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Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra)

ALL INDIA CO-ORDINATED RESEARCH PROJECT

ON

SUGARCANE AGRONOMY

ANNUAL REPORT

(2013-14)

COMPILED BY

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(Maharashtra)

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SUGARCANE AGRONOMY

Contents

INTRODUCTION

1. INTRODUCTION

Sugarcane is the most important cash crop of Maharashtra. Sugar industry plays a pivotal role in the socio-economic and educational development in rural areas of Maharashtra. During 2012-13, the area of sugarcane in the state was 8.45 lakh hectares with 700.0 lakh tons of Sugarcane production. The average sugarcane productivity was 83.0 t/ha while the average sugar recovery attained 11.41 % (Table 1).

Due to severe drought conditions in Maharashtra during 2012-13, there was reduction in sugarcane area compared to 2011-12 i.e. from 10.22 to 8.45 lakh hectares. However during 2013-14, the rainfall was good and hence the area was slightly increased (9.37 lakh ha). Because of good management of the crop by the farmers and due to increasing sugarcane prices and also the cultivation of drought tolerant sugarcane variety CoM 0265, the sugarcane productivity has increased from 81.6 to 83.0 t/ha with a slight decrease in the recovery compared to the earlier year i.e. from 11.55 to 11.41 % during 2012-13. The same trend was also observed during 2013-14. However, the productivity has slightly decreased, which might be due to hailstorm in the last crushing period.

For providing the high yielding and high sugar varieties and new agrotechniques for increasing yield, the Central Sugarcane Research Station, Padegaon is conducting research on varietal improvement along with development of new techniques especially planting systems, intercropping, ratoon management, IPM and INM, drought and salinity management and use of drip irrigation system with fertigation. The need-based future research strategies are development of extra-early sugarcane varieties maturing in 10 to 12 months, development of varieties for better juice quality, identification of varieties for specific characteristics i.e. drought and salt tolerance, woolly aphid tolerance /resistance, rust, brown spot, pokka boeng disease tolerant, higher production of fiber for co-generation, higher percentage of brix in early age of crop for higher ethanol production, etc. The efforts are also being made to develop non-flowering varieties with higher cane yield, CCS yield and sugar recovery. Similarly, the attention will be paid for development of anti-inversion varieties to minimize recovery losses in the delayed crushing. Special emphasis is being given for varietal development considering the global warming and the climate change. The soil test based yield target equations have been developed for the high yielding variety CoM 0265 (Phule 265) for achieving the target yield of 200 t/ha for recommendation to the farmers growing preseasonal sugarcane with and without FYM in medium deep black soils of Western Maharashtra. A number of outreach programmes were organized to transfer various technologies developed by the CSRS, Padegaon to the farmers and extension

agencies through “Rashtriya Krishi Vikas Yojana” project for increasing sugarcane productivity.

Table 1. The area, production, productivity, sugar production and sugarcane recovery in Maharashtra from 2000-01 to 2013-14

Year	Area (‘000’ ha)	Sugarcane production (Lakh ton)	Sugarcane productivity (t /ha)	Sugar production (Lakh ton)	Sugar recovery (%)
2000-01	595	495.89	83.3	67.05	11.64
2001-02	578	451.4	78.1	56.13	11.6
2002-03	599	370.15	61.8	65.19	11.66
2003-04	443	256.68	57.9	30.39	10.91
2004-05	324	204.75	63.2	22.62	11.45
2005-06	501	388.53	77.6	51.98	11.68
2006-07	1049	785.68	74.9	90.95	11.4
2007-08	1093	884.37	80.9	87.63	11.91
2008-09	768	606.48	79.0	46	11.46
2009-10	756	641.59	84.9	70.66	11.54
2010-11	964	788.38	81.8	90.52	11.31
2011-12	1022	834.16	81.6	78.03	11.55
2012-13	845	700	83.0	77.8	11.41
2013-14 (Tentative)	937	750	80.0	77.0	11.40

Season

and climate

CLIMATE AND CROP GROWTH

SUGARCANE CROP: SEASON AND CLIMATE (2012-14)

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

The total rainfall received during July, 2012 to March, 2014 (21 months) was 795.9 mm in 61 rainy days as against the normal rainfall of 1082.0 mm (21 months) indicating that the rainfall received during the season was 26.4 % less than normal. The data on climatic parameters during the crop season (July, 2012 to March, 2014) along with averages based on last 80 years (1932-33 to 2013-14) recorded at the meteorological observatory located at this research station are presented in Table 2 and graphically shown in Fig.1. The effect of the season on sugarcane at various growth phases has been elucidated below.

1) Germination phase for Adsali crop (July. to Sept., 2012)

The rainfall received during germination phase was 112.9 mm in 12 rainy days as against the normal of 301.0 mm. The average maximum temperature during this period was 30.2oC and minimum temperature was 22.7oC. The average relative humidity (morning) during this phase was 94.3 % which was 6.3 % more than the normal.

Evenly distributed rainfall, optimum temperature and high humidity resulted in good germination of Adsali crop of sugarcane.

2) Tillering phase (Oct-Dec., 2012) for *Adsali* and Germination phase for Preseason crop:

Total rainfall received during tillering phase was 67.6 mm which was 55 % less than the normal of last 80 years. The average maximum and minimum temperatures during this phase were 30.8 ºC and 16.9 ºC, respectively. The morning relative humidity was 97.7 % as against the normal 86 %. High humidity and low rainfall was not favorable for the tillering of *Adsali* sugarcane hence the productivity of *Adsali* sugarcane crushed during 2013-14 was slightly decreased. However, high humidity was also favorable for good germination of preseason sugarcane.

3) Early growth (*Adsali*)/Tillering (Preseason) and Germination phase (*Suru*) (Jan-Mar.2013)

During this phase the average maximum temperature was 33.0ºC and average minimum temperature was 14.5ºC, which was more than the normal i.e 15.07 ºC. These

temperatures were favourable for *Adsali* crop growth. Due to higher humidity (97.7 %) than the average (78 %), tillering of preseasonal sugarcane and germination/tillering of Suru sugarcane was also satisfactory.

4) Desiccation phase (April to May, 2013)

The mean maximum temperature was lower (38.2^{o}C) than the normal (39.8^{o}C) while the mean minimum temperature (22.7^{o}C) was more than the normal (21.2^{o}C). No rainfall was received during this phase. All these meteorological parameters were favorable for crop growth and sugar recovery.

5) Grand growth (*Adsali*)/Early growth phase (Preseason and *Suru*) (June to Sept., 2013)

During this phase, the average maximum and minimum temperatures were 29.4^{o}C and 21.4^{o}C, respectively i.e. optimum for crop growth. The total rainfall received during this phase was 524 mm in 32 rainy days as against the normal rainfall of 369.1 mm. The grand growth of *Adsali*, preseasonal and *Suru* sugarcane was good due to 41 % more rainfall than the normal during this growth phase.

6) Flowering and Maturity (*Adsali* and Preseason) Grand growth phase (*Suru*) (Oct-Dec., 2013)

During this phase, the mean maximum and minimum temperatures were 30.0^{o}C and 15.9 ^{o}C, respectively. Total rainfall received during this phase was 40.4 mm in 2 rainy days as against 37 mm average of last 80 years. The high humidity and optimum temperatures favored early and profuse flowering for all season planted crop. The 9 % more rainfall was received than the normal.

During Jan 2014 to March 2014, the mean maximum and minimum temperatures were 31.6 ^{o}C and 14.9 ^{o}C, respectively. The optimum maximum and minimum temperatures and dry season favored maturity and sugar recovery of sugarcane crop.

At tillering and early grand growth phase for Adsali sugarcane, the low rainfall (67.6 mm) was not favorable for the tillering of Adsali season. At maturity of Adsali, preseasonal and Suru sugarcane, the minimum temperature was (15.9 ^{o}C) which was as good as the avearge minimum temperature (15.5 ^{o}C) hence sugarcane maturity and accumulation of sugar resulted in almost same sugar recovery. The overall crop growth during this year was satisfactory. However, due to less number of cooler days, cloudy season during crushing period, and hail storm in last crushing period, the productivity during 2013-14 was slightly decreased as compared to last year (2012-13). However, due to the best crop management and better sugarcane prices the productivity and sugar recovery are maintained around 80 t/ha and 11.40% , respectively.

Table 2. Average weather parameters at CSRS, Padegaon during June 2012 to March2014

Sr. No.	Temperature (ºC)		Humidity (%)		Sunshine Hrs.	Rainfall (mm)	Rainy days
	Max.	Min.	Mor.	Eve.			
June 12	32.9	24.3	83	62	6.9	35.3	2
1. Germination phase for *Adsali* crop (Jul. to Sept., 2012)							
July 12	30.7	23.7	92	74	3.5	23.8	2
Aug 12	29.6	22.4	95	76	4.5	48.1	5
Sept 12	30.2	21.9	96	70	4.7	41.0	5
Average	**30.2**	**22.7**	**94.3**	**73.3**	**4.2**	**37.6**	**4.0**
Last 80 yrs avg	**29.2**	**21.8**	**88**	**64**	**4.9**	**298.3**	**-**
2. Tillering phase (Oct-Dec., 2012) for *Adsali*/Germination phase for Preseason crop							
Oct 12	31.1	19.9	98	68	6.8	57.4	6
Nov 12	30.8	17.2	97	65	7.8	10.2	1
Dec 12	30.5	13.7	98	57	8.5	00.0	-
Average	**30.8**	**16.9**	**97.7**	**63.3**	**7.7**	**22.5**	**3.5**
Last 80 yrs avg	**31.6**	**15.5**	**86**	**40**	**9.6**	**150.1**	**-**
3. Early growth (*Adsali*)/Tillering (Preseason) and Germination phase (*Suru*) (Jan-Mar.2013)							
Jan 13	31.1	12.3	97	41	8.1	00.0	-
Feb 13	32.4	14.6	94	42	8.0	00.0	-
Mar 13	35.6	16.6	90	45	8.0	0.5	-
Average	**33.0**	**14.5**	**93.7**	**42.7**	**8.0**	**0.2**	**3.5**
Last 80 yrs avg	**32.4**	**12.6**	**78**	**46**	**11.5**	**69**	**-**
4. Desiccation phase (April to May, 2013)							
April 13	37.9	20.9	89	51	9.1	00.0	-
May 13	38.5	24.5	86	57	8.1	00.0	-
Average	**38.2**	**22.7**	**87.5**	**54.0**	**8.6**	**00.0**	**-**
Last 80 yrs avg	**39.8**	**21.2**	**69**	**56**	**11.5**	**69**	**-**
5. Grand growth (*Adsali*)/Early growth phase (Preseason and *Suru*) (June to Sept., 2013)							
June 13	30.9	22.0	93	68	4.0	154.4	10
July 13	27.8	21.4	95	81	1.9	67.1	8
Aug 13	28.7	21.6	96	82	4.0	49.9	4
Sept 13	30.3	20.9	97	83	5.3	252.6	10
Average	**29.4**	**21.4**	**95.2**	**78.5**	**3.8**	**524**	**8**
Last 80 yrs avg	**30.8**	**21.9**	**87**	**61.2**	**5.2**	**369.1**	**-**
6. Flowering and Maturity (*Adsali* and Preseason)/Grand growth phase (*Suru*) (Oct-March, 2014)							
Oct 13	31.1	20.9	97	82	7.3	37.0	2
Nov 13	30.0	15.3	97	74	8.1	00.0	-
Dec 13	29.0	11.6	95	65	7.9	03.4	-
Average	**30.0**	**15.9**	**96.3**	**73.6**	**7.7**	**13.4**	**2.0**
Last 80 yrs avg	**31.6**	**15.5**	**86**	**40**	**9.6**	**164.3**	**-**
Jan 14	29.4	12.7	96	48	7.1	-	-
Feb 14	31.1	12.5	88	48	8.5	4.3	1
Mar 14	34.3	19.4	90	55	7.3	10.9	2
Average	**31.6**	**14.9**	**91.3**	**50.3**	**7.6**	**15.2**	**3**
Last 80 yrs avg	**32.4**	**12.6**	**78**	**28**	**10.0**	**12.7**	**--**

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

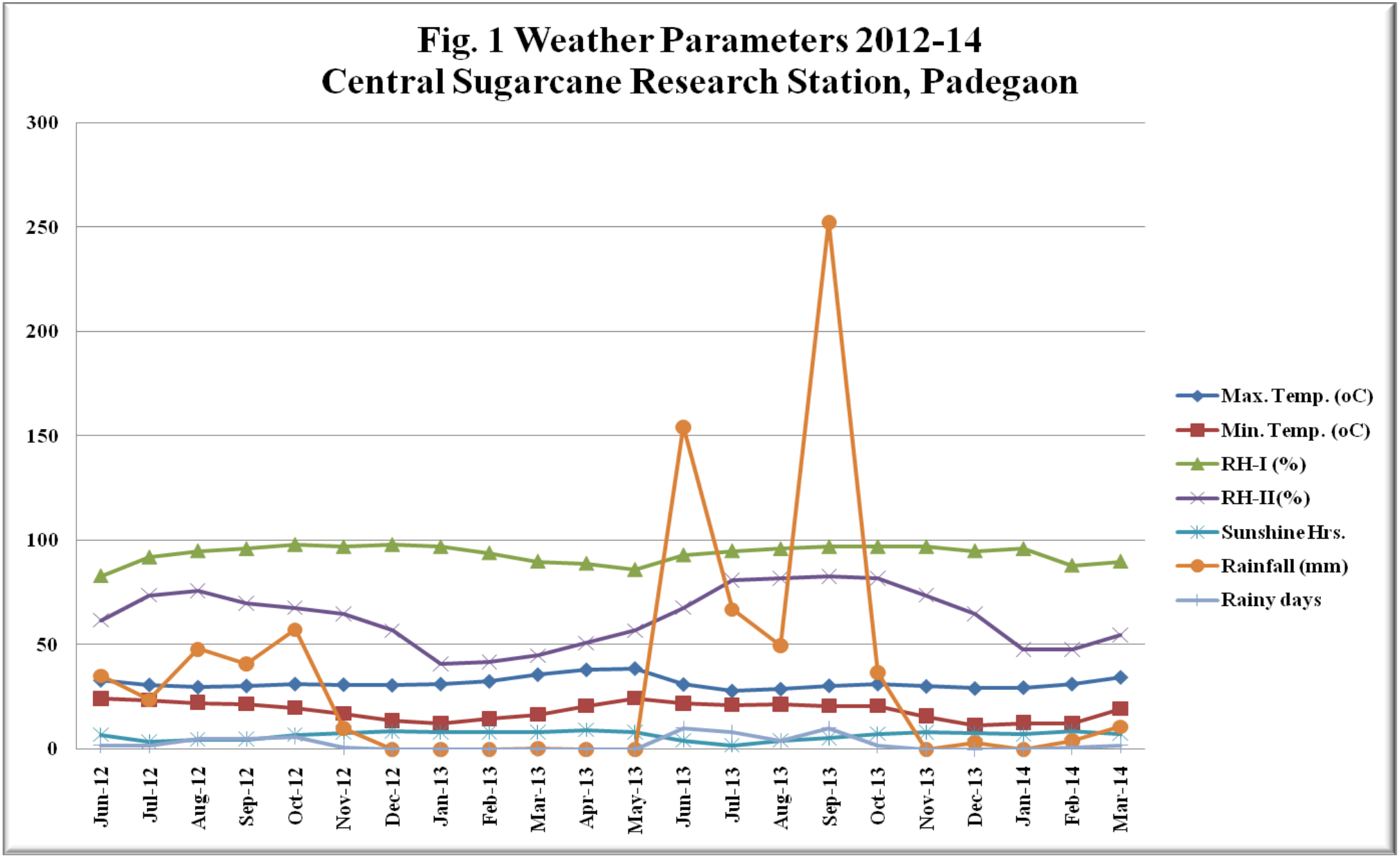
Table 3. Incidence of insect pests on sugarcane during 2012-14

Sr. No.	Name of pest	Extent of incidence (%)
1	Early shoot borer	17-21
2	Internodes borer	20-22
3	Top shoot borer	In trace to low
4	Mealy bugs	20-30
5	Wooly aphids	In traces to high
6	Scale insect	In trace to low
7	White fly	In traces
8.	Sugarcane Pyrilla	In trace

Table 4. Incidence of diseases on sugarcane during 2012-14

Sr.No.	Name of disease	Extent of incidence (%)
1	Rust	2-20%
2	G.S.D	1-3%
3	Smut	1-10%
4	Brown spot	10-60%
5	Pokka Boeing	2-15%

Fig. 1 Weather Parameters 2012-14
Central Sugarcane Research Station, Padegaon



Staff Position

ALL INDIA CO-ORDINATED RESEARCH PROJECT ON SUGARCANE

CENTRAL SUGARCANE RESEARCH STATION, PADEGAON

Dr. Suresh M. Pawar
Sugarcane Specialist

Staff Position: 2013-14

A) AICRP(S) Scheme

Sr. No.	Name	Designation
Sugarcane Agronomist		
1	Vacant	Jr. Agronomist From 05.03.2014
2	Dr. P.M.Chaudhari	Sugarcane Agronomist (Associate Professor) Holding additional charge of Jr. Agronomist
Technical Assistant (02)		
1	Shri. S.K. Ghodke	Technical Assistant
2	Shri. S.U.Deshmukh	Technical Assistant

Research Highlights

RESEARCH HIGHLIGHTS

AICRP (S) PROGRAMME

(2012-13)

A) On going experiment

Title 1: AS-42 Agronomic evaluation of promising new sugarcane genotypes (Spring Early planting)

The genotype Co 06002 was found significantly superior for cane and CCS yields than the other genotypes followed by PI 06032. The application of 125 % recommended dose of nitrogen produced significantly higher cane and CCS yields followed by 100 % recommended dose of nitrogen.

Title 2 : AS-42 Agronomic evaluation of promising new sugarcane genotypes (Spring Midlate planting)

The genotypes Co 86032 recorded significantly higher cane and CCS yields than the other genotypes and it was followed by Co-06015. The application of 125 percent recommended dose of nitrogen produced significantly higher cane and CCS yields followed by 100 % recommended dose of nitrogen.

Title 3: AS-63 Plant geometry in relation to mechanization in sugarcane.

The row spacing of 120 cm recorded the highest cane (124.43 t ha^{-1}) and CCS yield (18.46 t ha^{-1}). However, it was at par with the row spacing of 150 cm for both cane (121.25 t ha^{-1}) and CCS yields (17.70 t ha^{-1}). Significantly the highest cane (138.60 t ha^{-1}) and CCS (20.24 t ha^{-1}) yields were recorded by the variety CoM 0265 followed by Co 86032 (123.01 and 18.42 t ha^{-1}). The sugarcane variety CoC 671 was found to be the most superior with respect to juice quality.

Title 4: AS-66 Priming of cane node for accelerating germination.

The conventional 3 bud setts planting recorded significantly higher germination per cent (75.54) and it was found at par with rest of the treatments except treating cane node in hot water in 50 ^{0}C for 2 hrs . The Priming cane node with cattle dung plus cattle urine and water in 1:2:5 ratio for 15 minutes recorded significantly the highest cane and CCS yields (134.68 and 14.33 t/ha), treating cane node in hot water for 50^{o}c and urea solution (3%) for 2 hours was the next superior treatment.

Title 5: AS-65 Enhancing sugarcane productivity and profitability under Wheat – Sugarcane Cropping System.

The autumn planted sugarcane produced significantly higher cane yield and CCS yield (143.61 t ha^{-1} and 20.24 t ha^{-1}, respectively). Under intercropping system, autumn planted sugarcane + wheat (1:2) produced significantly higher cane yield and CCS yield (134.02 t ha^{-1} and 17.93 t ha^{-1},

respectively). The intercropping of autumn planted sugarcane + wheat (1:2) was found to be more remunerative.

Title: AS-64 Response of sugarcane crop to different plant nutrients in varied agro- ecological situations.

Application of NPK + Zn + S+ Fe+ Mn to sugarcane recorded significantly higher yields of cane and commercial cane sugar and it is comparable with application of fertilizers based on soil test.

B) Completed experiment

Title 1: AS-63 Plant geometry in relation to mechanization in sugarcane (Pooled)

The row spacing of 120 cm recorded the highest cane (122.33 t ha^{-1}) and CCS yield (17.42 t ha^{-1}). However, it was at par with the row spacing of 150 cm for both cane (116.89 t ha^{-1}) and CCS yields (16.50 t ha^{-1}). Significantly highest cane (136.69 t ha^{-1}) and CCS (19.20 t ha^{-1}) yields were recorded by the variety CoM 0265 followed by Co 86032 (121.31 and 17.27 t ha^{-1}). The sugarcane variety CoC 671 was found to be the most superior with respect to juice quality.

Title: AS-64 Response of sugarcane crop to different plant nutrients in varied agro- ecological situations.

Application of NPK + Zn + S+ Fe+ Mn to sugarcane recorded significantly higher yields of cane and commercial cane sugar and it is comparable with application of fertilizers based on soil test.

Research report

on

AICRP(S) Agronomy

A) On going Experiments

Project No. AS – 42

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

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 5 m^2,
Net	: 08 x 3 m^2,
Fertilizer dose	: 250:115:115 kg N, P_2O_5, K_2O ha^{-1},
Date of planting	: 19.01.2013
Date of harvesting	: 26.01.2014
Soil Status	: Irrigated, Medium black soil.

Treatment details:

No. of Main Treatments: 05

i) V_1 : Co 06001
ii) V_2 : Co 06002
iii) V_3 : Co 06022
iv) V_4 : PI 06032
v) V_5 : CoC 671

No. of Sub Treatments : 03

i) F_1 - 75% RD of N
ii) F_2 - 100% RD of N
iii) F_3 - 125% RD of N

Results:

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

Effect of genotypes:

Data presented in Table 1 revealed that the genotype Co 06002 recorded the highest cane (121.44 t ha^{-1}) and CCS yield (16.52 t ha^{-1}) and was significantly superior to all other genotypes. It was followed by Co 06032 (114.77 t ha^{-1} cane and 15.60 t ha^{-1} CCS yield).

Effect of nitrogen levels:

The nitrogen levels had a significant effect on both cane and CCS yields. Significantly the highest cane (123.33 t ha^{-1}) and CCS (16.68 t ha^{-1}) yields were recorded with application of 125% recommended dose of nitrogen. It was followed by 100 % recommended dose of nitrogen (113.81 and 15.32 t ha^{-1}).

Effect of interactions:

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

Growth and yield attributes:

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

Effect of genotypes:

The data presented in Table 2 revealed that the effect of genotypes was significant for all the parameters except germination per cent and height. The genotype, Co 06002 recorded significantly the highest tillering ratio (1.65), cane girth (9.6 cm), number of internodes per cane (24), millable canes per hectare (103910 ha^{-1}) and average weight per cane (1.18 kg). However, it was at par with PI 06032 in respect of cane girth, and average weight per cane.

Effect of nitrogen levels:

Effect of N levels was significant for the tillering ratio, number of internodes per cane, NMC and average cane weight. Application of 125% recommended dose of nitrogen recorded the highest tillering ratio (1.65), number of internodes per cane (23), NMC (103690 ha^{-1}) and average cane weight (1.20 kg $cane^{-1}$). The application of 100 % recommended N was found at par with 125 % recommended N in respect of tillering ratio only.

Effect of interactions:

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

Quality parameters:

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

Conclusion:

The genotype Co 06002 was found significantly superior for cane and CCS yields than the other genotypes followed by PI 06032. The application of 125 % recommended dose of nitrogen produced significantly higher cane and CCS yields followed by 100 % recommended dose of nitrogen.

Table 1. Cane and CCS yield of sugarcane genotypes at varying N levels

Treatments	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
A) Genotypes		
V_1– Co 06001	110.06	14.69
V_2 – Co 06002	121.44	16.52
V_3– Co 06022	107.40	14.23
V_4 – PI 06032	114.77	15.60
V_5 – CoC 671	112.59	15.18
SE±	**0.68**	**0.25**
C.D. at 5%	**1.90**	**0.72**
B) N levels		
F_1 - 75% N	102.73	13.72
F_2 - 100% N	113.81	15.32
F_3 – 125 % N	123.23	16.68
SE±	**2.43**	**0.46**
C.D. at 5%	**6.56**	**1.20**
C) Interactions		
SE±	**4.84**	**0.84**
C.D. at 5%	**NS**	**NS**
General Mean	**113.25**	**15.24**

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

Treatments	Germination (%)	Tillering ratio	Height (cm)	Girth (cm)	No. of internodes $cane^{-1}$	Millable canes (000 ha^{-1})	Avg. cane wt. (kg)
A) Genotypes							
V_1– Co 06001	65.38	1.58	270	9.3	22	97.09	1.13
V_2 – Co 06002	70.58	1.65	284	9.6	24	103.91	1.18
V_3– Co 06022	65.41	1.57	264	8.9	21	95.14	1.13
V_4 – PI 06032	69.31	1.61	281	9.5	23	98.20	1.17
V_5 – CoC 671	65.78	1.61	274	9.4	22	98.16	1.14
SE±	1.74	0.008	8.16	0.06	0.14	0.60	0.004
C.D. at 5%	**NS**	**0.022**	**NS**	**0.16**	**0.38**	**1.68**	**0.012**
B) N levels9.							
F_1 - 75% N	64.83	1.55	261	9.1	20	93.49	1.10
F_2 - 100% N	68.07	1.60	273	9.4	22	98.32	1.16
F_3 – 125 % N	68.97	1.65	289	9.5	23	103.69	1.20
SE±	2.04	0.03	9.50	0.24	0.28	1.08	0.014
C.D. at 5%	**NS**	**0.08**	**NS**	**NS**	**0.81**	**2.80**	**0.038**
C) Interactions							
SE±	4.32	0.10	9.78	0.63	0.72	2.42	0.06
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS
General Mean	67.29	1.60	274	9.34	22	98.50	1.15

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

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
A) Genotypes				
V_1– Co 06001	21.68	19.77	85.11	13.35
V_2 – Co 06002	21.53	19.61	84.04	13.25
V_3– Co 06022	22.08	19.64	87.02	13.48
V_4 – PI 06032	20.96	19.56	87.30	13.59
V_5 – CoC 671	22.36	19.62	89.10	13.60
SE±	1.52	0.78	2.04	0.32
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
B) N levels				
F_1 - 75% N	22.00	19.63	85.34	13.36
F_2 - 100% N	21.68	19.64	86.75	13.46
F_3 – 125 % N	21.50	19.65	87.47	13.54
SE±	0.98	0.15	1.32	0.14
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
C) Interactions				
SE±	1.18	0.52	0.90	0.28
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General Mean	**21.72**	**19.64**	**86.52**	**13.45**

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

Treatments	pH	EC (dsm^{-1})	O.C.%	Available nutrient status (kg ha^{-1})		
				N	P_2O_5	K_2O
A) Genotypes						
V_1– CoSnk 5103	8.04	0.34	0.59	183	15.9	242
V_2 – CoM 05082	8.06	0.34	0.56	179	15.2	243
V_3– CoSnk 5104	8.04	0.33	0.61	180	15.8	251
V_4 – Co 99004	8.03	0.35	0.56	186	17.7	272
V_5 – CoC 671	8.02	0.38	0.55	192	18.9	279
B) N levels						
F_1 - 75% N	8.02	0.33	0.58	178	18.2	268
F_2 - 100% N	8.03	0.34	0.57	183	15.9	258
F_3 – 125 % N	8.06	0.35	0.56	191	16.2	247
General Mean	**8.03**	**0.34**	**0.57**	**182**	**16.7**	**257**
Initial	**8.12**	**0.36**	**0.66**	**252**	**18.6**	**322**

Project No. AS – 42

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

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 5 m^2,
Net	: 08 x 3 m^2,
Fertilizer dose	: 250:115:115 kg N, P_2O_5, K_2O ha^{-1},
Date of planting	: 19.01.2013
Date of harvesting	: 27.01.2014
Soil Status	: Irrigated, Medium black soil.

Treatment details :

No. of Main Treatments : 05

i) V_1 : Co 06012
ii) V_2 : Co 06015
iii) V_3 : Co 06027
iv) V_4 : CoM 06082
v) V_5 : Co 86032

No. of Sub Treatments : 03

i) F_1 - 75% RD of N
ii) F_2 - 100% RD of N
iii) F_3 - 125% RD of N

Results:

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

Effect of genotypes:

Data presented in Table 1 revealed that the genotype Co 86032 recorded significantly the highest cane (124.15 t ha^{-1}) and CCS (17.14 t ha^{-1}) yields. It was followed by Co 06015.

Effect of nitrogen levels:

The N levels had a significant effect on both cane and CCS yields. Significantly the highest cane (123.57 t ha^{-1}) and CCS (17.00 t ha^{-1}) yields were recorded with the application of 125% recommended dose of N. It was followed by 100% recommended dose of N (117.26 t ha^{-1} and 16.07 t ha^{-1})

Effect of interactions:

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

Growth and yield attributes:

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

Effect of genotypes:

The data presented in Table 2 revealed that the effect of genotypes was found significant for all the parameters except number of millable canes and average cane weight. The genotype Co 86032 recorded significantly the highest germination (70.46 %), tillering ratio (1.80), millable height (292 cm), cane girth (9.5 cm), number of internodes per cane (24), and weight per cane (1.27 kg). However, it was at par with Co 06015 in respect of germination percentage and cane girth.

Effect of nitrogen levels:

Effect of N levels was significant for the millable height, number of internodes per cane and average cane weight. Application of 125% recommended dose of nitrogen recorded significantly the highest millable height (284 cm), number of internodes per cane (25.0) and the average cane weight (1.27 kg) over other levels. It was closely followed by 100 % recommended dose of nitrogen for all these parameters.

Effect of interactions:

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

Quality parameters:

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

Conclusion:

The genotypes Co 86032 recorded significantly higher cane and CCS yields than the other genotypes and it was followed by Co-06015. The application of 125 percent recommended dose of nitrogen produced significantly higher cane and CCS yields followed by 100 % recommended dose of nitrogen.

Table 1. Cane and CCS yield of sugarcane genotypes at varying N levels

Treatments	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
A) Genotypes		
V_1– Co 06012	118.38	16.31
V_2 – Co 06015	120.07	16.24
V_3– Co 06027	113.35	15.62
V_4 – CoM 06082	112.11	15.14
V_5 – Co 86032	124.15	17.14
SE±	**0.47**	**0.20**
C.D. at 5%	**1.36**	**0.58**
B) N levels		
F_1 - 75% N	111.99	15.20
F_2 - 100% N	117.26	16.07
F_3 – 125 % N	123.57	17.00
SE±	**2.24**	**0.27**
C.D. at 5%	**5.82**	**0.73**
C) Interactions		
SE±	**4.56**	**0.35**
C.D. at 5%	**NS**	**NS**
General Mean	**117.61**	**16.09**

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

Treatments	Germination %	Tillering ratio	Height (cm)	Girth (cm)	No of internodes $cane^{-1}$	Millable canes (000 ha^{-1})	Avg. cane wt. (kg)
A) Genotypes							
V_1– Co 06012	66.74	1.66	279	9.2	23	97.10	1.22
V_2 – Co 06015	70.45	1.71	281	9.3	23	94.74	1.27
V_3– Co 06027	66.48	1.60	275	9.0	22	96.98	1.17
V_4 – CoM 06082	64.40	1.51	263	8.9	22	100.27	1.12
V_5 – Co 86032	70.46	1.80	292	9.5	24	97.85	1.27
SE±	**0.92**	**0.03**	**1.05**	**0.08**	**0.12**	**1.85**	**0.07**
C.D. at 5%	**2.70**	**0.07**	**2.94**	**0.20**	**0.34**	**NS**	**NS**
B) N levels							
F_1 - 75% N	65.50	1.61	271	8.9	21	96.74	1.16
F_2 - 100% N	67.73	1.66	278	9.2	23	97.62	1.20
F_3 – 125 % N	69.91	1.70	284	9.5	25	97.80	1.27
SE±	**2.18**	**0.05**	**2.18**	**0.28**	**0.22**	**1.42**	**0.03**
C.D. at 5%	**NS**	**NS**	**6.34**	**NS**	**0.64**	**NS**	**0.08**
C) Interactions							
SE±	**4.36**	**0.08**	**5.20**	**0.48**	**0.63**	**3.02**	**0.05**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
General Mean	**67.71**	**1.65**	**278**	**9.2**	**23**	**97.39**	**1.21**

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

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
A) Genotypes				
V_1– Co 06012	21.42	19.67	90.11	13.78
V_2 – Co 06015	21.64	19.74	90.59	13.53
V_3– Co 06027	21.24	19.59	88.37	13.78
V_4 – CoM 06082	21.08	19.56	81.17	13.51
V_5 – Co 86032	22.08	19.79	90.67	13.81
SE±	**0.43**	**0.17**	**1.54**	**0.16**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
B) N levels				
F_1 - 75% N	21.19	19.63	88.31	13.57
F_2 - 100% N	21.36	19.63	89.85	13.71
F_3 – 125 % N	21.93	19.74	90.58	13.76
SE±	**0.36**	**0.10**	**0.93**	**0.09**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
C) Interactions				
SE±	**0.48**	**0.22**	**1.14**	**0.24**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General Mean	**28.55**	**19.66**	**89.58**	**13.68**

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

Treatments	pH	EC (dsm^{-1})	O.C.%	Available nutrient status (kg ha^{-1})		
				N	P_2O_5	K_2O
A) Genotypes						
V_1– Co 06012	8.1	0.36	0.6	186	17.5	268
V_2 – Co 06015	8.11	0.37	0.59	181	16.2	253
V_3– Co 06027	8.08	0.35	0.61	184	16.9	255
V_4 – CoM 06082	8.08	0.39	0.58	189	17.7	270
V_5 – Co 86032	8.09	0.39	0.59	195	19.4	275
B) N levels						
F_1 - 75% N	8.08	0.34	0.61	181	18.6	272
F_2 - 100% N	8.08	0.37	0.59	186	16.5	265
F_3 – 125 % N	8.09	0.39	0.57	194	16.9	255
General Mean	**8.09**	**0.37**	**0.59**	**187**	**17.5**	**262**
Initial	**8.12**	**0.36**	**0.68**	**271**	**17.9**	**312**

Project No. AS – 63

Title: Plant geometry in relation to mechanization in sugarcane.

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

Experimental Details:

Place	: CSRS, Padegaon,
Design	: Split plot,
Replication	: 3
Plot Size: Gross	: 08 x 06 m^2,
Net	: 6.00 x 04 m^2
	6.00 x 3.60 m^2
	6.00 x 3.00 m^2
	6.00 x 5.60 m^2
Fertilizer dose	: 250:115:115 kg N, P_2O_5, K_2O ha^{-1},
Date of planting	: 03.01.2013
Date of harvesting	: 28.01.2014
Soil Status	: Irrigated, Medium black soil.

Treatment details :

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

P_1 : 100 cm row distance

P_2 : 120 cm row distance

P_3 : 150 cm row distance

P_4 : 30 x 150 cm row distance

B) Sub plot treatments – Genotypes -4

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

Results:

The data on third year trial on cane and CCS yields, growth observations and quality parameters are presented in Table 1 to 3.

Effect of planting geometry:

Data presented in Table 1 revealed that the row spacing of 120 cm recorded significantly the highest cane yield (124.43 t ha^{-1}) and CCS yield (18.46 t ha^{-1}). However, it was at par with the row spacing of 150 cm for both cane (121.25 t ha^{-1}) and CCS yields (17.70 t ha^{-1}), respectively.

Effect of genotypes:

Significantly the highest cane (138.60 t ha^{-1}) and CCS (20.24 t ha^{-1}) yields were recorded with the variety CoM 0265. It was followed by Co 86032 (123.01 and 18.42 t ha^{-1}).

Effect of interactions:

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

Growth and yield attributes:

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

Effect of planting geometry:

The effect of row spacing was found significant for the millable height, cane girth and number of millable canes. The row spacing of 120 cm recorded significantly the highest millable height (301 cm) but it was at par with 150 cm row spacing. A similar trend was noticed for the cane girth (10.8 cm) and number of millable canes ha^{-1} (91180 ha^{-1}).

Effect of Genotypes:

The effect of genotypes was found significant on all the growth parameters except germination percentage and number of internodes. The genotype CoM 0265 registered significantly higher tillering ratio(1.81), millable height (312 cm), cane girth (11.1 cm), number of milliable cane (96400 ha^{-1}) and the average cane weight (1.44 kg $cane^{-1}$). It was found at par with Co 86032 except number of milliable canes.

Effect of interactions:

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

Quality parameters:

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

Effect of planting geometry:

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

Effect of Genotypes:

The genotype CoC 671 recorded significantly higher brix (21.90), sucrose (20.01%) and CCS (15.34%) than the other genotypes. While Co 86032 was found at par with respect to brix and CCS %

Effect of interactions:

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

Conclusion:

The row spacing of 120 cm recorded the highest cane (124.43 t ha^{-1}) and CCS yield (18.46 t ha^{-1}). However, it was at par with the row spacing of 150 cm for both cane (121.25 t ha^{-1}) and CCS yields (17.70 t ha^{-1}). Significantly the highest cane (138.60 t ha^{-1}) and CCS (20.24 t ha^{-1}) yields were recorded by the variety CoM 0265 followed by Co 86032 (123.01 and 18.42 t ha^{-1}). The sugarcane variety CoC 671 was found to be the most superior with respect to juice quality.

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

Treatments	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})
A) Planting geometry		
P_1 100 cm row distance	113.79	16.98
P_2 120 cm row distance	124.43	18.46
P_3 150 cm row distance	121.25	17.70
P_4 30 x 150 cm row distance	109.15	15.90
SE+	**1.48**	**0.46**
C.D at 5%	**4.26**	**1.19**
B) Genotypes		
V_1 CoM 0265	138.60	20.24
V_2 Co 86032	123.01	18.42
V_3 Co 94012	105.98	14.88
V_4 CoC 671	101.03	15.51
SE+	**2.14**	**0.58**
C.D at 5%	**6.84**	**1.51**
C) Interaction		
SE+	**5.36**	**0.93**
C.D at 5%	**NS**	**NS**
General mean	**117.15**	**17.26**

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

Treatments	Germ. (%)	Tillering ratio	Height (cm)	Girth (cm)	No. of internodes cane^{-1}	Millable canes (000ha^{-1})	Wt. cane^{-1} (kg)
A) Planting geometry							
P_1 100 cm row distance	74.87	1.58	297	10.4	28	84.49	1.34
P_2 120 cm row distance	76.50	1.73	301	10.8	29	91.18	1.37
P_3 150 cm row distance	76.20	1.68	299	10.6	28	89.09	1.36
P_4 30 x 150 cm row distance	73.45	1.59	283	9.7	27	82.67	1.32
S.E.+	**1.38**	**0.08**	**1.12**	**0.14**	**1.54**	**1.44**	**0.03**
C.D. at 5%	**NS**	**NS**	**3.34**	**0.38**	**NS**	**3.81**	**NS**
B) Genotypes							
V_1 CoM 0265	77.14	**1.81**	312	11.1	30	96.40	1.44
V_2 Co 86032	76.38	1.70	302	10.7	29	88.85	1.38
V_3 Co 94012	74.75	1.60	288	10.2	27	82.48	1.28
V_4 CoC 671	72.75	1.50	278	9.5	26	79.70	1.27
S.E.+	**1.96**	0.07	**2.42**	**0.18**	**1.78**	**1.74**	**0.04**
C.D. at 5%	**NS**	**0.18**	**6.29**	**0.45**	**NS**	**5.04**	**0.11**
C) Interaction							
S.E.+	**3.64**	**0.15**	**4.26**	**0.64**	**2.08**	**3.20**	**0.06**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
General mean	**75.25**	**1.65**	**295**	**10.37**	**28**	**86.86**	**1.34**

Table 3. Quality parameters as affected by various treatments.

Treatments	Brix(c)	Sucrose (%)	Purity(%)	CCS (%)
A) Planting geometry				
P_1 100 cm row distance	21.51	19.86	92.78	14.93
P_2 120 cm row distance	21.21	19.78	92.80	14.84
P_3 150 cm row distance	21.30	19.67	91.93	14.62
P_4 30 x 150 cm row distance	21.26	19.54	92.69	14.55
S.E.+	**0.15**	**0.14**	**0.56**	**0.24**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
B) Genotypes				
V_1 CoM 0265	21.13	19.59	92.57	14.63
V_2 Co 86032	21.59	19.68	92.74	14.94
V_3 Co 94012	20.57	19.57	91.82	14.04
V_4 CoC 671	21.90	20.01	93.06	15.34
S.E.+	**0.14**	**0.08**	**0.74**	**0.20**
C.D. at 5%	**0.36**	**0.22**	**NS**	**0.56**
C) Interaction				
S.E.+	**0.38**	**0.30**	**0.93**	**0.42**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General Mean	**21.32**	**19.71**	**92.55**	**14.74**

Project No. : AS 66

Title : Priming of cane node for accelerating germination.

Objective **:**

1) To find out suitable cane node priming technique.
2) To assess the effect of cane node on acceleration of germination

Experimental details:

Place	: CSRS, Padegaon,
Design	: Randomized Block Design
Replication	: 4
Plot Size: Gross	: 10 x 6 m^2,
Net	: 08 x 4 m^2
Variety	: Phule 265
Fertilizer dose	: 250:115:115 N: P_2O_5: K_2O kg ha^{-1}
Date of planting	: 16.02.2013
Date of harvesting	: 30.01.2014
Soil Status	: Irrigated, Medium black soil.

Treatments: 6

T_1 : Un-primed cane node.

T_2 :Treating cane node in hot water in 50^{o}c for 2 hours.

T_3 : Treating cane node in hot water in 50^{o}c and urea solution (3%) for 2hours

T_4 : Priming cane node with cattle dung, cattle urine and water in 1:2:5 ratio

T_5 : Conventional 3 bud setts planting.

T_6 : Primed and sprouted cane node (Incubated for four days after priming)

(Put the single cane node in the slurry of cattle dung, cattle urine and water for 15 minutes. take out the buds and put in decomposed FYM and covered it with sugarcane trash for 4-5 days for sprouting.)

Results :

The data of second year trial on cane and CCS yields, growth observations and quality parameters of different treatments are presented in Table 1 & 2.

Effect of cane and CCS yields:

The data on cane and CCS yields presented in Table 1 revealed that priming cane node with cattle dung plus cattle urine and water in 1:2:5 ratio (T_4) recorded significantly the highest cane and CCS yield (134.68 and 14.33 t ha^{-1}). However, it was at par with treating cane node in hot water in 50^{o}c and urea solution (3%) for 2 hours (T_3) (131.77 and 14.24 t ha^{-1}), treating cane node in hot water in 50^{o}c for 2 hours (T_4). (128.86 and 13.62 t ha^{-1}) and conventional 3 bud setts planting (T_5) (124.48 and 14.18 t ha^{-1}).

Growth and yield attributes:

The data regarding growth and yield attributes are presented in Table 2 .The data revealed that conventional 3 bud setts planting (T_4) recorded significantly higher germination per cent (75.54) and it was found at par with rest of the treatments except treating cane node in hot water in 50 ^{0}C for 2 hrs (T_2). The priming cane node with cattle dung plus cattle urine and water in 1:2:5 ratio (T_4) recorded significantly higher tillering ratio (1.78), millable height (306 cm), cane girth (11.1 cm), number of internodes (30), number millable canes (105180/ha) and weight per cane (1.28 kg). It was followed by treating cane node in hot water in 50^{o}c and urea solution (3%) for 2 hours (T_3).

Quality parameters:

The data regarding juice quality parameters are presented in Table 2 revealed that priming cane node with cattle dung, cattle urine and water in 1:2:5 ratio (T_4) recorded significantly the highest brix (22.30), sucrose (20.34 %), and CCS (14.33 %). While purity (96.28%) was recorded significantly the highest under treatment T_5 (conventional 3 bud setts planting).

Conclusion:

The conventional 3 bud setts planting recorded significantly higher germination per cent (75.54) and it was found at par with rest of the treatments except treating cane node in hot water in 50 ^{0}C for 2 hrs . The Priming cane node with cattle dung plus cattle urine and water in 1:2:5 ratio for 15 minutes recorded significantly the highest cane and CCS yields (134.68 and 14.33 t/ha), treating cane node in hot water for 50^{o}c and urea solution (3%) for 2 hours was the next superior treatment.

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

Treatment	Cane yield (t/ha)	CCS yield (t/ha))
T_1 : Un-primed cane node.	116.96	13.68
T_2 :Treating cane node in hot water in 50^{o}c for 2 hours.	128.86	13.62
T_3 : Treating cane node in hot water in 50^{o}c urea solution (3%) for 2 hours	131.77	14.24
T_4 : Priming cane node with cattle dung, cattle urine and water in 1:2:5 ratio	134.68	14.33
T_5 : Conventional 3 bud setts planting.	124.48	14.18
T_6 Primed and sprouted cane node (Incubated for four days after priming)	119.80	13.84
SE+	**3.88**	**0.10**
C.D at 5%	**10.86**	**0.28**
General Mean	**126.09**	**13.98**

Table : 2 Growth and juice quality attributes as affected by various treatments

Treatments	Germ. (%)	Tillering ratio	Height (cm)	Girth (cm)	No. of internodes	Millable canes (000 ha)	Av. cane wt. (kg)	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
T_1 : Un-primed cane node.	69.31	1.51	279	8.9	24	97.45	1.20	20.82	19.30	91.90	13.68
T_2 :Treating cane node in hot water in 50^{o}c for 2 hours.	64.33	1.63	286	9.6	27	103.06	1.25	20.43	19.14	92.78	13.62
T_3 : Treating cane node in hot water in 50^{o}c urea solution (3%) for 2hours	65.86	1.65	295	10.3	29	104.54	1.26	21.32	19.96	92.92	14.24
T_4 : Priming cane node with cattle dung, cattle urine and water in 1:2:5 ratio	71.08	1.78	306	11.1	30	105.18	1.28	22.30	20.34	91.12	14.33
T_5 : Conventional 3 bud setts planting.	75.54	1.36	268	9.7	25	101.16	1.23	20.17	19.60	96.28	14.18
T_6 Primed and sprouted cane node (Incubated for four days after priming)	73.66	1.32	266	9.5	23	99.80	1.20	20.30	19.34	95.10	13.84
SE+	**3.55**	**0.05**	**3.54**	**0.42**	**1.36**	**1.64**	**0.07**	**0.24**	**0.07**	**0.98**	**0.10**
C.D at 5%	**9.94**	**0.12**	**9.56**	**1.08**	**3.67**	**4.75**	**NS**	**0.67**	**0.18**	**2.94**	**0.28**
General Mean	**69.96**	**1.54**	**283**	**9.8**	**26**	**101.86**	**1.23**	**20.89**	**19.61**	**93.35**	**13.98**

Project No. AS – 65

Title: Enhancing sugarcane productivity and profitability under Wheat – Sugarcane Cropping system.

Objectives : To enhance the productivity of sugarcane under wheat – sugarcane cropping system.

Experiment details :

Place	: CSRS, Padegaon,
Design	: Randomized Block Design
Replication	: 3
Plot Size: Gross	: 08 x 06 m^2,
Net	: 06 x 04 m^2
Variety	: Phule 265
Date of planting	: As per treatment
Soil Status	: Irrigated, Medium black soil.

Treatment Details : 09

T1 : Autumn planted sugarcane
T2 : Autumn planted planted sugarcane + Wheat (1:2)
T3 : Autumn planted planted sugarcane + Wheat (1:3)
T4 : Wheat sown on 15th November – Late Sugarcane
T5 : Wheat sown on 15th December – Late Sugaracne
T6 : FIRB sowing of wheat 15th November (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February
T7 : FIRB Sowing of wheat 15th November (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March
T8 : FIRB sowing of wheat 15th December (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February.
T9 : FIRB Sowing of wheat 15th December (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March.

Result

This is first year trial. The data on cane and CCS yield, intercrop yield, biometric observations, quality parameters, monetary returns, cost of cultivation and B:C ratio are presented in Table 1 to 5.

Cane, CCS and intercrop yields

Data presented in Table 1 revealed that, cane yield and CCS yield (143.61 t ha^{-1} and 20.24 t ha^{-1}, respectively) were significantly higher in treatment T_1 (autumn planted Sugarcane) than the rest of the treatments. Regarding intercropping, autumn planted sugarcane + wheat (1:2) (T_2) produced significantly higher cane yield and CCS yield (134.02 t ha^{-1} and 17.93 t ha^{-1}, respectively) than other treatments except autumn planted sugarcane + wheat (1:3) (T_3).

As regards intercrop yield FIRB sowing of wheat 15th November (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March (T_7) recorded higher wheat yield (38.26 q ha^{-1}) followed by FIRB Sowing of wheat 15th November (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of February (T_6).

Biometric observations

The data presented in Table 2 indicated that, the tillering ratio (1.52) was significantly higher in autumn planted sole sugarcane (T_1) over rest of the treatments, however, it was on par with treatment T_2 (1.45). Also NMC/ha (99115) was found significantly higher in autumn planted sole sugarcane over rest of the treatments. The growth observations germination, millable height, girth, number of internodes $cane^{-1}$ and weight per cane were found to be non significant.

Quality parameters

The data presented in Table 3 showed that, there were no significant differences found with respect to quality parameters.

Economics

The data presented in Table 4 indicated that cane equivalent yield due to different treatments differed significantly. Significantly the highest cane equivalent yield (159.08 t ha^{-1}) recorded under autumn planted sugarcane + wheat (1:3) (T_3) which was at par with autumn planted sugarcane + wheat (1:2) (T_2) (156.49 t ha^{-1}).

The maximum gross monetary returns and net monetary returns were recorded by autumn planted sugarcane + wheat (1:3) (T_3) (Rs.3,57,950/- and Rs.2,41,092/-, respectively) which was followed autumn planted sugarcane + wheat (1:2) (T_2) (Rs.3,52,105/- and Rs.2,37,872/-). The benefit: cost ratio was higher in autumn planted sugarcane + wheat (1:2) (3.08) followed by treatment autumn planted sugarcane + wheat (1:3) (3.06).

Conclusion

The autumn planted sugarcane produced significantly higher cane yield and CCS yield (143.61 t ha^{-1} and 20.24 t ha^{-1}, respectively). Under intercropping system, autumn planted sugarcane + wheat (1:2) produced significantly higher cane yield and CCS yield (134.02 t ha^{-1} and 17.93 t ha^{-1}, respectively). The intercropping of autumn planted sugarcane + wheat (1:2) was found to be more remunerative.

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

Treatments	Cane yield (t ha^{-1})	CCS yield (t ha^{-1})	Wheat yield (q ha^{-1})
T_1- Autumn planted sugarcane	143.61	18.93	-
T_2-Autumn planted sugarcane + Wheat (1:2)	134.02	17.93	25.28
T_3- Autumn planted sugarcane + Wheat (1:3)	133.88	17.88	28.36
T_4- Wheat sown on 15th November – Late Sugarcane	120.34	15.97	18.62
T_5- Wheat sown on 15th December – Late Sugarcane	110.47	14.94	17.57
T_6- FIRB sowing of wheat 15th November (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February	91.28	12.33	33.12
T_7- FIRB Sowing of wheat 15th November (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March	85.41	11.37	38.26
T_8- FIRB sowing of wheat 15th December (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of February.	91.98	12.20	29.12
T_9- FIRB Sowing of wheat 15th December (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March.	84.44	11.25	30.21
SE $\pm$	2.54	0.54	--
CD at 5%	7.36	1.46	--
G.M.	110.60	14.90	27.56

Table 2. Mean ancillary observations as affected by various treatments

Treatments	Germi. (%)	Tillering Ratio	Millable height (cm)	Girth (cm)	No. of internodes/ cane	NMC (ha^{-1})	Wt/ cane (kg)
T_1- Autumn planted sugarcane	72.18	1.52	264	10.5	24	99115	1.55
T_2-Autumn planted sugarcane + Wheat (1:2)	70.33	1.45	262	10.2	23	90564	1.48
T_3- Autumn planted sugarcane + Wheat (1:3)	69.78	1.36	260	10.1	22	91278	1.47
T_4- Wheat sown on 15th November – Late Sugarcane	68.66	1.47	257	10.0	23	82526	1.46
T_5- Wheat sown on 15th December – Late Sugarcane	68.33	1.43	258	9.9	22	76296	1.45
T_6- FIRB sowing of wheat 15th November (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February	68.00	1.30	257	9.8	21	62198	1.47
T_7- FIRB Sowing of wheat 15th November (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March	67.00	1.28	256	9.7	20	58956	1.45
T_8- FIRB sowing of wheat 15th December (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February.	68.33	1.34	259	9.8	21	62248	1.48
T_9- FIRB Sowing of wheat 15th December (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March.	67.33	1.32	256	9.8	21	57936	1.46
SE $\pm$	1.36	0.04	3.78	0.64	1.18	2650	0.05
CD at 5%	NS	0.10	NS	NS	NS	7810	NS
G.M.	68.88	1.28	258.77	9.97	21.88	75679	1.47

Table 3. Mean quality parameters of sugarcane as affected by different intercropping treatments

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
T_1- Autumn planted sugarcane	21.45	19.20	89.38	13.18
T_2-Autumn planted sugarcane + Wheat (1:2)	22.26	19.18	86.24	13.38
T_3- Autumn planted sugarcane + Wheat (1:3)	22.24	19.55	87.58	13.36
T_4- Wheat sown on 15th November – Late Sugarcane	22.56	19.58	86.18	13.27
T_5- Wheat sown on 15th December – Late Sugarcane	21.60	19.35	89.25	13.53
T_6- FIRB sowing of wheat 15th November (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February	21.78	19.50	89.37	13.51
T_7- FIRB Sowing of wheat 15th November (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March	21.48	19.28	88.64	13.31
T_8- FIRB sowing of wheat 15th December (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February.	21.62	18.98	87.50	13.27
T_9- FIRB Sowing of wheat 15th December (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March.	21.10	19.28	86.78	13.32
SE $\pm$	0.48	0.34	1.19	0.18
CD at 5%	NS	NS	NS	NS
G.M.	21.78	19.32	87.88	13.34

Table 4. Economics of sugarcane intercropping as influenced by different treatments

Treatments	Cane yield (t ha^{-1})	Inter crop yield (t ha^{-1})	Cane equ. yield (t ha^{-1})	Gross monetary returns (Rs.ha^{-1})	Cost of production (Cost A) (Rs.ha^{-1})	Net returns (Rs.ha^{-1})	B:C ratio
T_1- Autumn planted sugarcane	143.61	--	143.61	323122	108983	214139	2.96
T_2-Autumn planted sugarcane + Wheat (1:2)	134.02	25.28	156.49	352105	114233	237872	3.08
T_3- Autumn planted sugarcane + Wheat (1:3)	133.88	28.36	159.08	357950	116858	241092	3.06
T_4- Wheat sown on 15th November – Late Sugarcane	120.34	18.62	136.89	308005	114233	193772	2.69
T_5- Wheat sown on 15th December – Late Sugarcane	110.47	17.57	126.08	283680	114233	169447	2.48
T_6- FIRB sowing of wheat 15th November (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February	91.28	33.12	120.72	271620	116858	154662	2.32
T_7- FIRB Sowing of wheat 15th November (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March	85.41	38.26	119.42	268695	116858	151837	2.30
T_8- FIRB sowing of wheat 15th December (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of February.	91.98	29.12	117.86	265185	116858	148327	2.27
T_9- FIRB Sowing of wheat 15th December (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March.	84.44	30.21	118.29	250403	116858	133545	2.14
SE $\pm$	2.54	--	4.15	--	--	--	--
CD at 5%	7.36	--	11.62	--	--	--	--
G.M.	110.60	27.56	133.16	--	--	--	--

Selling rate - 1. Sugarcane- Rs 2250 t^{-1}. 2. Wheat- Rs 2000 q^{-1}

Table 5. Mean data on soil properties at harvest as affected by different treatments

Treatments	pH	EC (dsm^{-1})	O.C. (%)	N $kgha^{-1}$	P_2O_5 $kgha^{-1}$	K_2O $kgha^{-1}$
Initial	**7.82**	**0.37**	**0.64**	**282**	**21**	**193**
T_1- Autumn planted sugarcane	7.69	0.29	0.68	208	25	279
T_2-Autumn planted sugarcane + Wheat (1:2)	7.68	0.27	0.72	218	23	298
T_3- Autumn planted sugarcane + Wheat (1:3)	7.71	0.30	0.75	228	25	284
T_4- Wheat sown on 15th November – Late Sugarcane	7.77	0.32	0.69	234	30	286
T_5- Wheat sown on 15th December – Late Sugarcane	7.63	0.30	0.75	212	25	293
T_6- FIRB sowing of wheat 15th November (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February	7.69	0.27	0.79	218	23	299
T_7- FIRB Sowing of wheat 15th November (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March	7.69	0.31	0.80	232	25	296
T_8- FIRB sowing of wheat 15th December (75 cm with 3 rows of wheat)+ Sugarcane in furrows in third week of February.	7.61	0.33	0.73	202	26	298
T_9- FIRB Sowing of wheat 15th December (75 cm with 3 rows of wheat) + Sugarcane in furrows in third week of March.	7.65	0.32	0.79	207	25	294

There were no remarkable difference in soil pH, EC, organic carbon and available N, P_2O_5 and K_2O content in soil after harvest of sugarcane due to different intercrop combination of wheat there was slight decrease in soil pH, EC, N and increase in available K_2O and soil organic carbon in intercropped plot and no effect on available P_2O_5 status after harvest of both the crops.

1. Title of expt: AS-64 Response of sugarcane crop to different plant nutrients in varied agro-ecological situations.

2. Objective:

To study the differential response of sugarcane crop to different nutrients.

3. Experimental details:

Design : RBD **Replications :** 3

Plot size : 5 rows 8 m length **Season :** Spring (Suru)

Variety: Phule 265 (CoM 0265)

Date of Planting : 16.01.2013 **Date of harvesting :** 26.03.2014

4. Treatment details :

Tr.No	Treatments
1.	Control (No fertilizer)
2.	N
3.	NP
4.	NPK
5.	NPK + S
6.	NPK + Zn
7.	NPK + Fe
8.	NPK + Mn
9.	NPK + Zn + S
10.	NPK + Zn + S+ Fe
11.	NPK + Zn + S+ Fe+ Mn
12.	Soil test based fertilizer application
13.	Only FYM application @ 20 t/ha

5. Results:

(a) Yield parameters:

The data in respect of yield and yield contributing parameters presented in Table 1(a) indicated that, the application of NPK + Zn + S+ Fe+ Mn (T_{11}) recorded significantly higher cane yield (136.34 t ha^{-1}) and it was at par with application of fertilizer based on soil test (T_{12}) and application of NPK + Zn + S+ Fe (T_{10}) (136.32 and 132.37 t ha^{-1}, respectively). In case of CCS yield, application of fertilizer based on soil test (T_{12}) recorded significantly the highest CCS yield (20.05 t ha^{-1}) and it was at par with application of NPK + Zn + S+ Fe+ Mn (T_{11}) and application of NPK + Zn + S+ Fe (T_{10}) (20.00 and 19.45 t ha^{-1} ,respectively). As regards the average cane weight, the application of NPK + Zn + S+ Fe+ Mn (T_{11}) and application of fertilizer based on soil test (T_{12}) recorded significantly the highest average cane weight (1.49 kg) over other treatments. The result

on number of millable canes indicated that the application of NPK + Zn + S (T_9) was found superior over other treatments. The differences in CCS % were non- significant.

(b) Soil chemical properties :

All the chemical properties of soil at harvest of sugarcane were significantly influenced by the treatments (Table1(b)). The significantly least soil pH of 7.60 was recorded by application of FYM 20 t/ha (T_{13}). The significantly lowest EC of 0.83 dSm^{-1} was recorded by application of FYM 20 t/ha (T_{13}) and Control (T_1) . As regards the soil organic carbon content, the results are non-significant, however numerically the highest figures are recorded by the application of NPK + Zn + S+ Fe+ Mn (T_{11}) and FYM 20 t/ha (T_{13}) (0.81 %).Application of N (T_2) (267.33 kg ha^{-1}) recorded significantly the highest available N in soil, where as application of NP (T_3) (23.62 kg ha^{-1}) was superior with respect to available P in soil. Application of NPK (T_4) recorded the highest available K (329.33 kg ha^{-1}) in soil.

(c) Nutrient uptake :

The data on uptake of NPK was presented in Table 1(c). The data revealed that significantly higher uptake of N was noticed by the application of fertilizers based on soil test (T_{12}) (276.33 kg ha^{-1}) and significantly higher uptake of P and K was noticed by the application of NPK + Zn + S+ Fe+ Mn (T_{11}) (34.10 and 272.43 kg ha^{-1}) which was found superior to all other treatments. In general, 1.83 to 2.71 kg N, 0.23 to 0.26 kg P and 1.60 to 1.96 kg K were required to produce one tone of cane yield.

(d) Conclusion :

Application of NPK + Zn + S+ Fe+ Mn to sugarcane recorded significantly higher yields of cane and commercial cane sugar and it is comparable with application of fertilizers based on soil test.

Table 1(a). Effect of different treatments on yield and yield parameters of sugarcane

Treat.	Yield (t ha^{-1})	CCS (t ha^{-1})	ACW (Kg)	NMC (000 ha^{-1})	CCS %
T_1	69.61	10.07	1.08	64.78	14.45
T_2	91.87	13.28	1.12	81.78	14.45
T_3	101.71	14.73	1.17	87.23	14.48
T_4	117.78	17.21	1.35	87.22	14.61
T_5	122.15	17.91	1.38	88.78	14.67
T_6	123.86	18.05	1.32	93.68	14.56
T_7	120.97	17.75	1.37	88.87	14.67
T_8	120.27	17.65	1.26	96.04	14.67
T_9	122.81	18.01	1.28	96.60	14.66
T_{10}	132.37	19.45	1.42	93.44	14.69
T_{11}	136.34	20.00	1.49	91.69	14.67
T_{12}	136.32	20.05	1.49	91.48	14.71
T_{13}	83.31	12.05	1.20	69.57	14.46
SE±	4.03	0.62	0.06	3.74	0.07
CD at 5%	11.77	1.81	0.17	10.91	NS

Table 1(b). Effect of different treatments on soil chemical properties at harvest.

Treat.	pH	EC (dS m^{-1})	Org. C. (%)	Av. Nutrients (Kg ha^{-1})		
				N	P_2O_5	K_2O
Initial	***7.68***	***0.78***	***0.67***	***256***	***19.1***	***298***
T_1	7.78	0.83	0.68	240.33	17.48	271.33
T_2	7.76	0.90	0.73	267.33	17.06	265.33
T_3	7.83	0.93	0.74	260.00	23.62	254.67
T_4	7.73	0.94	0.78	251.33	20.81	329.33
T_5	7.71	0.90	0.73	249.00	20.03	320.67
T_6	7.74	0.93	0.78	240.33	20.70	315.98
T_7	7.73	0.91	0.76	250.00	20.60	316.92
T_8	7.74	0.92	0.75	242.67	21.33	321.67
T_9	7.76	0.87	0.78	247.00	21.43	319.33
T_{10}	7.80	0.89	0.79	244.00	21.28	318.67
T_{11}	7.76	0.93	0.81	247.33	21.05	312.67
T_{12}	7.86	0.93	0.79	228.51	21.07	315.00
T_{13}	7.60	0.83	0.81	252.00	18.66	286.00
SE±	0.039	0.023	0.03	6.24	0.62	7.22
CD at 5%	0.115	0.068	NS	18.21	1.81	21.10

Table 1(c). Effect of different treatments on nutrient uptake by sugarcane

Treat.	Kg ha^{-1}			Kg t^{-1}		
	N	**P_2O_5**	**K_2O**	**N**	**P_2O_5**	**K_2O**
T_1	128.00	17.50	111.67	1.83	0.25	1.60
T_2	248.67	22.58	166.67	2.71	0.25	1.82
T_3	248.33	24.24	180.93	2.45	0.24	1.78
T_4	259.67	27.29	217.40	2.21	0.23	1.85
T_5	267.33	27.99	218.60	2.19	0.23	1.79
T_6	275.33	29.02	224.33	2.23	0.24	1.82
T_7	261.67	27.65	217.33	2.23	0.24	1.86
T_8	267.00	27.28	217.27	2.28	0.23	1.86
T_9	263.67	29.44	222.80	2.15	0.24	1.82
T_{10}	266.67	32.00	257.97	2.02	0.24	1.95
T_{11}	260.00	34.10	272.43	1.87	0.24	1.96
T_{12}	276.33	32.79	261.80	2.03	0.24	1.93
T_{13}	167.00	21.37	147.43	2.02	0.26	1.78
SE$\pm$	5.12	0.77	6.13	--	--	--
CD at 5%	14.95	2.25	17.91	--	--	--

CompletedExperiment

B) Completed experiment

Project No. AS – 63

Title: Plant geometry in relation to Mechanization of Sugarcane (Pooled)

Objective: 1) To work out optimum plant geometry for use of farm machinary.

2) To study varietal response to different plant geometry.

Experimental Details:

Place		: CSRS, Padegaon,
Design		: Split plot,
Replication		: 3
Plot Size	Gross	: 08 x 06 m^2,
	Net	: As per treatments
Fertilizer dose		: 250:115:115 kg N, P_2O_5, K_2O ha^{-1},
Year of Start		: 2011-12
Soil Status		: Irrigated, Medium black soil..

Treatment details :

A) Main plot treatments –Genotypes -5

P_1 : 100 cm

P_2 : 120 cm

P_3 : 150 cm

P_4 : 30 x 150 cm

B) Sub plot treatments – N levels – 3

V_1 : CoM 0265

V_2 : Co 86032

V_3 : Co 94012

V_4 : CoC 671

Results:

The pooled data on cane and CCS yields, growth observations and quality parameters are presented in Table 1 to 3.

Effect of planting geometry:

The data presented in Table 1 revealed that the row spacing of 120 cm recorded significantly the highest cane yield (122.33 t ha^{-1}) and CCS yield (17.42 t ha^{-1}). However, it was found at par with the row spacing of 150 cm for both cane (116.89 t ha^{-1}) and CCS yields (16.50 t ha^{-1}), respectively.

Effect of genotypes:

Significantly the highest cane (136.69 t ha^{-1}) and CCS (19.20 t ha^{-1}) yields were recorded with the variety CoM 0265 and it was followed by Co 86032 (121.31 and 17.27 t ha^{-1}).

Effect of interactions:

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

Growth and yield attributes:

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

Effect of planting geometry:

The effect of row spacing was found significant for the millable height, cane girth and number of millable canes. The row spacing of 120 cm recorded significantly the highest millable height (298 cm) but it was at par with 150 cm row spacing. A similar trend was noticed for the cane girth (10.6 cm) and number of millable canes ha^{-1} (89630 ha^{-1}).

Effect of Genotypes:

The effect of genotypes was significant on all the growth parameters except germination percentage and number of internodes. The genotype CoM 0265 registered significantly higher tillering ratio(1.78), millable height (310 cm), cane girth (10.9 cm), number of milliable cane (94810 ha^{-1}) and the average cane weight (1.44 kg $cane^{-1}$). Co 86032 was the next superior genotype in respect of the growth attributes.

Effect of interactions:

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

Quality parameters:

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

Effect of planting geometry:

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

Effect of Genotypes:

The genotype CoC 671 recorded significantly higher brix (22.03), sucrose (19.72%) and CCS (13.68%) than the other genotypes.

Effect of interactions:

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

Conclusion:

The row spacing of 120 cm recorded the highest cane (122.33 t ha^{-1}) and CCS yield (17.42 t ha^{-1}). However, it was at par with the row spacing of 150 cm for both cane (116.89 t ha^{-1}) and CCS yields (16.50 t ha^{-1}). Significantly the highest cane (136.69 t ha^{-1}) and CCS (19.20 t ha^{-1}) yields were recorded by the variety CoM 0265 followed by Co 86032 (121.31 and 17.27 t ha^{-1}). The sugarcane variety CoC 671 was found to be the most superior with respect to juice quality.

Table :-1 Mean cane and CCS Yields (t/ha) as affected by various treatments (Pooled)

Treatment	Cane Yield (t/ha)				CCS Yield (t/ha)			
	2011-12	**2012-13**	**2013-14**	**Pooled Mean**	**2011-12**	**2012-13**	**2013-14**	**Pooled Mean**
A) Planting geometry								
P_1 100 cm row distance	118.28	112.09	113.79	**114.72**	16.64	15.69	16.98	**16.43**
P_2 120 cm row distance	120.43	122.13	124.43	**122.33**	16.79	17.03	18.46	**17.42**
P_3 150 cm row distance	109.97	119.45	121.25	**116.89**	15.33	16.48	17.70	**16.50**
P_4 30 x 150 cm row distance	107.33	107.52	109.15	**108.00**	14.86	14.81	15.90	**15.19**
SE±	**1.87**	**1.64**	**1.48**	**1.78**	0.29	0.42	**0.46**	**0.35**
C.D. at 5%	**6.48**	**4.78**	**4.26**	**5.83**	1.01	1.14	**1.19**	**0.95**
B) Genotypes								
V_1 CoM 0265	134.73	136.74	138.60	**136.69**	18.51	18.87	20.24	**19.20**
V_2 Co 86032	119.70	131.22	123.01	**121.31**	16.60	16.80	18.42	**17.27**
V_3 Co 94012	102.67	104.12	105.98	**104.25**	14.17	14.42	14.88	**14.49**
V_4 CoC 671	98.90	99.18	101.03	**99.70**	14.33	13.90	15.51	**14.58**
SE±	**2.13**	**2.64**	**2.14**	**2.52**	0.31	0.65	**0.58**	**0.64**
C.D. at 5%	**6.21**	**7.18**	**6.84**	**6.80**	0.89	1.78	**1.51**	**1.72**
C) Interactions								
SE±	**4.26**	**5.02**	**5.36**	**4.64**	0.61	0.85	**0.93**	**0.87**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
G.M.	**113.99**	**115.30**	**117.15**	**115.48**	**15.90**	**16.00**	**17.26**	**16.38**

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

Treatments	Germination	Tillering ratio	Height (cm)	Girth (cm)	No of internodes cane^{-1}	Millable canes (000 ha^{-1})	Avg. cane wt. (kg)
A) Planting geometry							
P_1 100 cm row distance	74.02	1.59	295	10.3	26	84.54	1.35
P_2 120 cm row distance	74.93	1.69	298	10.6	27	89.63	1.37
P_3 150 cm row distance	74.38	1.66	297	10.4	27	85.34	1.37
P_4 30 x 150 cm row distance	71.97	1.56	281	9.7	25	82.01	1.31
SE±	**1.24**	**0.07**	**1.06**	**0.10**	**1.60**	**1.53**	**0.03**
C.D. at 5%	**NS**	**NS**	**2.75**	**0.27**	**NS**	**4.64**	**NS**
B) Genotypes							
V_1 CoM 0265	75.68	**1.78**	**310**	10.9	**29**	**94.81**	**1.44**
V_2 Co 86032	74.93	1.69	**300**	10.5	27	87.56	1.38
V_3 Co 94012	73.28	1.56	386	10.1	25	80.82	1.29
V_4 CoC 671	71.38	1.47	275	9.5	24	78.44	1.27
SE±	**1.79**	0.06	2.35	**0.17**	1.82	1.70	0.03
C.D. at 5%	**NS**	**0.15**	**6.11**	**0.48**	**NS**	**4.93**	**0.08**
C) Interactions							
SE±	**3.56**	**0.14**	**4.52**	**0.56**	**2.24**	**3.48**	**0.05**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
General Mean	**73.82**	**1.63**	**293**	**10.25**	**26**	**85.38**	**1.35**

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

Treatments	Brix (c)	Sucrose (%)	Purity (%)	CCS (%)
A) Planting geometry				
P_1 100 cm row distance	21.51	19.86	92.67	14.33
P_2 120 cm row distance	21.34	19.78	92.43	14.25
P_3 150 cm row distance	21.34	19.69	92.05	14.12
P_4 30 x 150 cm row distance	21.26	19.56	92.52	14.06
SE±	**0.16**	**0.13**	**0.63**	**0.18**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
B) Genotypes				
V_1 CoM 0265	21.06	19.52	92.58	14.05
V_2 Co 86032	21.52	19.66	92.43	14.22
V_3 Co 94012	20.83	19.56	91.76	13.76
V_4 CoC 671	22.03	20.15	92.90	14.75
SE±	**0.15**	**0.07**	**0.56**	**0.14**
C.D. at 5%	**0.40**	**NS**	**NS**	**0.39**
C) Interactions				
SE±	**0.32**	**0.18**	**0.75**	**0.36**
C.D. at 5%	**NS**	**NS**	**NS**	**NS**
General Mean	**21.36**	**19.72**	**92.42**	**14.19**

1. Title of expt: AS-64 Response of sugarcane crop to different plant nutrients in varied agro-ecological situations.

2. Objective:

To study the differential response of sugarcane crop to different nutrients.

3. Experimental details:

Design : RBD **Replications :** 3

Plot size : 5 rows 8 m length **Season :** Spring (Suru)

Variety : Phule 265 (CoM 0265)

Year	**Date of Planting**	**Date of harvesting**
2011-12	23.12.2010	09.02.2012
2012-13	21.01.2012	15.03.2013
2013-14	16.01.2013	26.03.2014

4. Treatment details :

Tr.No	**Treatments**
1.	Control (No fertilizer)
2.	N
3.	NP
4.	NPK
5.	NPK + S
6.	NPK + Zn
7.	NPK + Fe
8.	NPK + Mn
9.	NPK + Zn + S
10.	NPK + Zn + S+ Fe
11.	NPK + Zn + S+ Fe+ Mn
12.	Soil test based fertilizer application
13.	Only FYM application @ 20 t/ha

5. Results :

(a) Yield parameters:

The pooled data of three years with respect to cane and CCS yield was presented in Table 1(a) indicated that, the application of NPK + Zn + S+ Fe+ Mn (T_{11}) recorded significantly the highest cane and CCS yield (153.02 and 22.98 t ha^{-1}) and it was found at par with application of fertilizer based on soil test (T_{12}) (150.41 and 22.28 t ha^{-1},respectively) and application of NPK + Zn + S+ Fe (T_{10}) (149.59 and 22.20 t ha^{-1} ,respectively).

As regards the average cane weight, application of NPK + Zn + S+ Fe+ Mn (T_{11}) recorded significantly the highest average cane weight (1.65 kg) and application of NPK + Mn (T_8) recorded significantly highest NMC (99.12 000' ha^{-1}) over other treatments (Table 1(b)). The CCS % was not significantly affected by the different treatments (Table 1(c)).

(b) Soil chemical properties:

The pooled data on soil chemical properties at harvest were presented in Table 2(a). The soil pH was not significantly affected by the different treatments. The soil EC was increased in all the treatments over initials in three years, however the pooled results showed that the significantly lowest EC of 0.83 dSm^{-1} was recorded in control (T_1) . As regards the soil organic carbon content, significantly the highest figures were recorded by application of NPK + Zn + S+ Fe+ Mn (T_{11}) (0.91 %) and it was found at par with application of fertilizer based on soil test (T_{12}) and application of NPK + Zn + S+ Fe (T_{10}) (0.89 and 0.88 % , respectively). Significantly the highest available N of soil at harvest was recorded by application of N (T_2) (248 kg ha^{-1}) and it was at par with all other treatments except control (T_1). Application of NPK + Zn + S+ Fe+ Mn (T_{11}) (26.30 kg ha^{-1}) was superior in respect of available P status of soil, however application of fertilizer based on soil test (T_{12}) recorded the significantly the highest available K (300 kg ha^{-1}) in soil at harvest of sugarcane.

(c) Nutrient uptake :

The pooled data on uptake of NPK was presented in Table 2(b). The data revealed that significantly higher uptake of N was recorded by application of fertilizers based on soil test (T_{12}) (275 kg ha^{-1}) while significantly higher uptake of P and K was noticed by application of NPK + Zn + S+ Fe+ Mn (T_{11}) (48.92 and 305 kg ha^{-1}) which was superior to all other treatments. In general, 1.77 to 2.29 kg N, 0.26 to 0.31 kg P and 1.83 to 2.01 kg K were required to produce one tone of cane yield.

(d) Conclusion :

Application of NPK + Zn + S+ Fe+ Mn to sugarcane recorded significantly higher yields of cane and commercial cane sugar and it is comparable with application of fertilizers based on soil test.

Table 1(a). Effect of different treatments on cane and CCS yield of sugarcane (Pooled)

Treat.	Yield (t ha^{-1})				CCS (t ha^{-1})			
	2011-12	2012-13	2013-14	Mean	2011-12	2012-13	2013-14	Mean
T_1	117.72	66.30	69.61	84.54	17.56	9.52	10.06	12.38
T_2	136.87	88.45	91.87	105.73	19.87	12.46	13.28	15.20
T_3	153.34	98.30	101.71	117.78	22.02	14.14	14.73	16.96
T_4	179.85	118.70	117.78	138.78	25.65	16.91	17.21	19.92
T_5	181.47	115.40	122.15	139.67	27.18	17.04	17.91	20.71
T_6	181.97	120.45	123.86	142.09	26.86	16.98	18.04	20.63
T_7	173.25	122.73	120.97	138.98	25.05	16.67	17.75	19.82
T_8	181.38	120.52	120.27	140.72	26.88	16.44	17.65	20.32
T_9	185.33	119.40	122.81	142.51	27.61	17.90	18.00	21.17
T_{10}	187.45	128.96	132.37	149.59	27.69	19.47	19.45	22.20
T_{11}	191.45	131.26	136.34	153.02	28.74	20.91	19.31	22.98
T_{12}	185.99	128.91	136.32	150.41	27.55	19.26	20.05	22.28
T_{13}	124.17	74.56	83.31	94.01	17.91	10.78	12.04	13.58
SE±	6.78	3.28	4.03	2.25	2.12	0.52	0.62	0.41
CD at 5%	20.34	9.58	11.77	6.58	6.36	1.51	1.81	1.21

Table 1(b). Effect of different treatments on Average Cane Weight and Number of Milleable Canes of sugarcane (Pooled)

Treat.	Average Cane weight (kg)				NMC (000 ha^{-1})			
	2011-12	2012-13	2013-14	Mean	2011-12	2012-13	2013-14	Mean
T_1	1.54	0.99	1.08	1.20	76.44	66.97	64.66	69.36
T_2	1.75	1.01	1.12	1.29	78.21	87.57	81.78	82.52
T_3	1.86	1.07	1.17	1.37	82.44	91.87	87.18	87.16
T_4	2.05	1.05	1.35	1.48	87.73	113.05	87.03	95.94
T_5	2.09	1.08	1.38	1.52	86.83	106.85	88.51	94.06
T_6	2.10	1.08	1.32	1.50	86.65	111.53	93.60	97.26
T_7	1.98	1.12	1.37	1.49	87.50	109.58	88.30	95.13
T_8	2.05	1.06	1.26	1.46	88.48	113.70	95.20	99.12
T_9	2.08	1.27	1.28	1.54	89.10	94.02	96.20	93.11
T_{10}	2.10	1.34	1.42	1.62	89.26	96.24	93.22	92.91
T_{11}	2.12	1.33	1.49	1.65	90.31	98.69	91.51	93.50
T_{12}	2.10	1.26	1.49	1.62	88.57	102.31	91.49	94.12
T_{13}	1.57	1.02	1.20	1.26	79.09	73.10	69.62	73.94
SE±	0.09	0.03	0.06	0.05	1.26	2.85	3.74	3.67
CD at 5%	0.28	0.09	0.17	0.15	3.81	8.33	10.91	10.74

Table 1(c). Effect of different treatments on CCS % of sugarcane (Pooled).

Treatments	CCS (%)			
	2011-12	2012-13	2013-14	Mean
T_1	14.92	14.35	14.45	14.57
T_2	14.52	14.09	14.45	14.35
T_3	14.36	14.38	14.48	14.41
T_4	14.26	14.25	14.61	14.37
T_5	14.98	14.77	14.67	14.81
T_6	14.76	14.10	14.56	14.47
T_7	14.46	14.60	14.67	14.58
T_8	14.82	14.87	14.67	14.79
T_9	14.90	14.99	14.66	14.85
T_{10}	14.77	15.10	14.69	14.85
T_{11}	15.01	15.34	14.16	14.84
T_{12}	14.81	14.94	14.71	14.82
T_{13}	14.42	14.46	14.46	14.45
SE±	0.71	0.07	0.07	0.14
CD at 5%	NS	0.21	NS	NS

Table 2(a). Effect of different treatments on soil chemical properties at harvest of sugarcane (Pooled).

Treat.	pH				EC (dSm^{-1})			
	2011-12	2012-13	2013-14	Mean	2011-12	2012-13	2013-14	Mean
Initial	***7.9***	***7.28***	***7.68***		***0.35***	***1.61***	***0.78***	
T_1	7.87	7.51	7.78	7.72	0.16	1.51	0.83	0.83
T_2	7.34	7.43	7.76	7.51	0.22	1.59	0.90	0.90
T_3	7.63	7.50	7.83	7.65	0.26	1.65	0.93	0.95
T_4	7.69	7.40	7.73	7.61	0.28	1.66	0.94	0.96
T_5	7.83	7.46	7.71	7.67	0.27	1.56	0.90	0.91
T_6	7.73	7.36	7.74	7.61	0.28	1.64	0.93	0.95
T_7	7.86	7.33	7.73	7.64	0.29	1.62	0.91	0.94
T_8	7.88	7.41	7.74	7.68	0.31	1.63	0.92	0.95
T_9	7.81	7.40	7.76	7.66	0.33	1.54	0.87	0.91
T_{10}	7.67	7.44	7.80	7.64	0.32	1.61	0.89	0.94
T_{11}	7.93	7.40	7.76	7.70	0.38	1.65	0.93	0.99
T_{12}	7.91	7.49	7.86	7.75	0.36	1.68	0.93	0.99
T_{13}	7.71	7.30	7.60	7.54	0.19	1.53	0.83	0.85
SE±	0.04	0.01	0.039	0.06	0.06	0.01	0.023	0.017
CD at 5%	0.11	0.03	0.115	NS	0.18	0.03	0.068	0.051

Cont….

Table 2(a). Effect of different treatments on soil chemical properties at harvest of sugarcane (Pooled).

Treat.	Organic Carbon (%)				Available N (kg ha^{-1})			
	2011-12	2012-13	2013-14	Mean	2011-12	2012-13	2013-14	Mean
Initial	***0.8***	***0.87***	***0.67***		***219***	***176***	***256***	
T_1	0.69	0.86	0.68	0.74	215	168	240	208
T_2	0.73	0.91	0.73	0.79	281	196	267	248
T_3	0.74	0.91	0.74	0.80	247	202	260	236
T_4	0.74	0.99	0.78	0.84	260	201	251	237
T_5	0.71	0.91	0.73	0.78	262	203	249	238
T_6	0.76	1.00	0.78	0.85	277	197	240	238
T_7	0.78	0.94	0.76	0.83	279	198	250	242
T_8	0.76	0.93	0.75	0.81	278	200	243	240
T_9	0.81	0.96	0.78	0.85	277	207	247	244
T_{10}	0.83	1.01	0.79	0.88	278	201	244	241
T_{11}	0.90	1.03	0.81	0.91	279	200	247	242
T_{12}	0.86	1.03	0.79	0.89	281	204	229	238
T_{13}	0.78	0.89	0.81	0.83	254	188	252	231
SE±	0.12	0.03	0.03	0.015	2.00	1.48	6.24	6.79
CD at 5%	0.36	0.08	NS	0.045	6.07	4.25	18.21	19.82

Cont….

Table 2(a). Effect of different treatments on soil chemical properties at harvest of sugarcane (Pooled).

Treat.	Available P_2O_5 (kg ha^{-1})				Available K_2O (kg ha^{-1})			
	2011-12	2012-13	2013-14	Mean	2011-12	2012-13	2013-14	Mean
Initial	***24.5***	***22***	***19.1***		***219***	***176***	***256***	
T_1	14.46	20.82	17.48	17.59	269	174	271	238
T_2	19.79	21.70	17.06	19.52	284	204	265	251
T_3	20.13	23.09	23.62	22.28	285	212	255	250
T_4	22.76	23.84	20.81	22.47	312	228	329	290
T_5	23.79	22.36	20.03	22.06	327	236	321	294
T_6	25.47	24.23	20.70	23.47	330	236	316	294
T_7	27.54	23.60	20.60	23.91	332	240	317	296
T_8	27.20	24.73	21.33	24.42	333	242	322	299
T_9	28.42	25.63	21.43	25.16	333	236	319	296
T_{10}	29.10	25.62	21.28	25.33	335	241	319	298
T_{11}	31.79	26.05	21.05	26.30	337	244	313	298
T_{12}	30.42	27.07	21.07	26.19	335	250	315	300
T_{13}	18.48	22.32	18.66	19.82	294	180	286	253
SE±	1.00	0.34	0.62	1.39	0.93	0.84	7.22	5.46
CD at 5%	3.05	1.01	1.81	4.07	2.82	2.44	21.10	15.96

Table 2(b). Effect of different treatments on nutrient uptake nutrient requirement of sugarcane at harvest (Pooled).

Treat.	N uptake (Kg ha^{-1})				N requirement (Kg t^{-1})			
	2011-12	2012-13	2013-14	Mean	2011-12	2012-13	2013-14	Mean
T_1	115	201	128	148	0.98	3.03	1.84	1.95
T_2	217	229	248	232	1.59	2.59	2.71	2.29
T_3	229	235	248	237	1.49	2.39	2.44	2.11
T_4	237	234	259	244	1.32	1.97	2.20	1.83
T_5	244	235	267	249	1.34	2.04	2.19	1.86
T_6	269	230	275	258	1.48	1.91	2.23	1.87
T_7	276	232	261	256	1.59	1.89	2.16	1.88
T_8	283	233	267	261	1.56	1.93	2.22	1.90
T_9	289	240	263	264	1.56	2.01	2.15	1.91
T_{10}	297	234	266	266	1.58	1.81	2.01	1.80
T_{11}	313	232	260	268	1.63	1.77	1.91	1.77
T_{12}	312	237	276	275	1.68	1.84	2.03	1.85
T_{13}	177	221	167	188	1.43	2.96	2.00	2.13
SE±	1.29	1.45	5.12	15.60	--	--	--	--
CD at 5%	3.90	4.25	14.95	45.53	--	--	--	--

Cont….

Table 2(b). Effect of different treatments on nutrient uptake nutrient requirement of sugarcane at harvest (Pooled).

Treat.	P uptake (Kg ha^{-1})				P requirement (Kg t^{-1})			
	2011-12	2012-13	2013-14	Mean	2011-12	2012-13	2013-14	Mean
T_1	28.59	27.20	17.50	24.43	0.24	0.41	0.25	0.30
T_2	35.19	28.08	22.58	28.62	0.26	0.32	0.25	0.27
T_3	53.54	29.47	24.24	35.75	0.35	0.30	0.24	0.30
T_4	58.29	30.22	27.29	38.60	0.32	0.25	0.23	0.27
T_5	57.36	28.74	27.99	38.03	0.32	0.25	0.23	0.26
T_6	60.80	30.61	29.02	40.14	0.33	0.25	0.23	0.27
T_7	59.21	29.98	27.65	38.95	0.34	0.24	0.23	0.27
T_8	62.08	31.11	27.28	40.16	0.34	0.26	0.23	0.28
T_9	66.87	32.01	29.44	42.77	0.36	0.27	0.24	0.29
T_{10}	68.24	32.00	32.00	44.08	0.36	0.25	0.24	0.28
T_{11}	80.24	32.43	34.10	48.92	0.42	0.25	0.25	0.31
T_{12}	78.21	33.45	32.79	48.15	0.42	0.26	0.24	0.31
T_{13}	21.86	28.70	21.37	23.98	0.18	0.38	0.26	0.27
SE±	1.10	0.34	0.77	4.99	--	--	--	--
CD at 5%	3.34	1.01	2.25	14.56	--	--	--	--

Cont….

Table 2(b). Effect of different treatments on nutrient uptake nutrient requirement of sugarcane at harvest (Pooled).

Treat.	K uptake (Kg ha^{-1})				K requirement (Kg t $^{-1}$)			
	2011-12	2012-13	2013-14	Mean	2011-12	2012-13	2013-14	Mean
T_1	130	202	112	148	1.10	3.05	1.60	1.92
T_2	202	233	167	201	1.48	2.63	1.81	1.98
T_3	221	241	181	214	1.44	2.45	1.78	1.89
T_4	269	257	217	248	1.49	2.16	1.85	1.83
T_5	299	264	219	261	1.65	2.29	1.79	1.91
T_6	304	265	224	265	1.67	2.20	1.81	1.89
T_7	334	268	217	273	1.93	2.19	1.80	1.97
T_8	337	271	217	275	1.86	2.25	1.81	1.97
T_9	353	265	223	280	1.90	2.22	1.81	1.98
T_{10}	360	269	258	296	1.92	2.09	1.95	1.99
T_{11}	370	273	272	305	1.93	2.08	2.00	2.00
T_{12}	361	278	262	300	1.94	2.16	1.92	2.01
T_{13}	154	209	147	170	1.24	2.80	1.77	1.94
SE±	2.07	0.83	6.13	17.74	--	--	--	--
CD at 5%	6.27	2.43	17.91	51.80	--	--	--	--

Technical Programme

2014-15

Approved Technical Programme
for the year
(2014-15)

Crop Production

All India Coordinated Research Project on Sugarcane (AICRP) 2014-15:

1) AS 42:Agronomic evaluation of promising sugarcane genotypes . (Spring Early Planting)

2) AS 42:Agronomic evaluation of promising sugarcane genotypes . (Spring Midlate Planting)

3) AS 66: Priming of cane node for accelerating germination.

4) AS 65: Enhancing sugarcane productivity and profitability under Wheat-Sugarcane cropping system.

5) AS-69 Impact of integrated application of organics and inorganics in improving soil health and sugarcane productivity.