.D. at 5%	**NS**	**NS**
General Mean	**113.61**	**15.18**

Table 2. Growth and yield attributes of sugarcane genotypes at varying N levels

Treatments	Germination (%)	Tillering ratio	Height (cm)	Girth (cm)	No of internodes $cane^{-1}$	Millable canes (000 ha^{-1})	Avg. cane wt. (kg)
A) Genotypes							
V_1– CoSnk 5103	69.73	1.58	270	9.4	21	97.85	1.15
V_2 – CoM 05082	72.30	1.65	283	9.8	23	102.42	1.18
V_3– CoSnk 5104	70.82	1.61	279	9.6	22	97.68	1.18
V_4 – Co 99004	67.00	1.59	301	9.2	21	96.32	1.14
V_5 – CoC 671	66.93	1.56	236	9.2	20	94.31	1.13
SE±	**0.97**	**0.01**	**17.53**	**0.07**	**0.35**	**0.43**	**0.004**
C.D. at 5%	**NS**	**0.03**	**NS**	**0.23**	**1.16**	**1.40**	**0.014**
B) N levels							
F_1 - 75% N	66.57	1.55	280	9.1	20	93.04	1.10
F_2 - 100% N	69.86	1.60	256	9.5	22	97.86	1.16
F_3 – 125 % N	71.64	1.65	286	9.7	23	102.24	1.20
SE±	**1.94**	**0.018**	**14.52**	**0.18**	**0.38**	**0.77**	**0.019**
C.D. at 5%	**NS**	**0.054**	**NS**	**NS**	**1.14**	**2.29**	**0.056**
C) Interactions							
SE±	**4.34**	**0.041**	**12.48**	**0.42**	**0.86**	**1.74**	**0.043**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
General Mean	**69.35**	**1.60**	**274**	**9.4**	**22**	**97.71**	**1.16**

Table 3. Quality parameters of sugarcane genotypes at varying N levels

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
A) Genotypes				
V_1– CoSnk 5103	23.40	19.59	83.79	13.19
V_2 – CoM 05082	23.58	19.72	83.78	13.27
V_3– CoSnk 5104	22.18	19.42	88.15	13.37
V_4 – Co 99004	22.90	19.74	86.38	13.48
V_5 – CoC 671	22.73	19.58	86.18	13.48
SE±	**0.28**	**0.09**	**0.98**	**0.08**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
B) N levels				
F_1 - 75% N	23.20	19.68	84.93	13.34
F_2 - 100% N	22.96	19.60	85.61	13.33
F_3 – 125 % N	22.72	19.55	86.42	13.41
SE±	**0.21**	**0.13**	**0.98**	**0.13**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
C) Interactions				
SE±	**0.48**	**0.27**	**2.19**	**0.29**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General Mean	**22.96**	**19.61**	**85.66**	**13.36**

Table 4. Soil properties at harvest in different genotypes at varying N levels

Treatments	pH	EC (dsm^{-1})	O.C.%	Available nutrient status (kg ha^{-1})		
				N	P_2O_5	K_2O
A) Genotypes						
V_1– CoSnk 5103	8.07	0.33	0.6	183	15.8	239
V_2 – CoM 05082	8.08	0.33	0.58	179	15.1	239
V_3– CoSnk 5104	8.05	0.32	0.61	180	15.6	247
V_4 – Co 99004	8.05	0.35	0.56	185	17.3	261
V_5 – CoC 671	8.03	0.37	0.57	191	18.4	271
B) N levels						
F_1 - 75% N	8.03	0.33	0.58	179	17.9	264
F_2 - 100% N	8.05	0.33	0.58	183	15.8	256
F_3 – 125 % N	8.09	0.35	0.56	191	15.6	246
General Mean	**8.06**	**0.34**	**0.57**	**184**	**16.4**	**255**
Initial	**8.13**	**0.39**	**0.70**	**269**	**18.1**	**309**

Project No. : AS – 61

Title 3 : Optimizing irrigation scheduling in sugarcane under different planting methods.

Objective: To enhance water and crop productivity in sugarcane.

Experimental Details:
CSRS, Padegaon, Factorial RBD 3/9, 10 x 7.2 m^2, 8 x 5.4 m^2, 250:115:115 kg N, P_2O_5, K_2O ha^{-1}, Date of planting-15/02/2011, Harvesting date: 22/01/2012 irrigated, medium black.

Treatment details:

A) Planting methods: 3

P_1 Conventional planting at 90 cm row spacing
P_2 Paired row planting at 30-150 cm row spacing
P_3 Paired cum trench planting at 30-150 cm row spacing

B) Irrigation schedule (IW/CPE ratio): 3

I_1 0.6
I_2 0.9
I_3 1.2

Results: This is third year of the experiment**.** The data on cane and CCS yields, growth observations and quality parameters are presented in Table 1 to 4.

Effect of planting methods:

Data presented in Table 1 revealed that the planting methods did not have significant influence on the cane and CCS yields. However, conventional planting at 90 cm row spacing recorded numerically higher cane and CCS yield (122.58 and 16.57 t ha^{-1}) than the rest of the planting methods.

Effect of Irrigation schedules (IW/CPE ratio):

The treatment IW/CPE ratio 1.2 (66.67 mm CPE) recorded significantly highest cane and CCS yield (122.96 and 16.90 t ha^{-1} respectively) than other irrigation schedules.

Effect of Interactions:

The interactions were found to be not significant.

Growth and yield attributes: The data are presented in Table 2.

Effect of planting methods:

The planting methods did not show significant effect on any of the growth parameters.

Effect of Irrigation schedules (IW/CPE ratio):

The 1.2 IW/CPE ratio recorded significantly higher germination (74.21 %), tillering ratio (1.93), millable height (272 cm), cane girth (10.8 cm), number of

millables canes (90022 ha^{-1}) and average cane weight (1.37 kg). However, it was at par with 0.9 IW/CPE ratio with respect to the germination (68.65%) and no. of millables canes (90374 ha^{-1}).

Effect of Interaction:-

The interactions between planting methods and irrigation schedules in respect of all the growth parameters were found to be non significant.

Quality Parameters:-

The data pertaining to juice quality parameters are presented in Table 3.

Effect of planting methods:

None of the juice quality parameters was significantly influenced by the planting methods.

Effect of Irrigation schedules (IW/CPE ratio):-

The sucrose content and CCS % were significantly influenced by the irrigation schedules. The 1.2 IW/CPE ratio recorded the highest sucrose content (19.21 %) and CCS (13.74%). However, it was at par with 0.9 IW/CPE ratio.

Effect of interaction:-

The interactions between planting methods and irrigation schedules were found to be non significant for all the juice quality parameters.

Water use efficiency and water saving:

From the data presented in Table 4, it could be revealed that the water use efficiency was maximum in conventional planting at 90 cm with 0.6 IW/CPE ratio (10.17 q/ha-cm).

The per cent water saving ranged from 12.40 to 39.83 % over 90 cm conventional planting with 1.2 IW/CPE ratio. The maximum saving was observed in paired row planting and paired cum trench planting at 30-150 cm row spacing with 0.6 IW/CPE ratio (39.83%). The extent of decrease in yield over 90 cm conventional planting with 1.2 IW/CPE ratio ranged from 8.69 to 29.78 %. Maximum decrease in yield (29.78%) was recorded in paired cum trench planting at 30-150 cm row spacing with 0.6 IW/CPE ratio.

Conclusion:-

Conventional planting at 90 cm row spacing recorded significantly highest cane and CCS yields (122.58and 16.57 t ha^{-1}). Irrigation at 1.2 IW/CPE ratio recorded significantly higher cane and CCS yields (122.96 and 16.90 t ha^{-1}). Conventional planting at 90 cm row spacing with 0.6 IW/CPE ratio recorded higher WUE (10.17 g/ha.cm). The maximum water saving was observed in paired row planting and paired cum trench planting at 30-150 cm row spacing with 0.6 IW/CPE ratio (39.83%).

Table 1. Mean cane and CCS yields as affected by various treatments

Treatments	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
A) Planting methods		
P_1-Conventional planting at 90 cm row spacing	122.58	16.57
P_2-Paired row planting at 30-150 cm	109.20	14.77
P3-Paired cum trench planting at 30-150 cm	106.57	14.42
SE+	**3.31**	**0.46**
C.D. at 5%	**NS**	**NS**
B) Irrigation schedules (IW/CPE ratio)		
I_1- 0.6 (133.33 mm CPE)	101.09	13.34
I_2- 0.9 (88.89 mm CPE)	114.30	15.52
I_3- 1.2 (66.67 mm CPE)	122.96	16.90
SE+	**1.93**	**0.25**
C.D. at 5%	**5.93**	**0.78**
C) Interaction		
SE+	**3.33**	**0.44**
C.D. at 5%	**NS**	**NS**
CV%	**5.12**	**4.95**
General mean	**112.78**	**15.25**

Table 2. Growth and yield attributes as affected by various treatments.

Treatments	Germ (%)	Tillering ratio	Height (cm)	Girth (cm)	No. of internodes $cane^{-1}$	Millable canes ($000ha^{-1}$)	Wt. $cane^{-1}$ (kg)
A) Planting methods							
P_1- Conventional planting at 90 cm	69.89	1.82	263	10.3	24	93087	1.32
P_2- Pair row planting (30-150 cm)	68.04	1.80	258	10.0	22	85170	1.28
P3- Pair cum trench planting (30-150cm)	65.82	1.71	254	9.9	21	84255	1.27
S.E.+	**0.50**	**0.03**	**2.30**	**0.11**	**0.57**	**3223**	**0.01**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
B) Irrigation schedules (IW/CPE ratio)							
I_1- 0.6 (133.33 mm CPE)	60.90	1.65	246	9.7	18	82112	1.23
I_2- 0.9 (88.89 mm CPE)	68.65	1.74	258	9.8	22	90374	1.27
I_3- 1.2 (66.67 mm CPE)	74.21	1.93	272	10.8	26	90022	1.37
S.E.+	**2.10**	**0.03**	**2.63**	**0.17**	**1.74**	**1762**	**0.02**
C.D. at 5%	**6.48**	**0.09**	**8.09**	**0.53**	**NS**	**5431**	**0.05**
C) Interaction							
S.E.+	**3.64**	**0.05**	**4.55**	**0.29**	**3.02**	**3052**	**0.03**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
General mean.	**67.97**	**1.77**	**259**	**10.1**	**22**	**87504**	**1.29**

Table 3. Quality parameters as affected by various treatments.

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
A) Planting methods				
P_1- Conventional planting at 90 cm	19.85	18.85	96.04	13.52
P_2- Pair row planting (30-150 cm)	19.73	18.85	94.98	13.49
P3- Pair cum trench planting (30-150cm)	19.61	18.83	95.48	13.51
S.E.±	**0.15**	**0.14**	**0.09**	**0.09**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
B) Irrigation schedules (IW/CPE ratio)				
I_1- 0.6 (133.33 mm CPE)	19.07	18.36	94.64	13.19
I_2- 0.9 (88.89 mm CPE)	19.84	18.96	95.49	13.58
I_3- 1.2 (66.67 mm CPE)	20.28	19.21	96.27	13.74
S.E.±	**0.14**	**0.09**	**0.49**	**0.08**
C.D. at 5%	**NS**	**0.29**	**NS**	**0.24**
C) Interaction				
S.E.±	**0.25**	**0.16**	**0.85**	**0.14**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General mean	**19.73**	**18.84**	**95.50**	**13.51**

Table 4. Total water applied and water use efficiency

Treatments	Yield (t ha^{-1})	No. of irrigations	Total water applied (cm)	Water use efficiency (q/ha cm)	% water saving over control	Yield increase/ decrease over control (%)
P_1 I_1	113.76	12	111.86	10.17	33.92	-15.74
P_1I_2	121.22	17	140.31	8.64	17.11	-8.69
P_1I_3	132.76	23	169.29	7.84	-	-
P_2I_1	96.28	12	101.86	9.45	39.83	-27.48
P_2I_2	111.27	17	125.31	8.93	25.98	-15.74
P_2I_3	119.76	23	148.29	8.08	12.40	-9.79
P_3I_1	93.22	12	101.86	9.15	39.83	-29.78
P_3I_2	109.81	17	125.31	8.76	25.98	-17.28
P_3I_3	116.67	23	148.29	7.87	12.40	-12.11

I) Including effective rainfall

1) 0.6 IW/CPE ratio =31.86 cm

2) 0.9 IW/CPE ratio = 30.31 cm

3) 1.2 IW/CPE ratio = 23.29 cm

II) Including common irrigation = 20 cm

Project No. : AS 62

Title 4: Management of binding weeds in sugarcane.
Objective: To control binding weeds/creepers in sugarcane.

Experimental details:
CSRS, Padegaon, RBD, 3/10, 10 x 6 m^2, 8 x 4 m^2, Variety- CoM-0265, Planting date: 05/01/2011, Harvesting date: 21/01/2012

Treatments: 10

T_1 Control (weedy check)

T_2 Hoeing at 30, 60 and 90 DAP

T_3 Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP

T_4 Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP

T_5 Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D @1 kg a.i./ha at 75 DAP

T_6 Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP

T_7 Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP

T_8 Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP

T_9 Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP

T_{10} Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP

Results : This is the third year trial. The data on weed count, weed dry weight, weed control efficiency, cane and CCS yields, growth observations, quality parameters and economics of different treatments are presented in Table 1 to 4.

Weed flora and weed control efficiency:

The major weeds observed in the experimental plot were *Cyperus rotundus, Cynadon dactylon, Parthenium hysterophorus, Commalina bengalensis, Echnochloa, virudus, Acalypha indica, Ipomea aquitica, Convolvulus arvensis, Euphorbia hyperccifolia, Panicum isachmi, Digitaria sanguinalis,* etc. Out of these, *Convolvulus arvensis and Ipomea aquitica* were the binding weeds.

The data on weed intensity, dry weight of weeds and weed control efficiency are presented in Table 1. The overall minimum weed count (16, 21, 30, 28 per m^2) and dry weight of weeds (13, 15, 23, 17 g per m^2) coupled with maximum weed control efficiency (74.5, 72.7, 68.9, 76.7 %) at 30, 60, 90 and 120 DAP respectively were observed in the treatment T_4 i.e. Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP. This was followed by T_6 i.e. Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP.

Effect of cane and CCS yields:

The data on cane and CCS yields are presented in Table 2. The treatment T_4 i.e. Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP recorded the highest cane and CCS (129.06 and 17.41 t/ha). However, it was at par with the treatment T_3 i.e. Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP with respect to cane yield (123.52 t/ha).

Growth and yield attributes:

The data regarding growth and yield attributes are presented in Table 3. The data revealed that Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP recorded significantly higher germination (76.26 %), tillering ratio (1.23), millable height (220 cm), cane girth (10.9 cm), millable canes (100070/ha) and weight per cane (1.29 kg). The number of internodes (27) were the highest in T_3 i.e. Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP**.**

Quality parameters:

The data regarding juice quality parameters are presented in Table 3.The data revealed that the treatment T_4 i.e. Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D@ 1 kg a.i./ha at 75 DAP recorded the highest brix (21.10), sucrose (19.19 %), purity (92.12%) and CCS (13.49 %).

Economics of various treatments:

The comparative economics of various weed management treatments is presented in Table 4. Significantly higher gross monetary returns (Rs. 2,38,761/ha) were obtained in the treatment T_4 i.e. Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP. However, it was at par with the treatment T_3 i.e. Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP (Rs. 2,28,512/ha). The treatment T_4 recorded the highest net profit (Rs. 97,935/ha) but was at par with T_3 and T_5. The treatment T_4 also recorded the highest B:C ratio (1.7) but was at par with T_3 (1.67) and T_5 (1.64).

Conclusion:

The management of binding weeds by Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP recorded maximum weed control efficiency (76.71%) with significantly higher cane and CCS yields (129.06 and 17.41 t/ha), gross monetary returns (Rs. 2,38,761/ha), net monetary returns (Rs. 97,935/ha) and the B:C ratio (1.70). The treatment T_3 i.e. Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP was the next superior.

Table 1. Weed intensity, dry weight of weeds and weed control efficiency as affected by various treatments

Treatments	30 DAP			60 DAP			90 DAP			120 DAP		
	Weed count	Weed dry wt. (g/m^2)	WCE (%)	Weed count	Weed dry wt. (g/m^2)	WCE (%)	Weed count	Weed dry wt. (g/m^2)	WCE (%)	Weed count	Weed dry wt. (g/m^2)	WCE (%)
T_1 – Control (weedy check)	59	51	-	73	55	-	79	74	-	77	73	-
T_2 – Hoeing at 30,60 and 90 DAP	26	17	66.66	32	16	70.90	46	30	59.45	42	27	63.01
T_3- Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP	21	17	66.66	35	16	70.90	44	29	60.81	43	25	65.75
T_4- Atrazine @ 2 kg a.i./ha after 1st irrigation and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP	16	13	74.50	21	15	72.72	30	23	68.91	28	17	76.71
T_5- Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D@ 1 kg a.i./ha at 75 DAP	20	18	64.70	27	17	69.09	41	30	59.45	37	28	61.64
T_6- Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	13	15	70.58	22	16	70.90	33	27	63.51	31	26	64.38
T_7- Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	22	13	62.74	29	20	63.63	42	28	62.16	38	27	63.01
T_8- Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP	25	21	58.82	31	23	58.18	46	31	58.10	40	29	60.27
T_9- Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	28	23	54.90	34	24	56.36	49	33	55.46	41	32	56.16
T_{10}- Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	30	24	52.91	35	27	50.90	52	34	54.05	43	30	58.90

Table 2. Mean cane and CCS yields as affected by various treatments

Treatment	**Cane yield (t/ha)**	**CCS yield (t/ha))**
T_1 – Control (weedy check)	87.24	11.21
T_2 – Hoeing at 30,60 and 90 DAP	120.14	15.69
T_3- Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP	123.52	15.96
T_4- Atrazine @ 2 kg a.i./ha after 1st irrigation and hoeing followed by 2,4-D@ 1 kg a.i./ha at 75 DAP	129.06	17.41
T_5- Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D @1 kg a.i./ha at 75 DAP	121.38	15.78
T_6- Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	114.49	15.28
T_7- Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	112.06	14.60
T_8- Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP	111.83	14.39
T_9- Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	110.37	14.25
T_{10}- Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	109.36	14.39
SE+	**2.51**	**0.35**
C.D at 5%	**7.37**	**1.03**
CV%	**3.78**	**4.04**
General Mean	**114.97**	**14.90**

Table 3. Growth, yield and juice quality attributes as affected by various treatments

Treatments	Germ. (%)	Tillering ratio	Height (cm)	Girth (cm)	No. of internodes	Millable canes (000 ha)	Av. cane wt. (kg)	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
T1 – Control (weedy check)	60.14	1.01	198	9.2	17	77.14	1.13	20.27	18.37	89.75	12.85
T_2 – Hoeing at 30,60 and 90 DAP	73.27	1.20	216	10.6	16	95.34	1.26	20.77	18.72	90.23	13.06
T_3- Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP	74.76	1.20	218	10.7	27	96.49	1.28	20.27	18.39	91.50	12.92
T_4- Atrazine @ 2 kg a.i./ha after 1st irrigation and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP	76.26	1.23	220	10.9	24	100.07	1.29	21.10	19.19	92.12	13.49
T_5- Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D @1 kg a.i./ha at 75 DAP	72.55	1.20	219	10.8	26	95.56	1.27	20.44	18.56	90.98	13.00
T_6- Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	71.13	1.18	214	10.6	24	92.34	1.24	20.77	19.09	90.47	13.35
T_7- Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	69.56	1.16	212	10.5	23	91.06	1.23	20.94	18.74	89.58	13.03
T_8- Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP	68.17	1.16	211	10.1	23	92.42	1.21	20.77	18.53	89.32	12.87
T_9- Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	67.12	1.15	211	10.0	21	92.26	1.20	20.77	18.57	89.44	12.91
T_{10}- Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	66.04	1.14	212	10.1	20	90.32	1.21	20.77	18.81	90.78	13.16
SE+	**3.15**	**0.03**	**3.29**	**0.17**	**2.46**	**5.88**	**0.02**	**0.21**	**0.14**	**1.35**	**0.17**
C.D at 5%	**9.27**	**0.10**	**9.69**	**0.51**	**7.24**	**17.30**	**0.07**	**0.61**	**0.42**	**4.02**	**0.51**
General Mean	**70.73**	**1.17**	**214**	**10.43**	**24**	**92.55**	**1.24**	**20.67**	**18.69**	**90.49**	**13.07**

Table 4. Economics of various treatments

Treatments	Cane yield (t ha^{-1})	Gross monetary returns (Rs. ha^{-1})	Expdt. (Rs. ha^{-1})	Net profit (Rs. ha^{-1})	B:C ratio
T_1 – Control (weedy check)	87.24	161394	122848	38546	1.31
T_2 – Hoeing at 30,60 and 90 DAP	120.14	222259	140421	81838	1.58
T_3- Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP	123.52	228512	136635	91877	1.67
T_4- Atrazine @ 2 kg a.i./ha after 1st irrigation and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP	129.06	238761	140826	97935	1.70
T_5- Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D @ 1 kg a.i./ha at 75 DAP	121.38	224553	137077	87476	1.64
T_6- Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	114.49	211806	134017	77788	1.58
T_7- Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	112.06	207311	134371	72940	1.54
T_8- Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP	111.83	206885	133127	73758	1.55
T_9- Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	110.37	204185	132940	71245	1.54
T_{10}- Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	109.36	202316	133730	68586	1.51
SE ±	**2.51**	**4636**	**-**	**4636**	**0.03**
C.D at . 5%	**7.37**	**13635**	**-**	**13635**	**0.10**
General Mean	**114.97**	**212685**	**-**	**77769**	**1.57**

Project No. AS – 42

Title 5: Plant geometry in relation to mechanization in sugarcane.

Objectives: 1. To workout optimum plant geometry for use of farm machinery.
2. To study varietal response to different planting geometry.

Experimental Details:

CSRS, Padegaon, Split plot, 3/16, 250:115:115 kg N, P_2O_5, K_2O ha^{-1}, Date of planting-11/03/2011, Harvesting date: 14/02/2012, irrigated, medium black

Treatment details :

C) Main plot treatments –-5 inter-row spacings

P_1 100 cm row distance

P_2 120 cm row distance

P_3 150 cm row distance

P_4 30 x 150 cm row distance

B) Sub plot treatments – Genotypes -4

V_1 CoM 0265
V_2 Co 86032
V_3 Co 94012
V_4 CoC 671

Results:

This is the first year of the experiment**.** The data on cane and CCS yields, growth observations and quality parameters are presented in Table 1 to 3.

Effect of planting geometry:

Data presented in Table 1 revealed that the row spacing of 120 cm recorded the highest cane (120.43 t ha^{-1}) and CCS yield (16.79 t ha^{-1}). However, it was at par with the row spacing of 100 cm for both cane (118.28 t ha^{-1}) and CCS yields (16.64 t ha^{-1}).

Effect of genotypes:

The effect of genotypes on the cane and CCS yields was significant. Significantly highest cane (134.73 t ha^{-1}) and CCS (18.51 t ha^{-1}) yields were recorded with the variety, CoM 0265. It was followed by Co 86032 (119.70 and 16.60 t ha^{-1}).

Effect of interactions:

The interactions between planting geometry and the genotypes in respect of cane and CCS yields were found to be non significant.

Growth and yield attributes:

The data regarding growth and yield attributes are presented in Table 2.

Effect of planting geometry:

The effect of row spacing was significant only on the millable height, cane girth and no. of millable canes (Table 2). The row spacing of 150 cm recorded the highest millable height (297 cm) but it was at par with 120 cm and 100 cm row spacings. A similar trend was noticed for the cane girth (10.3 cm) while 100 cm and 120 cm row spacings were significantly superior to the others for the no.of millable canes ha^{-1}.

Effect of Genotypes:

The effect of genotypes was significant on all the growth parameters except germination percentage and no.of internodes. The genotype CoM 0265 registered significantly higher tillering ratio(1.78), millable height (308 cm), cane girth (10.8 cm), NMC (93790 ha^{-1}) and the average cane weight (1.44 kg $cane^{-1}$). Co 86032 was the next superior genotype in respect of all the growth attributes.

Effect of interactions:

The interactions between the planting geometry and genotypes was found to be non significant for all the growth parameters.

Quality parameters:

The data pertaining to juice quality parameters are presented in Table 3.

Effect of planting geometry:

The effect of planting geometry on juice quality parameters was found to be not significant.

Effect of Genotypes:

The genotype CoC 671 recorded significantly higher brix (22.19), sucrose (20.50%) and CCS (14.49%) than the other genotypes.

Effect of interactions:

There were no significant interactions among the planting geometries and the genotypes for different juice quality parameters.

Conclusion:

The row spacing of 120 cm recorded the highest cane (120.43 t ha^{-1}) and CCS yield (16.79 t ha^{-1}). However, it was at par with the row spacing of 100 cm for both cane (118.28 t ha^{-1}) and CCS yields (16.64 t ha^{-1}). Significantly highest cane (134.73 t ha^{-1}) and CCS (18.51 t ha^{-1}) yields were recorded in the genotype CoM 0265 followed by Co 86032 (119.70 and 16.60 t ha^{-1}). CoC 671 was found to be the most superior with respect to juice quality.

Table1. Mean cane and CCS yield as affected by various treatments

Treatments	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
A) Planting geometry		
P_1 100 cm row distance	118.28	16.64
P_2 120 cm row distance	120.43	16.79
P_3 150 cm row distance	109.97	15.33
P_4 30 x 150 cm row distance	107.33	14.86
SE+	**1.87**	**0.29**
C.D at 5%	**6.48**	**1.01**
B) Genotypes		
V_1 CoM 0265	134.73	18.51
V_2 Co 86032	119.70	16.60
V_3 Co 94012	102.67	14.17
V_4 CoC 671	98.90	14.33
SE+	**2.13**	**0.31**
C.D at 5%	**6.21**	**0.89**
C) Interaction		
SE+	**4.26**	**0.61**
C.D at 5%	**NS**	**NS**
General mean	**113.99**	**15.90**

Table 2. Growth and yield attributes as affected by various treatments.

Treatments	Germ. (%)	Tillering ratio	Height (cm)	Girth (cm)	No. of internodes cane^{-1}	Millable canes (000ha^{-1})	Wt. cane^{-1} (kg)
A) Planting geometry							
P_1 100 cm row distance	73.50	1.64	294	10.2	25	86.79	1.36
P_2 120 cm row distance	72.98	1.64	293	10.3	25	88.70	1.35
P_3 150 cm row distance	71.93	1.66	297	10.3	26	79.99	1.37
P_4 30 x 150 cm row distance	70.20	1.54	279	9.6	23	82.84	1.30
S.E.+	**0.93**	**0.02**	**1.85**	**0.09**	**1.56**	**1.148**	**0.01**
C.D. at 5%	**NS**	**NS**	**6.40**	**0.32**	**NS**	**3.976**	**NS**
B) Genotypes							
V_1 CoM 0265	73.95	1.78	308	10.8	28	93.79	1.44
V_2 Co 86032	73.25	1.72	298	10.3	26	86.79	1.38
V_3 Co 94012	71.53	1.54	283	9.9	24	79.65	1.29
V_4 CoC 671	69.88	1.45	273	9.3	22	78.09	1.27
S.E.+	**1.70**	**0.02**	**2.11**	**0.16**	**1.19**	**1.558**	**0.01**
C.D. at 5%	**NS**	**0.07**	**6.15**	**0.48**	**NS**	**4.548**	**0.04**
C) Interaction							
S.E.+	**3.40**	**0.04**	**4.21**	**0.33**	**2.39**	**3116**	**0.03**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
General mean	**72.15**	**1.62**	**290**	**10.1**	**25**	**84.58**	**1.34**

Table 3. Quality parameters as affected by various treatments.

Treatments	Brix(c)	Sucrose (%)	Purity(%)	CCS (%)
A) Planting geometry				
P_1 100 cm row distance	21.56	19.94	92.48	14.08
P_2 120 cm row distance	21.65	19.85	91.72	13.97
P_3 150 cm row distance	21.48	19.79	92.34	13.96
P_4 30 x 150 cm row distance	21.31	19.65	92.25	13.86
S.E.+	**0.15**	**0.07**	**0.40**	**2.04**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
B) Genotypes				
V_1 CoM 0265	20.98	19.43	92.65	13.73
V_2 Co 86032	21.44	19.69	91.86	13.87
V_3 Co 94012	21.40	19.61	91.67	13.79
V_4 CoC 671	22.19	20.50	92.61	14.49
S.E.+	**0.13**	**0.09**	**0.27**	**0.07**
C.D. at 5%	**0.38**	**0.28**	**NS**	**0.20**
C) Interaction				
S.E.+	**0.26**	**0.19**	**0.55**	**0.14**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General mean	**21.50**	**19.81**	**92.20**	**13.97**

Completed experiment No.1. (Project No. : AS 61)

Title : Optimizing irrigation scheduling in sugarcane under different planting methods.

Objective: To enhance water and crop productivity in sugarcane.

Experiment Details:-

CSRS, Padegaon, Factorial RBD 3/9, 10 x 7.2 m^2, 8 x 5.4 m^2, CoM 0265, 250:115:115 kg N, P_2O_5, K_2O ha^{-1}, Date of planting-27/02/2009, 21/03/2010 & 15/02/2011 Harvesting date: 24/02/2010, 23/03/2011 & 22/01/2012 irrigated, medium black.

Treatment details:

A) Planting methods: 3

P_1 Conventional planting at 90 cm row spacing

P_2 Paired row planting at 30-150 cm row spacing

P_3 Paired cum trench planting at 30-150 cm row spacing

B) Irrigation schedule (IW/CPE ratio): 3

I_1 0.6

I_2 0.9

I_3 1.2

Results:

The pooled data on cane and CCS yields, growth observations and quality parameters are presented in Table 1 to 4.

Effect of planting methods:-

Data presented in Table 1 revealed that the method of conventional planting at 90 cm row spacing recorded significantly higher cane and CCS yield (122.88 and 16.62 t ha^{-1}) than the rest of the planting methods.

Effect of Irrigation schedules (IW/CPE ratio):-

The treatment IW/CPE ratio 1.2 recorded significantly highest cane and CCS yield (121.86 and 16.75 t ha^{-1}) than other irrigation schedules.

Effect of Interaction:-

Effect of interactions between planting methods and irrigation schedules were found to be non-significant for both cane and CCS yields.

Growth and yield attributes:-

The data regarding growth and yield attributes are presented in Table 2.

Effect of planting methods:-

The data presented in Table 2 revealed that the conventional planting at 90 cm row spacing recorded significantly higher germination (67.96%) and millable height (260cm) than the other treatments. The planting methods did not have significant effect on other parameters.

Effect of Irrigation schedules (IW/CPE ratio):

All the parameters except no. of internodes and average cane weight were significantly affected. The 1.2 IW/CPE ratio recorded significantly higher germination (71.71 %), tillering ratio (1.88), millable height (268 cm), cane girth (10.6 cm) and millables canes (88580/ha). However, it was at par with 0.9 IW/CPE ratio in respect of no. of millable canes.

Effect of Interaction:-

The effect of interaction between planting methods and irrigation schedule was found to be non significant for all the growth and yield parameters.

Quality Parameters:-

The data pertaining to juice quality parameters are presented in Table 3.

Effect of planting methods:

None of the quality parameters was significantly influenced by the planting methods.

Effect of Irrigation schedules (IW/CPE ratio):-

The 1.2 IW/CPE ratio recorded significantly higher brix (19.92), sucrose (18.91 %), purity (96.16 %) and CCS (13.53 %). However, it was at par with 0.9 IW/CPE ratio for purity (95.68%) and CCS (13.56%).

Effect of interaction:-

Effect of interaction between planting methods and irrigation schedules were found to be non significant for all the parameters.

Water use efficiency and water saving:

From the data presented in Table 4, it could be revealed that the average water use efficiency was maximum in conventional planting at 90 cm with 0.6 IW/CPE ratio (10.00 q/ha-cm).

The per cent water saving ranged from 14.60 to 38.55% over conventional planting at 90 cm row spacing with 1.2 IW/CPE ratio. The maximum saving was observed in paired row planting and paired cum trench planting at 30-150 cm row spacing with 0.6 IW/CPE ratio (38.39%) & (38.55%) The extent of decrease in yield over 90 cm conventional planting with 1.2 IW/CPE ratio ranged from 5.97 to 27.05 %. Maximum decrease in yield (26.01 %) was recorded in paired cum trench planting at 30-150 cm row spacing with 0.6 IW/CPE ratio.

Conclusion:-

Conventional planting at 90 cm row spacing recorded significantly highest cane and CCS yields (122.88 and 16.62 t ha^{-1}). Irrigation at 1.2 IW/CPE ratio recorded significantly higher cane and CCS yields (121.86 and 16.75 t ha^{-1}). Conventional planting at 90 cm row spacing with 0.6 IW/CPE ratio recorded higher WUE (10.00 g/ha.cm). The maximum water saving was observed in paired row planting and paired cum trench planting at 30-150 cm row spacing with 0.6 IW/CPE ratio (38.39%) & (38.55%).

Recommendation:-

The planting of sugarcane variety CoM 0265 in *suru* season at 90 cm row spacing with irrigation at 1.2 IW/CPE ratio (66.67 mm CPE) is recommended for Western Maharashtra to get higher cane and CCS yield with higher water use efficiency.

Table 1. Mean cane and CCS yields as affected by various treatments (Pooled data: 2009-12)

Treatments	Cane yield (t ha^{-1})				CCS yield (t ha^{-1})			
	09-10	10-11	11-12	Pooled mean	09-10	10-11	11-12	Pooled mean
A) Planting methods								
P_1-Conventional planting at 90 cm row spacing	124.27	121.79	122.58	122.88	16.8.3	16.47	16.57	16.62
P_2-Paired row planting at 30-150 cm spacing	109.35	108.99	109.20	109.18	14.79	14.70	14.77	14.75
P_2-Paired cum trench planting at 30-150 cm spacing	106.11	105.50	106.57	106.06	14.34	14.27	14.42	14.34
S.E.±	2.28	2.26	3.33	1.30	0.32	0.30	0.46	0.16
C.D. at 5%	6.83	6.76	NS	3.89	0.96	0.91	NS	0.49
B) Irrigation schedules (IW/CPE ratio)								
I_1- 0.6 (133.33 mm CPE)	104.18	102.27	101.09	102.51	13.74	13.54	13.34	13.54
I_2- 0.9 (88.89 mm CPE)	113.82	113.12	114.30	113.75	15.42	15.33	15.52	15.42
I_3- 1.2 (66.67 mm CPE)	121.73	120.89	122.96	121.86	16.79	16.58	16.90	16.75
S.E.±	2.78	2.26	1.93	1.30	0.32	0.30	0.25	0.16
C.D. at 5%	6.83	6.76	5.93	3.89	0.96	0.91	0.78	0.49
C) Interaction								
SE ±	3.95	3.91	3.33	2.25	0.55	0.53	0.44	0.28
C.D at . 5%	NS	NS	NS	NS	NS	NS	NS	NS
C V	6.04	6.14	5.12	3.46	6.28	6.02	4.95	3.24
General Mean	**133.24**	**112.09**	**112.78**	**112.70**	**15.32**	**15.15**	**15.25**	**15.23**

Table 2. Growth and yield attributes as affected by various treatments (Pooled data: 2009-12)

Treatments	Germ. (%)	Tillering ratio	Height (cm)	Girth (cm)	No . of internodes cane^{-1}	Millable canes (000/ha)	Wt./cane (kg)
A) Planting methods							
P_1-Conventional planting at 90 cm row spacing	67.96	1.78	260	10.2	22	90.17	1.43
P_2-Paired row planting at30-150 cm spacing	65.83	1.74	257	10.0	21	85.18	1.32
P_2-Paired cum trench planting at 30-150 cm spacing	63.41	1.68	254	9.9	20	84.93	1.34
S.E.±	1.55	0.01	2.06	0.13	1.06	801	0.01
C.D. at 5%	4.65	0.04	6.19	0.39	3.17	2403	0.04
B) Irrigation schedules (IW/CPE ratio)							
I_1- 0.6 (133.33 mm CPE)	60.12	1.59	247	9.6	19	83.37	1.23
I_2- 0.9 (88.89 mm CPE)	65.37	1.72	255	9.8	21	88.33	1.29
I_3- 1.2 (66.67 mm CPE)	71.71	1.88	268	10.6	22	88.58	1.38
S.E.±	1.55	0.01	2.06	0.13	1.06	801	0.01
C.D. at 5%	4.65	0.04	6.19	0.39	3.17	2403	0.04
C) Interaction							
S.E.±	2.68	0.02	3.58	0.23	1.83	1389	0.02
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS
General mean.	**65.73**	**1.73**	**257**	**10.0**	**21**	**86.76**	**1.30**

Table 3. Quality parameters as affected by various treatments (Pooled data: 2009-12)

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
A) Planting methods				
P_1-Conventional planting at 90 cm row spacing	19.92	18.91	96.16	13.53
P_2-Paired row planting at30-150 cm spacing	19.76	18.78	95.37	13.52
P_2-Paired cum trench planting at 30-150 cm spacing	19.64	18.83	95.12	13.51
S.E.±	0.14	0.09	0.33	0.07
C.D. at 5%	NS	NS	NS	NS
B) Irrigation schedules (IW/CPE ratio)				
I_1- 0.6 (133.33 mm CPE)	19.11	18.39	94.61	13.25
I_2- 0.9 (88.89 mm CPE)	19.78	18.86	95.68	13.56
I_3- 1.2 (66.67 mm CPE)	20.43	19.27	96.36	13.75
S.E.±	0.14	0.09	0.33	0.07
C.D. at 5%	0.42	0.28	1.00	0.20
C) Interaction				
S.E.±	0.24	0.16	0.58	0.11
C.D. at 5%	NS	NS	NS	NS
General mean	**19.77**	**18.84**	**95.55**	**13.52**

Table 4. Total water applied and water use efficiency (Pooled data: 2009-12)

Treatments	Yield (t ha^{-1})	No. of irrigations	Total water applied (cm)	Water use efficiency (q/ha.cm)	% water saving over control	Yield increase or decrease over control (%)
$P_1 I_1$	113.73	11	113.63	10.00	32.79	-13.43
P_1I_2	123.54	16	139.65	08.84	17.40	-05.97
P_1I_3	131.37	23	169.05	07.77	-	-
P_2I_1	98.48	11	104.16	09.45	38.39	-25.04
P_2I_2	109.57	16	124.65	08.79	26.46	-16.60
P_2I_3	119.39	23	144.38	08.26	14.82	-09.12
P_3I_1	95.32	11	104.16	09.15	38.55	-27.45
P_3I_2	107.93	16	124.65	08.65	26.46	-17.85
P_3I_3	114.92	23	144.38	07.95	14.60	-12.53

I) Including effective rainfall

1) 0.6 IW/CPE ratio =40.83 cm

2) 0.9 IW/CPE ratio = 35.65 cm

3) 1.2 IW/CPE ratio = 27.05 cm

II) Including common irrigation (Av.) = 20 cm

Completed experiment No.2. (Project No. : AS 62)

Title : Management of binding weeds in Sugarcane.

Objective : To control binding weeds /creepers in sugarcane.

Experimental details :

CSRS, Padegaon, RBD, 3/10, 10 x 6 m^2, 8 x 4 m^2, Variety- CoM-0265, Planting date: 27/02/2009, 15/03/2010 & 05/01/2011 Harvesting date: 24/02/2010, 24/03/2011 & 21/01/2012

Treatments – 10

T_1 Control (weedy check)

T_2 Hoeing at 30, 60 and 90 DAP

T_3 Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP

T_4 Atrazine @ 2 kg a.i./ha after 1^{st} irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP

T_5 Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D @1 kg a.i./ha at 75 DAP

T_6 Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP

T_7 Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP

T_8 Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP

T_9 Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP

T_{10} Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP

Results :

The pooled data on weed count, weed dry weight, weed control efficiency cane and CCS yields, growth observations, quality parameters and economics of different treatments are presented in Table 1 to 5.

Weed flora and weed control efficiency:

The major weeds observed in the experimental plot were *Cyperus rotundus, Cynadon dactylon, Parthenium hysterophorus, Commalina bengalensis, Echnochloa, virudus, Acalypha indica, Ipomea aquitica, Convolvulus arvensis, Euphorbia hyperccifolia, Panicum isachmi, Digitaria sanguinalis,* etc. Out of these, *Convolvulus arvensis and Ipomea aquitica* were the binding weeds.

The data on weed intensity, dry weight of weeds and weed control efficiency are presented in Table 1. The overall minimum weed count (16, 20, 31, 40 per m^2) and dry weight of weeds (8, 12, 23, 19 g per m^2) coupled with maximum weed control efficiency (85.2, 82.6, 70.1, 75.0 %) at 30, 60, 90 and 120 DAP respectively were observed in the treatment T_4 i.e. Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP. This was followed by T_6 i.e. Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP.

Effect of cane and CCS yields :

The pooled data on cane and CCS yields are presented in Table 2. The treatment T_4 i.e. Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP recorded significantly highest cane and CCS yield (124.90 and 17.04 t/ha). It was followed by the treatment T_3 i.e. Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP (120.06 t cane and 16.05 t CCS/ha).

Growth and yield attributes :

The data regarding growth and yield attributes are presented in Table 3. The data revealed that T_4 i.e. Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP recorded significantly higher germination (74.94 %), tillering ratio (1.21), millable height (212 cm), cane girth (10.9 cm), number of internodes (25/cane), millable canes (97,282/ha) and weight per cane (1.27 kg). However, it was at par with T_3 (72.27 %), T_5 (72.11 %) and T_6 (70.96 %) for germination, T_3 (1.17), T_5 (1.18), T_6 (1.17) and T_5 (1.15) for tillering ratio, T_3 (10.6 cm) and T_5 (10.6 cm) for cane girth, T_5 and T_6 (25) for number of internodes/cane, T_3 (94,088/ha) for number of millable canes and T_2 (1.25 kg) and T_3 (1.23 kg) for the average cane weight.

Quality parameters:

The data regarding juice quality parameters are presented in Table 4.The data revealed that the treatment T_4 i.e. Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D@ 1 kg a.i./ha at 75 DAP recorded significantly higher brix (21.33), sucrose (19.44 %), purity (92.20%) and CCS (13.60 %). However, it was at par with T_2 and T_3 for brix, T_2 T_5 and T_7 for sucrose, T_2 and T_5 for purity .

Economics of various treatments:

The pooled comparative economics of various weed management treatments is presented in Table 5. Significantly higher gross monetary returns (Rs. 2,41,438/ha) were obtained in the treatment T_4 i.e. Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP. It was followed by T_3 i.e. Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP (Rs. 2,32,076/ha). The treatment T_4 recorded the highest net profit (Rs. 1,13,469/ha). The treatment T_4 also recorded the highest B:C ratio (1.89) but was at par with T_3 (1.83) .

Conclusion:

The management of binding weeds by Atrazine @ 2 kg a.i./ha after 1st irrigation (PE) and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP recorded maximum weed control efficiency (75 to 85 %) with significantly higher cane and CCS yields (124.90 and 17.04 t/ha), gross monetary returns (Rs. 2,41,438/ha), net monetary returns (Rs. 1,13,469/ha) and the B:C ratio (1.89). The treatments, T_3 and T_5 were the next economical ones.

RECOMMENDATION

Application of atrazine @ 2 kg a.i./ha as a pre-emergence spray after planting, hoeing at 30 days after planting and post-emergence spray of 2,4-D @ 1 kg a.i./ha at 75 days after planting is recommended for management of binding weeds in *suru* sugarcane.

Table 1. Weed intensity, weed dry weight and weed control efficiency as influenced by various treatments (Pooled data- 3 plant canes + 1 ratoon)

Treatments	30 DAP			60 DAP			90 DAP			120 DAP		
	Weed count	Weed dry wt. (g/m^2)	WCE (%)	Weed count	Weed dry wt. (g/m^2)	WCE (%)	Weed count	Weed dry wt. (g/m^2)	WCE (%)	Weed count	Weed dry wt. (g/m^2)	WCE (%)
T_1 – Control (weedy check)	63	54	-	72	69	-	85	77	-	81	76	-
T_2 – Hoeing at 30,60 and 90 DAP	29	18	66.66	34	18	73.91	47	31	59.74	44	29	61.84
T_3- Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP	23	17	68.51	31	14	79.71	42	31	59.74	40	28	63.15
T_4- Atrazine @ 2 kg a.i./ha after 1st irrigation and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP	16	08	85.18	20	12	82.60	31	23	70.12	29	19	75.00
T_5- Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D@ 1 kg a.i./ha at 75 DAP	22	16	70.37	27	16	76.81	40	30	61.03	38	28	63.15
T_6- Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	16	14	74.07	22	16	76.81	34	27	64.93	31	26	65.78
T_7- Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	24	18	66.66	30	20	71.01	43	29	62.33	40	28	63.15
T_8- Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP	26	19	64.81	32	23	66.66	44	32	58.44	41	30	60.52
T_9- Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	27	21	61.11	33	24	65.21	46	34	55.84	42	32	57.89
T_{10}- Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	29	22	59.25	34	26	62.31	48	35	54.54	44	32	57.89

Table 2. Mean cane and CCS yields as affected by various treatments (Pooled data- 3 plant canes + 1 ratoon)

Treatments	Cane yield (t/ha)				CCS yield (t/ha)			
	2009-10	**2010-11**	**2011-12**	**Pooled mean**	**2009-10**	**2010-11**	**2011-12**	**Pooled mean**
T_1 – Control (weedy check)	88.12	88.27	87.24	87.87	11.83	12.12	11.21	11.72
T_2 – Hoeing at 30,60 and 90 DAP	106.68	118.60	120.14	115.14	13.58	16.21	15.69	15.16
T_3- Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP	115.06	121.60	123.52	120.06	15.52	16.69	15.96	16.05
T_4- Atrazine @ 2 kg a.i./ha after 1st irrigation and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP	120.31	125.34	129.06	124.90	16.49	17.22	17.41	17.04
T_5- Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D@ 1 kg a.i./ha at 75 DAP	116.56	119.96	121.38	119.30	16.01	16.57	15.78	16.12
T_6- Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	117.50	112.49	114.49	114.82	16.09	16.11	15.28	15.82
T_7- Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	112.18	116.05	112.06	113.43	14.98	15.26	14.60	14.94
T_8- Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP	108.77	110.38	111.83	110.32	14.29	14.95	14.39	1954
T_9- Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	109.53	103.26	110.37	107.72	14.17	14.28	14.25	14.23
T_{10}- Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	104.03	114.27	109.36	109.22	13.31	15.72	14.39	14.47
SE ±	**2.50**	**2.33**	**2.51**	**1.58**	**0.33**	**0.36**	**0.35**	**0.26**
C.D at 5%	**7.43**	**6.86**	**7.37**	**4.64**	**1.00**	**1.05**	**1.03**	**0.77**
C V	**4.39**	**3.53**	**3.78**	**2.48**	**4.46**	**3.92**	**4.04**	**3.02**
General Mean	**109.77**	**114.27**	**114.97**	**112.27**	**14.55**	**15.72**	**14.90**	**15.00**

Table 3. Growth and yield attributes as affected by various treatments

Treatments	**Germination (%)**	**Tillering ratio**	**Height (cm)**	**Cane girth (cm)**	**No. of internodes**	**Millable canes (000 ha)**	**Av. cane wt. (kg)**
T_1 – Control (weedy check)	59.47	1.00	190	9.3	18	76.95	1.10
T_2 – Hoeing at 30,60 and 90 DAP	69.37	1.12	204	10.2	23	88.90	1.22
T_3- Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP	73.27	1.17	209	10.6	25	94.09	1.25
T_4- Atrazine @ 2 kg a.i./ha after 1st irrigation and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP	74.94	1.21	212	10.9	25	97.28	1.27
T_5- Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D@ 1 kg a.i./ha at 75 DAP	72.11	1.18	210	10.5	24	92.35	1.25
T_6- Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	70.96	1.17	208	10.4	23	92.22	1.22
T_7- Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	69.26	1.15	205	10.4	22	90.59	1.22
T_8- Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP	68.29	1.13	204	10.0	22	91.32	1.20
T_9- Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	66.66	1.11	202	9.9	21	88.68	1.20
T_{10}- Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	65.85	1.10	202	9.8	20	85.87	1.20
SE+	**1.40**	**0.02**	**1.60**	**0.09**	**1.08**	**1127**	**0.01**
C.D at 5%	**4.12**	**0.06**	**4.71**	**0.26**	**3.16**	**3314**	**0.03**
General Mean	**69.71**	**1.14**	**205**	**10.3**	**23**	**90.46**	**1.22**

Table 4. Quality parameters as affected by various treatments

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
T_1 – Control (weedy check)	20.44	21.02	90.51	13.46
T_2 – Hoeing at 30,60 and 90 DAP	20.77	19.18	92.42	13.54
T_3- Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP	20.83	19.10	91.99	13.48
T_4- Atrazine @ 2 kg a.i./ha after 1st irrigation and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP	21.33	19.44	94.20	13.60
T_5- Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D@ 1 kg a.i./ha at 75 DAP	20.21	19.16	93.16	13.51
T_6- Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	20.71	19.10	90.63	13.54
T_7- Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	21.49	19.34	93.76	13.60
T_8- Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP	20.66	19.18	92.61	13.51
T_9- Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	20.32	19.03	92.70	13.51
T_{10}- Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	20.66	19.21	93.13	13.61
SE+	**0.19**	**0.09**	**0.66**	**0.08**
C.D at 5%	**0.56**	**0.28**	**1.96**	**0.23**
General Mean	**20.80**	**19.19**	**92.41**	**13.53**

Table 5. Economics of various treatments

Treatments	Cane yield (t/ha)	Gross monetary returns (Rs/ha)	Expdt. (Rs/ha)	Net profit (Rs/ha)	B:C ratio
T_1 – Control (weedy check)	87.87	169866	116623	53242	1.46
T_2 – Hoeing at 30,60 and 90 DAP	115.14	222566	127380	95185	1.75
T_3- Atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D (1 kg a.i./ha) at 60 DAP	120.06	232076	125909	76167	1.49
T_4- Atrazine @ 2 kg a.i./ha after 1st irrigation and hoeing followed by 2,4-D @ 1 kg a.i./ha at 75 DAP	124.90	241438	127969	113469	1.89
T_5- Metribuzine @1.25 kg a.i./ha (PE) followed by 2,4-D@ 1 kg a.i./ha at 75 DAP	119.30	230607	126056	104550	1.83
T_6- Atrazine @ 2 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	114.82	221960	124816	97143	1.78
T_7- Metribuzine @1.25 kg a.i./ha (PE) + Almix 20 g/ha at 75 DAP	113.43	219260	125568	93692	1.75
T_8- Atrazine @ 2 kg a.i./ha (PE) + Ethoxysulfuron 50 g a.i./ha at 75 DAP	110.32	213261	123479	89782	1.73
T_9- Atrazine @ 2 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	107.72	208233	124567	83655	1.67
T_{10}- Metribuzine @1.25 kg a.i./ha (PE) + Dicamba 350 g a.i./ha at 75 DAP	109.22	211122	125464	85658	1.68
SE ±	**1.58**	**2839**	**-**	**2839**	**0.02**
C.D at . 5%	**4.64**	**8350**	**-**	**8350**	**0.06**
General Mean	**112.27**	**218879**	**-**	**90404**	**1.71**

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Technical Programme

Agronomy & Soil Science(AICRP): 2012-13

Sr. No	Name of experiment
1.	AS 42: Agronomic evaluation of promising sugarcane genotypes . (Autumn planting)
2.	AS 42:Agronomic evaluation of promising sugarcane genotypes . (Spring planting)
3.	AS 63 Plant geometry in relation to Mechanization of sugarcane.
4.	AS-64: Response of sugarcane crop to different plant nutrients in varied agro-ecological situations.
5.	AS-65: Enhancing sugarcane productivity and profitability under wheat-sugarcane cropping system
6.	AS 66: Priming of cane node for accelerating germination