Annual Report of Crop Production
(2016-17)
All India Co-ordinated Research Project (Sugarcane)

Experiment No. 1 **AS-68**

Title: Impact of integrated application of organics and inorganics in improving soil health and sugarcane productivity

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

Location: Shahjahanpur

Year of start: 2014-15

Year of completion: 2016-17

Treatments:

T_1	Application of trash @ 10 tonnes/ha + 50% RDF
T_2	Application of trash @ 10 tonnes/ha + 100% RDF
T_3	Application of trash @ 10 tonnes/ha + soil test basis (NPK application)
T_4	Application FYM @ 20 tonnes/ha +50% RDF(inorganic source)
T_5	Application FYM @ 20 tonnes/ha +100% RDF(inorganic source)
T_6	Application FYM @ 20 tonnes/ha + inorganic nutrient application based on soil test (NPK)
T_7	Application FYM @ 10 tonnes/ha+ bio-fertilizers (Azotobactor +PSB)+ 50% RDF
T_8	Application FYM @ 10 tonnes/ha+ bio-fertilizers (Azotobactor + PSB)+ 100% RDF
T_9	Application FYM @ 10 tonnes/ha+ bio-fertilizers (Azotobactor + PSB)+ soil test basis (NPK)

Design: RBD

Replication: 3

Plot size: 8.0 x 5.4 m^2

Variety: CoS 08279

The initial and at harvest details of soil is given in Table 1b. Experimental second ratoon crop was started on 08.03.2016 and harvested on 10.01.2017.

Experimental data (Table 1a) showed that application of FYM @ 10 tones/ha + bio-fertilizers (Azotobactor + PSB) @ 10 kg/ha each + soil test basis NPK (T_9) produced significantly higher second ratoon cane yield (82.16 t/ha) than those of other treatments except application FYM @ 20 tones/ha + inorganic nutrient application based on soil test (T_6) with cane yield of 79.50 t/ha. CCS % in cane was not affected significantly with different treatments. Maximum benefit cost ratio (1.64) was also obtained in T_9 treatment followed by T_6 treatment with benefit cost ratio of 1.61.

Summary:

Application of FYM @ 10 tones/ha + bio-fertilizers (Azotobactor + PSB) + soil test basis NPK (T_9) gave significantly higher second ratoon cane yield (82.16 t/ha) followed by application FYM @ 20 tones/ha + inorganic nutrient application based on soil test (T_6). Maximum benefit cost ratio (1.64) was also obtained in T_9 treatment.

Experiment No. 2 **AS – 69**

Title: Use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane

Objectives:

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.

Location: Shahjahanpur

Year of start: 2014-15

Year of completion: 2017-18

Treatments-

T_1	Conventional planting/ farmers practices (3 budded setts)
T_2	Planting of setts after overnight soaking in water
T_3	Planting of setts after overnight soaking in 50 ppm ethrel solution
T_4	Planting of setts after overnight soaking in 100 ppm ethrel solution
T_5	T_1 + GA_3 spray (35 ppm) at 90,120 and 150 DAP
T_6	T_2 + GA_3 spray (35 ppm) at 90,120 and 150 DAP
T_7	T_3 + GA_3 spray (35 ppm) at 90,120 and 150 DAP
T_8	T_4 + GA_3 spray (35 ppm) at 90,120 and 150 DAP

Design: RBD
Replication: Three
Plot size: 8.0×5.4 m^2
Variety: CoS 03251

The soil of the experimental field was sandy loam in texture, low in organic carbon (0.36 %), phosphorus (11.35 kg/ha) and potassium (122.0 kg/ha) with soil pH 6.8. The experimental crop was planted on 18.02.16 and harvested on 25.02.17.

The experimental results (Table 2) showed that germination % recorded under overnight soaking in 100 ppm ethrel solution was at par with overnight soaking in 50 ppm ethrel solution whereas, overnight soaking in 100 ppm ethrel solution was significantly superior to conventional and overnight soaking in water. Planting of setts after overnight soaking in 100 ppm ethrel solution + Gibberellic acid (35 ppm) spray at 90, 120 and 150 DAP produced significantly higher number of shoots, millable canes and cane yield (87.50 t/ha) than those of other treatments**.** CCS % in cane was not significantly affected with various treatments.

Summary:

Germination % recorded under overnight soaking in 100 ppm ethrel solution was at par with overnight soaking in 50 ppm ethrel solution and it was significantly superior to conventional and overnight soaking in water. Planting of setts after overnight soaking in 100 ppm ethrel solution + Gibberellic acid (35 ppm) resulted significantly higher number of shoots, millable canes and cane yield than those of other treatments.

Experiment No. 3 AS – 70

Title: Scheduling irrigation with mulch under different sugarcane planting methods

Objectives: To enhance crop and water productivity in sugarcane

Location: Shahjahanpur

Year of start: 2016 -17

Year of completion: 2018-19

Treatments:

(A.) Combination of planting methods and mulch practices		
i	P_1	Conventional flat planting (75cm row spacing) with organic mulching @ 6 t/ha (Sugarcane trash)
ii	P_2	Conventional flat planting (75 cm row spacing) without mulching
iii	P_3	Paired row trench planting (30:120 cm row spacing) with trash mulching @ 6 t/ha
iv	P_4	Paired row trench planting (30:120 cm row spacing) without mulching
(B.) Irrigation Schedule (IW/ CPE) with irrigation water depth 7.5 cm		
i	I_1	0.60
ii	I_2	0.80
iii	I_3	1.00

Design: Strip plot design
Replication: Three
Plot size: 7.5×5.4 m^2
Variety: CoS 08279

The soil of the experimental field was sandy loam in texture, low in organic carbon (0.36%), low in available phosphorus (11.35kg/ha) and medium in potassium (122.0 kg/ha) with 6.8 pH value. The experimental crop was planted on 19.2.2016 and harvested on 15.03.2017. Soil fertility status at harvest and other observations are given in Table 3 b.

The experimental results (Table 3a) showed that germination percent was significantly higher in paired row trench planting than conventional flat planting. Conventional flat planting (75 cm row spacing) with organic mulch @ 6 t/ha gave significantly higher number of shoots (1,73,580/ha) than that of paired row trench planting (120: 30 cm row spacing) whereas, significantly higher number of millable canes (1,26,450/ha) and cane yield (88.77 t/ha) were obtained in paired row trench planting (120: 30 cm row spacing) with organic mulching @ 6 t/ha than that of other treatments of planting methods and mulch practices. Maximum water use efficiency (1138.08 kg/ha cm) was recorded in paired row trench planting (120: 30 cm row spacing) with organic mulching @ 6 t/ha followed by paired row trench planting (30:120 cm row spacing) without mulching with water use efficiency of 1143.90 kg/ha cm.

In case of irrigation schedule at 1.00 IW/CPE ratio (I_3) significantly higher number of shoots (1, 55,250/ha), millable canes (1, 19,420/ha) and cane yield (89.57 t/ha) were obtained than those of other irrigation schedule while, maximum water use efficiency (1806.89 kg/ha cm) was obtained at 0.60 IW/CPE ratio (I_1) followed by 0.80 IW/CPE ratio (I_2) with water use efficiency of 1396.17 kg/ha cm. CCS percent was not affected significantly due to various planting methods and irrigation schedules.

Summary:

Paired row trench planting (120: 30 cm row spacing) with organic mulch @ 6 t/ha produced higher cane yield (88.77 t/ha) and maximum water use efficiency (1138.08 kg/ha. cm) than those of other planting methods and mulch practices. Irrigation schedule at 1.00 IW/CPE ratio (I_3) resulted significantly higher cane yield (89.57 t/ha) than that of rest irrigation schedule while, maximum water use efficiency (1806.89 kg/ha cm) was obtained at 0.60 IW/CPE ratio (I_1) followed by 0.80 IW/CPE ratio (I_2) with water use efficiency of 1396.17 kg/ha cm.

Experiment No. 4 AS – 72

Title: Agronomical evaluation of new sugarcane genotypes of advanced varietal trial (AVT)

Objectives: To access the performance of promising sugarcane genotypes of advanced varietal trial (AVT)

Location: Shahjahanpur
Year of start: 2016 -17
Year of completion: 2018-19

Treatments:

(A)Genotypes	
(i) Early genotypes	**(ii) Mid- late genotypes**
Entries:	**Entries:**
V_1- CoLk 11201	**V_1-** Co 11027
V_2- CoLk 11202	**V_2 -**CoH 11263
V_3- CoLk 11203	**V_3 -** CoLk 11204
V_4- CoH 11262	**V_4 -** CoLk 11206
	V_5 - CoPb 11214
	V_6 - CoS 11232
Standards	**Standards**
V_1- Co 0238	**V_1 -** CoS 767
V_2- CoJ 64	**V_2 -** CoS 8436
	V_3 - Co Plant 97222
(B) Spacing	
S_1 - 90 cm	
S_2 - 120 cm	

Design: RBD
Replication: Three
Plot size: 6 rows of 8 m length

The soils of experimental field was low in organic carbon (0.37%), medium in phosphorus (20.60 kg/ha) and potash (161.0 kg/ha) with pH 6. 7. Experimental plant crop of early genotypes was planted on 21.02.2016 and mid-late genotypes on 22.02.16. Crop of early genotypes was harvested on 02.03.2017 and mid- late genotypes on 06.03.17.

Experimental results of early genotypes (Table 4a) revealed that genotype CoLk 11202 produced significantly higher cane yield (105.50 t/ha) than those of standards Co 0238 (103.10 t/ha) and CoJ 64 (87.60 t/ha). Regarding spacing significantly higher cane yield (99.30 t/ha) was recorded with 90 cm spacing than that of 120 cm (90.40 t/ha). CCS % in cane was more or less similar under various genotypes and spacing treatments.

Experimental results of mid- late genotypes (Table 4b) showed that genotype CoLk 11206 produced significantly higher number of millable cane (1, 27,030 /ha) and cane yield (97.60 t/ha) than that of all three standards and other entries. Regarding spacing, significantly higher number of shoots (1, 62,760/ha), millable canes (1, 19,530/ha) and cane yield (91.52 t/ha) were recorded with 90 cm row spacing than those of 120 cm row spacing. CCS percent was not affected significantly due to various genotypes and spacing treatments.

Summary:

In early genotypes CoLk 11202 and mid–late genotype CoLk 11206 produced significantly higher cane yield than standards and other entries with cane yield of 105.50 t/ha and 97.60 t/ha , respectively. Row spacing of 90 cm was found superior to 120 cm spacing in cane yield under both early and mid – late genotypes with cane yield of 99.30/ha and 91.52 t/ha, respectively. CCS percent was not affected significantly due to various genotypes and spacing treatments.

Table 1a: Effect of treatment on stubbles, mother shoots, shoots, millable canes, cane yield, CCS% and B:C ratio in second ratoon cane

Treatment	Stubbles (000/ha)	M. Shoots (000/ha)	Shoots (000/ha)	Millable canes (000/ha)	Cane yield (t/ha)	CCS (%)	B:C ratio
T_1	20.49	34.49	137.50	83.07	65.35	12.15	1.40
T_2	19.91	33.22	161.57	84.23	73.56	12.54	1.53
T_3	21.88	36.46	159.14	83.56	72.25	11.98	1.50
T_4	21.99	36.11	167.13	86.25	70.35	12.69	1.45
T_5	23.03	38.43	166.09	89.36	68.85	12.45	1.44
T_6	22.80	37.27	155.90	110.67	79.50	12.32	1.61
T_7	20.83	34.61	147.57	83.85	71.85	12.53	1.48
T_8	20.26	32.99	168.98	107.75	76.20	12.27	1.58
T_9	22.22	36.34	173.26	120.25	82.16	12.23	1.64
SE±	**1.67**	**1.92**	**1.01**	**0.68**	**2.03**	**0.11**	-
CD at 5%	**NS**	**3.87**	**4.21**	**1.43**	**4.30**	**NS**	-

Table 2b: Details of soil health (Initial & at harvest)

Treatments	Bulk density (g/cm^3)		Soil pH		EC (dsm^{-1})		OC (%)		Av. P_2O_5 (kg/ha)		Av. K_2O (kg/ha)	
	Initial	At harvest	Initial	At harvest	Initial	At harvest	Initial	At harvest	Initial	At harvest	Initial	At harvest
T_1	1.01	1.06	7.10	7.7	0.032	0.60	0.37	0.43	11.07	20.80	66.67	165.75
T_2	1.22	1.03	6.89	7.7	0.020	0.046	0.38	0.37	10.00	22.00	140.67	168.00
T_3	1.05	1.09	7.08	7.6	0.022	0.049	0.47	0.39	9.73	22.40	137.00	159.00
T_4	1.21	1.07	7.13	7.7	0.024	0.051	0.34	0.40	12.40	37.20	137.00	173.00
T_5	1.25	1.04	7.30	7.8	0.021	0.051	0.47	0.40	8.13	19.20	162.00	127.00
T_6	1.11	1.05	7.12	7.9	0.022	0.059	0.42	0.41	9.07	26.80	165.33	217.28
T_7	1.08	1.23	7.22	8.0	0.024	0.58	0.50	0.48	8.53	16.40	140.33	218.00
T_8	1.26	1.11	6.90	7.9	0.027	0.53	0.49	0.41	9.20	22.00	151.33	218.40
T_9	0.84	1.09	7.04	7.8	0.028	0.63	0.47	0.45	10.93	39.60	151.67	218.40

Table 2: Effect of treatments on germination, shoots, millable canes, cane yield and CCS%

Treatments	Germination (%)	Shoots (000/ha)	Millable canes (000/ha)	Cane yield (t/ha)	CCS (%)
T_1- Conventional planting/ farmers practices (3 budded setts)	24.27	127.89	106.25	53.60	12.20
T_2- Planting of setts after overnight soaking in water	29.48	143.98	112.96	64.40	11.74
T_3- Planting of setts after overnight soaking in 50 ppm ethrel solution	35.83	144.91	121.76	75.30	11.82
T_4- Planting of setts after overnight soaking in 100 ppm ethrel solution	42.81	157.52	127.08	82.60	12.08
T_5- T_1 + GA_3 spray (35 ppm) at 90,120 and 150 DAP	29.90	136.92	109.72	59.60	11.84
T_6- T_2 + GA_3 spray (35 ppm) at 90,120 and 150 DAP	31.25	148.49	117.13	70.40	11.90
T_7- T_3 + GA_3 spray (35 ppm) at 90,120 and 150 DAP	35.94	157.06	136.34	83.30	12.05
T_8- T_4 + GA_3 spray (35 ppm) at 90,120 and 150 DAP	40.52	179.74	139.70	87.50	11.06
SE±	**5.42**	**6.51**	**2.60**	**1.03**	**0.29**
CD at 5%	**10.93**	**13.57**	**5.57**	**2.20**	**NS**

Table 3a: Effect of treatments on germination, shoots, plant height, millable canes, Cane yield and CCS%

Treatments	Germination (%)	Shoots (000/ha)	Millable canes (000/ha)	Plant height (m)	Cane yield (t/ha)	CCS (%)	Water use efficiency (K_g/ha cm)
A							
P_1	41.70	173.58	109.52	2.44	83.32	11.74	936.18
P_2	41.50	167.33	103.51	2.36	81.84	11.54	951.63
P_3	52.40	132.26	126.45	2.50	88.77	11.52	1138.08
P_4	52.10	128.40	123.18	2.39	85.60	11.74	1043.90
SE±	**0.49**	**0.89**	**1.59**	**0.03**	**0.42**	**0.17**	**-**
CD at 5%	**1.07**	**1.93**	**3.46**	**0.07**	**091**	**NS**	**-**
B							
I_1	47.90	146.32	111.99	2.36	81.31	11.64	1806.89
I_2	46.40	149.60	115.58	2.43	83.77	11.61	1396.17
I_3	46.50	155.25	119.42	2.48	89.57	11.74	1194.27
SE±	**0.48**	**0.90**	**1.57**	**0.04**	**0.45**	**0.16**	**-**
CD at 5%	**1.05**	**1.95**	**3.44**	**0.09**	**0.99**	**NS**	**-**

Table 3b: Effect of treatments on bulk density, EC, pH and soil fertility status at harvest in sugarcane crop

Treatments	Soil Fertility Status					
	Bulk density (g/cm^3)	EC (dsm^{-1})	pH	OC (%)	Av. P_2O_5 (kg/ha)	Av. K_2O (kg/ha)
P_1	1.08	0.06	6.9	0.47	6.8	132
P_2	1.10	0.52	7.1	0.37	5.6	156
P_3	1.15	0.05	7.1	0.39	7.2	143
P_4	1.12	0.06	7.2	0.43	6.8	135
I_1- 0.60	1.10	0.06	7.0	0.44	6.3	137
I_2- 0.80	1.12	0.06	7.1	0.36	7.5	150
I_3 -1.00	1.12	0.05	7.2	0.40	6.9	109

Table 4a: Effect of treatments on germination, shoots, millable canes, cane yield and CCS% in Early genotypes

Treatments	Germination (%)	Shoots (000/ha)	Millable canes (000/ha)	Cane yield (t/ha)	CCS (%)
(A)Genotypes					
Entries					
CoLk 11201	46.04	138.59	106.14	94.30	13.01
CoLk 11202	41.62	149.98	113.01	105.50	12.97
CoLk 11203	44.47	131.60	109.85	89.60	13.43
Co H 11262	43.65	151.40	110.35	88.70	12.63
Standards					
Co 0238	43.96	144.36	102.54	103.10	13.00
CoJ 64	47.50	158.83	107.93	87.60	12.90
SE±	**0.64**	**1.33**	**0.40**	**3.80**	**0.16**
CD at 5%	**1.31**	**2.71**	**0.82**	**7.72**	**0.33**
(B) Spacing					
S_1- 90 cm	46.01	164.35	113.98	99.30	13.08
S_2 -120cm	44.74	127.23	102.79	90.40	12.91
SE±	**0.30**	**0.63**	**0.86**	**1.79**	**0.08**
CD at 5%	**NS**	**1.27**	**1.75**	**3.64**	**0.15**

Table 4b: Effect of treatments on germination, shoots, millable canes, cane yield and CCS% in Mid - late genotypes

Treatments		Germination (%)	Shoots (000/ha)	Millable canes (000/ha)	Cane yield (t/ha)	CCS (%)
(A) Genotypes						
Entries						
V_1-	Co 11027	24.54	117.57	80.71	70.20	13.12
V_2-	CoH 11263	35.90	136.73	110.13	93.50	12.07
V_3-	CoLk 11204	43.30	168.38	115.15	96.30	12.05
V_4-	CoLK11206	43.90	155.71	127.03	97.60	12.32
V_5-	CoPb 11214	44.35	160.36	124.54	94.50	12.33
V_6-	CoS 11232	17.85	83.91	62.19	57.10	12.02
Standards						
V_7-	CoS 767	37.95	158.29	124.07	88.40	12.56
V_8-	CoS 8436	39.15	161.21	121.86	81.30	12.71
V_9-	CoPant 97222	39.10	151.52	110.00	89.50	12.23
SE±		**1.79**	**0.49**	**1.01**	**1.79**	**0.16**
CD at 5%		**NS**	**1.022**	**2.09**	**3.64**	**0.32**
(B)Spacing						
S_1- 90 cm		36.52	162.76	119.53	91.52	12.23
S_2 -120cm		35.83	110.90	96.62	77.90	12.56
SE±		**1.035**	**0.28**	**0.58**	**3.80**	**0.09**
CD at 5%		**NS**	**0.59**	**1.21**	**7.73**	**0.19**