SUGARCANE AGRONOMY

A) On going Experiments

Project No. AS – 42

Title: Agronomic evaluation of promising sugarcane genotypes (Spring Early)

Objective:
1) To find out the suitable sugarcane genotypes for early spring planting.
2 To find out suitable sugarcane genotypes for highest cane and CCS yield.
3) To find out the suitable fertilizer dose for promising sugarcane genotypes.
4) To find out suitable interaction of promising sugarcane genotypes and fertilizer dose for highest cane and CCS Yield.

Experimental Details:

Place	: CSRS, Padegaon,
Design	: Split plot
Replication	: 3
Plot Size: Gross	: 10 x 6 m^2,
Net	: 08 x 4 m^2,
Fertilizer dose	: 250:115:115 kg N, P_2O_5, K_2O ha^{-1},
Date of planting	: 07.01.2015
Date of harvesting	: 30.01.2016
Soil Status	: Irrigated, Medium black soil.

Treatment details:

No. of Main Treatments: 05

V_1 : Co 09004

V_2 : MS 10001

V_3 : Co 09007

V_4 : CoN 09072

V_5 : CoC 671

No. of Sub Treatments : 03

F_1 - 75% RD of N

F_2 - 100% RD of N

F_3 - 125% RD of N

Results:

The data on first year trial for cane and CCS yields, growth observations and quality parameters are presented in Table 1 to 5.

Effect of genotypes:

Data presented in Table 1 revealed that the genotype Co 09007 recorded the highest cane yield (166.56 t ha^{-1}) and it was at par with Co 09004. Significantly the highest CCS yield (25.06 t ha^{-1}) was recorded by Co 09004 followed by Co 09007.

Effect of nitrogen levels:

The nitrogen levels had a non significant effect on CCS yield. While significantly the highest cane yield (162.55 t ha^{-1}) was recorded with the application of 125% recommended dose of nitrogen followed by 100% N.

Growth and yield attributes:

The data regarding growth and yield attributes are presented in Table 2 (a) and 2 (b).

Effect of genotypes:

The data presented in Table 2 the revealed that genotype Co 09007 recorded significantly the highest germination (62.17 %, 61.23%, and 60.50%) at 63 DAP, 77 DAP and 91 DAP, respectively. and tillering ratio (1.41, 1.61, 1.79, 1.94 and 2.15) at 8^{th} week, 12^{th} week, 16^{th} week, 20^{th} week and 24^{th} week after planting, respectively. At 20^{th} and 24^{th} week tillering ratio was found at par with MS 10001.

The genotype Co 09007 recorded significantly the highest average cane weight (1.68 kg) and millable cane (99722). However, it was found at par with Co 09004 (1.65 kg) and CoC 671 (1.62 kg) with respect to cane weight and MS 10001 (99306), Co 09004 (99230) and CoC 671 (99152), with respect to millable cane, respectively. The tillering ratio, number of internodes, girth per cane (cm) and millable height were found to be non significant.

Effect of nitrogen levels:

The effect of nitrogen levels on germination, tillering ratio and no. of internodes was found to be non significant while, it was significant for the cane girth, millable cane, millable height and average cane weight. Application of 125% recommended dose of nitrogen recorded the highest cane girth (8.77 kg, 9.73 kg and 10.75 kg) at 11 month, 12 month and harvest, respectively and found at par with 100% RDN, millable height (252.90cm, 257.43cm, and 262.40cm), at 11 month, 12 month and harvest, respectively. It also recorded significantly higher average cane weight (1.63 kg $cane^{-1}$) and millable cane (99481). The application of 100 % recommended N was found at par with 125 % recommended N in respect of millable height at 11 month.

Quality parameters:

The genotypes, N levels recorded the significant and their interactions found to be non significant influence on juice quality parameters (Table 3).

The genotype Co 09004 recorded significantly the highest brix (22.08), sucrose (21.17%), CCS (15.34%) and purity (95.81%). It was found at par with CoC 671 and CoN 09072 with respect to brix and MS 10001 and Co 09007 with respect to purity per centage.

The application of 100% recommended dose of nitrogen recorded significantly highest brix (22.05%), Sucrose (20.73%), and CCS (14.83%) which was found at par with applicantion of 125% recommended dose of nitrogen respect of sucrose per centage.

Effect of interactions:

The interactions effect between genotype and ferilizer levels are presenred in Table 4(a) to 4(e).

The interactions between genotypes and fertilizer levels were found to be non significant for germination per centage, tillering ratio and number of internodes however, it was found significant for cane girth, millable height, average cane weight, millable cane, cane yield and CCS yield of sugarcane.

The interaction between genotype Co 09004 and application of 75% recommended dose of nitrogen recorded significantly highest cane girth (9.92 cm, 10.88cm 11.90cm) at 11 month 12 month and harvest [Table 4(a)].

The interaction between genotype Co 09007 and application of 100% recommended dose of nitrogen recorded significantly highest cane weight (1.78 kg) and cane yield (175.73 t ha^{-1}). However it was found at par with genotype Co 09004 with application of 75% RDN (1.75 kg), genotype CoC 671 with application of 125% RDN (1.76 kg) with respect to average cane weight and genotype Co 09004 and application of 75% RDN (173.93 t ha^{-1}), genotype MS 10001 and application of 125% RDN (173.47 t ha^{-1}) with respect to cane yield [Table 4(d)].

Significantly the highest millable cane was found in genotype Co 09007 and application of 125% RDN (100739) however, it was found at par with MS 10001 and application of 125% RDN (99906), CoC 671 and application of 75% RDN (99789), CoN 09072 and application of 75% RDN (99767)[Table 4(c)].

Significantly the highest CCS yield was found in interaction of genotype Co 09004 and application of 75% RDN (26.26 t ha^{-1}) however, it was at par with interaction of Co 09004 with application of 100% RDN (25.70 t ha^{-1}), Co 09007 and application of 100% RDN (25.68 t ha^{-1}).

Conclusion:

The genotype Co 09007 was found significantly superior for cane yields and genotype Co 09004 for CCS yield than the other genotypes. The application of 125 % recommended dose of nitrogen produced significantly higher cane yield. While CCS yield was not affected by differnt nitrogen levels. Genotype Co 09004 recorded significantly the highest brix, sucrose %, CCS % and purity % as compared to the other genotypes. The quality parameter did not affect due to different N levels. In interaction effect genotype Co 09007 with 100% N recorded significantly the highest cane yield (175.73 t ha^{-1}) while CCS yield (26.26 t ha^{-1}) was significant in interaction of Co 09004 with 75% N.

Table 1. Cane and CCS yield affected by sugarcane genotypes and N levels

Treatments	Cane yield ($t\ ha^{-1}$)	CCS yield ($t\ ha^{-1}$)
A) Genotypes		
V_1– Co 09004	163.40	25.06
V_2 – MS 10001	160.44	23.09
V_3– Co 09007	166.56	24.06
V_4 – CoN 09072	152.00	22.07
V_5 – CoC 671	154.09	22.35
SE±	**1.72**	**0.26**
C.D. at 5%	**5.62**	**0.85**
B) N levels		
F_1 - 75% N	157.63	22.92
F_2 - 100% N	158.05	23.46
F_3 – 125 % N	162.21	23.59
SE±	**1.06**	**0.21**
C.D. at 5%	**3.14**	**NS**
C) Interactions		
SE±	**2.38**	**0.46**
C.D. at 5%	**7.02**	**1.35**
General Mean	**159.30**	**23.33**

Table 2. (a) Growth and yield attributes affected by sugarcane genotypes and N levels

Treatments	Germination %						Tillering ratio				
A) Genotypes	21 DAP	35 DAP	49 DAP	63 DAP	77 DAP	91 DAP	8th Week	12th Week	16th Week	20th Week	24th Week
V_1– Co 09004	40.94	46.15	52.70	55.88	54.61	53.88	1.10	1.30	1.53	1.58	1.87
V_2 – MS 10001	36.60	42.10	50.01	52.96	51.91	50.96	1.14	1.34	1.63	1.69	2.04
V_3– Co 09007	48.31	53.36	59.55	62.17	61.23	60.50	1.41	1.61	1.79	1.94	2.15
V_4 – CoN 09072	37.58	42.97	53.02	55.64	54.93	53.97	1.07	1.25	1.40	1.93	1.60
V_5 – CoC 671	37.50	43.00	50.01	52.62	52.02	50.96	1.08	1.29	1.53	1.52	1.82
SE±	**3.38**	**3.22**	**2.82**	**1.14**	**0.79**	**0.75**	**0.05**	**0.06**	**0.04**	**0.09**	**0.05**
C.D. at 5%	**NS**	**NS**	**NS**	**3.73**	**2.58**	**2.47**	**0.17**	**0.20**	**0.15**	**0.31**	**0.17**
B) N levels											
F_1 - 75% N	39.90	45.55	52.09	54.51	54.06	53.18	1.18	1.38	1.61	1.68	1.90
F_2 - 100% N	39.48	44.27	52.47	56.09	54.24	53.42	1.14	1.34	1.57	1.76	1.88
F_3 – 125 % N	41.17	46.73	54.61	56.96	56.52	55.57	1.16	1.35	1.55	1.77	1.90
SE±	**1.20**	**1.26**	**1.03**	**0.61**	**54.94**	**0.70**	**0.02**	**0.02**	**0.02**	**0.05**	**0.03**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
C) Interactions											
SE±	2.68	2.81	2.32	1.37	1.29	1.57	0.04	0.05	0.05	0.12	0.08
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
General Mean	**40.18**	**45.52**	**53.06**	**55.85**	**54.06**	**54.05**	**1.16**	**1.36**	**1.58**	**1.73**	**1.90**

2. (b) Growth and yield attributes affected by sugarcane genotypes and N levels

Treatments	No. of Internodes			Girth (cm)			Millable height (cm)			ACW (kg)	Millable Cane
A) Genotypes	11 month	12 month	Harvest	11 month	12 month	At Harvest	11 month	12 month	Harvest		
V_1– Co 09004	18.32	20.30	22.22	8.51	9.47	10.49	241.93	246.58	251.56	1.65	99230
V_2 – MS 10001	17.85	19.83	21.89	8.30	9.26	10.28	248.97	253.25	258.22	1.57	99306
V_3– Co 09007	19.56	21.54	23.67	8.94	9.90	10.92	249.40	253.81	258.78	1.68	99722
V_4 – CoN 09072	18.32	20.30	22.56	8.28	9.24	10.26	250.18	254.59	259.56	1.55	98276
V_5 – CoC 671	18.39	20.37	22.56	8.54	9.50	10.52	248.73	253.14	258.11	1.62	99152
SE±	**0.95**	**0.95**	**0.51**	**0.16**	**0.25**	**0.19**	**2.41**	**1.81**	**2.65**	**0.01**	**251**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.06**	**820**
B) N levels											
F_1 - 75% N	18.56	20.54	22.67	8.27	9.23	10.25	243.29	251.69	256.67	1.60	98539
F_2 - 100% N	18.27	20.25	22.27	8.51	9.47	10.49	247.34	247.70	252.67	1.60	99391
F_3 – 125 % N	18.64	20.62	22.80	8.77	9.73	10.75	252.90	257.43	262.40	1.63	99481
SE±	**0.54**	**0.54**	**0.32**	**0.12**	**0.12**	**0.12**	**1.90**	**1.84**	**1.90**	**0.01**	**177**
C.D. at 5%	**NS**	**NS**	**NS**	**0.36**	**0.36**	**0.35**	**5.61**	**5.44**	**5.62**	**0.02**	**524**
C) Interactions											
SE±	**1.21**	**1.21**	**0.73**	**0.27**	**0.27**	**0.27**	4.25	4.12	4.26	**0.02**	**397**
C.D. at 5%	**NS**	**NS**	**NS**	**0.81**	**0.80**	**0.80**	**12.54**	**12.16**	**12.82**	**0.06**	**1171**
General Mean	**18.49**	**20.47**	**22.58**	**8.51**	**9.47**	**10.49**	**247.84**	**252.27**	**257.24**	**1.61**	**99137**

Table 3. Quality parameters as affected by sugaracane genotypes and N levels

Treatments	Brix (c)	Sucrose (%)	CCS (%)	Purity (%)
A) Genotypes				
V_1– Co 09004	22.08	21.17	15.34	95.81
V_2 – MS 10001	21.46	20.33	14.39	95.44
V_3– Co 09007	21.03	19.79	14.44	95.03
V_4 – CoN 09072	21.49	20.74	14.51	93.80
V_5 – CoC 671	21.98	20.90	14.52	94.07
SE±	**0.15**	**0.14**	**0.05**	**0.41**
C.D. at 5%	**0.50**	**0.47**	**0.19**	**1.35**
B) N levels				
F_1 - 75% N	21.35	20.35	14.53	94.27
F_2 - 100% N	22.05	20.73	14.83	95.15
F_3 – 125 % N	21.43	20.68	14.56	95.07
SE±	**0.15**	**0.10**	**0.08**	**0.30**
C.D. at 5%	**0.45**	**0.32**	**0.25**	**NS**
C) Interactions				
SE±	**0.34**	**0.24**	**0.19**	**0.45**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General Mean	**21.61**	**20.59**	**14.64**	**94.83**

Table 4.(a) Girth of sugarcane affected by Interactions of genotypes and N levels

Genotypes / N levels	V_1: Co 09004	V_2: MS 10001	V_3: Co 09007	V_4: CoN 09072	V_5: CoC 671
11 month					
F_1 - 75% N	9.92	8.29	8.82	8.22	8.59
F_2 - 100% N	8.05	8.35	8.92	8.72	8.49
F_3 – 125 % N	7.55	8.25	9.09	7.89	8.55
SE±	**0.27**				
C.D. at 5%	**0.81**				
12 month					
F_1 - 75% N	10.88	9.25	9.78	9.18	9.55
F_2 - 100% N	9.01	9.31	9.88	9.68	9.45
F_3 – 125 % N	8.51	9.21	10.05	8.85	9.51
SE±	**0.27**				
C.D. at 5%	**0.80**				
Harvest					
F_1 - 75% N	11.90	10.27	10.80	10.20	10.57
F_2 - 100% N	10.03	10.33	10.90	10.70	10.47
F_3 – 125 % N	9.53	10.23	11.07	9.87	10.53
SE±	**0.27**				
C.D. at 5%	**0.80**				

Table 4. (b) Cane weight of sugarcane affected by Interactions of genotypes and N levels

Genotypes / N levels	V_1: Co 09004	V_2: MS 10001	V_3: Co 09007	V_4: CoN 09072	V_5: CoC 671
F_1 - 75% N	1.75	1.69	1.64	1.47	1.45
F_2 - 100% N	1.66	1.45	1.78	1.48	1.65
F_3 – 125 % N	1.53	1.58	1.61	1.69	1.76
SE±	**0.02**				
C.D. at 5%	**0.06**				

Table 4 (c) Millable cane as affected by Interactions of genotypes and N levels

Genotypes / N levels	V_1: Co 09004	V_2: MS 10001	V_3: Co 09007	V_4: CoN 09072	V_5: CoC 671
F_1 - 75% N	99306	99222	98872	99767	99789
F_2 - 100% N	99372	98789	99556	96044	98933
F_3 – 125 % N	99011	99906	100739	99017	98733
SE±	**397**				
C.D. at 5%	**1171**				

Table 4. (d) Cane yield as affected by Interactions of genotypes and N levels

Genotypes / N levels	V_1: Co 09004	V_2: MS 10001	V_3: Co 09007	V_4: CoN 09072	V_5: CoC 671
F_1 - 75% N	173.93	144.20	162.60	146.93	160.47
F_2 - 100% N	164.80	163.67	175.73	141.80	144.27
F_3 – 125 % N	151.47	173.47	161.33	167.27	157.53
SE±	**2.38**				
C.D. at 5%	**7.02**				

Table 4. (e) CCS yield as affected by Interactions of genotypes and N levels

Genotypes / N levels	V_1: Co 09004	V_2: MS 10001	V_3: Co 09007	V_4: CoN 09072	V_5: CoC 671
F_1 - 75% N	26.26	20.56	23.61	21.01	23.18
F_2 - 100% N	25.70	24.02	25.68	20.57	21.32
F_3 – 125 % N	23.22	24.68	22.91	24.63	22.54
SE±	**0.45**				
C.D. at 5%	**1.35**				

Table 5. Soil properties at harvest in different treatments

Treatments	**pH**	**EC (dsm^{-1})**	**O.C.%**	**Available nutrient status (kg ha^{-1})**		
				N	**P_2O_5**	**K_2O**
A) Genotypes						
V_1– Co 09004	8.10	0.40	0.68	188.01	15.37	247.05
V_2 – MS 10001	8.01	0.35	0.66	186.02	16.94	258.04
V_3– Co 09007	8.08	0.40	0.60	184.04	15.51	245.03
V_4 – CoN 09072	8.11	0.39	0.64	189.06	17.96	279.07
V_5 – CoC 671	8.15	0.43	0.62	193.07	19.42	286.01
B) N levels						
F_1 - 75% N	8.08	0.39	0.67	197.04	17.94	270.04
F_2 - 100% N	8.1	0.36	0.65	187.01	16.74	265.04
F_3 – 125 % N	8.11	0.42	0.60	185.07	16.44	254.04
General Mean	**8.09**	**0.394**	**0.64**	**188.04**	**17.04**	**263.04**
Initial	**8.21**	**0.41**	**0.71**	**258.02**	**19.52**	**356.02**

Project No. AS – 42

Title: Agronomic Evaluation of promising Sugarcane genotypes (Spring Midlate)

Objective: 1) To find out the suitable sugarcane genotypes for early spring planting.
2)To find out suitable sugarcane genotypes for highest cane and CCS yield.
3)To find out the suitable fertilizer dose for promising sugarcane genotypes.
4)To find out suitable interaction of promising sugarcane genotypes and fertilizer dose for highest cane and CCS Yield.

Experimental Details :

Place	: CSRS, Padegaon,
Design	: Split plot
Replication	: 3
Plot Size: Gross	: 10 x 6 m^2,
Net	: 08 x 4 m^2,
Fertilizer dose	: 250:115:115 kg N, P_2O_5, K_2O ha^{-1},
Date of planting	: 07.01.2015
Date of harvesting	: 30.01.2016
Soil Status	: Irrigated, Medium black soil.

Treatment details :

No. of Main Treatments : 05

V_1 : Co 09009

V_2 : CoM 09057

V_3 : Co 10033

V_4 : CoM 10084

V_5 : Co 86032

No. of Sub Treatments : 03

F_1 - 75% RD of N

F_2 - 100% RD of N

F_3 - 125% RD of N

Results:

The data on first year trial for cane and CCS yields, growth observations and quality parameters are presented in Table 1 to 5.

Effect of genotypes on yield:

Data presented in Table 1 revealed that the genotype Co 10033 and Co 09009 were recorded significantly the highest cane yield (166.20 t ha^{-1}) and CCS yield (22.17 t ha^{-1}) over all other genotypes, respectively.

Effect of nitrogen levels on yield:

Significantly the highest cane yield (161.33 t ha^{-1}) and CCS yield (20.45 t ha^{-1}) were recorded with the application of 100% recommended dose of nitrogen, however it was at par with the application of 125% recommended dose of nitrogen.

Growth and yield attributes:

The data regarding growth and yield attributes are presented in Table 2 (a) and 2 (b).

Effect of genotypes:

The data presented in Table 2 revealed that genotype Co 86032 recorded significantly the highest germination (47.23 %, 53.21%, 64.02%, 66.16%, 65.69%, and 64.74%) however it was found at par with genotype CoM 09057 and Co 10033 at 21 DAP, 35 DAP, 49 DAP, 63 DAP 77 DAP and 91 DAP, respectively.

The genotype Co 10033 recorded significantly the highest average cane weight (1.66kg) and millable cane (99852). However, it was found at par with CoM 09057 (99500) and Co 86032 (99333) with respect to millable cane. The genotype Co 86032 recorded significantly the highest cane girth (78.7, 9.14 and 10.62cm) at 11^{th} and 12^{th} month and at harvest it was found at par with all the remaining genotypes except Co 09009. The tillering ratio and number of internodes were found to be non significant due to different genotypes.

Effect of nitrogen levels:

Effect of N levels was significant for the cane girth, millable cane, millable height and average cane weight. Application of 100% recommended dose of nitrogen recorded the highest cane girth (7.91 kg, 9.18 kg and 10.66 kg) at 11 month, 12 month and harvest, respectively, millable height (220.64cm, 221.49cm, and 230.67cm), at 11 month, 12 month and harvest, respectively, average cane weight (1.57 kg $cane^{-1}$) and millable cane (99616) however it was found at par with the application of 125 % recommended dose of nitrrogen.

Quality parameters:

The genotypes and N levels recorded the significant effect and their interactions found to be non significant influence on juice quality parameters (Table 3).

The genotype Co 09009 recorded significantly the highest brix (22.98), sucrose (20.19%), CCS (14.34%) and purity (95.40%) than all other genotypes.

The application of 100% recommended dose of nitrogen recorded significantly highest brix (20.05%), Sucrose (18.54%), CCS (13.38%) and Purity (93.40 %) which was found at par with applicantion of 125% recommended dose of nitrogen respect of sucrose per centage.

Effect of interactions:

The interactions effect between genotype and ferilizer levels are presenred in Table 4(a) to 4(e).

The interactions between genotypes and fertilizer levels were found to be non significant for germination per centage, tillering ratio, number of internodes and cane girth however, it was found significant for millable height, average cane weight, millable cane, cane yield and CCS yield of sugarcane.

The interaction between genotype Co 10033 (V_3) and application of 125% recommended dose of nitrogen (F_3) (Table 4 (a)) recorded significantly the highest millable height (246.75 cm, 251.02cm 260cm) at 11 month 12 month and harvest, respectively, however it was found at par with genotype Co 09009 (V_1) and application of 125% RDN

(F_3)(238.41cm), genotype CoM 09057 (V_2) and application of 125% RDN (F_3)(237.21cm), genotype Co 86032 (V_5) and application of 75% RDN(F_1)(237.08cm), genotype CoM 09057 (V_2) and application of 100% RDN (F_2) (228.54cm) and genotype CoM 1084(V_4) and application of 75% RDN (F_1)(225.29cm) at 11 month, genotype Co 09009(V_1) and application of 125% RDN (F_3)(242.70cm), genotype Co 86032(V_5) and application of 75% RDN (F_1)(241.35cm), genotype CoM 09057 (V_2) and application of 100% RDN (F_2) (232.69cm) and genotype CoM 10084(V_4) and application of 75% RDN (F_1) (229.70cm) at 12 month, genotype Co 09009 (V_1)and application of 125% RDN(F_3)(247.67cm), genotype CoM 09057(V_2) and application of 125% RDN (F_3)(246.33cm), genotype CoM 09057(V_2) and application of 100% RDN (F_2)(237.67cm), genotype CoM 1084(F_4) and application of 75% RDN(F_1)(234.67cm), genotype Co 86032(V_5) and application of 100% RDN(F_2) (233.00cm) and genotype CoM 09057(V_2) and application of 75% RDN (F_1) (229.67cm), respectively.

The interaction between genotype Co 10033(V_3) and application of 100% recommended dose of nitrogen (F_2) recorded significantly the highest cane weight (1.81 kg) However, it was found at par with genotype Co 09009 and application of 75% (F_1)and V_3 X F_1 (1.74 kg), and genotype Co 09009 and application of 100% RDN (1.70 kg).

The significantly the highest millable cane was found in genotype Co 10033(V_3) and application of 125% RDN(F_3)(100889) however, it was found at par with Co 10033(V_3) and application of 75% RDN(F_1)(100000), and CoM 09057(V_2) and application of 100% and 125% RDN (F_3)(99722) and V_5 x F_1.

The significantly the highest cane yield(178.80 t ha^{-1}) was found in interaction of genotype Co 10033(V_3)and application of 100% RDN(F_2) however, it was found at par with Co 10033(V_3) and application of 125% RDN (F_3)(175.80 t ha^{-1}), Co 10033(F_3) and application of 75% RDN (F_1)(174.00 t ha^{-1}), Co 09009(F_1) and application of 75% RDN(F_1) (173.00 t ha^{-1}) and Co 09009 (V_1)and application of 100% RDN(F_2)(166.80 t ha^{-1}).

The significantly the highest CCS yield (22.50 t ha^{-1}) was found in interaction of genotype Co 09009 (V_1)and application of 100% RDN(F_2)(24.38 t ha^{-1}) however, it was found at par with genotype Co 09009(V_1) and application of 75% RDN(F_1)(24.37 t ha^{-1}), genotype Co 10033(V_3) and application of 100% RDN(F_2)(22.50 t ha^{-1}) and genotype Co 09009(V_1) and application of 125% RDN (F_3) (22.06 t ha^{-1}) and V_5 x F_2.

Conclusion:

The genotype Co 10033 was found significantly superior for cane yield and genotype Co 09009 for CCS yield than the other genotypes. The application of 100 % recommended dose of nitrogen produced significantly higher Cane and CCS yields. Significantly the highest Cane yield was found in interaction of genotype Co 10033 with application of 100% RDN and CCS yield was significantly highest in genotype Co 09009 and application of 100% RDN. Significantly the highest brix(c) (28.98), sucrose% (20.19%), CCS% (14.34%) and purity% (95.40%) was recorded by genotype Co 09009 and 100% RDN.

Table 1. Cane and CCS yield as affected by sugarcane genotypes and N levels

Treatments	Cane yield ($t\ ha^{-1}$)	CCS yield ($t\ ha^{-1}$)
A) Genotypes		
V_1– Co 09009	154.60	22.17
V_2 – CoM 09057	127.91	17.10
V_3– Co 10033	166.20	20.50
V_4 – CoM 10084	153.22	18.99
V_5 – Co 86032	148.67	20.19
SE±	**2.81**	**0.39**
C.D. at 5%	**9.19**	**1.28**
B) N levels		
F_1 - 75% N	146.53	18.95
F_2 - 100% N	161.33	20.45
F_3 – 125 % N	154.49	19.97
SE±	**2.50**	**0.36**
C.D. at 5%	**7.39**	**1.07**
C) Interactions		
SE±	**5.31**	**0.81**
C.D. at 5%	**16.67**	**2.39**
General Mean	**150.12**	**19.79**

Table 2.(a)Growth and yield attributes as affected by sugarcane genotypes and N levels

Treatments	Germination %						Tillering ratio				
A) Genotypes	21 DAP	35 DAP	49 DAP	63 DAP	77 DAP	91 DAP	8th Week	12th Week	16th Week	20th Week	24th Week
V_1–Co 09009	36.44	38.69	47.71	49.85	49.37	48.42	0.97	1.16	1.34	1.51	1.66
V_2–CoM 09057	46.73	52.47	62.54	64.68	64.21	63.26	0.97	1.12	1.36	1.30	1.73
V_3–Co 10033	46.12	51.54	61.35	63.49	63.02	62.07	1.05	1.22	1.46	1.72	1.93
V_4–CoM 10084	34.11	41.52	54.40	56.54	56.06	55.11	0.98	1.13	1.41	1.51	1.76
V_5–Co 86032	47.23	53.21	64.02	66.16	65.69	64.74	1.02	1.17	1.62	1.51	2.17
SE±	**2.92**	**2.54**	**2.66**	**0.94**	**0.97**	**1.14**	**0.02**	**0.02**	**0.04**	**0.05**	**0.06**
C.D. at 5%	**9.54**	**8.29**	**8.67**	**3.08**	**3.17**	**3.74**	**NS**	**NS**	**NS**	**NS**	**NS**
B) N levels											
F_1 - 75% N	42.95	48.31	58.88	61.02	60.55	59.60	1.03	1.19	1.47	1.58	1.87
F_2 - 100% N	41.17	46.66	57.68	59.82	59.34	58.39	1.00	1.16	1.50	1.55	1.94
F_3 – 125 % N	42.25	47.47	57.45	59.60	59.12	58.17	0.97	1.13	1.48	1.57	1.82
SE±	1.85	1.49	1.52	0.75	0.76	0.85	0.01	0.01	0.03	0.04	0.06
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
C) Interactions											
SE±	**4.13**	**3.34**	**3.40**	**1.68**	**1.71**	**1.90**	**0.03**	**0.03**	**0.07**	**0.10**	**0.15**
C.D. at 5%	**NS**	**NS**	**NS**	**4.96**	**5.05**	**5.61**	**0.10**	**NS**	**NS**	**NS**	**NS**
General Mean	**42.13**	**47.48**	**58.00**	**60.15**	**59.67**	**58.72**	**1.00**	**1.16**	**1.48**	**1.57**	**1.88**

Table 2.(b) Growth and yield attributes as affected by sugarcane genotypes and N levels

Treatments	No. of Internodes			Girth (cm)			Millable height (cm)			ACW (kg)	Millable Cane
A) Genotypes	11 month	12 month	Harvest	11 month	12 month	Harvest	11 month	12 month	Harvest		
V_1–Co 09009	17.59	19.63	22.11	7.44	8.66	10.14	197.66	201.92	206.89	1.57	98748
V_2–CoM 09057	18.06	20.10	22.56	7.83	9.10	10.59	221.80	228.72	237.89	1.29	99500
V_3– Co 10033	17.13	19.17	21.67	7.76	9.05	10.53	208.82	213.13	219.44	1.66	99852
V_4–CoM 10084	17.04	19.08	21.56	7.64	8.91	10.40	196.04	200.36	205.33	1.55	99132
V_5–Co 86032	17.48	19.52	22.00	7.87	9.14	10.62	215.22	219.58	224.56	1.50	99333
SE±	**0.59**	**0.59**	**0.59**	**0.08**	**0.07**	**0.09**	**6.76**	**3.97**	**5.69**	**0.02**	**188**
C.D. at 5%	**NS**	**NS**	**NS**	**0.28**	**0.24**	**0.31**	**22.04**	**12.97**	**18.59**	**0.07**	**612**
B) N levels											
F_1 - 75% N	17.94	19.98	22.47	7.57	8.82	10.31	190.00	194.36	199.33	1.46	98901
F_2 - 100% N	17.08	19.12	21.60	7.91	9.18	10.66	220.64	221.49	230.67	1.57	99616
F_3 – 125 % N	17.36	19.40	21.87	7.65	8.92	10.41	217.23	218.23	226.47	1.51	99422
SE±	**0.42**	**0.42**	**0.42**	**0.05**	**0.09**	**0.07**	**6.07**	**3.41**	**5.13**	**0.02**	**194**
C.D. at 5%	**NS**	**NS**	**NS**	**0.15**	**0.28**	**0.22**	**17.91**	**10.6**	**15.15**	**0.07**	**573**
C) Interactions											
SE±	0.94	0.94	0.94	0.12	0.21	0.16	13.58	7.63	11.48	0.05	434
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**40.06**	**22.50**	**33.89**	**0.17**	**1281**
General Mean	**17.46**	**19.50**	**21.98**	**7.71**	**8.97**	**10.46**	**209.29**	**211.36**	**218.82**	**1.51**	**99313**

Table 3. Quality parameters of sugarcane affected by sugaracane genotypes and N levels

Treatments	Brix (c)	Sucrose (%)	CCS (%)	Purity (%)
A) Genotypes				
V_1– Co 09009	20.98	20.19	14.34	95.40
V_2 – CoM 09057	20.46	19.33	13.37	90.25
V_3– Co 10033	18.03	15.79	12.34	90.25
V_4 – CoM 10084	18.49	17.74	12.39	94.13
V_5 – Co 86032	20.08	18.90	13.57	94.02
SE±	**0.15**	**0.14**	**0.08**	**0.24**
C.D. at 5%	**0.50**	**0.47**	**0.27**	**0.79**
B) N levels				
F_1 - 75% N	19.35	18.16	13.12	92.58
F_2 - 100% N	20.05	18.54	13.38	93.40
F_3 – 125 % N	19.43	18.48	13.10	92.45
SE±	**0.15**	**0.10**	**0.08**	**0.26**
C.D. at 5%	**0.45**	**0.32**	**0.23**	**0.79**
C) Interactions				
SE±	**0.34**	**0.24**	**0.18**	**0.59**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General Mean	**19.61**	**18.39**	**13.20**	**92.81**

Table 4.(a) Millable height of sugarcane affected by Interactions of genotypes and N levels

Genotypes / **N levels**	V_1: Co 09009	V_2:CoM 09057	V_3: Co 10033	V_4: CoM 1084	V_5: Co 86032
11 month					
F_1 - 75% N	192.29	220.41	211.08	225.29	237.08
F_2 - 100% N	162.29	228.54	168.62	166.95	223.62
F_3 – 125 % N	238.41	237.21	246.75	195.87	184.95
SE±	**13.58**				
C.D. at 5%	**22.06**				
12 month					
F_1 - 75% N	196.36	224.70	215.35	229.70	241.35
F_2 - 100% N	166.69	232.69	173.03	171.35	228.02
F_3 – 125 % N	242.70	208.02	251.02	200.03	189.36
SE±	**7.63**				
C.D. at 5%	**22.50**				
Harvest					
F_1 - 75% N	201.33	229.67	220.33	234.67	246.33
F_2 - 100% N	171.67	237.67	178.00	176.33	233.00
F_3 – 125 % N	247.67	246.33	260.00	205.00	194.33
SE±	**11.48**				
C.D. at 5%	**33.89**				

Table 4. (b) Cane weight of sugarcane affected by Interactions of genotypes and N levels

Genotypes / N levels	V_1: Co 09009	V_2:CoM 09057	V_3: Co 10033	V_4: CoM 1084	V_5: Co 86032
F_1 - 75% N	1.76	1.50	1.74	1.58	1.54
F_2 - 100% N	1.70	1.26	1.81	1.44	1.60
F_3 – 125 % N	1.55	1.10	1.74	1.61	1.35
SE±	**0.05**				
C.D. at 5%	**0.17**				

Table 4 (c) Millable cane of sugarcane affected by Interactions of genotypes and N levels

Genotypes / N levels	V_1: Co 09009	V_2:CoM 09057	V_3: Co 10033	V_4: CoM 1084	V_5: Co 86032
F_1 - 75% N	98444	99056	100000	99444	100167
F_2 - 100% N	98222	99722	98667	99062	98833
F_3 – 125 % N	99578	99722	100889	98889	99000
SE±	**434**				
C.D. at 5%	**1281**				

Table 4. (d) Cane yield of sugarcane affected by Interactions of genotypes and N levels

Genotypes / N levels	V_1: Co 09009	V_2:CoM 09057	V_3: Co 10033	V_4: CoM 1084	V_5: Co 86032
F_1 - 75% N	173.00	148.07	174.00	157.53	154.07
F_2 - 100% N	166.80	126.07	178.80	142.87	157.93
F_3 – 125 % N	154.00	109.60	175.80	159.27	134.00
SE±	**5.60**				
C.D. at 5%	**16.52**				

Table 4. (e) CCS yield of sugarcane affected by Interactions of genotypes and N levels

Genotypes / N levels	V_1: Co 09009	V_2:CoM 09057	V_3: Co 10033	V_4: CoM 1084	V_5: Co 86032
F_1 - 75% N	24.37	19.61	21.73	19.29	20.86
F_2 - 100% N	24.38	17.07	22.50	17.59	21.91
F_3 – 125 % N	22.06	14.61	20.98	20.09	17.80
SE±	**0.86**				
C.D. at 5%	**2.55**				

Table 5. Soil properties at harvest in different treatments

Treatments	pH	EC (dsm^{-1})	O.C.%	Available nutrient status (kg ha^{-1})		
				N	P_2O_5	K_2O
A) Genotypes						
V_1– Co 09009	8.18	0.39	0.65	184.01	17.44	269.01
V_2 – CoM 09057	8.19	0.4	0.63	187.02	16.42	257.07
V_3– Co 10033	8.11	0.41	0.61	178.01	15.52	252.02
V_4 – CoM 10084	8.14	0.42	0.64	192.05	17.25	276.09
V_5 – Co 86032	8.13	0.4	0.63	198.03	18.72	274.02
B) N levels						
F_1 - 75% N	8.17	0.38	0.65	198.04	18.91	277.08
F_2 - 100% N	8.14	0.39	0.61	178.07	15.72	258.02
F_3 – 125 % N	8.15	0.43	0.62	187.02	16.56	262.09
General Mean	8.15	0.404	0.632	187.824	17.07	265.642
Initial	8.28	0.46	0.78	294.02	21.16	384.05

Project No. : AS 69
Title: **Use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane**
Objective:

1) To accelerate rate and extent of sugarcane germination through the use of PGRs.
2) To assess the effect of PGRs on sugarcane growth, yield and juice quality

Experimental details:

Place	: CSRS, Padegaon,
Design	: Randomized Block Design
Replication	: 3
Plot Size: Gross	: 10 x 6 m^2,
Net	: 08 x 4 m^2
Variety	: Co-86032
Fertilizer dose	: 250:115:115 N: P_2O_5: K_2O kg ha^{-1}
Date of planting	: 05.01.2015
Date of harvesting	: 15.01.2016
Soil Status	: Irrigated, Medium black soil.

Treatment details:

1. T_1 : Conventional planting/Farmers' practice (3-bud setts)
2. T_2 : Planting of setts after overnight soaking in water
3. T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution
4. T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution
5. T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP
6. T_6 : T_2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP
7. T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP
8. T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP

Results :

The data of first year trial on cane and CCS yields, growth observations and quality parameters of different treatments are presented in Table 1 to 4.

Effect on germination (%):

The data on germination presented in Table (2a) revealed that germination at 10 DAP was observed nil and the effect due to different treatments on germination was found to be non significant at 20 DAP. The germination (22.94%, 37.31%, and 45.72%,) was found significantly higher with planting of setts after overnight soaking in 50 ppm ethrel solution (T_3) while it was found at par with T_7, T_4, T_8 and T_6 at 30, 40, and 50 DAP.

Effect on cane and CCS yields:

The data on cane and CCS yields presented in Table 1 revealed that planting of setts after overnight soaking in 50 ppm ethrel solution with GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_7) recorded significantly the highest cane and CCS yield (132.33 and 20.13 t ha^{-1}). However, it was found at par with planting of setts after overnight soaking in 100 ppm ethrel solution with GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_8) (129.07 and 18.90 t ha^{-1}), Planting of setts after overnight soaking in water with GA_3 spray (35 ppm) at 90, 120

and 150 DAP (T_6) (126.07 and 18.57 t ha^{-1}), Planting of setts after overnight soaking in 100 ppm ethrel solution (T_4) (125.27 and 18.37 t ha^{-1}) and planting of setts after overnight soaking in 50 ppm ethrel solution (T_3) (124.53 and 18.54 t ha^{-1}).

Growth and yield attributes:

The data regarding growth and yield attributes are presented in Table 2 (a) and 2 (b). The data revealed that the planting of setts after overnight soaking in 50 ppm ethrel solution with spraying of GA_3 (35 ppm) at 90, 120 and 150 DAP (T_7) recorded significantly higher tillering ratio (1.52, 2.02, 2.08, 2.03, 1.99, 1.96, 1.94, 1.93, 1.92, and 1.89) at 90, 120, 150, 180, 210, 240, 270, 300, 330 and harvest, millable height (103.67 cm, 112.33cm, 126.33cm, 135.33cm, 148.33cm, 163.33cm, 179.33cm, 190.33cm) at 150, 180, 210, 240, 270, 300, 330 and harvest, millable cane (98106) at harvest, respectively. However, it was found at par with planting of setts after overnight soaking in water and GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_6), planting of setts after overnight soaking in 100 ppm ethrel solution and GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_8), planting of setts after overnight soaking in 50 ppm ethrel solution (T_3), planting of setts after overnight soaking in 100 ppm ethrel solution (T_4) at 150, 180, 210, 240,270, 300, 330 DAP, and at harvest. Millable height was found non signficant at 60, 90 and 120 DAP. Effect of different treatments on girth, number of internodes and average cane weight found to be non significant.

The data regarding leaf area (cm^2/cane) are presented in Table 3. The leaf area (189.04 cm^2/cane 443.05 cm^2/cane, 710.04 cm^2/cane, 974.09 cm^2/cane, 1275.94 cm^2/cane, 1629.36 cm^2/cane, 1936.82 cm^2/cane, 2191.75 cm^2/cane, 2285.70 cm^2/cane, and 2337.04 cm^2/cane) was found significantly higher with planting of setts after overnight soaking in 50 ppm ethrel solution and GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_7) and it was found at par with T_3 , T_4, T_6 and T_8 at 90, 120, 150, 180, 210, 240, 270, 300, 330 DAP and harvest.

The data regarding biomass accumulation and root dry weight (gm/cane) are presented in Table 4. The biomass accumulation (93.60 gm/cane, 129.02 gm/cane, 197.36 gm/cane, 303.83 gm/cane, 467.83 gm/cane, 636.35 gm/cane, 790.98 gm/cane, 953.93 gm/cane, and 1052.54 gm/cane) was found significantly higher with planting of setts after overnight soaking in 50 ppm ethrel solution with GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_7) and it was found at par with T_3 , T_4, T_6 and T_8 at 120, 150, 180, 210, 240, 270, 300, 330 DAP and harvest. The data revealed that the planting of setts after overnight soaking in 50 ppm ethrel solution with GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_7) recorded significantly higher root dry weight (56.4 gm/cane, and 123.6 gm/cane), However, it was at par with Planting of setts after overnight soaking in 100 ppm ethrel solution with GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_8), planting of setts after overnight soaking in water with GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_6) planting of setts after overnight soaking in 50 ppm ethrel solution (T_3) and planting of setts after overnight soaking in 100 ppm ethrel solution (T_4) at 120 and 180 DAP.

Quality parameters:

The data regarding juice quality parameters are presented in Table 5 revealed that planting of setts after overnight soaking in 50 ppm ethrel solution and GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_7) recorded significantly the highest brix (22.52), and and CCS%

(15.18 %) while it was at par with T_3 , T_4, T_6 and T_8 and sucrose and purity were not affected by different treatments.

Conclusion:

The germination (22.94%, 37.31%, and 45.72%,) was found significantly higher with planting of setts after overnight soaking in 50 ppm ethrel solution (T_3) while it was found at par with treatments T_7, T_4, T_8 and T_6 at 30, 40, and 50 DAP. The planting of setts after overnight soaking in 50 ppm ethrel solution with GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_7) recorded significantly the highest cane and CCS yield (132.33 and 20.13 t ha^{-1}). However, it was at par with planting of setts after overnight soaking in 100 ppm ethrel solution and GA_3 spray (35 ppm) at 90, 120 and 180 DAP (T_8) (129.07 and 18.90 t ha^{-1}), Planting of setts after overnight soaking in water with GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_6) (126.07 and 18.57 t ha^{-1}), planting of setts after overnight soaking in 50 ppm ethrel solution (T_3) (124.53 and 18.54 t ha^{-1}) and planting of setts after overnight soaking in 100 ppm ethrel solution (T_4) (125.27 and 18.37 t ha^{-1}). The planting of setts after overnight soaking in 50 ppm ethrel solution and GA_3 spray (35 ppm) at 90, 120 and 150 DAP (T_7) recorded significantly the highest brix (22.52), and and CCS% (15.18 %) while it was at par with T_3 , T_4, T_6 and T_8 and sucrose and purity were not affected by different treatments.

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

Treatment	Cane yield (t/ha)	CCS yield (t/ha))
T_1 : Conventional planting/Farmers' practice (3-bud setts)	110.20	14.65
T_2 : Planting of setts after overnight soaking in water	113.73	15.79
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	124.53	18.54
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	125.27	18.37
T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	112.00	15.13
T_6 : T_2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	126.07	18.57
T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	132.33	20.13
T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	129.07	18.90
SE+	**5.94**	**1.04**
C.D at 5%	**18.03**	**3.17**

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

Treatments	Germination (%) (DAP)					Tillering ratio (DAP)									
	10	**20**	**30**	**40**	**50**	**90**	**120**	**150**	**180**	**210**	**240**	**270**	**300**	**330**	**Ht**
T_1 : Conventional planting/Farmers' paraction (3-bud setts)	0	11.50	19.11	32.81	40.89	1.29	1.78	1.82	1.77	1.73	1.62	1.59	1.56	1.55	1.54
T_2 : Planting of setts after overnight soaking in water	0	12.53	20.10	34.47	42.88	1.31	1.80	1.84	1.79	1.73	1.70	1.64	1.62	1.61	1.60
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	0	13.36	22.94	37.31	45.72	1.48	1.97	1.98	1.93	1.91	1.89	1.87	1.83	1.79	1.78
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	0	13.04	22.25	36.62	45.03	1.46	1.95	1.95	1.90	1.88	1.85	1.83	1.82	1.81	1.77
T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0	11.84	19.31	33.68	42.09	1.32	1.81	1.84	1.79	1.75	1.71	1.68	1.64	1.62	1.61
T_6 : T_2 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0	12.19	20.44	34.81	43.22	1.50	2.01	2.06	2.01	1.97	1.94	1.91	1.86	1.82	1.82
T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0	13.17	22.61	36.98	45.39	1.52	2.02	2.08	2.03	1.99	1.96	1.94	1.93	1.92	1.89
T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	0	12.50	22.25	36.62	45.03	1.49	1.98	2.02	1.97	1.93	1.90	1.88	1.86	1.81	1.81
SE+	**0**	**0.92**	**0.84**	**0.94**	**1.05**	**0.06**	**0.06**	**0.05**	**0.05**	**0.06**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
C.D at 5%	**0**	**NS**	**2.55**	**2.84**	**3.18**	**0.17**	**0.18**	**0.16**	**0.17**	**0.18**	**0.15**	**0.17**	**0.16**	**0.15**	**0.14**

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

Treatments	Girth (cm)	Inodes	Mill. cane	AWC (Kg)	Millable height (cm) DAP										
					60	90	120	150	180	210	240	270	300	330	Ht
T_1 : Conventional planting/Farmers' practice (3-bud setts)	9.6	25	95489	1.16	34.86	69.33	79.00	91.33	95.00	108.00	116.67	129.67	144.00	161.33	172.33
T_2 : Planting of setts after overnight soaking in water	10.4	21	96006	1.18	33.98	66.00	81.33	92.00	96.67	110.67	119.67	132.67	147.67	163.67	174.67
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	10.0	24	97539	1.28	32.97	70.00	88.00	101.67	108.67	122.67	131.67	144.67	159.67	175.67	186.67
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	9.6	21	97567	1.28	32.49	59.00	85.67	100.67	109.33	123.33	132.33	145.33	160.33	176.33	187.33
T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	10.2	22	95411	1.17	31.89	59.67	81.67	93.33	98.33	112.33	121.33	134.33	149.33	165.00	176.00
T_6 : T_2 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	9.2	26	97300	1.30	31.83	62.33	87.67	101.33	109.67	123.67	132.67	145.67	160.67	176.67	187.67
T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	9.8	23	98106	1.35	31.68	70.33	92.33	103.67	112.33	126.33	135.33	148.33	163.33	179.33	190.33
T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	9.6	21	96211	1.34	31.70	57.33	79.33	99.33	107.67	121.67	130.67	143.67	158.67	174.67	185.67
SE+	**0.38**	**1.39**	**570.81**	**0.06**	**5.75**	**7.87**	**3.19**	**2.91**	**4.02**	**4.13**	**3.91**	**4.29**	**4.19**	**4.16**	**4.22**
C.D at 5%	**NS**	**NS**	**1731.35**	**NS**	**NS**	**NS**	**NS**	**8.83**	**12.21**	**12.53**	**11.85**	**13.00**	**12.72**	**12.63**	**12.79**

Table 3. Leaf area per cane of sugarcane as affected by various treatments

Treatments	Leaf Area (cm^2/cane)									
	90	**120**	**150**	**180**	**210**	**240**	**270**	**300**	**330**	**Harvest**
T_1 : Conventional planting/Farmers' practice (3-bud setts)	161.12	338.28	635.23	952.51	1253.56	1607.58	1914.50	2169.66	2014.45	1967.13
T_2 : Planting of setts after overnight soaking in water	169.19	366.52	660.19	957.52	1258.56	1612.42	1919.32	2174.62	2019.51	1972.19
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	187.27	441.28	708.57	972.17	1273.27	1627.67	1934.77	2189.27	2034.96	1987.64
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	186.42	439.42	706.82	970.49	1271.42	1625.48	1932.62	2187.42	2032.54	1985.22
T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	164.46	368.46	662.12	946.52	1247.16	1601.82	1908.19	2163.67	2008.58	1961.26
T_6 : T_2 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	182.38	433.04	693.38	970.76	1271.51	1625.71	1930.04	2184.98	2029.47	1982.15
T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	189.04	443.05	710.04	974.09	1275.94	1629.36	1936.82	2191.75	2036.79	1989.47
T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	183.56	434.24	701.23	965.23	1266.25	1623.51	1933.89	2185.56	2031.05	1983.73
SE+	**2.57**	**13.74**	**15.17**	**3.31**	**3.30**	**3.38**	**3.28**	**2.41**	**2.56**	**3.08**
C.D at 5%	**7.78**	**41.67**	**46.00**	**10.03**	**10.00**	**10.25**	**9.96**	**7.30**	**7.77**	**9.33**

Table 4. Biomass accumulation and Root gry weight of sugarcane as affected by various treatments (gm/cane).

Treatments	Boimass (gm/cane)										Root dry Weight (gm/cane) (DAP)		
	90	**120**	**150**	**180**	**210**	**240**	**270**	**300**	**330**	**Harvest**	**50**	**120**	**180**
T_1 : Conventional planting/Farmers' practice (3-bud setts)	60.48	72.12	107.54	175.88	286.35	446.35	614.87	769.50	932.45	1031.06	0.21	18.9	73.7
T_2 : Planting of setts after overnight soaking in water	65.44	77.08	112.50	180.84	291.31	451.31	619.83	774.46	937.41	1036.02	0.33	21.1	78.5
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	69.19	91.83	127.25	195.59	304.39	466.06	634.58	789.21	952.16	1050.77	0.40	52.7	109.8
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	68.34	89.64	125.40	193.74	304.21	464.21	632.73	787.36	950.31	1050.58	0.35	52.0	109.5
T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	61.04	65.68	101.10	169.44	279.91	439.91	608.43	763.06	926.01	1024.62	0.25	32.3	86.2
T_6 : T_2 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	67.30	90.27	125.69	192.70	304.50	464.50	633.02	787.65	950.60	1049.21	0.36	50.5	111.9
T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	70.96	93.60	129.02	197.36	307.83	467.83	636.35	790.98	953.93	1052.54	0.54	56.4	123.6
T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	63.15	88.12	120.21	191.88	299.02	459.02	627.54	782.17	945.12	1043.73	0.49	54.1	109.4
SE+	**3.84**	**2.38**	**3.46**	**2.90**	**3.50**	**3.89**	**3.38**	**3.24**	**3.39**	**3.35**	**0.12**	**2.06**	**5.52**
C.D at 5%	**NS**	**7.23**	**10.48**	**8.81**	**10.60**	**11.81**	**10.24**	**9.82**	**10.29**	**10.17**	**NS**	**6.27**	**16.75**

Table 5. Quality parameters of sugarcane affected by sugaracane genotypes and N levels

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
T_1 : Conventional planting/Farmers' practice (3-bud setts)	20.91	18.83	89.13	13.31
T_2 : Planting of setts after overnight soaking in water	20.92	18.95	91.00	13.85
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	22.14	19.77	91.20	14.92
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	22.23	19.75	94.85	14.65
T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	20.73	18.69	88.71	13.51
T_6 : T_2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	22.00	19.63	91.75	14.70
T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	22.52	20.92	87.53	15.18
T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	22.36	19.95	86.08	14.67
SE+	**0.33**	**0.53**	**10.56**	**0.37**
C.D at 5%	**1.01**	**NS**	**NS**	**1.11**

Table 6. Soil properties at harvest in different treatments

Treatments	pH	EC (dsm^{-1})	O.C.%	Available nutrient status ($kg\ ha^{-1}$)		
				N	P_2O_5	K_2O
T_1 : Conventional planting/Farmers' practice (3-bud setts)	7.79	0.52	0.65	261	22.5	264
T_2 : Planting of setts after overnight soaking in water	7.78	0.53	0.66	247	20.3	259
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	7.81	0.50	0.60	232	19.7	252
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	7.54	0.49	0.61	235	19.9	248
T_5 : T_1 + GA_3 spray (35 ppm) at 90, 120 and 150 DAP	7.58	0.53	0.65	260	22.0	261
T_6 : T_2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	7.57	0.49	0.61	228	20.5	255
T_7 : T_3+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	7.57	0.50	0.62	230	20.4	252
T_8 : T_4+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	7.62	0.51	0.65	248	21.2	263
Initial	**7.69**	**0.44**	**0.67**	**272**	**24.7**	**278**

Project No. AS – 68

1. Title of expt.: Impact of integrated application of organics and inorganics in improving soil health and sugarcane productivity (Ratoon-I).

2. Objectives :

To develop nutrient management strategy for sustaining soil health and sugarcane production.

3. Experimental details:

Year of start	: 2014-15	Period of Expt.	:1 Plant + 2 ratoons
Variety	: CoM 0265 (Phule 265)	Season	: Suru
Treatments	: Nine	Replications	: Three
Design	: RBD	Plot size	: 7.2 X 6.0 m
Date of Ratooning	: 18.2.2015	Date of harvesting	:21.3.2016
Soil type	: Inceptisol		

4. Treatment details:

Tr. No	Treatments (Ratoon-I)
1.	Application of trash at 10 t ha^{-1} + 50% RDF
2.	Application of trash at 10 t ha^{-1} + 100% RDF
3.	Application of trash at 10 t ha^{-1} + RDF as per soil test
4.	FYM @ 20 t ha^{-1} + 50 % RDF
5.	FYM @ 20 t ha^{-1} + 100 % RDF
6.	FYM @ 20 t ha^{-1} + RDF as per soil test
7.	FYM @ 10 t ha^{-1} + BF (Aceto. + PSB) + 50 % RDF
8.	FYM @ 10 t ha^{-1} + BF (Aceto. + PSB) + 100 % RDF
9.	FYM @ 10 t ha^{-1} + BF (Aceto. + PSB) + RDF as per soil test

Results:

a. Yield and yield contributing parameters:

The data in respect of yield of ratoon and yield contributing parameters presented in Table 1 revealed that the application of FYM @ 20 t ha^{-1} + RDF as per soil test recorded significantly highest cane girth (9.98cm) while it was found at par with all the treatments except T_1. The number of tillers was significantly highest in treatment T_9. Also treatment T_6 receiving 100 % RDF along with 20 t ha^{-1} FYM recorded significantly the higher number of average cane weight (1.97 kg), milleable canes (85.89 '000 ha^{-1}), and cane yield (165.99 t ha^{-1}). However, it was found at par with all treatments except T_1 for average cane weight, T_5, T_8, T_9, T_4 and T_3 for number of milleable canes, and T_9, T_5, T_8, T_4 and T_7 for cane yield. Significantly the higher CCS yield (24.24 t ha^{-1}) was observed in treatment T_9 and it was found at par with treatment T_6, T_5, T_8, T_4, and T_7. Different treatments imposed on sugarcane ratoon were not exerted a significant effect on quality parameters viz, Brix (%), Pole (%), Purity (%) and CCS (%).

b. Soil chemical properties:

The soil chemical properties have been analyzed from pre and post harvest soils of sugarcane and presented in Table 2. The soil pH was slightly reduced in all the integrated nutrient management treatments. The lowest soil pH (7.27) was recorded in treatment of T_7 receiving 50 % RDF along with 10 t ha^{-1} FYM + biofertilizers and found highest in the treatment T_1 receiving 50 % RDF (7.47). The soil EC was increased in all the treatments over the initials. The significantly lowest EC was noted in the treatment T_1 receiving 50 % RDF and T_2 receiving 100 % RDF only and it was found highest in treatment T_6 .

Soil organic carbon content was reduced in the inorganic treatments T_1, T_2 and T_3 and it was increased in all other all the integrated nutrient management treatments over the initial status. The treatments T_4 receiving 50 % RDF along with 20 t ha^{-1} FYM and T_6 receiving RDF as per soil test along with 20 t ha^{-1} FYM were recorded significantly the higher organic carbon (0.77 %) and it was at par with all treatments except T_1 and T_3.

The treatment T_6 receiving RDF as per soil test along with 20 t FYM recorded significantly the higher available N and available P (286 and 26.24 kg ha^{-1}) after harvest however, significantly higher available K was recorded in the treatment T_5 receiving 100 % RDF along with 20 t ha^{-1} FYM (324 kg ha^{-1}) followed by T_6.

c. Economics:

The data pertaining to gross returns, net returns and benefit-cost ratio as affected by different treatments are presented in Table No. 3a and 3b. It is revealed that, the application of RDF as per soil test along with 20 t ha^{-1} FYM (T_6) recorded significantly the higher per hectare gross returns (Rs.3,73,486 ha^{-1}), and followed by T_9 receiving RDF as per soil test along with 10 t ha^{-1} FYM + biofertilizers and T_5 receiving 100 % RDF along with 20 t ha^{-1} FYM (Rs.3,69,254 and 3,63,029 ha^{-1}, respectively) and lowest in the treatment T_1 (Rs.2,67,315 ha^{-1}). The treatment T_6 reported significantly the higher per hectare net return (Rs.2,46,669 ha^{-1}), and lowest in the treatment T_1 (Rs.1,47,641 ha^{-1}). The highest benefit-cost ratio was reported in the treatments T_3 receiving only RDF as per soil test (3.05) and it was found lowest in the treatment T_4 (2.00).

d. Conclusion:

Application of recommended dose fertilizers as per soil test along with 20 t ha^{-1} FYM for preseasonal sugarcane was found beneficial in terms of yield, quality and soil health.

Table 1. Effect of different treatments on yield and yield contributing parameters of sugarcane ratoon.

Treat.	Girth (cm)	No. of Internodes	ACW (Kg)	NMC (000 ha^{-1})	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})	Brix (%)	Pole (%)	Purity (%)	CCS (%)
T_1	8.94	21	1.47	69.36	118.81	16.88	19.0	13.06	95.21	14.21
T_2	9.21	27	1.75	71.23	126.51	18.05	20.0	13.27	94.97	14.27
T_3	9.33	28	1.77	80.46	133.69	19.47	21.0	12.98	94.34	14.55
T_4	9.53	25	1.87	81.31	154.37	21.97	20.5	13.71	95.39	14.26
T_5	9.80	24	1.93	83.73	161.35	22.87	19.5	13.75	95.03	14.18
T_6	9.98	24	1.97	85.89	165.99	23.54	19.0	13.83	95.53	14.16
T_7	9.30	26	1.82	78.40	144.37	20.73	20.0	13.12	94.20	14.36
T_8	9.51	26	1.89	82.83	157.70	22.85	20.5	13.06	94.84	14.48
T_9	9.81	29	1.95	82.72	164.11	24.24	21.0	12.73	94.87	14.77
SE±	0.26	2.31	0.13	3.43	9.86	1.45	1.64	2.06	1.21	0.23
CD at 5%	0.78	6.93	0.37	10.30	29.56	4.33	NS	NS	NS	NS

Table 2. Effect of different treatments on soil chemical properties at harvest of sugarcane ratoon.

Treat.	pH	EC (dS m^{-1})	Org. C. (%)	Av. Nutrients (kg ha^{-1})		
				N	P	K
Initial	*7.48*	*0.39*	*0.71*	*234.90*	23.46	264.52
T_1	7.47	0.47	0.69	189.90	19.31	240.83
T_2	7.37	0.46	0.70	204.30	20.10	262.54
T_3	7.44	0.50	0.69	217.80	21.48	248.72
T_4	7.34	0.58	0.77	229.50	23.66	294.13
T_5	7.41	0.61	0.76	262.80	24.75	324.72
T_6	7.31	0.63	0.77	286.20	26.24	314.85
T_7	7.27	0.58	0.74	225.00	21.19	278.33
T_8	7.35	0.59	0.75	259.20	22.97	301.04
T_9	7.34	0.62	0.75	280.80	23.86	279.32
SE±	0.04	0.03	0.04	4.28	0.59	5.65
CD at 5%	0.12	0.09	0.12	12.84	1.77	16.95

Table 3a. Cost of different inputs (Rs. ha^{-1})

Tr. No.	Inputs applied					Fertilizer cost (Rs.ha^{-1})	Cost of Cultivation (Rs)
	FYM (t ha^{-1})	Nutrient (kg ha^{-1})			Biofrtilizers (kg ha^{-1})		
		N	P	K			
T_1	--	125	58	58	--	7831	92588
T_2	--	250	115	115	--	13760	98517
T_3	--	312.5	115	86.25	--	13722	98479
T_4	20	125	58	58	--	89047	173804
T_5	20	250	115	115	--	94976	179733
T_6	20	312.5	115	86.25	--	94938	179695
T_7	10	125	58	58	12.5	49851	134608
T_8	10	250	115	115	12.5	55780	140537
T_9	10	312.5	115	86.25	12.5	55742	140499

Table 3b. Economics of different treatments

Treat.	Gross returns (Rs. ha^{-1})	Cost of Cultivation (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	B : C Ratio
T_1	267315	92588	147641	2.89
T_2	284639	98517	162046	2.89
T_3	300810	98479	180096	3.05
T_4	347336	173804	223341	2.00
T_5	363029	179733	237875	2.02
T_6	373486	179695	251372	2.08
T_7	324843	134608	200975	2.41
T_8	354834	140537	234275	2.52
T_9	369254	140499	246669	2.63
SE $\pm$	22183	--	22183	--
CD at 5 %	66503	--	66503	--

Rates of fertilizers:

Urea = Rs. 5.68 Kg $^{-1}$ SSP = Rs.7.82 Kg $^{-1}$ MOP = Rs. 16.84 Kg $^{-1}$

FYM = Rs.4500 t $^{-1}$

Cane price: Rs. 2250 t $^{-1}$