Information of the coordinated project on AICRP on sugarcane

1. Introduction

Sugarcane is a universal crop having sweeting agent (sucrose) and it is the primary age old source of it .It is cultivated both in tropical and sub-tropical areas of India. Sugarcane is one of the most important agro industrial crops in the country, with 4.29 million hectares under cultivation, about 300 millions tonnes productions with an average productivity of around70 tonnes per hectare. The approximate sugarcane coverage is 2 % of the net sown area of the country. Sugarcane occupies a key position in Indian agriculture by virtue of its wide distribution in most of the states of the country. Although area under the crop remains more or less static, yet the research outcome has accelerated vertical growth in sugarcane production. India today tops among the sugar producing countries of the world both in production as well as consumption. A bumper crop of sugarcane coupled with higher recovery of sugar from cane has contributed to this all time high record production of sugar during this season. However, it is not all; we have to go a long way in meeting the projected demand of 27 million tons of sugar by 2020 AD.

There are about 435 sugar factories in the country. This industry is the second largest agro based industry. The by product of sugarcane are also of immense economic importance. The chief byproduct is Molasses, which is used as a raw material by alcohol based industries. The second byproduct, sugarcane bagasse is chief source of fuel in sugar mills. Excess bagasse is used by paper industries. Another byproduct, press mud is of immense importance from farmer point of view.

2. Historical background of the centre:-

Sugarcane research work at this station started in March, 1996 when AICRP on sugarcane-Kota came into function, the project was sanctioned in the year 1994-95 vide ICAR letter No. 10 – 17 /92 –CC(1)dated 7.8.95, fresh administrative & financial sanction was issued by the comptroller, RAU, Bikaner vide letter No. PD/Gr.II/ICAR/26/93-94/7814-24 dated 25/27.1.1996.

3. Mandate and objectives: -

The main objectives of the project are as under:

- To evolve / identify promising early and mid-late duration sugarcane varieties having better yield and sucrose than the existing standards.
- To evolve / identify promising high yield and high sucrose variety having better ratooning ability along with tolerance to moisture stress and also resistance to various diseases and pests.
- Breeder seed production to cope ups the farmers demand for quality seed.
- Development of suitable crop geometry, efficient nutrient management and economic weed control to get maximum yield and sucrose both in plant and ratoon crops.
- Transfer of improved technology through frontline demonstrations and making new varieties popular among farming community.
- Survey and screening of sugarcane varieties for red-rot and smut.
- To coordinated and monitor multi location testing of germplasm
- To enhance and maintain disease free nucleus seed material distribution

4. Organization and structure:

The ARS Kota centre which is a unit of Agriculture University, Kota comes in zone Vth (Humid South Eastern Plain) which includes the district of Kota, Bundi, Baran, Jhalawar and part of sawaimadhopur, lies in the south eastern of the state of Rajasthan. Rainfall of the zone varies from 650 to 1000 mm. The main Crop of the rabi season are Wheat, Mustard, Coriander, Chickpea and Sugarcane etc.

At this station about 42 scientist including nearly 75 supporting staff with a self content sylvan complex having 105 hectare farm areas, out of which about 40 ha area is under research block and remaining farm area use for seed multiplication of different crop varieties. Besides AICRP on sugarcane, 14 ICAR project, state & non plan projects are also working at the centre. In the state sugarcane occupies nearly 10,000 ha area with the production 42, 1716 tonne & productivity 42226 kg /ha. At the centre main activity includes research work based on ICAR requirement, feed back problems of zone , extension activities, plant clinic services, medium rang whether forecast to farmers and seed production of new varieties .The centre also multiply seed of recommend varieties of the zone .

5. Staff position:-

Discipline	**Post**
Plant Breeding &Genetics	Dr. Pramod Kumar Sugarcane Breeder (2013 to continue)
Agronomy	Dr. B.S. Meena Sugarcane Agronomist (2013 to continue)
Technical Staff	1.Sh C.L. Gour Technical Assistant 2. Vacant

6. Budget Position:

(In Rs)

Opening balance (2015-16)	**Remittance by ICAR (2015-16)**	**Total fund ((2015-16)**	**Actual expenditure for the year**	**ICAR share 75%**	**State share 25%**	**Closing balance end of the year (March 31th,2015)**
1*	**2**	**3**	**4**	**5**	**6**	
(+) 10,48,807	18,83,000	29,31,807	43,29,618	32,47,214	10,82,404	(-) (-) 3,15,407

***** Comptroller, AU/Kota/ CA/Baldi&Associate/PVT/2015-16/7 dated 19.05.2015.

ANNUAL REPORT

CROP PRODUCTION

(Year 2015-2016)

Expt. No. AS 42 /Sugarcane/Agronomy/Kota/2015-16/Spring -1

1	**Name of the Project**	:	AICRP on Sugarcane
2	**Location**	:	Agriculture Research Station, Kota
3	**Title of Experiment**	:	Agronomic Evaluation of Promising Sugarcane Genotypes
4	**Year of start**	:	2015-16 (with change of genotypes)
5	**Year of completion**		2015-16
6	**Brief description of the experiment**		
(i)	**Objective**	:	To work out agronomy of sugarcane varieties from advanced varietal trial (AVT)
(ii)	**Treatment**	:	
	1. Varieties	:	V_1 – CoPb 09181 V_2 – CoH 09264 V_3 – CoH 09262 V_4- COLK 09202 V_5– CoPK-05191(C)
	2. Fertilizer levels	:	F_1 – 75 % of the recommended dose of N (150) F_2 – 100 % of the recommended dose of N (200) F_3 - 125 % of the recommended dose of N (250)
(iii)	**Design**	:	Factorial, RBD
(iv)	**Replication**	:	3
(v)	**Plot size**	:	6 x 5.4 m^2
(vi)	**Weed Control**	:	Spray of Atrazine @ 2.0 kg a. i./ha as PE followed by one hand weeding at 60 DAP
(vii)	**Fertilizer**	:	Uniform application of the recommended dose of P& K (60:40 Kg/ha) was given in all treatments. % RDN applied as per treatment.1/4 dose of N and full dose of P&K applied at the time of planting and remaining dose of N applied in 3 splits within in 120 DAP (Tillering, grand growth and first rain shower) .
(viii)	**Date of Planting**	:	**Ist year** 09.03.2015
(ix)	**Date of Harvesting**	:	15.03.2016

7. Physico-chemical properties of experimental soil :

The data in Table –AS 42.1 showed that soil of experimental trial was clay loam in texture, alkaline in reaction, (1.42 mg/m^3). The soil was medium in available phosphorus and high in available nitrogen and potassium during 2015-16.

Table: AS 42.1 Physico- chemical properties of the experimental field.

Parameters	Value
Textural class	Clay loam
Bulk density (mg/m^3)	1.46
Particle density (mg/m^3)	2.65
Porosity (%)	48.00
Soil pH (1:2.5)	8.19
Organic carbon (%)	0.56
available N (Kg/ha)	355.00
available $P_2 O_5$ (Kg/ha)	25.20
available K_2O (Kg/ha)	287.00

8. Results: The experiments crop was planted in spring on 09.03.2015 and harvested in 15.03.2016.The experiment consisted of 5 genotypes viz CoPb 09181, CoH 09264, CoH 09262, CoLK 09202 and CoPK 05191(c) and three fertility levels viz; F_1-75% of the recommended dose of N (150 kg/ha), F_2 -100 % of the recommended dose of N (200 kg/ha) and F_3 - 125 % of the recommended dose of N (250 kg/ha).

During 2015-16 a perusal of data (AS 42.2) showed that among genotypes CoPb 09181 recorded significantly higher germination (56.29 %), tiller count and number of millable cane(130.77 thousand / ha) over CoH 09264, CoH 09262 and CoLK 09202 and at par with CoPK 05191**.** Cane length of CoLK 09202 (228.70 cm) was significantly higher than other variety and at par with CoH 09262. Similarly CoPb 09181 recorded significantly the highest cane yield (102.78 t/ha) and CCS yield (13.35 t/ha) over rest of the genotypes. Whereas brix (21.23 %), sucrose (18.73 %) and CCS (12.94 %) recorded significantly higher in genotype CoPK 05191 over CoH 09264, CoH 09262 and CoLK 09202 and at par with CoPK 05191. Single cane weight did not showed significant difference among different genotypes being higher in CoH 09264 followed by CoPb 09181.

The fertility levels i.e.100% of the recommended dose of N (200 kg/ha) significantly influenced germination (53.70 %), tiller count (150.04 thousand/ha), cane length (126.98 cm), millable cane (126.98 thousand/ha), single cane weight (833.47 g) and cane yield (94.31 t/ha) and all quality parameters over 75 % RDN (150 kg/ha) and at par with fertility level of 125 % RDN (250 kg/ha). However, the response of N was also obtained up to 100 % of recommended level of N in respect to yield attributes, cane yield and in term of cane quality. Interaction between genotypes and fertility levels were found no significant during 2015-16.

9. Summary: Among genotypes CoPb 09181produced significantly higher millable cane (1, 30,770/ha) and cane yield (102.78 t/ha) over CoH 09264, CoH 09262 and CoLK 09202 and at par with CoPK 05191. However, CoPK-05191 also maintained its superiority over other genotypes in terms of cane quality. Yield attributes, cane yield (85.20 t/ha) and cane quality increased significantly upto 100% of the recommended dose of N fertilizer in different genotypes during 2015-16.

10. Significant findings: Among genotypes CoPb 09181produced significantly higher millable cane (1, 30,770/ha) and cane yield (102.78 t/ha) over CoH 09264, CoH 09262 and CoLK 09202 and at par with CoPK 05191. However, CoPK-05191 also maintained its superiority over other genotypes in terms of cane quality. Cane yield and cane quality increased significantly upto 100% of the recommended dose of N fertilizer in different genotypes during 2015-16.

11. Scientist attached: Dr. B.S. Meena

Table AS 42.2: Effect of genotypes and fertility levels on yield attributes, yield and quality of the sugarcane during 2015-16 at Kota.

Treatment	Germination (%)	Tillers (000/ha)	Cane length (cm)	Millable cane (000/ ha)	Single cane weight (g)	Cane yield (t/ha)	Brix (%)	Sucrose (%)	CCS (%)	CCS yield (t/ha)
Varieties										
CoPb 09181	56.29	155.02	224.98	130.77	820.56	102.78	21.18	18.67	12.89	13.35
CoH 09264	53.51	144.59	223.04	122.74	830.22	90.73	20.42	17.89	12.32	11.19
CoH 09262	51.79	141.89	221.13	119.72	817.22	87.83	19.53	16.97	11.64	10.23
COLK 09202	46.26	135.99	228.70	118.96	808.91	83.16	19.30	16.73	11.46	9.55
CoPK 05191(c)	55.47	153.48	225.00	128.52	810.67	96.63	21.23	18.73	12.94	12.52
SEm ±	0.65	1.97	2.65	1.70	8.90	1.42	0.17	0.17	0.13	0.22
CD (P=0.05)	1.87	5.69	7.66	4.90	NS	4.10	0.48	0.49	0.36	0.64
CV	6.52	7.13	6.25	7.23	5.76	8.15	4.31	5.07	5.44	10.31
Fertility levels										
75 % RDN	50.14	136.00	213.95	116.51	784.35	85.20	19.64	17.08	11.72	10.04
100 % RDN	53.70	150.04	228.87	126.98	833.47	94.31	20.67	18.15	12.51	11.84
125 %RDN	54.14	152.54	230.90	128.94	834.73	97.17	20.69	18.16	12.52	12.22
SEm ±	1.21	3.69	4.96	3.17	16.65	2.66	0.31	0.32	0.24	0.41
CD (P=0.05)	3.52	10.68	14.37	9.185	48.21	7.70	0.90	0.93	0.68	1.20
CV	6.53	7.14	6.25	7.226	5.76	8.15	4.31	5.07	5.44	10.31

Expt.No.AS 68/ARS Kota/Sugarcane/Agronomy/2014-15 to 2015-16/ Spring-2

1.	Name of the project		:	All India Coordinated Research Project on Sugarcane
2.	Location		:	Agriculture Research Station, Kota
3.	Title of the experiment		:	Impact of integrated application of organics and inorganics in improving soil health and sugarcane productivity
4.	Year of start		:	2014 -15
5	Year of completion			2016-17
5.	Brief description of the experiment :			
	(i)	Objectives	:	To develop nutrient management strategy for sustaining soil health and sugarcane production.

(ii) Treatments	**Sugarcane (plant crop)**	**Ratoon-I**	**Ratoon- II**
T_1	No organic + 50% RDF	Application of trash at 10 tonnes/ ha + 50% RDF	Application of trash at 10 tonnes/ ha + 50% RDF
T_2	No organic + 100% RDF	Application of trash at 10 tonnes/ ha + 100% RDF	Application of trash at 10 tonnes/ ha + 100% RDF
T_3	No organic + soil test based recommendation	Application of trash at 10 tonnes/ ha + soil test basis (NPK application)	Application of trash at 10 tonnes/ ha + soil test basis (NPK application)
T_4	Application of FYM/Compost @ 20 tonnes / ha + 50% RDF (inorganic source)	Application of FYM/Compost @ 20 tonnes / ha + 50% RDF (inorganic source)	Application of FYM/Compost @ 20 tonnes / ha + 50% RDF (inorganic source)
T_5	Application of FYM/Compost @ 20 tonnes / ha + 100% RDF (inorganic source)	Application of FYM/Compost @ 20 tonnes / ha + 100% RDF (inorganic source)	Application of FYM/Compost @ 20 tonnes / ha + 100% RDF (inorganic source)
T_6	Application of FYM/Compost @ 20 tonnes / ha + inorganic nutrient application based on soil test (rating chart)	Application of FYM/Compost @ 20 tonnes / ha + inorganic nutrient application based on soil test (NPK application)	Application of FYM/Compost @ 20 tonnes / ha + inorganic nutrient application based on soil test (NPK application)
T_7	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + PSB) + 50% RDF	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + PSB) + 50% RDF	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + PSB) + 50% RDF
T_8	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + PSB) + 100% RDF	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + PSB) + 100% RDF	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + PSB) + 100% RDF
T_9	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + PSB) + soil test basis	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + PSB) + soil test basis (NPK application)	Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + PSB) + soil test basis (NPK application)

	(iii)	Design	:	RBD
	(iv)	No. of replications	:	3
	(v)	Spacing	:	Recommended row spacing of the zone
	(vi)	Plot size (gross)	:	6 x 4.5 (27 M^2) (6row; 6 m length)
	(vii)	No. of rows	:	6
	(viii)	Other experiment details		
	((ix)	Fertilizer doses	:	As per treatments i.e. 50% RDF (100:30:20 kg N $P_2O_5K_2O$/ha),100 % RDF(200:60:40 kg N $P_2O_5K_2O$/ha) and STBR(150:50:30 kg N $P_2O_5K_2O$/ha) 1. The application rate of biofertilizer (*Azotobacter* + PSB) 5 kg/acre (solid based fertilizer 10^{7-8}cfu). 2. $ZnSO_4$ @ 25 kg/ha applied at the start of the cycle. 3. 10 t/ha Trash inoculated with cellulolytic organism such as *Trichoderma viride* @ 500 g/tonne.
	(x)	Cultural practices	:	Earthing up, Tying, Detrashing and Propping as & when required, Spray of atrazine @ 2.0 kg a.i. / ha as PE followed one hand weeding at 60DAP.
	(xi)	Variety	:	CoPK-05191 (Pratap Ganna-1)
	(xii)	Date of Planting	:	**Ist year** **Ratoon-I** 21.2.2014 15.3.2015
	(xiii)	Date of harvesting	:	10.03.2015 6.3.2016

6. Physico-chemical properties of experimental soil:

Table- AS 68.1 showed that soil of the experimental field was clay loam in texture, alkaline in reaction, medium in organic carbon, available phosphorus and high in available nitrogen and potassium and deficient in zinc.

Table :AS 68.1 : Physico- chemical properties of the experimental field.

Parameters	Value
Textural class	Clay loam
Bulk density (mg/m^3)	1.40
Particle density (mg/m^3)	2.64
Porosity (%)	46.00
Soil pH (1:2.5)	8.22
Ec (ds/m^2)	0.34
Organic carbon (%)	0.50
Available N (Kg/ha)	361
Available P_2 O_5 (Kg/ha)	23.5
Available K_2O (Kg/ha)	325
Available Zn (DTPA)	0.55

7. Results: A field experiment was planted 21th Febuary, 2014 and 15th march, 2015 at ARS, Kota to develop nutrient management strategy for sustaining soil health and sugarcane production. Sugarcane variety CoPK-05191 was planted at 75 cm row distance, keeping 3 budded 4 setts per meter row length. Fertilizer, FYM and biofertilizer and cane trash were applied as per treatment. Cultural operations were followed as per recommendation as and when desired.

During 2014-15: Data presented in table AS 68.2 revealed that significantly higher germination (45.53 and 50.97 %) at 30 and 45 DAP, Tillers at 120 DAP (1,75,400/ha) and

NMC(1,32,100/ha) was obtained with the application of 100% RDF through inorganic source enriched with 10 t FYM /ha +12.5 + 12.5 kg / ha (Azotobactor + PSB) over T_1,T_4 and T_7 treatments. However, other treatments were at par with each other. Whereas tillers population at 150 DAP (1,86,670/ha) and cane girth (9.70 cm) was recorded maximum in T_9 treatment which was significantly higher over T_1, T_4 and T_7 and at par with rest of treatments. Longer (255.03 cm) and single cane weight (856 g) were also harvested with application of 20 t FYM / ha along with inorganic nutrient application based on soil test, significantly higher over T_1,T_4 and T_7 in cane length and single cane weight only T_1 and at par with rest of treatments. Application of 100% RDF/ STBR with organic manure or biofertilizer were increased millable cane, cane length and individual cane weight and observed superior as compared to control.

Data presented in Table AS 68.4 revealed that cane yield (98.20 t/ha) and CCS (12.10 t/ha) were recorded significantly higher by application of in organic nutrient based on soil test enriched with 10 t FYM /ha +12.5 + 12.5kg/ha (Azotobactor + PSB) over T_1, T_4 and T_7 treatments and at par with rest of treatments. The higher cane yield was the cumulative effect of higher cane length, girth and NMC. However, quality parameter i.e. brix (20.40%),sucrose (17.87%),CCS (12.30% and purity (87.56%) were recorded maximum under application of inorganic nutrient based on soil testing along with 20 t FYM/ha which was significantly superior over T_1,T_4 and T_7 treatments except rest of treatments. Significant increase in soil organic carbon (0.54%) and infiltration rate (4.70 mm/hr) was also obtained by application of inorganic nutrient based on soil testing along with 20 t FYM/ha over T_1, T_2 and T_3 treatments and at par with rest. FYM application in combination of either 100 % RDF or STBR increased SOC and infiltration rate over without added FYM and biofertilizer treated plots. Increase in infiltration rate can be attributed to increase SOM. Water stable aggregates increased with application of FYM (Table AS 68.6).Soil pH (8.14) and bulk density (1.35 mg/m^2) of soil reduced with application of T6 treatment over T1, T2 and T3 treatments and at par with rest. Application of inorganic nutrients enriched biofertilizer with FYM also loosened soil and showed lowest values of bulk density. Lower bulk density and soil pH determinate in manure treated plots was because of higher OM content of soil increased root growth, better aggregation and increased volume of micro pores. Application of inorganic nutrients enriched biofertilizer with FYM could not influence EC significantly over application of inorganic nutrient treatments. These results suggested that added organic substances either through plant residues or manure/ biofertilizer conserved soil organic carbon to a greater extent. Significantly higher available N (340 kg/ha) in soil was obtained with T_5 treatment over T_1, T_2 and T_3 treatments and at par with rest. Whereas higher available P (25.65 kg/ha) was noted with T_9 which was significantly superior over T_1, T_2 and T_3 treatments except rest of treatments. Available K(325 kg/ha) in soil also increased significantly with T_6 over T_1, T_2 and T_3 treatments. Application of inorganic nutrient either 100% RDF or STBR along with 20/10tFYM/ha enriched with biofertilizer ensured C addition and increase in microbial activity. Manure application significantly increased SOC and NPK availability as compared to no use of organic. It indicated that application of biofertilizer enriched with FYM improving soil structure, SOC and available nutrients status in soil during plant crop growth.

Data presented in table AS 68.8 revealed that there were differences in cost of cultivation, GR, NR owing to different treatment cost. The higher GR, NR and BCR recorded with application of T_9 treatment which was significantly higher over T_1, T_4 and T_7 and at par with rest of treatments. However, maximum cane production cost(Rs1,17,804/ha) recorded in T_5 treatment owing to higher cost of FYM and lower added of nutrients, whereas. Lowest production cost, GR and NR recorded in T_1.

During 2015-16: Data presented in table AS 68.3 revealed that significantly higher germination (47.70 and 51.70 %) at 30 and 45 DAP, Tillers (1,73,630 and 1,83,350/ha) at 120 DAP and at 150 DAP, cane length (234.80 cm) and NMC(1,24,940/ha) were obtained with the application of inorganic nutrient based on soil testing through inorganic source enriched with 10 t FYM /ha +12.5 + 12.5 kg / ha (Azotobactor + PSB) over T_1,T_4 and T_7 treatments and at par with rest of treatments. Whereas cane girth (8.70 cm) was recorded maximum in T_9 treatment which was significantly higher over T_1 and at par with rest of treatments. Single cane weight (830 g) was also obtained with application of 20 t FYM/ha along with inorganic nutrient application based on soil test, significantly higher over T_1, T_4 and T_7 and at par with rest of treatments. Application of 100 % RDF/ STBR with organic manure or biofertilizer were increased millable cane, cane length and individual cane weight and observed superior as compared to trash application treatments.

Data presented in Table AS 68.5 revealed that cane yield (85.00 t/ha) and CCS (10.34 t/ha) were recorded significantly higher by application of inorganic nutrient based on soil test enriched with 10 t FYM /ha + 12.5 + 12.5 kg/ha (Azotobactor + PSB) over T_1, T_4 and T_7 treatments and at par with rest of treatments. The higher cane yield was the cumulative effect of higher cane length, girth and NMC. However, quality parameter i.e. brix (20.17%), sucrose (17.63%),CCS(12.12% and purity (87.39%) were recorded maximum under application of inorganic nutrient based on soil testing along with 20 t FYM/ha which was significantly superior over T_1,T_4 and T_7 treatments except rest of treatments. Significant increase in soil organic carbon (0.55%) and infiltration rate (4.68 mm/hr) was also obtained by application of inorganic nutrient based on soil testing along with 20 t FYM/ha over only T_1 treatment and at par with rest. Soil pH (8.12) and bulk density (1.34 mg/m^2) of soil reduced significantly with application of T_6 treatment over T_1, T_2 and T_3 and T_7 and T_8 treatments and at par with rest. Same trend in EC was also noted during the second year. Significantly higher available N (361 kg/ha) in soil was obtained with T_6 treatment over T_1 and T_7 treatments and at par with rest of treatments. Whereas higher available P (26.70 kg/ha) was noted with T_6 which was significantly superior over only T_1, treatment except rest of treatments. Available K (330 kg/ha) in soil also increased significantly with T_6 over T_1, T_2 and T_3 treatments and at par with rest of treatments.

Data presented in table AS 68.9 revealed that there were differences in cost of cultivation, GR, NR owing to different treatment cost. The higher GR and NR recorded with application of T_9 treatment which was significantly higher over T_1, T_4 and T_7 and at par with rest of treatments. Significantly the highest BCR recorded in T_9 treatment only over T_4 and at par with rest. However, maximum cane production cost(Rs1,17,804/ha) recorded in T_5 treatment owing to higher cost of FYM and lower added of nutrients, whereas. Lowest production cost, GR and NR recorded in T_1.

8. Summary: Among the treatment combination of nutrient management strategy, application of based on soil test (150:50:30 kg N,P_2 O_5, K_2O/ha) through inorganic source enriched with 10 t FYM/ha +12.5 + 12.5kg/ha (Azotobactor + PSB) was found excellent for increasing cane yield (98.20 and 85.00 t/ha), CCS yield (12.10 and 10.34 t/ha) and net returns(Rs1,15,660 and 85,376/ha) respectively, during both the years which was significantly superior over T_1,T_4 and T_7 treatments except rest treatments. Whereas, application of 150:50:30 kg $NP_2O_5K_2O$/ha (STB) through inorganic source enriched with 20 t FYM /ha (T_6) found significantly superior and nest best treatment in respect of growth, quality and improving status of soil during both the years.

9. Significant findings: The experiment is ongoing in third year.

10. **Scientist attached**: Dr. B.S. Meena

Table: AS 68.2: Integrated applications of organics and in organics on germination, growth and yield attributes of sugarcane during 2014-15 at Kota

Treatment	Germination (%)		Tillers (000 /ha)		Cane length (cm)	Cane girth (cm)	NMC (000/ ha)	Cane weight (g)
	30 DAP	45 DAP	120DAP	150DAP				
T_1 - No organic + 50% RDF	36.60	40.50	143.63	155.03	210.00	6.67	100.77	638.33
T_2 - No organic + 100% RDF	42.83	43.57	165.47	175.40	230.67	8.47	121.00	821.67
T_3 - No organic + soil test based recommendation	41.43	43.30	165.23	175.17	235.53	8.53	118.40	816.67
T_4 – Application of FYM/Compost @ 20tonnes/ha +50%RDF (inorganic source)	38.37	41.40	157.07	168.10	227.43	7.50	111.67	808.33
T_5 -Application of FYM/Compost @ 20 tonnes / ha +100%RDF (inorganic source)	45.05	49.93	172.63	182.53	252.33	8.60	128.67	840.00
T_6 -Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	43.40	45.50	171.63	184.27	255.03	8.50	131.40	856.00
T_7 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF	39.83	43.37	157.83	168.73	228.00	7.53	113.00	820.00
T_8 Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	45.53	50.97	175.40	184.00	252.37	8.63	132.10	850.00
T_9 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	44.10	47.40	172.07	186.67	251.70	9.70	130.23	834.67
SEm ±	1.89	2.14	5.85	5.51	8.86	0.53	5.99	40.46
CD (P=0.05)	5.73	6.49	17.75	16.72	26.87	1.60	18.17	122.72
CV	7.81	11.87	6.16	5.44	6.44	11.08	8.59	8.68

Table AS 68.3: Integrated applications of organics and in organics on germination, growth and yield attributes of sugarcane rattoning during 2015-16 at Kota.

Treatment	Germination (%)		Tillers (000 /ha)		Cane length (cm)	Cane girth (cm)	NMC (000/ ha)	Cane weight (g)
	30 DAP	45 DAP	120DAP	150DAP				
T_1 - Application of trash @ 10 tonnes/ha + 50% RDF	38.60	41.77	146.80	146.01	196.68	7.00	101.35	701.67
T_2 - Application of trash @ 10 tonnes/ha + 100% RDF	41.83	44.20	164.13	170.67	221.01	8.41	115.67	806.67
T_3 - Application of trash @ 10 tonnes/ha + soil test based recommendation	42.50	44.30	170.33	172.41	220.71	8.45	115.08	810.00
T_4 – Application of FYM/Compost @ 20tonnes/ha +50%RDF (inorganic source)	39.53	42.27	153.67	160.01	199.42	7.73	103.34	722.00
T_5 -Application of FYM/Compost @ 20 tonnes / ha +100%RDF (inorganic source)	46.13	51.53	170.27	176.81	233.40	8.52	117.34	820.68
T_6 -Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	43.77	46.50	171.33	180.85	234.18	8.53	120.50	830.00
T_7 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF	39.50	42.70	154.47	160.74	205.02	7.77	107.40	720.00
T_8 Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	46.47	51.40	172.60	181.01	233.35	8.57	122.60	821.67
T_9 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	47.70	51.70	173.63	183.35	234.80	8.70	124.94	825.00
SEm ±	1.83	2.42	5.98	7.28	9.11	0.46	5.21	31.27
CD (P=0.05)	5.56	7.35	18.15	22.09	27.65	1.39	15.81	94.84
CV	7.40	13.11	6.31	7.41	7.18	9.72	7.90	6.91

Table AS 68. 4: Effect of integrated application of organics and inorganics on cane yield, quality and soil health during 2014-15 at Kota.

Treatment	Cane yield (t/ha)	Brix (%)	Sucrose (%)	CCS (%)	CCS (t/ha)	Purity (%)
T_1 - No organic + 50% RDF	75.40	17.83	15.22	10.35	7.83	85.33
T_2 - No organic + 100% RDF	92.00	18.07	15.46	10.53	9.70	85.53
T_3 - No organic + soil test based recommendation	90.33	19.00	16.42	11.24	10.15	86.42
T_4 – Application of FYM/Compost @ 20tonnes/ha +50%RDF(inorganic source)	80.87	19.53	16.97	11.64	9.41	86.88
T_5 -Application of FYM/Compost @ 20 tonnes / ha +100%RDF(inorganic source)	95.00	20.30	17.76	12.23	11.63	87.49
T_6 -Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	97.40	20.40	17.87	12.30	12.01	87.56
T_7 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF	81.00	20.00	17.45	12.00	9.73	87.27
T_8 Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	97.67	20.33	17.80	12.25	11.96	87.52
T_9 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	98.20	20.35	17.81	12.26	12.10	87.48
SEm ±	4.85	0.49	0.51	0.38	0.74	0.41
CD (P=0.05)	14.70	1.49	1.54	1.14	2.24	1.25
CV	9.35	4.37	5.18	5.58	12.18	0.82

Table AS 68. 5: Effect of integrated application of organics and inorganics on cane yield and quality parameters of sugarcane during 2015-16 at Kota.

Treatment	Cane yield (t/ha)	Brix (%)	Sucrose (%)	CCS (%)	CCS (t/ha)	Purity (%)
T_1 - Application of trash @ 10 tonnes/ha + 50% RDF	69.00	18.02	15.41	10.49	7.26	85.52
T_2 - Application of trash @ 10 tonnes/ha + 100% RDF	79.33	18.73	16.15	11.03	8.74	86.18
T_3 - Application of trash @ 10 tonnes/ha + soil test based recommendation	78.68	20.10	17.56	12.07	9.52	87.31
T_4 – Application of FYM/Compost @ 20tonnes/ha +50%RDF(inorganic source)	71.02	19.50	16.94	11.62	8.26	86.85
T_5 -Application of FYM/Compost @ 20 tonnes / ha +100%RDF(inorganic source)	80.67	20.12	17.57	12.09	9.75	87.34
T_6 -Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	83.67	20.17	17.63	12.12	10.16	87.39
T_7 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF	72.00	18.43	15.84	10.80	7.78	85.88
T_8 Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	84.00	20.13	17.59	12.10	10.16	87.37
T_9 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	85.00	20.17	17.63	12.12	10.34	87.34
SEm ±	3.73	0.51	0.53	0.39	0.61	0.41
CD (P=0.05)	11.32	1.54	1.59	1.18	1.86	1.26
CV	8.27	4.53	5.37	5.79	11.63	0.83

Table: AS 68.6: Effect of integrated application of organics and inorganics on soil properties and nutrient status of soil after completion of one year crop cycle 2014-15 at Kota

Treatment	OC (%)	Soil pH	Ec (ds/m^2)	Bulk density (Mg/m^2)	Infiltration rate (mm/hr)	Nutrient status of soil (kg/ha) after harvest		
						N	P	K
T_1 - No organic + 50% RDF	0.47	8.21	0.32	1.42	3.80	275	14.40	275
T_2 - No organic + 100% RDF	0.46	8.22	0.35	1.43	3.90	287	16.70	299
T_3 - No organic + soil test based recommendation	0.48	8.20	0.33	1.41	3.90	290	16.90	295
T_4 – Application of FYM/Compost @ 20tonnes/ha +50%RDF(inorganic source)	0.53	8.15	0.31	1.37	4.60	322	24.40	313
T_5 -Application of FYM/Compost @ 20 tonnes / ha +100%RDF (inorganic source)	0.52	8.17	0.30	1.36	4.60	340	25.30	318
T_6 -Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	0.54	8.14	0.29	1.35	4.70	335	25.10	325
T_7 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF	0.52	8.15	0.29	1.37	4.50	211	23.50	314
T_8 Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	0.51	8.16	0.28	1.38	4.60	333	24.70	320
T_9 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	0.53	8.15	0.28	1.37	4.70	325	25.65	317
SEm ±	0.022	0.020	0.09	0.025	0.25	16.10	2.15	8.50
CD (P=0.05)	0.066	0.060	NS	0.071	0.73	47.15	6.40	24.70
CV	5.30	4.70	4.90	5.7	2.50	4.50	6.00	4.70
Initial	0.50	8.22	0.34	1.40	4.00	361	23.5	325

Table AS 68.7: Effect of integrated application of organics and inorganics on soil properties and nutrient status of soil after completion of two years crop cycle (2015-16) at Kota.

Treatment	OC (%)	Soil pH	Ec (ds/m^2)	Bulk density (Mg/m^2)	Infiltration rate (mm/hr)	Nutrient status of soil (kg/ha) after harvest		
						N	P	K
T_1 - Application of trash @ 10 tonnes/ha + 50% RDF	0.50	8.19	0.31	1.39	4.20	320	18.10	300
T_2 - Application of trash @ 10 tonnes/ha + 100% RDF	0.51	8.20	0.31	1.38	4.23	322	21.50	305
T_3 - Application of trash @ 10 tonnes/ha + soil test based recommendation	0.52	8.19	0.30	1.38	4.22	345	20.90	302
T_4 – Application of FYM/Compost @ 20tonnes/ha +50%RDF(inorganic source)	0.54	8.13	0.29	1.36	4.61	350	25.70	322
T_5 -Application of FYM/Compost @ 20 tonnes / ha +100%RDF (inorganic source)	0.54	8.14	0.29	1.35	4.61	360	26.00	325
T_6 -Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	0.55	8.12	0.28	1.34	4.68	361	26.70	330
T_7 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF	0.51	8.20	0.29	1.38	4.55	318	25.00	323
T_8 Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	0.52	8.18	0.28	1.37	4.63	356	25.70	327
T_9 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	0.54	8.14	0.28	1.37	4.68	360	26.50	328
SEm ±	0.02	0.02	0.08	0.015	0.16	13.90	2.25	8.62
CD (P=0.05)	0.049	0.06	NS	0.04	0.46	NS	6.63	25.86
CV	5.27	4.72	4.87	5.50	2.55	5.50	5.90	5.00
Initial	0.50	8.22	0.34	1.40	4.00	361	23.50	325

Table: AS 68.8: Cost and economics of integrated application of organics and in organics treatments during 2014-15 at Kota.

Treatment	Treatment cost (Rs/ha)	Production cost (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B: C ratio
T_1 - No organic + 50% RDF	3,402	98,402	1,73,420	75,018	1.76
T_2 - No organic + 100% RDF	6,804	1,01,804	2,11,600	1,09,796	2.08
T_3 - No organic + soil test based recommendation	5,324	1,00,324	2,07,767	1,07,443	2.07
T_4 – Application of FYM/Compost @ 20tonnes/ha +50%RDF (inorganic source)	5,002	1,14,402	1,85,993	71,591	1.63
T_5 -Application of FYM/Compost @ 20 tonnes / ha +100%RDF (inorganic source)	8,404	1,17,804	2,18,500	1,00,696	1.85
T_6 -Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	6,924	1,16,324	2,24,020	1,07,696	1.93
T_7 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF	6,078	1,08,278	1,86,300	78,022	1.72
T_8 Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	9,480	1,11,680	2,24,633	1,12,953	2.01
T_9 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	8,000	1,10,200	2,25,860	1,15,660	2.05
SEm ±	-	-	11,149	11,149	0.11
CD (P=0.05)	-	-	33,815	33,815	0.33
CV	-	-	9.35	20	9.90

Common cost of cultivation: Rs 95,000 / ha **Cane price:** Rs 2300/ton

Rate of fertilizers (Rs / kg): Urea = 6, SSP =8, MOP =18, ZnSO4 = 40.70, FYM =800/ton, Bio-fertilizers each (Azotobacter and PSB) =75

Table AS 68.9: Cost and economics of integrated application of organics and in organics treatments during 2015-16 at Kota.

Treatment	Treatment cost (Rs/ha)	Production cost (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B: C ratio
T_1 - Application of trash @ 10 tonnes/ha + 50% RDF	5002	100002	1,58,700	58,698	1.59
T_2 - Application of trash @ 10 tonnes/ha + 100% RDF	8,404	1,03,404	1,82,467	79,063	1.76
T_3 - Application of trash @ 10 tonnes/ha + soil test based recommendation	6,924	1,01,924	1,80,972	79,048	1.78
T_4 – Application of FYM/Compost @ 20tonnes/ha +50%RDF (inorganic source)	19,402	1,14,402	1,63,338	48,936	1.43
T_5 -Application of FYM/Compost @ 20 tonnes / ha +100%RDF (inorganic source)	22,804	1,17,804	1,85,533	67,729	1.57
T_6 -Application of FYM/Compost @ 20 tonnes / ha + in organic nutrient application based on soil test (rating chart)	21,324	1,16,324	1,92,433	76,109	1.65
T_7 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 50% RDF	13,202	1,08,202	1,65,600	57,398	1.53
T_8 Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + 100% RDF	16,604	1,11,604	1,93,200	81,596	1.73
T_9 -Application of FYM/Compost @ 10 tonnes / ha + biofertilizer (*Azotobacter/ Acetobacter* + *PSB*) + soil test basis	15,124	1,10,124	1,95,500	85,376	1.78
SEm ±	-	-	8,582	7,561	0.07
CD (P=0.05)	-	-	26,029	22,934	0.23
CV	-	-	8.27	19.00	7.84

Common cost of cultivation: Rs 95,000 / ha **Cane price:** Rs 2300/ton

Rate of fertilizers (Rs / kg): Urea = 6, SSP =8, MOP =18, ZnSO4 = 40.70, FYM =800/ton, Bio-fertilizers each (Azotobacter and PSB) =75

Trash cost including Trichoderma = Rs 1600/ ha, STB =Rs 5324/ha

Code No./Expt.No.AS 69/ARS Kota/Sugarcane/Agronomy/AICRP/Spring/2015-16/S-3

1.	Name of the project	:	All India Coordinated Research Project on Sugarcane	
2.	Location	:	Agriculture Research Station, Kota	
3.	Title of the experiment	:	Use of plant growth regulators (PGRs) for enhanced yield and quality of sugarcane	
4.	Year of start	:	Spring 2015-16	
5	Year of Completion	:	2017-18	
6.	Brief description of the experiment :			
	i) 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.	
	ii) Treatments	:	T_1 : Conventional planting/ Farmers' practice (3-bud 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 : T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP T_6 : T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP T_7 : T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP T_8 : T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	
	iii)	Design	:	RBD
	iv)	Replication	:	3
	v)	Spacing	:	Recommended row spacing of the zone
	vi)	Plot size (gross)	:	6 x 4.5 (27 M^2) (6row; 6 m length)
	vii)	Variety	:	CoPK 05191 (Pratap Ganna-1)
	viii)	Fertilizer doses	:	As per treatments
	ix)	Cultural practices	:	Earthing up, Tying, Detrashing and Propping as & when required,
	x)	Weed control		Spray of atrazine @ 2.0 kg a.i. / ha as PE followed one hand weeding at 60DAP.
	xi)	Irrigation		As per need
	xii)	Insect/pest control		As and when need
	xiii)	Date of Planting	:	12.3.2015
	(xiv)	Date of harvesting	:	5.03.2016

7. Results: A field experiment was planted 12th March, 2015 at ARS, Kota to accelerate rate and extent of sugarcane germination, growth, yield and juice quality through the use of PGRs. Sugarcane variety CoPK-05191 was planted at 75 cm row distance, keeping 3 budded 4 setts per meter row length. Uniform application of RDF was applied and cultural operations were followed as per recommendation as and when desired. Significant variation on germination was observed at all the germination stages with the application of Ethrel treatments. Significant enhancement in percent germination at 10, 30, 40, and 50 DAP, recorded with the application of planting of setts after over night soaking in 50 ppm ethrel solution along with spry of GA_3 at 90,120,150 DAP treatment over T_1, T_2, T_5 and T_6 and at par with the rest of treatments. Whereas, significantly higher germination at 20 DAP was observed under T_8 treatment. Tillers count significantly increased at all the stages under the

treatment planting of setts after over night soaking in 100 ppm ethrel solution + GA_3 spray at 90,120,150 DAP over T_1, T_2, T_5 and T_6 and at par with the rest of treatments. Gibberellic acid stimulated cane growth when it was sprayed at vegetative upto actively growing period. Gibberellic acid can affect cell elongation, stem growth as well as root growth and help in better extensive root system develop. This treatment had also significant effect on leaf area (cm^2/plant) over T_1, T_2, T_3 and T_4 and at par with rest. Whereas, significantly higher leaf area at harvest (389.73cm^2/plant) was also observed under the same treatment. Dry matter accumulation in the sugarcane at 120,150 and 180 DAP significantly increased by the application of planting of setts after over night soaking in 100 ppm ethrel solution + GA_3 spray at 90,120,150 DAP treatment over T_1 and T_2 and at par with the rest. While Dry matter accumulation at early growth (90 DAP) and harvest stage, recorded significantly higher under the same treatment over T_1, T_2, T_5 and T_6 and at par with the rest of treatments. Hence DMA in sugarcane took place with faster rate after 90 upto 180 DAP.Thereafter, the rate of accumulation reduced drastically at harvest under either control or no use of ethrel and GA_3 treatment. Application of planting of setts after over night soaking in 100 ppm ethrel solution + GA_3 spray at 90,120,150 DAP treatment had significant effect on plant height at all the stages over T_1, T_2,and T_5,whereas recorded significantly higher plant height (259.23 cm) at harvest only over T_1, T_2 and at par with the rest of treatments. Root dry weight significantly increased at 50 and 120 DAP by the application of planting of setts after over night soaking in 100 ppm ethrel solution + GA_3 spray at 90,120,150 DAP over T_1, T_2,and T_5, and at par with the rest. Whereas, significantly higher root dry weight at 180 DAP and at harvest, recorded under the same treatment over T_1, T_2, T_3, T_5 and T_6 and at par with rest. Data presented in table AS 69.4 revealed that significantly higher NMC (1,45,330/ha), cane weight (857 g/plant), cane yield (98.77 t/ha), ^{o}Brix (21.10 %), sucrose (18.59 %), CCS (12.84 %), CCS (12.68 t/ha) and purity (88.09 %) were obtained with the application of planting of setts after over night soaking in 100 ppm ethrel solution + GA_3 spray at 90,120,150 DAP over T_1 and T_2 treatments and at par with rest of treatments. It is an eco-friendly chemical and has tremendous potential to augment cane yield and sugar productivity. The main effects of applying ethrel to sugarcane as a ripener are to the increase sucrose percent, cane and juice purity without producing a noticeable effect on stalk mass within treatments.

Data presented in table AS 69.5 revealed that there were differences in cost of cultivation, GR, NR owing to different treatment cost. The higher GR and NR recorded with application of T_8 treatment which was significantly higher over T_1 and T_2 and at par with rest of treatments. Significantly the highest BCR recorded in T_4 treatment over T_1,T_2,T_5 and T_6 and at par with rest. However, maximum cane production cost (Rs1, 15,450 /ha) recorded in T_8 treatment owing to higher cost of GA_3 including spray labour cost. Whereas, lowest production cost, GR and NR recorded in T_1.

8. Summary: Among treatment combination of PGR, planting of setts after over night soaking in 100 ppm ethrel solution + GA_3 spray at 90,120,150 DAP treatment was found excellent for increasing DMA, leaf area, root dry weight, NMC (1,45,330/ha), cane weight (857 g/plant), cane yield (98.77 t/ha),^{o}Brix (21.10 %), sucrose (18.59 %), CCS (12.84 %), CCS (12.68 t/ha) and purity (88.09 %), GR and NR (Rs 2,46,917 and 1,31,467 /ha) which was significantly superior over T_1 and T_2 treatments and at par with rest of treatments. Whereas, significant enhancement in germination at 10, 30, 40, and 50 DAP, recorded with the application of planting of setts after over night soaking in 50 ppm ethrel solution along with spry of GA_3 at 90,120,150 DAP treatment over T_1, T_2, T_5 and T_6 and at par with the rest of treatments.

9. Significant findings: The experiment is ongoing in second year.

10. **Scientist attached**: Dr. B.S. Meena

Table AS 69.1: Effect of plant growth regulators on germination and tillering of sugarcane during 2015-16 at Kota.

Treatment	Germination (%)					Tillers (000 / ha)			
	10 DAP	20 DAP	30 DAP	40 DAP	50 DAP	90 DAP	120 DAP	150 DAP	180 DAP
T_1 : Conventional planting / Farmers' practice (3-bud setts)	5.03	17.77	37.17	43.00	47.00	70.26	135.27	146.97	160.00
T_2 : Planting of setts after overnight soaking in water	5.47	18.31	38.83	43.67	47.33	72.40	136.63	147.73	162.00
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	6.26	19.96	43.03	47.60	53.33	85.40	150.10	186.33	196.67
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	6.75	20.05	43.17	47.20	52.67	88.67	150.40	189.47	200.07
T_5 : T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	5.65	19.15	38.63	43.73	48.00	76.02	144.40	157.65	170.00
T_6 : T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	5.70	19.45	38.73	43.47	48.33	76.87	146.00	159.87	171.67
T_7 : T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	7.00	21.42	43.80	48.93	55.13	90.34	157.47	197.07	205.67
T_8 : T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	6.85	21.57	43.70	48.50	54.50	92.73	159.07	199.33	208.00
SEm ±	0.51	0.73	1.56	1.50	2.02	4.72	5.18	7.35	8.62
CD (P=0.05)	1.53	2.20	4.71	4.53	6.12	14.29	15.66	22.23	26.07
CV	14.43	6.38	6.59	5.67	6.90	10.03	6.08	7.35	8.10

Table AS 69.2: Effect of plant growth regulators on leaf area and biomass accumulation in sugarcane plant on dry weight basis at different growth stages during 2015-16 at Kota.

Treatment	Leaf area (cm^2/ plant)					Dry matter accumulation (g / plant)				
	90 DAP	120 DAP	150 DAP	180 DAP	At harvest	90 DAP	120 DAP	150 DAP	180 DAP	At harvest
T_1 : Conventional planting/ Farmers' practice (3-bud setts)	248.40	261.97	266.67	310.03	336.40	52.37	88.47	141.03	186.87	284.67
T_2 : Planting of setts after overnight soaking in water	250.50	263.67	268.00	316.77	336.80	54.43	92.83	141.67	188.60	289.33
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	257.17	263.43	273.33	317.78	352.53	59.90	100.53	154.30	207.00	326.67
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	258.33	265.07	274.33	318.58	359.53	64.47	103.33	156.57	210.27	333.33
T_5 : T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	275.17	285.27	302.67	342.13	371.00	55.77	104.00	156.93	214.10	295.33
T_6 : T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	276.57	288.00	303.67	343.63	372.90	56.83	106.90	158.60	215.47	296.73
T_7 : T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	287.07	290.00	311.00	352.67	385.00	66.87	112.17	170.30	226.83	340.00
T_8 : T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	288.07	295.00	314.67	356.90	389.73	68.17	115.27	173.90	228.73	341.67
SEm ±	9.62	8.34	11.99	10.71	12.18	3.14	5.00	6.87	8.78	13.84
CD (P=0.05)	29.12	25.24	36.29	32.41	36.87	9.51	15.14	20.78	26.56	41.86
CV	6.23	5.22	7.18	5.58	5.81	9.10	8.42	7.59	7.25	7.64

Table AS 69.3: Effect of plant growth regulators on plant height and root dry weight of sugarcane at different growth stages during 2015-16 at Kota.

Treatment	Plant height (cm)					Root dry weight (g /plant)			
	90 DAP	120 DAP	150 DAP	180 DAP	At harvest	50 DAP	120 DAP	180 DAP	At harvest
T_1 : Conventional planting/ Farmers' practice (3-bud setts)	84.80	127.07	149.53	168.63	223.47	0.40	0.72	1.35	2.10
T_2 : Planting of setts after overnight soaking in water	85.53	129.03	152.33	173.63	225.87	0.40	0.73	1.36	2.11
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	95.33	135.50	160.30	180.63	240.30	0.45	0.80	1.55	2.82
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	97.47	137.23	163.63	182.80	246.63	0.47	0.82	1.54	2.83
T_5 : T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	89.20	136.97	157.98	179.37	244.87	0.41	0.77	1.52	2.50
T_6 : T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	89.60	138.47	159.03	180.00	248.70	0.42	0.79	1.52	2.53
T_7 : T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	98.33	147.03	172.80	195.03	258.60	0.46	0.83	1.69	2.92
T_8 : T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	101.13	149.27	173.23	195.73	259.23	0.46	0.84	1.70	2.95
SEm ±	3.63	5.48	4.95	5.30	7.75	0.02	0.02	0.05	0.04
CD (P=0.05)	10.99	16.58	14.98	16.03	23.46	0.05	0.07	0.16	0.13
CV	6.79	6.90	5.32	5.04	5.51	6.31	5.36	6.16	2.83

Table AS 69.4: Effect of plant growth regulators on yield attributes, yield and quality parameters of sugarcane during 2015-16 at Kota.

Treatment	NMC (000/ ha)	Cane weight (g)	Cane yield (t/ha)	Brix (%)	Sucrose (%)	CCS (%)	CCS (t/ha)	Purity (%)
T_1 : Conventional planting/ Farmers' practice (3-bud setts)	123.33	700.00	80.37	19.33	16.77	11.49	9.26	86.67
T_2 : Planting of setts after overnight soaking in water	125.33	703.33	81.37	19.38	16.82	11.53	9.40	86.75
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	135.00	823.33	92.53	20.37	17.83	12.28	11.37	87.53
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	139.67	830.00	94.63	20.50	17.97	12.38	11.72	87.65
T_5 : T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	135.13	804.00	90.77	20.63	18.11	12.48	11.34	87.74
T_6 : T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	136.67	815.00	91.97	20.70	18.18	12.53	11.51	87.80
T_7 : T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	144.00	856.67	97.57	21.03	18.52	12.78	12.47	88.05
T_8 : T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	145.33	857.00	98.77	21.10	18.59	12.84	12.68	88.09
SEm ±	4.66	35.18	3.85	0.41	0.42	0.31	0.60	0.33
CD (P=0.05)	14.10	106.46	11.65	1.23	1.27	0.94	1.81	1.00
CV	5.96	7.63	7.33	3.46	4.07	4.37	9.26	0.65

Table AS 69.5: Cost and economics of plant growth regulators treatments in sugarcane during 2015-16 at Kota.

Treatment	Treatment cost (Rs/ha)	Production cost (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B: C ratio
T_1 : Conventional planting/ Farmers' practice (3-bud setts)	0	1,01,804	2,00,917	99,113	1.97
T_2 : Planting of setts after overnight soaking in water	1,970	1,03,774	2,03,417	99,643	1.96
T_3 : Planting of setts after overnight soaking in 50 ppm ethrel solution	2,123	1,03,927	2,31,333	1,27,406	2.23
T_4 : Planting of setts after overnight soaking in 100 ppm ethrel solution	2,276	1,04,080	2,36,583	1,32,503	2.27
T_5 : T1+GA_3 spray (35 ppm) at 90, 120 and 150 DAP	11,370	1,13,170	2,26,917	1,13,747	2.01
T_6 : T2+ GA_3 spray (35 ppm) at 90, 120 and 150 DAP	13,340	1,15,144	2,29,917	1,14,773	2.00
T_7 : T3 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	13,493	1,15,297	2,43,917	1,28,620	2.12
T_8 : T4 + GA_3 (35 ppm) spray at 90, 120 and 150 DAP	13,646	1,15,450	2,46,917	1,31,467	2.14
SEm ±	-	-	9,623.11	9,295.90	0.06
CD (P=0.05)	-	-	29,119.13	28,129.01	0.20
CV	-	-	7.33	13.60	5.38

Common cost of cultivation: Rs 1,01,804 / ha **Cane price:** Rs 2500/ton

Rate of fertilizers (Rs / kg): Urea = 6, SSP =8, MOP =18 , FYM =800/ton, Ethrel = 120/100 ml , GA_3 = 260/5 g

FRONT LINE DEMONSTRATION (FLD) 2015-16

TECHNICAL REPORT OF THE FRONTLINE DEMONSTRATIONS OF SUGARCANE CONDUCTED BY AICRP ON SUGARCANE, KOTA CENTRE (2015-16)

1.	Name of the crop	:	Sugarcane
2.	Season	:	Spring (2015-16)
3.	Objective	:	Popularization of new cane variety and sustainable development of sugarcane based cropping system
4.	Name of the farmer	:	Sh. Mahadeva
5.	location	:	Jad ka Nayagoan, Teh,Hindoli Distt. Bundi
6.	Area under demonstration	:	1.0 ha
7.	Irrigated / rainfed	:	Irrigated
8.	Category of beneficence		
	(a) Medium / small / marginal	:	Medium
	(b) SC/ST/OBC/General	:	ST
9.	Rainfall pattern	:	Medium
10.	Field condition		
	(a) Topography	:	Plains
11.	Production technology adopted	:	
	(a) Variety	:	CoPb 09181
	(b) Seed rate	:	72 q/ha
	(c) Source of seed	:	ARS, Ummedganj, Kota.
	(d) Seed treatment	:	0.05% carbendazim
	(e) Planting date	:	20.3.2015
	(f) Fertilizer		
	(i) Basal dose of N	:	50 N : 60 P_2O_5 : 40 K_2O ha^{-1}
	(ii) Top dressing in three splits	:	150 kg N as per recommendation
	(h) Weed control	:	Atrazine @ 2.0 kg ha /ha PE + Two hand weeding at 60 & 90 DAP

(i) Plant protection measures : Monocrotophos @ 1 lit./ha

12. Date of harvesting : 15..3. 2016

13. Estimate of yield (t/ha) :
(i) Improved Technology (IT) : 95.50 t/ha
(ii) Farmer Practice (FP) : 82. 70 t/ha
(iii) Per cent increase over local check : 15.48 %

14. Economics :

S. No.	Items	Cost of Cultivation (Rs/ha)	
		IT	FP
1.	Land preparation & ploughing	11600	10600
2.	Labor component (planting, earthing, and hand weeding etc.)	29000	29500
3.	**Input** Cane Seed	15300	13700
	Herbicide	1000	-
	Fertilizers	7600	6300
	Plant Protection	2500	1600
4.	Irrigation	15000	15000
5.	Harvesting	13000	13000
	Total cost of cultivation (Rs./ha)	**95,,000**	**89,700**
6.	Value of produced (Rs./ha)	2,38,750	2,06,750
7.	Net return (Rs./ha)	1,43,750	1,17,050
8.	B: C Ratio	2.51	2.30

* Selling price Rs. 2500 t/ha

15. **Farmers reaction :**

Farmers were quite satisfactory and impressed cane production. They had following reaction:

1. Sowing of three budded setts gave better and uniform germination over two or three piece of whole cane.
2. Sowing of setts if furrows with recommended spacing gave better plant population as compared to local ones.
3. Use of recommended varieties for the zone reduced the seed cost
4. Balanced fertilization of nutrients also reduced the input cost.
5. Use of seed treatment minimizes the disease infection
6. Use of herbicides for weed control reduce the total cost of cultivation
7. Control of shoot borer with prescribed insecticide at proper stage proved of assistance.

WEATHER DATA
Period: February, 2015 to April, 2016

Std. Week No.	Period from - to	Temperature ^{0}C		Relative Humidity (%)	Rainfall (mm)	Rainy days
		Max.	Min.			
7	09-15 Feb2015	23	9	80	3.1	1
8	16-22 Feb2015	22	10	82	1.4	-
9	23 Feb2015-01 Mar.2015	24	11	92	22.8	3
10	02-08 march 2015	26	12	73	2.5	1
11	10-16 march 2015	28	11	73	-	-
12	17-23 march 2015	29	12	70	-	-
13	24-30 march 2015	31	14	70	-	-
14	31march 2015-06 April 2015	32	15	69	-	-
15	07-13 April 2015	34	18	65	-	-
16	14-20 April 2015	35	18	68	-	-
17	21-27 April 2015	37	19	60	-	-
18	28 April -04 May 2015	42	21	63	-	-
19	05 may 2015 - 11 May 2015	42	25	65	-	-
20	12 may 2015 - 18 May 2015	44	26	63	-	-
21	19 may 2015- 25 May 2015	46	26	62	-	-
22	26 may 2015 - 2 June 2015	47	26	65	-	-
23	3 June 2015 – 9 June2015	40	26	58	7.5	1
24	09-15 June	41	29	33.45	-	-
25	16-22 June	38.5	29.30	47.36	0.80	1
26	23-29 June	37.10	28.51	55.79	-	-
27	30 June-06 July	37.14	28.51	55.79	-	-
28	07-13 July	33.87	26.27	72.50	93.80	5
29	14-20 July	33.13	26.31	79.50	137.8	5
30	21-27 July	29.21	24.94	87.50	189.9	6
31	27 July-03 Aug.	31.73	25.81	73.93	7.3	1
32	04-10 Aug.	31.86	26.73	84.93	129.2	2
33	11-14 Aug.	31.00	25.86	84.86	132.5	4
34	18-24 Aug.	33.46	25.63	65.21	-	-
35	25-31 Aug.	34.59	26.46	66.93	14.2	2
36	01-07 Sept.	34.97	25.54	55.71	17.7	1
37	08-14 Sept.	37.63	27.33	47.50	-	-
38	15-21 Sept.	35.01	26.10	60.71	7.0	1
39	22-28 Sept.	35.63	24.56	42.64	-	-

40	29 Sept.-05 Oct.	37.33	23.44	28.14	-	-
41	06-12 Oct.	37.74	25.09	28.21	-	-
42	13-19 Oct.	37.31	25.13	33.14	-	-
43	20-26 Oct.	34.83	22.96	35.86	-	-
44	27 Oct.-02 Nov.	30.83	19.40	48.14	-	-
45	03-09 Nov.	32.86	21.13	40.79	-	-
46	10-16 Nov.	31.71	19.77	40.79	-	-
47	17-23 Nov.	29.27	15.63	43.43	-	-
48	24-30 Nov.	28.16	19.91	53.37	-	-
49	01-07 Dec.	27.7	9.00	92.7	-	-
50	08-14 Dec.	24.2	6.00	85.6	-	-
51	15-21 Dec.	22.1	3.80	90.9	-	-
52	22-28 Dec.2015	27.1	6.80	102.4	-	-
01	29 Dec.-04 Jan.2016	25.4	8.60	92.9	-	-
02	05-11 Jan.2016	25.4	8.50	91.1	-	-
03	12-18 Jan.	20.6	8.10	93.0	-	-
04	19-25 Jan.	23.8	5.00	89.1	-	-
05	26 Jan.-01 Feb.	25.5	8.70	88.9	-	-
06	02-08 Feb.	24.6	7.00	89.4	-	-
07	09-15 Feb.	25.0	10.9	81.6	-	-
08	16-22 Feb.	28.6	10.5	82.0	-	-
09	23 Feb.-01 March 2016	35.0	13.7	97.7	-	-
10	03-09 march 2016	31.1	14.6	85.9	-	-
11	10-16 march 2016	32.1	15.4	75.0	-	-
12	17-23 march 2016	35.6	15.7	63.3	-	-
13	24-30 march 2016	36.5	17.0	60.6	-	-
14	Apr02-Apr.08.2016	38.8	21.1	48.0	-	-
15	Apr09-Apr.015.2016	38.1	21.3	38.4	-	-