CROP PRODUCTION

Technical Programme - 2023-2024

AS-72	**:**	**Agronomic performance of elite sugarcane genotypes**
Objective	**:**	To assess the performance of promising sugarcane genotypes of Advanced Varietal Trial (AVT)
Year of start	**:**	2016-2017
Duration	**:**	Long term (Genotypes to be selected annually)
Locations	**:**	All centres where post of Agronomist has been provided as well as any voluntary centre.
Planting time	**:**	North West, North Central & North East Zones: February-March Peninsular & East Coast Zones: Ist fortnight of January
Treatments	**:**	
1. Genotypes	**:**	Varieties and only one of the checks of the Centre's zone
2. Agronomy	**:**	**Spacing : S**pacing for all the entries ▪ 120 cm (for North West, North Central, North East and East Coast Zones). ▪ 150 cm (for the Peninsular Zone). **Fertilizer levels**: (2) 100 % and125% of the recommended dose of NPK for the zone
Design	**:**	RBD
Replication	**:**	3
Plot size	**:**	North West, North Central, North East and East Coast Zones: 5 rows of 6 m length. Peninsular Zone: 4 rows of 6 m length.

Note: 1. Seed material of the test varieties may please be obtained from concerned breeder of the center.

2. Separate trials to be laid out for early and mid-late maturity groups along with zonal checks.

Observations to be recorded	**:**	i) Initial soil fertility status for available NPK, soil texture, physico-chemical properties of the soil. ii) Data on germination, no. of millable canes, cane yield, Pol (%), CCS (t/ha).

List of varieties (zone-wise) for the Experiment AS 72 during 2023-24

I. North West Zone (AVT II Plant)

Early maturing varieties (4): CoS 17231, CoS 17232, CoPb 18181, CoLk 18202

Zonal Check (3): CoJ 64, Co 0238, Co 05009

Mid-late maturing varieties (6): Co 18022, CoPb 18213, CoPb 18214, CoS 18231, CoS 18232, CoS 18233

Zonal Check (3): CoS 767, CoPant 97222, Co 05011

II. North Central & North East Zones (AVT II Plant)

Early maturing varieties (5): CoP 18436, CoP 18437, CoP 18438, CoSe 18451, CoSe 18452

Zonal Check (3): CoLk 94184, CoSe 95422, CoSe 01421

Mid-late maturing varieties (7): CoSe 16454, CoP 17436, CoP 17437, CoP 17438, CoP 17440, CoP 17441, CoSe 17451

Zonal Check (3): BO 91, CoP 06436, CoP 9301

III. Peninsular Zone (AVT II Plant)

Varieties (12): Co 17001, Co 17002, Co 17003, Co 17004, Co 17005, Co 17010, Co 17012, Co 17013, CoVC 17061, CoN 17072, MS 17082, and CoT 17366

Zonal Check (3): Co 86032, CoC 671 and Co 09004

IV. East Coast Zone (AVT II Plant)

Early maturing varieties (4): CoA 19321, CoC 19337, CoV 19356, CoV 19357

Zonal Check (3): CoA 92081, CoC 01061and CoOr 03151

Mid-late maturing varieties (5): CoV 18358, CoA 19322, CoC 19339, CoV 19358, CoV 19359

Zonal Check (3): CoV 92102, Co 86249, Co 06030

Note : Varieties other than listed above should not be included or substituted.

AS-74	**:**	**Evaluation of sugarcane varieties for drought tolerance**

Objective	**:**	Identification of drought tolerant varieties suitable for specific agro-climatic condition.
Year of start	**:**	2018-2019
Duration	**:**	Long term (Based on 2-years crop performance)
Locations	**:**	All centres where post of Agronomist has been provided as well as any voluntary centre.
Planting time	**:**	North West, North Central & North East Zones: February-March Peninsular & East Coast Zones: Ist fortnight of January
Treatments	**:**	**(a) Newly released varieties:** • Early maturing (3) • Mid-late maturing (3) **(b) Irrigation regimes: 2** • IW/CPE ratio 1.0 • IW/CPE ratio 0.3
Total no. of treatments:		12
Design	**:**	Strip plot design
Replication	**:**	3
Plot size	**:**	North West, North Central, North East and East Coast Zones : 8 rows of 8 m length. Peninsular Zone : 8 rows of 8 m length.
Methodology	**:**	All the irrigation regimes would be applied 50 days after planting in the main season crop of the region.
Observations to	**:**	i) Root dry weight at 50, 100, 150 and 200 DAP. ii) Relative leaf water content 24 hrs before and after each irrigation 50 DAP onwards. iii) Soil moisture content before and after each irrigation. iv) Leaf area index and specific leaf weight at 50, 100, 150 and 200 DAP. v) Dry matter accumulation at 50, 100, 150, 200 and at harvest. vi) Monthly tiller count and other plant biometric data. vii) Yield attribute and cane yield viii) Juice quality at 10 and 12 months stages including juice extraction percentage.

Protocol for determination of:

1. Relative leaf water content
2. Leaf area index (LAI) and specific leaf weight

Relative leaf water content (RWC):

1. Take LTM leaf & cut out 20 leaf disc using sharp cork borer.
2. Take the fresh weight of these leaf discs (20 discs). Take middle part of the leaf and avoid taking midrib.
3. Incubate the discs of leaf in distilled water for 6 hrs under proper illumination (use fluorescent tubes). Incubation can be done in petri dishes.
4. After 6 hrs, take out the discs, wipe out with tissue paper & weight the same, which is recorded as turgid weight.
5. Dry the discs (drying can be done at 60^0C) and record the dry weight.
6. Calculate the RWC (Relative Water Content %) using following formula :

$$\text{RWC \%} = \frac{\text{Fresh weight} - \text{Dry weight}}{\text{Turgid weight} - \text{dry weight}} \times 100$$

Leaf area index can be calculated by following formula:

$$\text{Leaf area index} = \frac{\text{Leaf area}}{\text{Ground area}}$$

Specific leaf weight (SLW)

1. Take LTM leaf and measure the length (L) and width (W) (centre of the leaf). Multiply (LxW) with factor 0.627 to get leaf area of the leaf.
2. Dry the same leaf in oven at 60^0C and take the weight of the dry leaf. SLW is calculated using following formula :

$$\text{SLW (g/cm}^2\text{)} = \frac{\text{Dry weight of leaf taken for the area}}{\text{Leaf area}}$$

AS 77: Evaluation of liquid nano urea for its efficacy in enhancing N use efficiency and sugarcane growth and yield

Objectives:

1. To assess the effect of liquid nano urea spray on sugarcane growth, yield and quality
2. To work out the conventional urea substitution through liquid nano urea
3. To design the nano urea spray schedule for sugarcane and assess the economics

Year of Start: 2022 (to be carried out for two consecutive plant –ratoon cycles)

Centres: All the centres

Treatment Details

1. Half of RDN applied as 50% basal through fertilizers and rest in two equal split sprays of liquid nano urea at 45 and 90 DAP
2. Half of RDN applied as 50% basal through fertilizers and rest in three equal split sprays of liquid nano urea at 30, 60 and 90 DAP
3. Half of RDN applied as 50% basal through fertilizers and rest in three equal split sprays of liquid nano urea at 45, 90 and 135 DAP
4. 75 % of RDN applied as 50% basal through fertilizers and rest in two equal split sprays of liquid nano urea at 45 and 90 DAP
5. 75 % of RDN applied as 50% basal through fertilizers and rest in three equal split sprays of liquid nano urea at 30, 60 and 90 DAP
6. 75 % of RDN applied as 50% basal through fertilizers and rest in three equal split sprays of liquid nano urea at 45, 90 and 135 DAP
7. RDN applied as 50% basal through fertilizers and rest in two equal split sprays of liquid nano urea at 45 and 90 DAP
8. RDN applied as 50% basal through fertilizers and rest in three equal split sprays of liquid nano urea at 30, 60 and 90 DAP
9. RDN applied as 50% basal through fertilizers and rest in three equal split sprays of liquid nano urea at 45, 90 and 135 DAP
10. RDN applied as per conventional recommendation for the zone through conventional fertilizers

Replications: 03
Design: Randomized block design

Note: Sett soaking is to be done at least for 04 hours before planting. Full dose of P, K, Zn and S to be applied as per recommendation for the zone.

Season: Main season of planting
Variety: Ruling common variety of the region
Spacing : 120 cm between rows with 3 bud setts
Planting method : Conventional

Observations to be recorded:

1. Germination count/ plant population at 30 and 45 DAP
2. Tiller population at monthly interval
3. Millable canes, length, girth and cane weight at harvest
4. Cane and sugar yield
5. Juice quality parameters (Brix, pol, purity) at 10 and 12 months age
6. Soil analysis initial and after harvest of each crop (bulk density, infiltration rate, organic carbon, soil pH, EC, available N, P_2O_5, K_2O in kg/ha)
7. Economics
8. Nutrient uptake (N, P, K)) at harvest
9. Soil microbial parameters (optional)
10. Phyto-toxicity to sugarcane crop, if any. Visual observations to be recorded and reported.

AS – 78: Evaluating efficacy of consortium of agricultural beneficial microorganisms as soil health and plant health products on yield and quality of sugarcane

Objectives

1. To assess efficiency of Soil health and Plant health consortia produced from agricultural beneficial microorganisms for increasing yield and quality of sugarcane
2. To study saving of chemical fertilizers with application of **Soil health and plant health** consortia in plant – ratoon system
3. Effect of application of soil & plant health product on soil fertility & crop productivity

Year of Start: 2023 (to be carried out for two consecutive plant –ratoon cycles)

Locations: All the centres

Treatment details

T1- Absolute control
T2-100% NPK (Recommended dose of fertilizers)
T3- 100% NPK + Drenching of Soil health product at planting, 30, 75 and 120 DAP + Foliar application of Plant health product *at* 60 DAP
T4- 75% NPK + Drenching of Soil health product at planting, 30, 75 and 120 DAP + Foliar application of Plant health product *at* 60 DAP
T5- 50% NPK + Drenching of Soil health product at planting, 30, 75, and 120 DAP +Foliar application of Plant health product at 60 DAP
T6- 25% NPK + Drenching of Soil health product at planting, 30, 75, and 120 DAP + Foliar application of Plant health product at 60 DAP
T7- Zero NPK + Drenching of Soil health product at planting, 30, 75, and 120 DAP + Foliar application of Plant health product at 60 DAP
T8- N_0 P_{100} K_{100} + Drenching of Soil health product at planting, 30, 75, and 120 DAP + Foliar application of Plant health product at 60 DAP

Note:
FYM @ 20 tonnes/ha (dry weight) to all treatments except T1.
Plant Health product @ 3 L/ha & Soil Health product* @ 10 L/ha

*****Soil health Product and Plant health Product for treatment at different centres will be provided by VSI, Pune

Plot size : 6 -8 rows X 8 m
Row to Row Distance : 150 cm in PZ & ECZ; 120 cm in NWZ & NCZ
Variety : Most prevalent variety of the region
Replications : Three
Design : RBD
Planting Material : Two/ three bud setts

Observations to be recorded

Growth Observations:

a. Germination % at 30, 45 days
Tiller count at 60, 90, 120 days after planting

b. Harvesting parameters:
Total height
Millable height
Girth
No. of internodes
Length of internodes
No. of millable canes at 10^{th} month age
Yield (kg/plot & t/ha)

c. Juice Quality parameters:
Pol
Brix
CCS %
Purity %
CCS yield (t/ha)
Reducing/ Non reducing sugar

d. Economics
1. Cost of cultivation
2. Gross returns
3. Monitory returns
4. B:C ratio

e. Microbial analysis:
- Total viable count of soil at initial, at earthing-up & at harvest
- Total viable count (microbial count) of all endophytes from plant – root, Juice & leaf from soil N-Fixers, P, K, S, Si, Fe &Zn solubilizers at 120 days, 8 months at harvest.
- **Soil Analysis: available** N, P, K, C:N ratio, pH (at initial and at harvest)
- **Plant analysis:** N content after 3, 6, 9 & 12 months from DOP
- **Nutrient Balance sheet.**

AS-79	**:**	**Evaluation of new herbicide molecules for weed management in sugarcane plant crop**

Objectives

1. To evaluate new herbicide molecules for broad spectrum weed control in sugarcane plant crop.
2. To develop a cost effective weed management technology for managing weeds in sugarcane plant crop.

Year of start **:** 2023-2024

Duration **:** Two consecutive plant crops and residual impact on subsequent ratoon crops (03 years)

Locations **:** All centres where post of Agronomist has been provided as well as any voluntary centre.

Planting time **:** North West, North Central & North East Zones: February-March
Peninsular & East Coast Zones: Ist fortnight of January

Treatments **:**

T1: Pre emergence application of Clomazone 22.5 % + Metribuzine 21 % WP (ready mix) 2.5 kg/ha followed by one inter-cultivation at 60 days after planting (partial earthing up)
T2: Pre emergence application of Clomazone 30 % + Sulfentrazone 28 % WP (ready mix) 2.5 kg/ha followed by one inter-cultivation at 60 days after planting (partial earthing up)
T3: Post emergence application of 2-4 D sodium salt + Metribuzine+ Pyrazosulfuron ethyl (ready mix) 3 kg/ha at 2-4 leaf stage of weeds followed by earthing up at 120 DAP
T4: Post emergence application of Halosulfuron methyl + Metribuzine (ready mix) @ 1 L/ha at 2-4 leaf stage of weeds followed by earthing up at 120 DAP
T5: Post emergence application of Topramezone + Atrazine (ready mix) 3 L/ha at 2-4 leaf stage of weeds followed by earthing up at 120 DAP
T6: Pre emergence application of Atrazine 80% WP @ 2.5 kg/ha followed by one inter-cultivation at 60 days after planting (partial earthing up)
T7: Post emergence application of 2,4 D Na salt @ 2.5 kg/ha at 2-4 leaf stage of weeds followed by earthing up at 120 DAP
T8: Weed free check
T9: Weedy check

Total no. of treatments: 09

Design **:** RBD

Replication **:** 3

Plot size **:** 6-8 rows X 8 m

Observations to be recorded:

a. Germination % at 30, 45 days

Tiller count at monthly interval

b. Harvesting parameters:

Total height
Millable height
Girth
No. of internodes
Length of internodes
No. of millable canes at 10^{th} month age
Yield (kg/plot & t/ha)

c. Juice Quality parameters:

Pol
Brix
CCS %
Purity %
CCS yield (t/ha)
Reducing/ Non reducing sugar

d. Economics

1. Cost of cultivation
2. Gross returns
3. Monitory returns
4. B:C ratio

e. Weed observations

1. Weed count at 30 days interval up to 120 days after planting
2. Weed density and weed dry weight of grasses, broad-leaved weeds and sedges
3. Weed control efficiency and Weed index of different treatments

Format for submission of Annual Report of Crop Production

1	Project No.	
2	Title	
3	Objectives	
4	Details of the treatment/ technical programme (in bullet form)	
5	Design	
6	Replications	
7	Plot size	
8	Climatic parameters (rainfall, Temperature-maximum & minimum, RH, etc.)	
9	Observations on soil health (initial and after harvest of crop: Bulk density, infiltration rate, organic carbon, available N, P_20_5 and K_2O in kg/ha)	
10	Summary of results in 200 words (1) Germination count/ plant population at 30 and 45 DAP / DAR 2)Tiller population at 120 and 150 DAP or DAR 3) No. of millable canes, length, girth and cane weight at harvest 4) Cane and sugar yield (t/ha) 5) Juice quality parameters (Brix, pol, purity) at 10 and 12 months age of crop 6) Soil analysis initial and after harvest of each crop (bulk density, infiltration rate, organic carbon, soil pH, EC, available NPK) 7) Nutrient composition of organic source used 8 Economics 9) Nutrient uptake (NPK) at harvest (optional) 10) Soil microbial parameters (optional)	

Note: The related analysed data must be given in tabular form