

RESEARCH HIGHLIGHT (2015-16)
Entomology Section, Vasantdada Sugar Institute, Pune

I) ALL INDIA COORDINATED RESEARCH PROGRAMME

E 4.1: Evaluation of zonal varieties /genotypes for their reaction against major insect pests.

E. 4.1.1: Evaluation of zonal varieties /genotypes for their reaction against major insect pests in IVT Early:

Out of 15 varieties/genotypes screened CoC 671, Co 12006, CoT 12367 & Co 94008 showed moderately susceptible reaction to early shoot borer, while all varieties/genotypes showed less susceptible reaction to internode borer and mealy bug

E. 4.1.2: Evaluation of zonal varieties /genotypes for their reaction against major insect pests in AVT I Plant Early:

Out of 11 varieties/genotypes screened Co 10004, Co 10024, Co 10026 and Co 85004 showed less susceptible reaction to early shoot borer, all varieties/genotypes showed less susceptible reaction to internode borer. Co 10006, Co 10024, Co 10026 and Co 94008 showed less susceptible reaction to mealy bug.

E. 4.1.3: Evaluation of zonal varieties / genotypes for their reaction against major insect pests in AVT (II plant) Early

Out of 6 varieties/genotypes screened Co 09007 and Co 85004, showed less susceptible reaction to early shoot borer, all varieties/genotypes showed less susceptible reaction to internode borer and moderately susceptible reaction to mealy bug.

E. 4.1.4: Evaluation of zonal varieties / genotypes for their reaction against major insect pests in AVT (Ratoon) Early.

All 6 varieties/genotypes screened showed less susceptible reaction to early shoot borer, internode borer and scale insect. Co 09004 and Co 94008 showed less susceptible reaction to mealy bug.

E. 4.1.5: Evaluation of zonal varieties /genotypes for their reaction against major insect pests in IVT Midlate

Out of 17 varieties/genotypes screened Co 12024 found highly susceptible to early shoot borer, all 17 varieties/genotypes showed less susceptible reaction to internode borer and Co 12016, Co 12024 and CoN 12073 showed moderately susceptible reaction to mealy bug

E. 4.1.6: Field screening of sugarcane varieties/ genotypes in AVT (I plant) Midlate to major pests

Out of 13 varieties/genotypes screened Co 10017, Co 10031, Co 10033, CoT 10369, Co 86032 and Co 99004 found less susceptible to early shoot borer, all 13 varieties/genotypes showed less susceptible reaction to internode borer and Co 09009, Co 10033 and CoT 10368 were free from mealy bug infestation

E.28: Survey and Surveillance of sugarcane insect pests:

Average % incidence of early shoot borer was minimum 4.10 % in CoM 0265 and maximum 29.40 % in Co VSI 9805. Incidence of ESB was more in sugarcane planted in March. The % incidence of internode borer and mealy bug was more in sugarcane planted in adsali season as compared to sugarcane planted in suru season. On sugarcane rust disease recorded first time rust feeder larvae (*Mycodiplosis coimbatorensis*).

E.30: Monitoring of insect pests and bio agents in sugarcane Agro-ecosystem:

The % incidence of early shoot borer noticed maximum 2.39 % in March 2015. The % incidence, intensity and infestation index of internode borer was noticed maximum 10 %, 0.56 % and 0.06 respectively in Nov.2015. The incidence and intensity of mealy bug was observed maximum 14.0 % and 2.35% in Aug.2015.

E.34: Standardization of simple, cost effective techniques for mass multiplication of sugarcane bio-agents.

During 2015-16 Entomology Section produced 605.90 cc (121.18 lac) eggs of *C. cephalonica* and 448 cards (89.60 lac parasites) of *Trichogramma chilonis* parasites. Supplied 204.50 Trichocards for the control of sugarcane borer on 13.63 ha area.

E.36: Management of borer complex of sugarcane through lures.

In Pheromone traps negligible adults of early shoot borer and Internode borer were captured. Top shoot borer adults were not captured. The % incidence of ESB was maximum 4.09 % in April 2015 in treated plot, while it was maximum 4.46% in May 2015 in control plot. The % incidence of internode borer was noticed maximum 4.0 % in June 15 and Dec 2015, while it was 16.0 % in July 2015 in control plot. Treated and control plots were free from top borer infestation.

E.37: Bio efficacy of new insecticides for control of sugarcane early shoot borer.

In January planted Co 86032 sugarcane, soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha at the time of planting and 60 DAP or spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30& 60DAP or soil application of Fipronil 0.3 G @25 kg/ha at the time of planting and 60 DAP or Spraying of Spinosad 45% SC @ 90ml/ha at 30 and 60DAP were found best for control of Early shoot borer.

For control of early shoot borer in sugarcane soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha at the time of planting and 60 DAP or spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30& 60DAP or Spraying of Spinosad 45% SC @ 90 ml/ha at 30 and 60DAP or Fipronil 0.3 G @25 kg/ha at the time of planting and 60 DAP or spraying of Flubendiamide 39.35% @ 250ml/ha at 30&60DAP were found best.

**Annual Report of AICRP on Sugarcane 2015-16
Entomology Section, VSI, Pune.**

D) ALL INDIA COORDINATED RESEARCH PROGRAMME

- 1. Project no.** : E. 4.1.1 (AICRP'S)
2. Discipline : Agril. Entomology
3. Title of the project : Evaluation of zonal varieties /genotypes for their reaction against major insect pests.
4. Title of experiment : Field screening of sugarcane varieties/genotypes in IVT Early to major pests.
5. Objective : To grade the entries in the trials for their behavior towards damage by key pests in the area.
6. Year of commencement : 1985 – 86 (Continuing)
7. Year of implementation : 2015 -2016(1st year)
8. Source of finance : ICAR/VSI Pune.
9. Project leader and Associate :Shri.R.G.Yadav, Scientific Officer& Head, Entomology
: Mrs.P.V.Gadade,Research Assistant, Entomology

10. Details of experiment:

- a) Treatments** :Fifteen (12+3)
1. Co12001 **2.**Co12003 **3.**Co12006 **4.**Co12007 **5.**Co12008 **6.**CoM12081 **7.** CoM 12082
8. CoM12083 **9.** CoN 12071 **10.** CoN12072 **11.** CoT 12366 **12.**CoT12367 **13.** Co 85004 (std) **14.** Co 94008 (std) **15.** CoC 671
b) Design : RBD
c) Replication : Two
d) Type of soil : Heavy
e) Plot size : Gross:6 m x 6 rows x1.2 mt,Net:5 m x 6 rows x 1.2 mt.
f) Location : Vasantdada farm, VSI, Pune
g) Date of planting : 03.01.2015
h) Date of harvesting : 05.11.2015
i) Method of observations:

Early shoot borer: Observations to be recorded in post-germination phase at 30 days interval up to 120 days (At 30,60,90 and 120 DAP).Ten clumps were selected from each plot and total germinated shoots were counted. The shoots affected by early shoot borer showing “dead hearts” were counted. Calculated the % incidence as per the following formula,

$$\% \text{ Incidence} = \frac{\text{Number of dead hearts}}{\text{Total number of shoots}} \times 100$$

Cumulative incidence of up to 120 DAP should be calculated. Number of bored plants/ha be also recorded.

The grade of infestation was given as under,

30 DAP			60 DAP			90 DAP			90 DAP			Cumulative % incidence	No. of bored plants/ha
No. of shoots (I+II+III)	No. of dead hearts (I+II+III)	% Incidence	No. of shoots (I+II+III)	No. of dead hearts (I+II+III)	% Incidence	No. of shoots (I+II+III)	No. of dead hearts (I+II+III)	% Incidence	No. of shoots (I+II+III)	No. of dead hearts (I+II+III)	% Incidence		

No. of shoots observed at 120 DAP + Dead hearts at 30, 60 and 90 DAP

No. of dead hearts observed at 120, 30, 60 and 90 DAP

$$\text{Cumulative \% at 120 DAP} = \frac{\text{Total no. of dead hearts observed at 120} + \text{no. of dead hearts observed at 30, 60, 90 DAP}}{\text{No. of shoot observed at 120 DAP} + \text{dead hearts at 30, 60, 90 DAP}} \times 100$$

No. of bored plants/ha will be calculated on the basis of cumulative percentage

No. of bored plants/ha = No. of dead hearts observed at 120, 30, 60 and 90 DAP x 10000/net plot area in sq.mt

Grade	% Incidence
Less Susceptible (LS)	below 15
Moderately Susceptible (MS)	15.1-30
Highly Susceptible (HS)	above 30

Internode borer/ root borer: Minimum twenty-five canes were selected randomly from each plot and total no. of internodes and internodes affected due to internode borer in each cane were counted. Calculated the % incidence on cane basis, % intensity on nodal basis (by considering total number of nodes on observed cane will be recorded to compute infestation index). Infestation index will be recorded for internode borer, whereas only percent incidence will be observed for root borer on external visible symptoms as per following formula,

$$\% \text{ Incidence} = \frac{\text{Number of affected canes}}{25(\text{Cane})} \times 100$$

$$\% \text{ Intensity} = \frac{\text{Number of affected internodes}}{\text{Total number of internodes}} \times 100$$

$$\text{Infestation index} = \frac{\% \text{ Incidence} \times \% \text{ Intensity}}{100}$$

The grade of infestation was given as under,

Grade	Internode borer % Incidence	Root borer % Incidence
Less Susceptible (LS)	below 20	below 15
Moderately Susceptible (MS)	20.1-40	15.1-30
Highly Susceptible (HS)	above 40	Above 30

Top Borer:

For east and peninsular zone it should be recorded on fifth/seventh month and at harvest. Observation to be recorded from at least three meter row length. Count the total no. of canes and the total no. of infested canes. At harvest minimum 25 canes will be selected randomly from each plot and top portion of cane should be split for the confirmation of incidence of top borer. Calculated the % incidence as per following formula.

$$\% \text{ Incidence} = \frac{\text{Total number of infested cane observed from 3 m row length}}{\text{Total number of canes observed from 3 m row length}} \times 100$$

$$\% \text{ Incidence} = \frac{\text{Total no. of infested cane (I+II+III)}}{\text{Total number of canes (I+II+III)}} \times 100$$

Grade	% Incidence
Less Susceptible (LS)	below 10
Moderately Susceptible (MS)	10.1- 20
Highly Susceptible (HS)	above 20

Pyrilla : The population of nymph and adult to be recorded from a unit of 10 canes (20 leaves)

Average population of nymphs and adults per leaf will be recorded.

Observations on egg mass and cocoons of ecto-parasite, *Epiricania melanoluca* will be recorded.

Observations to be recorded at an interval of Fortnight and pick incidence of pyrilla and its ecto-parasitoids will be reported in the report.

The grade of infestation was given as under,

Grade	Pyrilla (nymph and adult) / leaf
Less Susceptible (LS)	below 5
Moderately Susceptible (MS)	5.1-20
Highly Susceptible (HS)	above 20

White fly:

Population of nymph and puparia will be recorded from a unit of 10 cane (20 leaves) from proximal, middle and distal region.

Average population per 2.5 sq.cm will be recorded.

The grade of infestation was given as under

Grade	White fly (nymph and puparia) / 2.5 sq.cm
Less Susceptible (LS)	below 2.0
Moderately Susceptible (MS)	2.1-5
Highly Susceptible (HS)	above 5

Scale insect:

A. **Natural infestation:-** At harvest 25 canes will be selected randomly from each plot and affected internodes due to Scale insect in each cane will be recorded. Calculated the % incidence as per following formula,

$$\% \text{ Incidence} = \frac{\text{Total no of infestated canes (I+II+III)}}{75(\text{Cane})} \times 100$$

$$\% \text{ Intensity} = \frac{\text{Total no of infestated internodes (I+II+III)}}{\text{Total no of internodes (I+II+III)}} \times 100$$

Grade of infestation was given as under,

Grade	Scale insect (% Incidence)
Less Susceptible (LS)	below 10
Moderately Susceptible (MS)	10.1-35
Highly Susceptible (HS)	above 35

B. Artificial infestation: The genotypes of ratoon consisting of single row of 6m/3m for each genotype are evaluated after artificially infesting individual cane in each row with scale infested cut pieces of canes at about five months age of the crop.

The evaluation will be done at harvest by considering following points.

1. The total no. of canes, no. of scale insect infested cane and no. of canes died due to scale insect will be recorded.
2. Number of internodes affected by scale insects in 10 randomly selected canes in each row, total no. of internodes in these 10 canes will also be recorded.
3. Visual rating of genotypes on the basis of degree of scale insect encrustation on internodes will be observed by adopting the following different levels of scale insect encrustation.

Artificially infested canes by scale insect will exhibit cent percent incidence, hence per cent incidence may not be necessary.

$$\% \text{ Intensity} = \frac{\text{No. of internodes affected by scale insect in 10 canes}}{\text{Total no of internodes in 10 canes}} \times 100$$

$$\% \text{ drying} = \frac{\text{No. of cane dried due to scale insect attack}}{\text{Total no of canes in the row}} \times 100$$

Visual rating will be employed for the degree of scale insect encrustation. Even if one internode shows encrustation, the variety will be rated accordingly. The different levels of infestation are given below:

	Degree of scale insect encrustation		Category
1	Few scale insects here and there without well established colony on any internode	-	Very light infestation (VL)
2	Scale insect encrustation covering approximately ¼ of internode	-	light infestation (L)
3	Scale insect encrustation covering approximately ½ of internode	-	Moderate infestation (M)
4	Scale insect encrustation covering approximately ¾ of internode	-	Severe infestation (S)
5	Scale insect encrustation covering more than ¾ of internode	-	Very severe infestation (VS)

The genotypes/varieties are then rated as follows			
1	Genotype/varieties showing 'VL' and L infestation	-	Less susceptible (LS)
2	Genotype/varieties showing 'M' infestation	-	Moderately susceptible (MS)
3	Genotype/varieties showing 'S' and 'VS' infestation/ those showing drying of canes	-	Highly susceptible (HS)

Mealy bug: At harvest, twenty five canes will be selected randomly from each plot and affected internodes due to Mealy bug will be recorded. Calculate the %incidence and % intensity as per the following formula,

$$\% \text{ Incidence} = \frac{\text{Number of affected canes}}{25(\text{Cane})} \times 100$$

$$\% \text{ Intensity} = \frac{\text{Total number of infected internodes}}{\text{Total number of internodes}} \times 100$$

Grade of infestation given as under,

Grade	Mealy bug % Incidence
Less Susceptible (LS)	below 5
Moderately Susceptible (MS)	5.1-30
Highly Susceptible (HS)	above 30

$$\% \text{ Incidence} = \frac{\text{Total no of infestated canes (I+II+III)}}{75(\text{Cane})} \times 100$$

$$\% \text{ Intensity} = \frac{\text{Total no of infestated internodes (I+II+III)}}{\text{Total no of internodes (I+II+III)}} \times 100$$

Sugarcane Woolly Aphid (SWA): Five canes will be selected from each plot and observe the incidence of SWA on top, middle and bottom leaf in each cane. Observations will be recorded on the basis of percentage leaf area covered by nymphs and adults.

$$\text{Avg SWA Grade} = \frac{\text{Total grade (I+II+III)}}{45(5 \text{ Plants} \times 3 \text{ Leaves} \times 3 \text{ Replications})}$$

% leaf area covered by aphid colony	SWA Grade	Observed grade	Categorization of variety/genotype
Nil	0	-	-
<25%	1	Up to 1.0	Less susceptible (LS)
25-50	2	1.1-3.0	Moderately susceptible (MS)
>50%	3	>3.0	Highly susceptible (HS)

Spittle bug: Twenty five canes will be selected randomly from each plot and presence of spittle bug on cane will be considered as infested cane.

% incidence will be calculated as per following formula:

$$\% \text{ Incidence} = \frac{\text{Total number of affected canes}}{25(\text{Cane})} \times 100$$

$$\% \text{ Incidence} = \frac{\text{Total number of infested canes (I+II+III)}}{75(\text{Cane})} \times 100$$

Grade will be calculated as given below:

Grade	% Incidence
Less Susceptible (LS)	below 5
Moderately Susceptible (MS)	5.1. -30
Highly Susceptible (HS)	above 30

Termite :

- a) **At germination:** After germination carefully dug out 1 m row length (Aprox.4 setts) at 2 places in each plot preferably from boarder lines without affecting setts and observe eye bud damage and cut end damage caused by termite. After taking the observation, setts should be covered with the soil so that maintain the plant population in the experimental plots.,

Calculated the % incidence as per following formula

$$\% \text{ Incidence at germination} = \frac{\text{Total no of setts affected due to eye bud damage or cut end damage}}{\text{Total no.of setts observed}} \times 100$$

$$\% \text{ Incidence at germination} = \frac{\text{Total no of setts affected due to eye bud damage or cut end damage (I+II+III)}}{\text{Total no.of setts observed in spotI \& spot II (I+II+III)}} \times 100$$

- b) **At harvest:** Twenty five canes will be randomly selected (preferably from middle row) from each plot. Number of infected cane will be judge on the basis of mud tunnels present on the cane or dry leaf sheath on observed cane. Calculated the % incidence as per following formula

$$\% \text{ Incidence at harvest} = \frac{\text{Total no of infestated canes (I+II+III)}}{75(\text{Cane})} \times 100$$

Grade will be calculated as given below:

Grade	% Incidence
Less Susceptible (LS)	below 10
Moderately Susceptible (MS)	10.1-35
Highly Susceptible (HS)	above 35

White grub: Grubs population will be recorded by digging 1 sq.m area at 5 different sites in the field. Population per ha. will be calculated as per given formula

$$\text{Population of grubs/ha} = \text{Total no. of grub} \times 2000$$

11. Results:

The data presented in table 1 indicated that the cumulative % incidence of early shoot borer was above 15 % in CoC 671(17.06%), Co 12006 (17.11 %), CoT 12367 (20.63) & Co 94008(26.88%) while in other varieties it was below 15%. No. of bored plants/ha by early shoot borer were minimum 2778 in CoM 12083. The % incidence of internode borer was maximum in CoM 12083 (12 %) and Co 12001 (10%), In all varieties / genotypes screened % intensity of internode borer was below 1.0 %. The infestation index of internode borer was bellow 1.00 in all varieties / genotypes screened. The incidence of mealy bug was found 2 % in Co12001, Co 12006, CoN 12072 and CoT 12367, while other varieties / genotypes were free from it.

12. Conclusion:

Out of 15varieties/genotypes screened CoC 671, Co 12006, CoT 12367 &Co 94008 showed moderately susceptible reaction to early shoot borer, while all varieties/genotypes showed less susceptible reaction to internode borer and mealy bug.

Table.1 Reaction of sugarcane genotypes/varieties to major insect pest in IVT early.

Sr.no	Varieties/ genotype	Early shoot borer (% incidence)						Top borer			Internode borer			Stalk borer			Root borer
		30 DAP	60 DAP	90 DAP	120 DAP	cum	No. of bored plants/ha	III Brood	III Brood	At harv est	% incidenc e	% intensit y	Infestatio n index	% incidence	% inten sity	Infes tatio n inde x	% incid ence
								5 th month	7 th month								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IVT early																	
1	Co 12001	0.00	0.00	2.78	6.00	5.56 (2.06)	11111				10(2.62)	0.55	0.11				
2	Co 12003	0.00	0.00	10.71	0.00	5.56 (2.06)	8333				2 (1.41)	0.12	0.01				
3	Co 12006	0.00	3.57	0.00	15.38	17.11 (4.13)	30556				8(2.83)	0.53	0.06				
4	Co 12007	0.00	0.00	0.00	5.66	5.00 (1.97)	8333				4(2.12)	0.23	0.01				
5	Co 12008	0.00	3.45	4.69	8.20	13.51 (3.72)	25000				8(2.91)	0.63	0.05				
6	CoM 12081	0.00	0.00	5.26	5.88	12.10 (3.52)	25000				2(1.41)	0.12	0.01				
7	CoM 12082	0.00	0.00	1.92	6.25	8.44 (2.88)	11111				6(2.52)	0.36	0.03				
8	CoM 12083	0.00	0.00	0.00	1.72	1.92 (1.40)	2778				12(3.54)	0.99	0.12				
9	CoN 12071	0.00	0.00	0.00	8.77	8.83 (3.05)	13889				2(1.41)	0.10	0.01				
10	CoN 12072	0.00	0.00	3.28	7.89	10.12 (3.25)	22222				8(2.91)	0.46	0.04				
11	CoT 12366	0.00	0.00	1.89	2.86	4.11 (2.14)	8333				4(2.12)	0.26	0.01				
12	CoT 12367	4.76	0.00	5.56	17.65	20.63 (4.56)	41667				4(1.81)	0.23	0.02				
13	Co 85004 (std)	0.00	0.00	0.00	4.17	5.76 (2.33)	11111				2(1.41)	0.12	0.01				
14	Co 94008 (std)	0.00	0.00	10.00	22.22	26.88 (5.23)	50000				4(2.12)	0.25	0.01				
15	CoC 671 (std)	0.00	0.00	9.09	7.55	17.06 (3.93)	22222				2(1.41)	0.12	0.01				
	S.E ±																
	C.D at 5%					NS											
	C.V										NS						

Sr.no	Varieties/ge notype	Pyrilla		white fly per 2.5 sq.cm SMW=	Scale insect				Mealy bug		Av. SWA Grade SMW=	Mites No.of grubs/ ha SMW=	Thrips % intensit y SMW=	Blac k bug /leaf SM W=	Spittl e bug % incide nce SMW =	Termite (%)		White grub No.of grubs/ ha SMW =
		N+A /leaf SMW=	EME/ CE per plant SMW=		Nat.Infe		Art.Infe		% inciden ce	% intens ity								
					% inciden ce	% intensit y	% inciden ce	% drying								33	Harve st 34	
		19	20	21	22	23	24	25	26	27	28	29	30	31	32			33
1	Co 12001								2 (1.41)	0.11								
2	Co 12003								0(0.71)	0.00								
3	Co 12006								2(1.41)	0.14								
4	Co 12007								0 (0.71)	0.00								
5	Co 12008								0 (0.71)	0.00								
6	CoM 12081								0 (0.71)	0.00								
7	CoM 12082								0 (1.41)	0.00								
8	CoM 12083								0(0.71)	0.00								
9	CoN 12071								0(0.71)	0.00								
10	CoN 12072								2(1.41)	0.12								
11	CoT 12366								2(1.41)	0.13								
12	CoT 12367								0(0.71)	0.00								
13	Co 85004 (std)								0(0.71)	0.00								
14	Co 94008 (std)								0(0.71)	0.00								
15	CoC 671 (std)								0(0.71)	0.00								
	S.E \pm																	
	C.D at 5%								NS									
	C.V																	

LS-Less Susceptible, MS-Moderately Susceptible, HS-Highly Susceptible. Figures in parenthesis are transformed values while those outside original values.

- 1. Project No** : E 4.1.2
2. Discipline : Agril Entomology
3. Title of project : Evaluation of zonal varieties/ genotypes for their reaction against major insect pests.
4. Title of experiment : Field screening of sugarcane varieties/ genotypes in AVT Early (I plant) to major pests.
5. Objective : To grade the entries in the trial for their behavior towards damage by key pest in the area.
6. Year of commencement : 1982 – 83
(Change of varieties as per AICRP'S Programme)
7. Year of implementation : 2015-16 (1st Year)
8. Source of finance : ICAR/VSI, Pune
9. Project leader and Associate : Shri. R.G. Yadav, Scientific Officer & Head, Entomology
: Mrs.P.V.Gadade, Research Assistant, Entomology

10. Details of experiment:

- a) Treatments** : Eleven (8+3)
1.Co10004 2.Co10005 3.Co10006 4.Co10024 5.Co10026 6.Co10027 7. CoT 10366 8. CoT10367 9. Co85004(std) 10.Co94008 (std) 11.CoC 671(std)

- b. Design** : RBD
c) Replications : Two
d) Type of soil : Heavy
e) Plot size: Gross : 6m X 3.6 m² **Net:** 6 m X 2.4 m²
f) Location : Vasantdada farm
g) Date of planting : 09.01.2015
h) Date of harvesting : 14.01.2016

i) Method of observations: The observations were recorded as given in trial E.4.1.1

11. Results:

The data in table 2 revealed that the cumulative per cent incidence of early shoot borer was above 30.0 % in Co 10006 (38.62%), while it was minimum 7.86 % in Co 10024. The no. of bored plants/ha by early shoot borer were minimum 13889 in Co 10024, while it was maximum 88889 in Co 10006. The % incidence of internode borer was minimum 2 % in Co 10024, while it was maximum 14 % in CoT 10367. The % intensity and infestation index of internode borer was below 1 % in all varieties/genotypes screened. The per cent incidence of mealy bug was maximum 12% in Co 10027, while varieties viz. Co 10024 and co 10026 were free from it.

12. Conclusion:

Out of 11 varieties/genotypes screened Co 10004, Co 10024, Co 10026 and Co 85004 showed less susceptible reaction to early shoot borer, all varieties/genotypes showed less susceptible reaction to internode borer. Co 10006, Co 10024, Co 10026 and Co 94008 showed less susceptible reaction to mealy bug.

Table.2 Reaction of sugarcane genotypes/varieties to major insect pest in AVT I plant early.

Sr.no	Varieties/ genotype	Early shoot borer (% incidence)						Top borer			Internode borer			Stalk borer			Root borer
		30 DAP	60 DAP	90 DAP	120 DAP	cum	No. of bored plants/ha	III Brood	III Brood	At harvest	% incidence	% intensi ty	Infestatio n index	% incidence	% inten sity	Infes tatio n inde x	% incid ence
								5 th month	7 th month								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IVT early																	
1	Co 10004	0.00	0.00	4.00	10.17	12.33 (20.26)	22222				4 (1.81)	0.28	0.02				
2	Co 10005	0.00	0.00	3.70	13.11	16.30 (23.58)	30556				4 (1.81)	0.25	0.02				
3	Co 10006	0.00	0.00	39.53	21.43	38.62 (38.32)	88889				4 (1.81)	0.27	0.02				
4	Co 10024	0.00	0.00	6.15	1.69	7.86 (15.53)	13889				2 (1.41)	0.14	0.01				
5	Co 10026	0.00	0.00	10.39	1.85	14.79 (21.68)	25000				12 (3.54)	0.75	0.09				
6	Co 10027	0.00	0.00	8.22	7.14	15.97 (23.53)	27778				4 (2.12)	0.30	0.01				
7	CoT 10366	0.00	0.00	8.47	9.09	18.45 (25.44)	25000				4 (1.81)	0.28	0.02				
8	CoT 10367	5.00	0.00	25.00	10.64	29.09 (32.23)	44444				14 (3.80)	0.92	0.14				
9	Co 85004 (Std)	0.00	0.00	6.56	6.49	11.15 (19.50)	25000				4 (1.81)	0.30	0.03				
10	Co94008 (Std)	0.00	0.00	20.00	7.69	19.64 (26.05)	36111				4 (1.81)	0.29	0.03				
11	CoC 671 (Std)	0.00	0.00	24.14	5.56	15.27 (22.33)	27778				12 (3.49)	0.79	0.11				
	S.E ±																
	C.D at 5%					NS					NS						
	C.V																

Sr.no	Varieties/genotype	Pyrilla		white fly per 2.5 sq.cm SMW=	Scale insect				Mealy bug		Av. SWA Grade SMW=	Mites	Thrips	Black bug /leaf SMW=	Spittle bug	Termite (%)		White grub
		N+A /leaf SMW=	EME/ CE per plant SMW=		Nat.Infe		Art.Infe		% incidence	% intensity		No.of grubs/ha SMW=	% intensity SMW=		% incidence SMW=	Germ ination	Harvest	No.of grubs/ha SMW=
					% incidence	% intensity	% incidence	% drying										
		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1	Co 10004								8 (2.38)	0.68								
2	Co 10005								6 (2.12)	0.63								
3	Co 10006								2 (1.41)	0.33								
4	Co 10024								0 (0.71)	0.00								
5	Co 10026								0 (0.71)	0.00								
6	Co 10027								12 (3.32)	1.79								
7	CoT 10366								6 (2.52)	0.68								
8	CoT 10367								10 (2.62)	1.81								
9	Co 85004 (Std)								10 (3.09)	1.07								
10	Co94008 (Std)								4 (1.81)	0.43								
11	CoC 671 (Std)								8 (2.38)	1.66								
	S.E \pm																	
	C.D at 5%																	
	C.V								NS									

Figures in parenthesis are transformed values while those outside are original values.

- 1. Project No** : E 4.1.3
- 2. Discipline** : Agril Entomology
- 3. Title of project** : Evaluation of zonal varieties / genotypes for their reaction against major insect pests in AVT (II plant) Early
- 4. Title of experiment** : Field screening of sugarcane varieties/ genotypes in AVT (II plant) Early to major pests.
- 5. Objective** : To grade the entries in the trial for their behavior towards damage by key pest in the area.
- 6. Year of commencement** : 1982 – 83 (Change of varieties as per AICRP'S Programme)
- 7. Year of implementation** : 2015-16
- 8. Source of finance** : ICAR/VSI, Pune
- 9. Project leader and Associate** : Shri. R.G. Yadav, Scientific Officer & Head, Entomology
: Mrs.P.V.Gadade, Research Assistant, Entomology
- 10. Details of experiment:**
- a. Treatments** : Six (3+3)
- 1. Co 09004 2. Co 09007 3. CoN 09072 4. Co 85004 (Std) 5. Co 94008 (Std) 6. CoC 671 (Std)**
- b. Design** : RBD
- c. Replication** : Four
- d. Type of soil** : Heavy
- e. Plot size** : Gross 6m x 3.6 m² Net 6m x 2.4 m²
- f. Location** : Vasantdada farm, VSI, Pune
- g) Date of Planting** : 08.01.2015
- h) Date of Harvesting** : 14.01.2016
- i) Method of observations** : The observations were recorded as given in trial E.4.1.1

11. Results:

The data in table 3 revealed that the cumulative per cent incidence of early shoot borer was above 30.0 % in Co 94008 (33.21%), while it was minimum 14.28 % in Co 85004. The no. of bored plants/ha by early shoot borer were minimum 11806 in Co 85004, while it was maximum 36111 in Co 94008. The % incidence of internode borer was minimum 2 % in Co 09004, while it was maximum 15 % in CoC 671. The % intensity of internode borer was below 1 % in all varieties/genotypes screened except CoC 671 (1.04%). The infestation index of internode borer was below 1 % in all varieties/genotypes screened. The per cent incidence of mealy bug was maximum 19% in CoC 671, while it was minimum 2 % in Co 94008.

Pooled data in table no.4 indicates that the cumulative per cent incidence of early shoot borer was above 15 % in CoN 09072 (18.01 %), Co 09004(23.65), CoC 671(26.43%) and Co 94008 (24.08%). The % incidence of internode borer was minimum 2.67 % in Co 09004, while it was maximum 11 % in CoC 671. The per cent incidence of mealy bug was maximum 17 % in CoC 671, while it was minimum 5.67 % in Co 94008.

12. Conclusion: Out of 6 varieties/genotypes screened Co 09007 and Co 85004, showed less susceptible reaction to early shoot borer, all varieties/genotypes showed less susceptible reaction to internode borer and moderately susceptible reaction to mealy bug.

Table.3 Reaction of sugarcane genotypes/varieties to major insect pest in AVT II plant early.

Sr.no	Varieties/ genotype	Early shoot borer (% incidence)						Top borer			Internode borer			Stalk borer			Root borer
		30 DAP	60 DAP	90 DAP	120 DAP	cum	No. of bored plants/ha	III Brood	III Brood	At harvest	% incidence	% intensi ty	Infestatio n index	% incidence	% inten sity	Infes tatio n inde x	% incid ence
								5 th month	7 th month								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IVT early																	
1	Co 09004	0.00	2.50	9.30	12.09	20.61 (26.49)	13889				2.0 (1.26)	0.14	0.01				
2	Co 09007	0.00	0.00	14.15	6.35	16.98 (23.57)	15972				3.0 (1.61)	0.20	0.01				
3	CoN 09072	0.00	0.00	19.30	8.13	20.00 (25.83)	24306				5.0 (2.16)	0.44	0.03				
4	Co 85004 (Std)	0.00	1.89	4.08	8.93	14.28 (22.01)	11806				6.0 (2.10)	0.58	0.08				
5	Co 94008 (Std)	0.00	2.38	28.07	15.70	33.21 (34.90)	36111				6.0 (2.10)	0.72	0.09				
6	CoC 671 (Std)	0.00	0.00	5.56	12.40	17.69 (24.24)	15278				15.0 (3.91)	1.04	0.16				
	S.E ±																
	C.D at 5%					NS					NS						
	C.V																

Sr.no	Varieties/geno type	Pyrilla		white fly per 2.5 sq.cm SMW=	Scale insect				Mealy bug		Av. SWA Grade SMW=	Mites	Thrips	Black bug /leaf SMW=	Spittle bug	Termite (%)		White grub
		N+A /leaf SMW=	EME/ CE per plant SMW=		Nat.Infe		Art.Infe		% incidence	% intensity		No.of grubs/ha SMW=	% intensity SMW=	% incidence SMW=	Germination	Harvest	No.of grubs/ha SMW=	
					% incidence	% intensity	% incidence	% drying										
		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1	Co 09004								6 (2.02)	1.06								
2	Co 09007								4 (1.81)	0.56								
3	CoN 09072								12 (3.31)	1.74								
4	Co 85004 (Std)								10 (3.16)	1.24								
5	Co 94008 (Std)								2 (1.41)	0.20								
6	CoC 671 (Std)								19 (4.18)	2.76								
	S.E ±								0.47									
	C.D at 5%								1.44**									
	C.V								36.13									

Figures in parenthesis are transformed values while those outside are original values.

Table 4: Mean Per cent incidence of major insect pests in AVT Early (Pooled)

Sr. No.	Variety	Early shoot borer		Internode borer		Mealy bug	
		Mean % incidence	Grade	Mean % incidence	Grade	Mean % incidence	Grade
1	Co 09004	23.65 (27.66)	MS	2.67 (1.55)	LS	6.00 (2.22)	MS
2	Co 09007	14.43 (21.36)	LS	7.33 (2.32)	LS	8.00 (2.53)	MS
3	CoN 09072	18.01 (23.68)	MS	5.00 (2.01)	LS	11.00 (3.04)	MS
4	Co 85004 (Std)	13.8 (21.25)	LS	6.33 (2.36)	LS	14.67 (3.70)	MS
5	Co 94008 (Std)	28.08 (30.15)	MS	10.00 (3.01)	LS	5.67 (2.06)	MS
6	CoC 671 (Std)	26.43 (29.56)	MS	11.00 (3.29)	LS	17.00 (3.88)	MS
	S.E \pm	2.01		0.33		0.35	
	C.D at 5%	5.73**		0.93**		1.00**	
	C.V	27.21		46.67		41.90	

LS-Less Susceptible, MS-Moderately Susceptible, HS-Highly Susceptible

Figures in parenthesis are transformed values while those outside are original values.

- 1. Project No** : E 4.1.4
- 2. Discipline** : Agril Entomology
- 3. Title of project** : Evaluation of zonal varieties / genotypes for their reaction against major insect pests in AVT (Ratoon) Early.
- 4. Title of experiment** : Field screening of sugarcane varieties/ genotypes in AVT (Ratoon) Early to major pests.
- 5. Objective** : To grade the entries in the trial for their behavior towards damage by key pest in the area.
- 6. Year of commencement** : 1982 – 83 (Change of varieties as per AICRP'S Programme)
- 7. Year of implementation** : 2015-16
- 8. Source of finance** : ICAR/VSI, Pune
- 9. Project leader and Associate** : Shri. R.G. Yadav, Scientific Officer & Head, Entomology
Mrs.P.V.Gadade, Research Assistant, Entomology
- 10. Details of experiment:**
- a. Treatments** : Six (3+3)
1. Co 09004 2. Co 09007 3. CoN 09072 4. Co 85004 (Std) 5. Co 94008 (Std)
6. CoC 671 (Std)
- b. Design** : RBD
- c. Replication** : Four
- d. Type of soil** : Heavy
- e. Plot size** : Gross 6m x 3.6 m² Net 6m x 2.4 m²
- f. Location** : Vasantdada farm, VSI, Pune
- g) Date of Ratooning** : 26.02.2015
- h) Date of Harvesting** : 14.1.2016
- i) Method of observations** : The observations were recorded as given in trial E.4.1.1

11. Results:

The data in table 5 revealed that the cumulative per cent incidence of early shoot borer was below 15 % in all varieties/genotypes screened. The no. of bored plants/ha by early shoot borer were minimum 9722 in Co 94008, while it was maximum 22222 in CoN 09072. The % incidence of internode borer was minimum 3 % in Co 09004, while it was maximum 16 % in Co 09007. The % intensity and infestation index of internode borer was below 1 % in all varieties/genotypes screened. The per cent incidence of mealy bug was minimum in Co 94008 (2%) and Co 09004 (3%), while it was maximum in CoC 671 (13%) and Co 85004(12%). The per cent incidence of scale insect was maximum in CoC 671 (8%), while Co 09004, CoN 09072 and Co 94008 were free from scale insect infestation.

12. Conclusion:

All 6 varieties/genotypes screened showed less susceptible reaction to early shoot borer, internode borer and scale insect. Co 09004 and Co 94008 showed less susceptible reaction to mealy bug.

Table.5 Reaction of sugarcane genotypes/varieties to major insect pest in AVT (Ratoon) early.

Sr.no	Varieties/ genotype	Early shoot borer (% incidence)						Top borer			Internode borer			Stalk borer			Root borer
		30 DAP	60 DAP	90 DAP	120 DAP	cum	No. of bored plants/ha	III Brood	III Brood	At harv est	% incidenc e	% intensit y	Infestatio n index	% incidence	% inten sity	Infes tatio n inde x	% incid ence
1	2	3	4	5	6	7	8	5 th month	7 th month	11	12	13	14	15	16	17	18
IVT early																	
1	Co 09004	0.00	7.61	4.05	1.23	8.08 (16.10)	10417				3 (1.62)	0.17	0.01				
2	Co 09007	4.92	2.65	4.44	0.42	6.00 (14.10)	10417				16 (2.57)	0.88	0.23				
3	CoN 09072	7.58	4.94	4.30	1.83	9.94 (16.55)	22222				7 (2.77)	0.44	0.05				
4	Co85004 (Std)	0.00	4.23	3.47	3.18	8.15 (16.26)	16667				8 (2.77)	0.50	0.06				
5	Co 94008 (Std)	1.47	1.74	4.86	1.03	7.14(14 .67)	9722				14 (1.26)	0.90	0.14				
6	CoC 671 (Std)	0.00	5.00	5.43	1.27	9.62 (15.94)	17361				6 (3.12)	0.76	0.06				
	S.E ±																
	C.D at 5%					NS					NS						
	C.V																

Sr.no	Varieties/genotype	Pyrilla		white fly per 2.5 sq.cm SMW=	Scale insect				Mealy bug		Av. SWA Grade SMW=	Mites No.of grubs/ ha SMW=	Thrips % intensity SMW=	Black bug /leaf SMW=	Spittle bug % incidence SMW=	Termite (%)		White grub No.of grubs/ ha SMW=
		N+A /leaf SMW=	EME/ CE per plant SMW=		Nat.Infe		Art.Infe		% incidence	% intensity								
					% incidence	% intensity	% incidence	% drying								33	Harvest 34	
		19	20	21	22	23	24	25	26	27	28	29	30	31	32			33
1	Co 09004				0 (1.26)	0.00			3.0 (0.71)	0.28								
2	Co 09007				1 (3.9 4)	0.22			8.0 (1.06)	0.86								
3	CoN 09072				0 (2.45)	0.00			9.0 (0.71)	1.19								
4	Co85004 (Std)				1 (2.67)	0.13			12.0 (1.06)	1.38								
5	Co 94008 (Std)				0 (3.21)	0.00			2.0 (0.71)	0.11								
6	CoC 671 (Std)				8 (2.65)	4.06			13.0 (2.65)	1.33								
	S.E ±								0.34									
	C.D at 5%				NS				1.01**									
	C.V								58.61									

Figures in parenthesis are transformed values while those outside are original values.

- 1. Project No** : E 4.1.5
- 2. Discipline** : Agril Entomology
- 3. Title of project** : Evaluation of zonal varieties/ genotypes for their reaction against major insect pests.
- 4. Title of experiment** : Field screening of sugarcane varieties/ genotypes in IVT Midlate to major pests.
- 5. Objective** : To grade the entries in the trial for their behavior towards damage by key pest in the area.
- 6. Year of commencement** : 1982 – 83(Change of varieties as per AICRP'S Programme)
- 7. Year of implementation** : 2015-16
- 8. Source of finance** : ICAR/VSI, Pune
- 9. Project leader and Associate** : Shri. R.G. Yadav, Scientific Officer & Head, Entomology
: Mrs.P.V.Gadade, Research Assistant, Entomology
- 10. Details of experiment:**
- a. Treatments** : Seventeen (15+2)
1. Co12009 2.Co12012 3. Co12014 4. Co.12016 5.Co12017 6.Co12019 7.Co12021
8.Co12024 9. CoM12084 10. CoM12085 11.CoM12086 12.CoN12073 13. CoN 12074 14.CoT 12368 15.VSI 12121 16.Co 86032 17. Co 99004
- b. Design** : RBD
- c. Replication** : Two
- d. Type of soil** : Heavy
- e. Plot size** : Gross 6m x 6 R X 1.2 m Net 5m x 6 R X 1.2 m
- f. Location** : Vasantdada farm, VSI, Pune
- g) Date of Planting** : 27.12.2014
- h) Date of Harvesting** : 28.10.2015
- i) Method of observations** : The observations were recorded as given in trial E.4.1.1

11. Results:

The data in Table 6 indicated that cumulative % incidence of early shoot borer was above 30% in Co12024 (37.09%) while it was minimum in Co 99004 (4.76 %) and Co12019 (5.16%).The no. of bored plants/ha by early shoot borer was maximum 58333 in Co 12024 ,while it was minimum 5556 in Co 99004. The % incidence of internode borer was maximum 18 % in Co 12016 and Co 12021, while it was minimum 2% in Co 12012, Co 12019 and Co 99004.The % intensity of internode borer was maximum 1.66 % in Co 12021. The infestation index of internode borer was below 1.00 in all varieties/ genotypes screened. The incidence of mealy bug was maximum 10 % in Co 12024 and CoN 12073.

12. Conclusion:

Out of 17 varieties/genotypes screened Co 12024 found highly susceptible to early shoot borer, all 17 varieties/genotypes showed less susceptible reaction to internode borer and Co 12016, Co 12024 and CoN 12073 showed moderately susceptible reaction to mealy bug.

Table.6 Reaction of sugarcane genotypes/varieties to major insect pest in IVT Midlate.

Sr.no	Varieties/ genotype	Early shoot borer (% incidence)						Top borer			Internode borer			Stalk borer			Root borer
		30 DAP	60 DAP	90 DAP	120 DAP	cum	No. of bored plants/ha	III Brood 5 th month	III Brood 7 th month	At harvest	% incidence	% intensity	Infestation index	% incidence	% intensity	Infestation index	% incidence
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
IVT early																	
1	Co 12009	0.00	0.00	2.94	8.93	9.22 (3.08)	16667				8 (2.91)	0.50	0.04				
2	Co 12012	0.00	2.50	6.58	9.70	13.67 (3.76)	52778				2 (1.41)	0.28	0.01				
3	Co 12014	0.00	0.00	0.00	5.26	8.33 (2.42)	8333				8 (2.91)	0.54	0.04				
4	Co 12016	0.00	0.00	0.00	14.81	13.75 (3.52)	22222				18 (4.29)	1.49	0.27				
5	Co 12017	0.00	0.00	0.00	8.45	8.74 (3.03)	16667				4 (2.12)	0.26	0.03				
6	Co 12019	0.00	0.00	0.00	5.26	5.16 (2.38)	8333				2 (1.41)	0.15	0.01				
7	Co 12021	0.00	12.12	0.00	5.71	11.10 (3.40)	22222				18 (4.29)	1.66	0.3				
8	Co 12024	0.00	0.00	8.57	37.50	37.09 (5.98)	58333				6 (2.52)	0.38	0.03				
9	Co 12084	0.00	0.00	5.77	9.09	13.60 (3.75)	22222				4 (1.81)	0.28	0.02				
10	CoM 12085	0.00	0.00	16.00	18.18	22.62 (4.35)	50000				14 (3.80)	1.33	0.19				
11	CoM 12086	0.00	0.00	2.38	25.00	21.42 (4.27)	41667				10 (3.23)	0.63	0.07				
12	CoN 12073	0.00	0.00	0.00	5.17	7.14 (2.28)	8333				6 (2.52)	0.36	0.03				
13	CoN 12074	0.00	3.57	2.94	12.50	17.41 (4.22)	19444				6 (2.52)	0.49	0.04				
14	CoT 12368	0.00	0.00	17.86	7.69	17.61 (4.00)	25000				4 (1.81)	0.29	0.03				
15	VSI 12121	0.00	0.00	2.13	11.11	11.56 (3.39)	25000				10 (3.23)	0.60	0.06				
16	Co 86032 (std)	0.00	2.38	12.12	10.39	18.42 (4.26)	36111				16 (4.03)	1.29	0.21				
17	Co 99004 (std)	0.00	0.00	0.00	5.26	4.76 (1.94)	5556				2 (1.41)	0.13	0.01				
	SE										0.46						
	CD 5%					NS					1.36**						
	CV										23.64						

Sr.no	Varieties/ge notype	Pyrilla		white fly per 2.5 sq.cm SMW=	Scale insect				Mealy bug		Av. SWA Grade SMW=	Mites No.of grubs/ ha SMW=	Thrips % intensit y SMW=	Blac k bug /leaf SM W=	Spittl e bug		Termite (%)		White grub No.of grubs/ ha SMW =
		N+A /leaf SMW=	EME/ CE per plant SMW=		Nat.Infe		Art.Infe		% inciden e	% intens ity					% incide nce SMW =	Germ inatio n	Harve st		
					% inciden ce	% intensit y	% inciden ce	% drying											
		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
1	Co 12009								4.0 (2.12)	0.74									
2	Co 12012								0.0 (0.71)	0.00									
3	Co 12014								0.0 (0.71)	0.00									
4	Co 12016								6.0 (2.52)	0.96									
5	Co 12017								0.0 (0.71)	0.00									
6	Co 12019								0.0 (0.71)	0.00									
7	Co 12021								0.0 (0.71)	0.00									
8	Co 12024								10.0 (2.62)	0.78									
9	Co 12084								0.0 (0.71)	0.00									
10	CoM 12085								6.0 (2.52)	0.84									
11	CoM 12086								0.0 (0.71)	0.00									
12	CoN 12073								10.0 (3.23)	1.44									
13	CoN 12074								2.0 (1.41)	0.12									
14	CoT 12368								0.0 (0.71)	0.00									
15	VSI 12121								0.0 (0.71)	0.00									
16	Co 86032 (std)								4.0 (1.81)	0.26									
17	Co 99004 (std)								0.0 (0.71)	0.00									
	SE								0.56										
	CD 5%								1.67										
	CV								57.72										

Figures in parenthesis are transformed values while those outside are original values.

- 1. Project No** : E 4.1.6
- 2. Discipline** : Agril Entomology
- 3. Title of project** : Evaluation of zonal varieties/ genotypes for their reaction against major insect pests.
- 4. Title of experiment** : Field screening of sugarcane varieties/ genotypes in AVT (I plant) Midllate to major pests.
- 5. Objective** : To grade the entries in the trial for their behavior towards damage by key pest in the area.
- 6. Year of commencement** :1982 – 83(Change of varieties as per AICRP’S Programme)
- 7. Year of implementation** : 2015-16
- 8. Source of finance** : ICAR/VSI, Pune
- 9. Project leader and Associate** : Shri. R.G. Yadav, Scientific Officer & Head, Entomology
: Mrs.P.V.Gadade, Research Assistant, Entomology
- 10. Details of experiment:**
- a. Treatments** : Thirteen (11+2)
- 1. Co 09009 2.Co 10015 3. Co10017 4. Co.10031 5.Co10033 6.CoM 10083 7.CoT 10368 8.CoT 10369 9. CoVc 10061 10. PI 10131 11.PI 10132 12.Co 86032(std) 13. Co 99004(std)**
- b. Design** : RBD
- c. Replication** : Two
- d. Type of soil** : Heavy
- e. Plot size** : Gross 6m x 3.6 m² Net 6m x 2.6 m²
- f. Location** : Vasantdada farm, VSI, Pune
- g) Date of Planting** : 09.01.2015
- h) Date of Harvesting** : 14.01.2016
- i) Method of observations** : The observations were recorded as given in trial E.4.1.1

11. Results:

The data in Table 7 indicated that cumulative % incidence of early shoot borer was above 30% in Co 09009 (34.56%) while it was minimum in Co 86032 (3.57 %) and Co10033 (6.43%).The no. of bored plants/ha by early shoot borer was maximum 66667 in Co 09009 ,while it was minimum 5556 in Co 86032. The % incidence of internode borer was maximum 10 % in Co 10017 and PI 10132, while it was minimum 2% in Co 10015, Co 10031, Co 10083 and Co 86032.The % intensity of internode borer was maximum 1 % in PI 10132, while in other varieties/gene types it was below 1%. The infestation index of internode borer was below 1.00 in all varieties/ genotypes screened. The incidence of mealy bug was maximum 18 % in CoM 10083, while Co 09009, Co 10033 and CoT 10368 were free from mealy bug infestation.

12. Conclusion:

Out of 13 varieties/genotypes screened Co 10017,Co 10031,Co 10033,CoT 10369, Co 86032 and Co 99004 found less susceptible to early shoot borer, all 13 varieties/genotypes showed less susceptible reaction to internode borer and Co 09009, Co 10033 and CoT 10368 were free from mealy bug infestation.

Table.7 Reaction of sugarcane genotypes/varieties to major insect pest in AVT I PI Midlate

Sr.no	Varieties/ genotype	Early shoot borer (% incidence)						Top borer			Internode borer			Stalk borer			Root borer
		30 DAP	60 DAP	90 DAP	120 DAP	cum	No. of bored plants/ha	III Brood	III Brood	At harvest	% incide nce	% intensit y	Infestatio n index	% incidence	% inten sity	Infes tatio n inde x	
1	2	3	4	5	6	7	8	5 th month	7 th month	11	12	13	14	15	16	17	18
IVT early																	
1	Co 09009	0.00	0.00	29.69	9.80	34.56 (5.91)	66667				4 (1.81)	0.28	0.02				
2	Co 10015	0.00	0.00	16.36	7.02	19.72 (4.50)	36111				2 (1.41)	0.15	0.01				
3	Co 10017	0.00	0.00	4.40	6.25	10.43 (3.30)	25000				10 (3.23)	0.62	0.07				
4	Co 10031	0.00	0.00	10.42	2.86	10.94 (2.72)	19444				2 (1.41)	0.16	0.01				
5	Co 10033	0.00	0.00	1.72	4.35	6.43 (2.60)	8333				4 (2.12)	0.27	0.01				
6	CoM 10083	0.00	0.00	22.92	15.38	25.96 (4.81)	52778				2 (1.41)	0.14	0.01				
7	CoT 10368	0.00	0.00	8.00	14.04	18.79 (4.30)	33333				8 (2.83)	0.74	0.08				
8	CoT 10369	0.00	0.00	7.45	3.75	11.95 (3.48)	30556				6 (2.52)	0.40	0.03				
9	Co Vc 10061	0.00	0.00	4.26	12.24	16.45 (4.09)	22222				10 (2.52)	0.77	0.09				
10	PI 10131	0.00	0.00	3.85	12.28	16.13 (4.03)	25000				4 (2.12)	0.26	0.01				
11	PI 10132	0.00	4.17	7.32	9.68	16.68 (4.09)	27778				10 (2.62)	1.00	0.2				
12	Co 86032 (std)	0.00	4.17	0.00	1.89	3.57 (1.74)	5556				2 (1.41)	0.26	0.01				
13	Co 99004 (std)	0.00	0.00	3.33	9.09	11.11 (2.74)	11111				4 (1.81)	0.42	0.04				
	SE																
	CD 5%					NS					NS						
	CV																

Sr.no	Varieties/ge notype	Pyrilla		white fly per 2.5 sq.cm SMW=	Scale insect				Mealy bug		Av. SWA Grade SMW=	Mites No.of grubs/ ha SMW=	Thrips % intensit y SMW=	Blac k bug /leaf SM W=	Spittle bug		Termite (%)		White grub No.of grubs/ ha SMW =	
		N+A /leaf SMW=	EME/ CE per plant SMW=		Nat.Infe		Art.Infe		% incidence	% intens ity					% incidence	% drying	% incidence SMW =	Germ ination		Harve st
					% inciden ce	% intensit y	% inciden ce	% drying												
		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35		
1	Co 09009								0.0 (0.71)	0.00										
2	Co 10015								6.0(1.81)	0.90										
3	Co 10017								2.0(1.41)	0.13										
4	Co 10031								4.0(2.12)	0.31										
5	Co 10033								0.0(0.71)	0.00										
6	CoM 10083								18.0(4.29)	2.39										
7	CoT 10368								0.0(0.71)	0.00										
8	CoT 10369								2.0(1.41)	0.14										
9	Co Vc 10061								8.0(2.52)	0.75										
10	PI 10131								12.0(3.32)	1.08										
11	PI 10132								2.0(1.41)	0.30										
12	Co 86032 (std)								2.0(1.41)	0.49										
13	Co 99004 (std)								8.0(2.83)	0.56										
	SE								0.61											
	CD 5%								1.84*											
	CV								40.79											

Figures in parenthesis are transformed values while those outside are original values

- 1. Project no.** : E. 28 (AICRP's)
2. Discipline : Agril. Entomology
3. Title of the project : Survey and surveillance of sugarcane insect pests.
4. Title of experiment : Survey and surveillance of sugarcane insect pests.
5. Objective : To identify the key insect pests of sugarcane in the area.
6. Year of commencement : 2003-04
7. Year of implementation : 2015-16
8. Source of finance : ICAR/VSI, Pune.
9. Project leader and Associate : Shri.R.G.Yadav, Scientific Officer & Head, Entomology.
: Mrs.P.V.Gadade, Research Assistant, Entomology

10. Method of observations:

- i) Roving survey of sugarcane fields at 5-8 Km distance be recorded.
- ii) Report containing information on location, variety, date of planting. Spacing, fertilizer doses and inter crops, if any.
- iii) Observations on incidence of borers be recorded by examining 100 canes at five places (four corners and in the middle), sucking pests by examining 20 canes and others as mentioned in technical programme of E 4.1.

11. Results

Table no.8 shows that % incidence of early shoot borer was in the range of 1.58 to 49.62 %. In Co 86032 % incidence of ESB was in the range of 1.58 to 25.60%. The average % incidence of early shoot borer was 13.39 % in Co 86032. The % incidence of early shoot borer was in the range of 1.96 to 5.21 % in CoM 0265. In CoM 0265 average % incidence of ESB was 4.10 %. Average % incidence of ESB was 11.77 % in CoC 671. Average % incidence of ESB was 8.88 % in 152-5. The average % incidence of ESB of was 29.4 % in Co VSI 9805. Incidence of ESB was more in sugarcane planted in March.

The % incidence and % intensity of Internode borer was maximum 24.8 % & 5.45% in Co VSI 03102 planted in adsali season. Per cent incidence and % intensity of Internode borer was 17.0 % and 4.23 % in Co 86032 planted in pre -season. Per cent incidence and % intensity of Internode borer was minimum 13.6 % and 3.67 % respectively in Co VSI 03102 planted in suru season. The % incidence of internode borer was more in sugarcane planted in adsali season as compared to sugarcane planted in suru season.

The % incidence and % intensity of mealy bug was maximum 35.80 % & 12.45% in Co VSI 03102 planted in adsali season. Per cent incidence and % intensity of mealy bug was 16.8 % and 5.17 % respectively in Co 86032 planted in pre -season. The % incidence and % intensity of mealy bug was minimum 13.4 % and 4.26 % in Co VSI 03102 planted in suru season. The % incidence of mealy bug was more in sugarcane planted in adsali season as compared to sugarcane planted in suru season.

Recorded first time rust feeder larvae (*Mycodiplosis coimbatorensis*) feeding on spores of sugarcane rust disease.

12. Conclusion:

Average % incidence of early shoot borer was minimum 4.10 % in CoM 0265 and maximum 29.40 % in Co VSI 9805. Incidence of ESB was more in sugarcane planted in March. The % incidence of internode borer and mealy bug was more in sugarcane planted in adsali season as compared to sugarcane planted in suru season. On sugarcane rust disease recorded first time rust feeder larvae (*Mycodiplosis coimbatorensis*).

Table 8: Per cent incidence /intensity of major pests at Manjri farm VSI, Pune.

Sr. No.	Plot No.	Village	Variety	Date of planting/ratoon	Name of the Pest						
					Early shoot borer	Mealy bug		Root borer		Internode borer	
						% Inci.	% inci.	% inten.	% inci.	% inci.	% inci.
1	B11	Manjri Bk	Co 86032	05.2.15	1.58						
2	A13	Manjri Bk	Co 86032	12.5.15	5.78						
3	A14	Manjri Bk	Co 86032	15.2.15	7.72						
4	A16	Manjri Bk	Co 86032	02.3.15	14.50						
5	A17	Manjri Bk	Co 86032	03.3.15	18.01						
6	A18	Manjri Bk	Co 86032	03.3.15	16.73						
7	A20	Manjri Bk	Co 86032	06.3.15	15.78						
8	AC1	Manjri Bk	Co 86032	09.3.15	25.60						
9	A6	Manjri Bk	Co 86032	13.3.15	14.04						
10	A7	Manjri Bk	Co 86032	13.3.15	16.12						
11	A11	Manjri Bk	Co 86032	13.3.15	11.53						
				Average	13.39						
12	A21	Manjri Bk	CoM 0265	25.1.15	4.43						
13	A22	Manjri Bk	CoM 0265	25.1.15	1.96						
14	A23	Manjri Bk	CoM 0265	25.1.15	4.81						
15	B10	Manjri Bk	CoM 0265	06.2.15	5.21						
				Average	4.10						
16	C22	Manjri Bk	CoC 671	28.2.15	18.48						
17	B10	Manjri Bk	CoC 671	06.2.15	5.06						
				Average	11.77						
18	B21	Manjri Bk	152-5	11.3.15	8.04						
19	B22	Manjri Bk	152-5	12.3.15	9.73						
				Average	8.88						
20	B 27	Manjri Bk	Co VSI 9805	04.3.15	49.62						
21	B 10	Manjri Bk	Co VSI 9805	06.2.15	9.17						
				Average	29.4						
22	C 14	Manjri Bk	Co VSI 03102	18.08.14		35.8	12.45	0.00	0.00	24.8	5.45
23	C 10	Manjri Bk	Co 86032	31.10.14		16.8	5.17	0.00	0.00	17.0	4.23
24	C 15	Manjri Bk	Co VSI 03102	11.12.14		13.4	4.26	0.00	0.00	13.6	3.67

- 1. No. of experiment** : E. 30 (AICRP's)
- 2. Discipline** : Agril. Entomology.
- 3. Title of the project** : Monitoring of insect pests and bio agents in sugarcane agro- ecosystem.
- 4. Title of experiment** : Monitoring of insect pests and bio agents in sugarcane agro- ecosystem.
- 5. Objective** : To monitor the key insect pests and natural enemies in the area.
- 6. Year of commencement** : 2006-2007
- 7. Year of implementation** : 2015-16
- 8. Source of finance** : ICAR/VSI Pune.
- 9. Project leader and Associate** : Shri.R.G.Yadav, Scientific Officer & Head, Entomology.
: Mrs.P.V.Gadade, Research Assistant, Entomology
- 10. Details of Experiment**
- a. Location : Vasantdada Farm, VSI, Pune
- b. Variety : Co 86032
- c. Date of Planting : 5.2.2015
- d. Date of Harvesting : 3.12.2015 (for Seed)

11. Method of observation:

- : i) Planting of sugarcane variety recommended for the region in 0.2 ha area.
- ii) All recommended practices to be followed except application of insecticide.

Observations to be recorded: Observations on incidence of borers be recorded by examining 100 canes at five places (four corners and in middle), sucking pests by examining 20 canes and others as mentioned in technical programme of E 4.1.

ii) Meteorological data (weekly averages) to be recorded on: temperature (max & min), relative humidity, no. of rainy days and total rainfall.

12. Results and Discussion

The per cent incidence of early shoot borer was maximum 2.39 % in March 2015, while in Feb 2015 it was minimum (0.76%).The % incidence, intensity and infestation Index of internode borer was maximum 10.0 %, 0.56 % and 0.06 respectively in Nov.2015, while in June, July and August 2015 crop was free from Internode borer infestation. The incidence and intensity of mealy bug was observed maximum 14 % and 2.35 % in Aug. 2015, while it was free from mealy infestation in June 15 and Dec.15. (Table 9)

13. Conclusion

The % incidence of early shoot borer noticed maximum 2.39 % in March 2015. The % incidence, intensity and infestation index of internode borer was noticed maximum 10 %, 0.56 % and 0.06 respectively in Nov.2015.The incidence and intensity of mealy bug was observed maximum 14.0 % and 2.35% in Aug.2015.

Table 9: The % incidence / intensity of major insect pests during 2015-16.

Sr. No	Month	Early shoot borer	Internode borer			Mealy bug	
		% incidence	% incidence	% intensity	Infestation index	% incidence	% intensity
1	February 2015	0.76					
2	March 2015	2.39					
3	April 2015	1.23					
4	May 2015	1.04					
5	June 2015		0.00	0.00	0.00	0.00	0.00
6	July 2015		0.00	0.00	0.00	5.00	0.90
7	August 2015		0.00	0.00	0.00	14.00	2.35
8	September 2015		4.00	0.32	0.01	11.00	1.67
9	October 2015		3.00	0.26	0.01	5.00	0.45
10	November 2015		10.00	0.56	0.06	1.00	0.06
11	December 2015		3.00	0.17	0.01	0.00	0.00

- Project No** : E-34
2. Title : Standardization of simple, cost effective techniques for mass multiplication of sugarcane bio-agents.
3. Location : VSI, Pune
4. Project leader and Associate : Shri. R.G. Yadav, Scientific Officer & Head, Entomology : Mrs.P.V.Gadade
5. Objective : To develop simple and cost effective mass multiplication techniques of promising bio-agents of the area.
6. Duration : Three years
7. Year of commencement : 2003-04
8. Year of implementation : 2015-16
9. Source of finance : ICAR/VSI, Pune
10. Treatments : Mass multiplication of *Trichogramma chilonis*

11. Methodology: Studies on mass production of *Corcyra cephalonica*, laboratory host for *Trichogramma* egg parasite

Filling of *Corcyra* rearing boxes: Emergence of adults took place 40-45 days and it continues for further 45 days. The wooden *Corcyra* rearing cages of 20x10x7 cubic inch are used for filling of heat sterilized 2.5 Kg of half crushed jowar flour. Dried yeast tablets are mixed in it to increase the nutritive value of the diet. Nucleus culture of 0.5 cc (Approximately 10,000) *Corcyra* eggs has introduced in it. The rearing cage has a wooden lid at the top. The lid has a window of wire mesh for ventilation. Laboratory sanitation and sterilization of wares has adopted to avoid fungal / bacterial contamination. At hatching, *Corcyra* larvae feed on the provided diet throughout their larval period and pupate in the cages. In each cage, 10,000 introduced *Corcyra* eggs hatched into only 3000 to 5000 larvae/adult within 60 days. The life of *Corcyra* adult varies from 3 to 5 days.

Collection of host eggs: The emerged *Corcyra* adults were collected regularly, using plastic tubes preferably in morning hours. Collected adults have placed to egg laying chamber for mating. A size of wooden *Corcyra* eggs laying chamber is 8x8x8 cubic h. Eggs laying chamber has a wire mesh at bottom and a wooden lid at the top with wire mesh window to provide the honey (35% diluted) swab to adult moths as a feeding material. The eggs laid by the female come out directly through the wire mesh fitted at the bottom of egg laying chamber. The chambers are provided with iron steel tripod stand with egg collecting vial at the bottom. On the next day, egg-collecting vials has removed from eggs laying chambers. Dust, scale and antennae are separated with the help of tea sieve, hairbrush and blotting paper. Cleaned eggs were counted with measuring cylinder/cc unit and poured in screw jar & stored at 10 C in B.O.D. incubator up to 10 to 21 days and used for *Trichogramma* multiplication.

12. Results:

Table No.10 indicates that during 2015-16 Entomology Section produced *Corcyra* eggs 605.90 cc (121.18 lac) with a monthly average of 50.49 cc (10.10 lac). During 2015-16 Entomology Section produced 448 cards (89.60 lac parasites) of *Trichogramma chilonis* parasites with a monthly average of 37.33 cards (7.46 lac parasites).

During 2015-16 Entomology Section supplied 204.50 Tricho cards for the control of borers on 13.63 ha area and 2.00 cc *Corcyra* eggs as a nucleus culture. (Table 11).

13. Conclusion:

During 2015-16 Entomology Section produced 605.90 cc (121.18 lac) eggs of *C. cephalonica* and 448 cards (89.60 lac parasites) of *Trichogramma chilonis* parasites. Supplied 204.50 Trichocards for the control of sugarcane borer on 13.63 ha area.

Table 10 : Monthly production of *C. cephalonica* eggs and *T. chilonis* parasitoids cards during April, 2015 to March 2016

Sr. No.	Month	<i>Corcyra</i> eggs Produced (cc)		<i>T. chilonis</i> parasitoids cards	
		Per month	Per day	Per month	Per day
1	April 2015	7.00	0.23	7.00	0.23
2	May 2015	9.10	0.29	3.00	0.08
3	June 2015	26.30	0.88	9.00	0.30
4	July 2015	63.30	2.04	30.00	0.97
5	August 2015	36.50	1.18	28.00	0.90
6	September 2015	52.30	1.74	56.00	1.86
7	October 2015	72.30	2.33	58.00	1.87
8	November 2015	69.80	2.33	51.00	1.70
9	December 2015	72.50	2.34	45.00	1.45
10	January 2016	61.60	1.99	50.00	1.61
11	February 2016	54.60	1.88	60.00	2.06
12	March 2016	80.60	2.60	51.00	1.64
	Total	605.90	19.83	448	14.67
	Average	50.49	1.65	37.33	1.22

Table 11: Supply of *T. chilonis* parasitoids cards/*Corcyra* eggs during 2015-16

Sr. No.	Name of sugar mill/other	No.of Tricho cards supplied	Amount (Rs.)	Area covered (ha)	<i>Corcyra</i> eggs supplied(cc)	Amount (Rs.)
1.	Vitthalrao Shinde ssk,ltd Dist-Solapur	75	7125.00	5.00	-	-
2.	Kay Bee Exports Phaltan	20	1900.00	1.33	-	-
3.	Vikrant Patil T.K.Warna Kolhapur	12	1140.00	0.8	-	-
4.	Farmers	46	4370.00	3.06		
5.	Ms.Ladkat(Student)				2.00	190.00
6.	Venktesh Krupa Sugar mill Dist-Pune	20	1900.00	1.33		
	Total A=	173	16435.00	11.53		
7	VSI Farm (Gratis) Total B=	31.5	2992.50	2.10		
	Total C= (A+B)=	204.50	19427.50	13.63		
				Total D=	2.00	190.00
	Grand Total F=(C+D)=		19617.50			

- 1. Project No** : E.36
2. Discipline : Agril Entomology
3. Title of the project : Management of borers complex of sugarcane through lures.
4. Title of experiment : Management of borers complex of sugarcane through lures.
5. Objective : To manage sugarcane borers (Early shoot borer, top borer, internode borer and stalk borer) through pheromone traps.
6. Year of commencement : 2012-13
7. Year of implementation : 2015-2016
8. Source of finance : ICAR/VSI Pune.
9. Project leader and Associate : Shri.R.G.Yadav, Scientific Officer & Head, Entomology.
: Mrs.P.V.Gadade, Research Assistant, Entomology
10. Details of Experiment
a. Treatment : Pheromone lures of early shoot borer, Top borer & Internode borer
b. Location : Vasantdada Farm, VSI, Pune
c. Variety : CoM 0265
d. Plot size : Two block each of minimum half acre. In first block trap should be installed and second be kept as such.
e. Date of Planting : 07.02.2015 (T) & 06.02.2015 (C)
f. Date of Harvesting : 3.12.2015 (for seed)

11. Methodology:

In Peninsular and East Coast Zone, the test insect-pest will be early shoot bore, top borer & internode borer. Six pheromone traps for each pest will be installed in second fortnight of February till harvest of crop. In half acre of sugarcane crop. The pheromone lures will be changed after two months.

Observations to be recorded:

i. Observations on number of moths trapped will be recorded at weekly interval. The mean number of moth capture will be worked out. The correlation and regression of moth captures will be worked out with weekly meteorological parameters.

12. Result:

Data in Table 12 shows that the % incidence of ESB was maximum 4.09 % in April 2015 in treated plot, while it was maximum 4.46% in May 2015 in control plot. The % incidence of internode borer was noticed maximum 4 % in June 15 and Dec 15, while it was 16 % in July 15 in control plot. Treated and control plots were free from top borer infestation.

During 9th to 48th meteorological week 0.50, 0.17, 0.17, 0.17 and 0.50 moths of ESB were captured per trap/week in 17th, 26th, 27th, 33rd and 35th meteorological week respectively .During 9th to 48th meteorological week 0.17 moths of Internode borer were captured per trap/week only in 17^t, 20th and 21st meteorological week. During 9th to 48th meteorological week top shoot borer moths were not captured. (Table 13)

Conclusion:

In Pheromone traps negligible adults of early shoot borer and Internode borer were captured. Top shoot borer adults were not captured. The % incidence of ESB was maximum 4.09 % in April 2015 in treated plot, while it was maximum 4.46% in May 2015 in control plot. The % incidence of internode borer was noticed maximum 4.0 % in June 15 and Dec 2015, while it was 16 .0 % in July 2015 in control plot. Treated and control plots were free from top borer infestation.

Table 12: The per cent incidence /intensity of borers in treated/control plot.

Sr. No.	Month	Early shoot borer		Top shoot borer		Internode borer					
		% incidence		% incidence		% incidence		% intensity		Infestation index	
		T	C	T	C	T	C	T	C	T	C
1	February 2015	0.00	0.00	0.00	0.00						
2	March 2015	0.73	0.32	0.00	0.00						
3	April 2015	4.09	2.20	0.00	0.00						
4	May 2015	2.79	4.46	0.00	0.00						
5	June 2015			0.00	0.00	4.00	0.00	1.07	0.00	0.04	0.00
6	July 2015			0.00	0.00	0.00	16.00	0.00	2.66	0.00	0.43
7	August 2015			0.00	0.00	0.00	4.00	0.00	0.42	0.00	0.02
8	September 2015			0.00	0.00	0.00	4.00	0.00	0.33	0.00	0.01
9	October 2015			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	November 2015			0.00	0.00	0.00	4.00	0.00	0.32	0.00	0.01
11	December 2015			0.00	0.00	4.00	4.00	0.21	0.28	0.01	0.01

Table 13: Mean Moths captured/week/trap

Sr. No.	SMW	Mean Moths captured/week/trap		
		Early shoot borer	Internode borer	Top shoot borer
1	9	0	0	0
2	10	0	0	0
3	11	0	0	0
4	12	0	0	0
5	13	0	0	0
6	14	0	0	0
7	15	0	0	0
8	16	0	0	0
9	17	0.50	0.17	0
10	18	0	0	0
11	19	0	0	0
12	20	0	0.17	0
13	21	0	0.17	0
14	22	0	0	0
15	23	0	0	0
16	24	0	0	0
17	25	0	0	0
18	26	0.17	0	0
19	27	0.17	0	0
20	28	0	0	0
21	29	0	0	0
22	30	0	0	0
23	31	0	0	0
24	32	0	0	0
25	33	0.17	0	0
26	34	0	0	0
27	35	0.50	0	0
28	36	0	0	0
29	37	0	0	0
30	38	0	0	0
31	39	0	0	0
35	40	0	0	0
36	41	0	0	0
37	42	0	0	0
38	43	0	0	0
39	44	0	0	0
40	45	0	0	0
41	46	0	0	0
42	47	0	0	0
43	48	0	0	0

1. **Project No** : E.37 (AICRP'S)
2. **Discipline** : Agril Entomology
3. **Title of the project** : Bioefficacy of new insecticides for control of sugarcane early shoot borer.
4. **Title of experiment** : Bioefficacy of new insecticides for control of sugarcane early shoot borer
5. **Objective** : To find out effective strategy for the management of early shoot borer
6. **Year of commencement** : 2013-2014
7. **Year of implementation** : 2015-16
8. **Source of finance** : ICAR/VSI Pune.
9. **Project leader and Associate** : Shri.R.G.Yadav, Scientific Officer & Head, Entomology.
: Mrs.P.V.Gadade, Research Assistant, Entomology

10. Details of Experiment

a. Treatment

- T 1- Soil application of Fipronil 0.3G @25kg/ha at the time of planting and 60 DAP
T 2-Soil application of Chlorantraniliprole 0.4 G @22.5kg/ha at the time of planting and 60 DAP
T 3-Spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 and 60 DAP
T 4-Spraying of Spinosad 45% SC @ 90 ml/ha at 30and 60DAP
T5- Spraying of Flubendiamide 39.35% @ 125 ml/ha at 30 and 60 DAP
T6- Soil application of Phorate 10 G 15 kg/ha at the time of planting and60 DAP
T 7- Soil application of Carbofuron 3G @ 33 kg/ha at the time of planting and 60 DAP
T 8-Untreated control

b. Design : RBD

C.Replication : Three

d. Type of soil : Heavy

e. Plot size : Gross-6 m x 7.2 m² Net: 6 x 4.8 m²

f. Location : Vasantdada Farm, VSI, Pune

g. Variety : Co 86032

h. Date of Planting : 09.01.2015

i. Date of Harvesting : 12.01.2016

j. Method of observation: Germination per cent at 45 DAP. Tillering per cent at 120 DAP. ESB infestation will be recorded by counting number of dead hearts easily pulled out and emitting offensive odour as well as the total number of shoots /plant in each net plot on 45, 60, 90 and 120 DAP. The percent incidence of early shoot borer will be worked out by following formula

$$\% \text{ incidence} = \frac{\text{No. of dead hearts}}{\text{Total no of shoots}} \times 100$$

The cumulative percent infestation will be worked out by taking progressive total of infected shoots in proportion to total shoot formed.

Yield, growth and quality parameters.

- a. Germination %
- b. Tillering percent at 120 DAP
- c. No. of millable canes
- d. Cane yield (ton/ha)
- e. Growth parameters (total cane height(cm), millable cane height(cm), number of internodes and girth of cane)
- f. Quality parameters

11. Results:

The germination percent at 45 DAP was lowest 60.17 % in soil application of Carbofuran 3 G @ 33 kg/ha at the time of planting & 60 DAP, while it was highest 69.50 % in soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha at the time of planting & 60 DAP. At 120 DAP tillering ratio was highest 1.95 in soil application of Fipronil 0.3 G @ 25 kg/ha at the time of planting & 60 DAP and it was lowest 1.37 in Spraying of Spinosad 45% SC @ 90 ml/ha at 30 and 60DAP. (Table 15)

Cumulative incidence of early shoot borer was statistically lowest (1.50%) in spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60 DAP while it was highest in Phorate (37.19%) @ 15 kg /ha at the time of planting & 60 DAP and untreated control (37.04 %). Cumulative incidence of early shoot borer was 1.50 %, 1.87 %, 13.74 % and 15.66 % respectively in spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60DAP, soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha, Soil application of Fipronil 0.3G @25kg/ha at the time of planting and 60 DAP and spraying of Flubendiamide 39.35% @250 ml/ha at 30 & 60DAP. No. of bored plants/ha were lowest 4464 in spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60DAP, while it was highest 1, 41,667 in soil application of Phorate 10 G @ 15 kg/ha at the time of planting and 60 DAP. (Table 14)

The total cane height, millable cane height and no. of internodes were highest 273.00, 228.00 and 22 respectively in soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha at the time of planting and 60 DAP. The CCS ton/ha was highest 18.88 in soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha at the time of planting and 60 DAP. Plant population was statistically maximum 90179/ha in spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60DAP and minimum 69544/ha in untreated control. Cane yield t/ha was statistically high 137.66, 123.52, 120.29 and 115.92 t/ha in soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha, spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha, soil application of Fipronil 0.3 G @25 kg/ha and Spraying of Spinosad 45 % SC @ 90 ml/ha respectively, while it was lowest 86.58t/ha in untreated control.(Table 15.)

Pooled data in table 16 revealed that cumulative incidence of early shoot borer was statistically lowest 2.89 %, 8.46 %, 12.30 %, 16.02 %, 25.25% and 25.28% in spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60DAP, soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha at the time of planting and 60 DAP, spraying of Flubendiamide 39.35% @250 ml/ha at 30 & 60DAP, soil application of Fipronil 0.3 G @25 kg/ha at the time of planting and 60 DAP, soil

application of Carbofuran 3 G @ 33 kg/ha at the time of planting & 60 DAP and Spraying of Spinosad 45% SC @ 90ml/ha at 30 and 60DAP respectively.

The sugarcane yield t/ha was statistically highest 128.56, 120.34,119.41, 117.32,116.88 and 108.78 in soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha at the time of planting and 60 DAP , spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60DAP, Spraying of Spinosad 45% SC @ 90ml/ha at 30 and 60DAP, soil application of Fipronil 0.3 G @25 kg/ha at the time of planting and 60 DAP, spraying of Flubendiamide 39.35% @250 ml/ha at 30 & 60DAP and soil application of Carbofuran 3 G @ 33 kg/ha at the time of planting & 60 DAP respectively.

12. Conclusion:

In January planted Co 86032 sugarcane, soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha at the time of planting and 60 DAP or spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30& 60DAP or soil application of Fipronil 0.3 G @25 kg/ha at the time of planting and 60 DAP or Spraying of Spinosad 45% SC @ 90ml/ha at 30 and 60DAP were found best for control of Early shoot borer.

For control of early shoot borer in sugarcane soil application of Chlorantraniliprole 0.4 G @22.5 kg/ha at the time of planting and 60 DAP or spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30& 60DAP or Spraying of Spinosad 45% SC @ 90 ml/ha at 30 and 60DAP or Fipronil 0.3 G @25 kg/ha at the time of planting and 60 DAP or spraying of Flubendiamide 39.35% @ 250 ml/ha at 30 & 60 DAP were found best.

Table.14 - Per cent incidence of early shoot borer

sr. no	Varieties//genotype	Early shoot borer (% incidence)					
		30DAS	45DAS	60 DAS	90 DAS	120 DAS	Cumulative
1	2	3	4	5	6	7	8
1	T1	0.00	0.00	0.00	7.84	7.03	13.74 (21.46)
2	T2	0.00	0.24	0.20	0.66	1.06	1.87 (7.53)
3	T3	0.00	0.53	0.00	0.75	0.38	1.50 (6.40)
4	T4	0.35	0.49	0.19	9.31	14.18	23.05 (24.18)
5	T5	0.31	0.73	1.66	4.85	10.17	15.66 (22.92)
6	T6	1.08	0.25	0.42	23.73	19.84	37.19 (37.53)
7	T7	0.00	0.00	0.83	18.30	17.16	32.41 (34.42)
8	T8	0.00	0.27	0.21	21.30	21.05	37.04 (37.34)
	S.E ±						3.78
	C.D at 5%						11.52***
	C.V						26.89

Figures in parenthesis are transformed values while those outside are original values.

Table 15:- Growth and quality parameters.

Sr. no	Treatment	Mean% Germination 45 DAP	Tillering ratio 120 DAP	Total cane height (cm)	Millable cane height (cm)	No.of internodes	Diameter (cm)	Brix %	pole %	CCS %	CCS ton /ha	Plant Population /ha	Single cane Weight (Kg)	Yield/ha ton
1	T1	65.50	1.95	226.00	193.00	19	3.16	19.44	16.43	11.26	14.03	85615	1.41	120.29
2	T2	69.50	1.82	273.00	228.00	22	3.29	19.59	18.79	13.66	18.88	89782	1.53	137.66
3	T3	63.33	1.73	246.67	200.00	21	3.17	20.33	18.51	13.15	16.15	90179	1.37	123.52
4	T4	67.83	1.37	241.33	201.00	20	3.29	19.12	17.49	12.46	14.47	83532	1.39	115.92
5	T5	68.33	1.47	229.67	195.33	19	2.99	18.96	17.77	12.79	13.31	82837	1.26	104.05
6	T6	65.67	1.59	249.00	208.33	20	3.20	19.44	16.92	11.78	12.47	79266	1.35	107.24
7	T7	60.17	1.58	232.33	204.67	20	3.26	18.60	17.34	12.46	13.08	76984	1.37	105.03
8	T8	61.67	1.48	241.33	205.33	18	3.11	19.26	17.55	12.48	10.83	69544	1.25	86.58
	S.E±											2242.03		8.77
	C.D at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	6800.46***	NS	26.61*
	C.V											4.72		13.50

Figures in parenthesis are transformed values while those outside are original values.

Table 16. Pooled data of ESB % incidence & Sugarcane yield.

Sr. no	Treatment	ESB Mean % incidence	Mean Yield t /ha	Dose /ha	Insecticide cost	Total cost (Rs.)	Gross return	Net return	Net Profit	B:C ratio
1	T-1 Soil application of Fipronil 0.3G @25kg/ha at the time of planting and 60 DAP	16.02 (3.85)	117.32	25 kg	2450	102450	234640	54140	51690	1:2.29
2	T-2 Soil application of Chlorantraniliprole 0.4 G @22.5kg/ha at the time of planting and 60 DAP	8.46 (2.65)	128.56	22.5 kg	4981	104981	257120	76620	71639	1:2.45
3	T-3 Spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 and 60 DAP	2.89 (1.64)	120.34	375 ml	5500	105500	240680	60180	54680	1:2.29
4	T-4 Spraying of Spinosad 45 % SC @ 90 ml/ha at 30 and 60 DAP	25.28 (4.90)	119.41	90ml	1802	101802	238820	58320	56518	1:2.36
5	T-5 Spraying of Flubendiamide 39.5 % SC @ 250 ml/ha at 30 and 60 DAP	12.30 (3.36)	116.88	125 ml	2585	102585	233760	53260	50675	1:2.29
6	T-6 Soil application of Phorate 10 G 15 kg/ha at the time of planting and 60 DAP	34.99 (5.82)	100.67	15 kg	1400	101400	201340	20840	19440	1:2.00
7	T-7 Soil application of Carbofuron 3G @ 33 kg/ha at the time of planting and 60 DAP	25.25 (4.95)	108.78	33kg	3302	103302	217560	37060	33758	1:2.11
8	T-8 Untreated control	37.78 (6.09)	90.25			100000	180500			1:1.81
	SE	0.35	4.59							
	CD	1.00***	13.11***							
	CV	25.22	12.22							

Figures in parenthesis are transformed values while those outside are original values.

Technical Programme 2016-17 (2015-16 Planting)
Entomology Section

I. RESEARCH SPONSERED BY ICAR

ALL INDIA COORDINATED RESEARCH PROGRAMME

- Project No** : E 4.1
Title : Evaluation of zonal varieties / genotypes for their reaction against major insect pests.
- Project No** : E 4.1.1
Title : Field screening of sugarcane varieties/genotypes in IVT Early to major pests
- Project No** : E 4.1.2
Title : Field screening of sugarcane varieties/genotypes in AVT Early (I plant) to major pests
- Project No** : E 4.1.3
Title : Field screening of sugarcane varieties/genotypes in AVT Early (II plant) to major pests
- Project No** : E 4.1.4
Title : Field screening of sugarcane varieties/genotypes in AVT Early (Ratoon) to major pests
- Project No** : E 4.1.5
Title : Field screening of sugarcane varieties/genotypes in IVT Midlate to major pests
- Project No** : E 4.1.6
Title : Field screening of sugarcane varieties/genotypes in AVT midlate (I plant) to major pests
- Project No** : E 4.1.7
Title : Field screening of sugarcane varieties/genotypes in AVT midlate (II plant) to major pests
- Project No** : E 4.1.8
Title : Field screening of sugarcane varieties/genotypes in AVT midlate (Ratoon) to major pests
- Project No** : E.28
Title : Survey and surveillance of sugarcane insect pests.
- Project No** : E.30
Title : Monitoring of insect pests and bio agents in sugarcane agro- ecosystem..
- Project No** : E.34
Title : Standardization of simple, cost effective techniques for mass multiplication of sugarcane Bioagents
- Project No** : E.36
Title : Management of borer's complex of sugarcane through lures
- Project No** : E.37
Title : Bioefficacy of new insecticides for the control of sugarcane early shoot borer