

**ANNUAL RESEARCH REPORT OF SUGARCANE ENTOMOLOGY M.S.R.S., N.A.U.
NAVSARI FOR THE YEAR 2013-14**

Project no. E.4.1:

- 1. Title** : Evaluation of zonal varieties/ genotypes for their reaction against major insect pests
- 2. Objective** : To grade the entries in the Zonal Varietal Trials for their behavior towards damage by key pests in the area.
- 3. Year of start** : 2013-14
- 4. Location** : Regional Sugarcane Research Station, Navsari.
- 5. No. of replications** : Three
- 6. Plot size** : 6.00 X1.00 M
- 7. Date of planting** : 11-12-2012
- 8. Varieties** : IVT/AVT
- 9. Signature of the scientist in charge of the experiment :**
- 10. Name and designation** : Dr. Mahesh. B. Patel
Associate Research Scientist (Ento.)

Methodology:

The IVT/AVT/other sugarcane genotypes were planted separately at Main Sugarcane Research Station, Navsari Agricultural University, Navsari. The experimental plot was kept unsprayed through out the period of observation for insect pest attacking on sugarcane crop. Observations were also recorded in the experimental as well as breeding varietal trial as per details given below for following pests.

Observations were recorded:

1. Early shoot borer, *Chilo infuscatellus* (S.)

Observations were recorded in post-germination phase at 30 days interval up to 120 days (At 30, 60, 90 and 120 DAP). The observation on the total number of shoots and number of dead hearts due to the early shoot borer was recorded. Calculated the per cent incidence as per the following formula:

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

The Cumulative incidence of up to 120 DAP was calculated. Number of bored plants/ha was also recorded. The data were worked out on per cent basis and were statistically analyzed.

2. Top borer: - *Scirpophaga excerptalis* (Wlk): Per cent incidence was recorded on 5th month, 7th month and at harvest (i.e. 12th months.). The observations were recorded, for the total number of canes and total number of infested canes. The data were worked out on per cent basis and were statistically analyzed.

3. Internode borer : *Chilo sacchariphagous indicus* (Kapur) and **4. Root borer:**

□ Minimum 25 canes were selected randomly from each plot and total number of internodes and internodes affected due to internode borer in each cane was counted at harvest. Calculated the per cent incidence on cane basis, per cent intensity on nodal basis (By considering total number of nodes on observed cane was recorded to compute infestation index). Infestation index was worked out, whereas only per cent incidence was observed for root borer on external visible symptoms up to 6 month. The data were worked out on per cent basis and were statistically analyzed.

5. Scale insects, *Melanaspis glomerata* (Green): and **6. Mealy bugs:-** *Saccharicoccus sacchari* (Cockerell): At harvest 25 canes were selected randomly from each plots and affected internode due to scale insect and mealy bugs. Per cent incidence and intensity were calculated for both the pests. The data were statistically analyzed.

7. Pyrilla:

□ The population of nymph and adult were recorded from a unit of 10 canes (20 leaves). Average population of nymphs and adults per leaf was noted. Observations on egg mass and cocoons of ecto-parasite, *Epiricania melanoleuca* were recorded. Observations were recorded at an interval of fortnight and peak incidence of pyrilla and its ecto-parasitoid was also recorded. □

8. Whitefly:- *Aleurolobus barodensis* (M) : Population of nymph and puparia were recorded from a unit of 10 canes (20 leaves) from proximal, middle and distal region. Average population per 2.5 sq. cm were reported.

Project E.4.1.1 AVT (E) II P trial:

Table -4.1.1.1 Screening of sugarcane varieties against ESB in AVT (E) II P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Early shoot borer				Cumulative % incidence	No. of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP		
1	Co 8001	0.00	7.82 (0.92)	10.65(2.48)	8.90 (1.40)	4.87	8117
2	CoVSI 08121	0.00	9.23 (1.57)	7.99(1.01)	11.35 (2.87)	5.14	8567
3	Co 85004	0.00	9.22 (1.57)	10.83(2.61)	9.01 (1.46)	5.05	8417
4	Co 94008	0.00	11.84 (3.33)	9.58(1.78)	11.71 (3.16)	7.85	13083
5	CoC 671	0.00	10.68(2.44)	10.46(2.30)	15.05 (5.82)	10.14	16900
	S.Em.+(T)	-	0.90	0.64	0.70		
	C. D @ 5%	-	NS	NS	2.27		
	C. V. %	-	16.04	11.13	10.75		

Figures in the parenthesis are original values and those outside are arcsine transformed values

Early shoot borer, *Chilo infuscatellus* (S.):

The data are presented in table 4.1.1.1. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer at 60 DAP and 90 DAP were found non significant. While, at 120 DAP, these were found significant. Based on the cumulative per cent infestation of early shoot borer ranged from 4.87 to 10.14 per cent. The least incidence was observed in Co 8001 (4.87 %) while maximum incidence was observed in CoC 671 (10.14%).

Table -4.1.1.2 Screening of sugarcane varieties against top borer in AVT (E) II P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence Of Top Borer		
		5 th month	7 th month	At harvest
1	Co 8001	8.43(1.26)	9.55(1.75)	10.19(2.16)
2	CoVSI 08121	9.36(1.65)	11.20(2.82)	8.22(1.14)
3	Co 85004	9.21(1.57)	10.99(2.66)	11.12(2.75)
4	Co 94008	11.63(3.58)	11.81(3.21)	10.85(2.56)
5	CoC 671	10.48(2.12)	10.63(2.41)	8.73(1.44)
	S.Em.+(T)	0.95	0.55	0.46
	C. D @ 5%	NS	NS	1.49
	C. V. %	16.67	8.75	7.58

Figures in the parenthesis are original values and those outside are arcsine transformed values

Top borer: - *Scirpophaga excerptalis* (Wlk):

The data are presented in table 4.1.1.2. From the table, it is seen that the per cent infestation of top borer at 5th month and 7th was found non significant. While, at harvest, it was found significant. Based on the per cent infestation of top borer ranged from 1.14 to 2.75 per cent. The least incidence was observed in CoVSI 08121 (1.14 %) while maximum incidence was observed in Co 85004 (2.75%).

Table -4.1.1.3 Screening of sugarcane varieties against internodes borer and root borer in AVT (E) II P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Internode Borer			% Root borer
		% incidence	% intensity	% Infestation index	
1	Co 8001	22.05 (13.33)	9.71 (1.84)	0.25	22.05 (13.33)
2	CoVSI 08121	24.35 (16.00)	10.56 (2.37)	0.38	17.46 (8.00)
3	Co 85004	28.18 (21.33)	10.32 (2.22)	0.47	24.35 (16.00)
4	Co 94008	14.43 (5.33)	7.30 (0.65)	0.03	22.05 (13.33)
5	CoC 671	30 (24.00)	12.01 (3.35)	0.81	17.46 (8.00)
	S.Em.+(T)	1.12	0.53		1.26
	C. D @ 5%	3.66	1.74		4.10
	C. V. %	8.18	9.23		10.54

Figures in the parenthesis are original values and those outside are arcsine transformed values

Internode borer : *Chilo sacchariphagous indicus* (Kapur)

The data are presented in table 4.1.1.3. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of internode borer was found significant. Based on the percent incidence of internode borer ranged from 5.33 to 24.00 per cent. The least incidence was observed in Co 94008 (5.33 %) while maximum incidence was observed in CoC 671 (24 %).

Based on the percent intensity of internode borer ranged from 0.65 to 3.35 per cent. The least intensity was observed in Co 94008 (0.65 %) while maximum intensity was observed in CoC 671 (3.35 %).

Root borer : *Emmalocera depresella* (Swinhoe)

The data are presented in table 4.1.1.3. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of root borer was found significant. Based on the percent incidence of root borer ranged from 8.00 to 16.00 per cent. The least incidence was observed in CoVSI 08121 (8.00 %) while maximum incidence was observed in Co 85004 (16 %).

Table -4.1.1.4 Screening of sugarcane varieties against Scales and Mealy bugs in AVT (E) II P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Scale insects		Mealy bugs	
		% incidence	% intensity	% incidence	% intensity
1	Co 8001	17.46 (8.00)	6.72 (0.37)	13.55 (5.33)	6.66 (0.36)
2	CoVSI 08121	17.46 (8.00)	6.36 (0.23)	17.46 (8.00)	9.3 (1.61)
3	Co 85004	17.46 (8.00)	6.33 (0.22)	39.82 (40.00)	15.53 (6.33)
4	Co 94008	22.05 (13.33)	7.61 (0.77)	17.46 (8.00)	8.01 (0.95)
5	CoC 671	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
	S.Em.+(T)	1.03	0.34	1.75	0.84
	C. D @ 5%	3.35	1.11	5.70	2.75
	C. V. %	11.10	8.97	16.09	16.17

Figures in the parenthesis are original values and those outside are arcsine transformed values

Scale insects, *Melanaspis glomerata* (Green)

The data are presented in table 4.1.1.4. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of scale insects were found significant. Based on the percent incidence of scale ranged from 0.00 to 13.33 per cent. The least incidence was observed in CoC 671 (0.00 %), while maximum incidence was observed in Co 94008 (13.33 %).

The data are presented in table 4.1.1.4. From the table, it is seen that the differences due to various genotypes in respect of percent intensity of scale was found significant. Percent intensity of scale ranged from 0.00 to 0.77 per cent. The least intensity was observed in CoC 671 (0.00 %) while maximum intensity was observed in Co 94008(0.77 %).

Mealy bugs:- *Saccharicoccus sacchari* (Cockerell)

The data are presented in table 4.1.1.4. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of mealy bugs were significant. Percent incidence of mealy bugs ranged from 0.00 to 40.00 per cent. The least incidence was observed in CoC 671 (0.00 %) while maximum incidence was observed in Co 85004 (40 %).

The data are presented in table 4.1.1.4. From the table, it is seen that the differences due to various genotypes in respect of percent intensity of mealy bugs were significant. Percent intensity of mealy bugs, ranged from 0.00 to 6.33per cent. The least intensity was observed in CoC 671 (0.00 %) while maximum intensity was observed in Co 85004 (6.33 %).

Project E.4.1.2 IVT early trial:

Table -4.1.2.1 Screening of sugarcane varieties against ESB in IVT early trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Early shoot borer				Cumulative % incidence	No.of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP		
1	Co 10004	0.00	12.09(3.43)	11.63(3.10)	9.94(1.98)	8.02	13367
2	Co 10005	0.00	13.21(4.38)	12.44(3.67)	10.26(2.18)	8.61	14350
3	Co 10024	0.00	8.26(1.16)	9.29(1.61)	9.18(1.55)	4.00	6667
4	Co 10026	0.00	10.36(2.25)	7.84(0.93)	10.24(2.19)	5.13	8550
5	Co 10027	0.00	7.94(0.98)	10.73(2.51)	9.00(1.45)	4.67	7783
6	CoM 10081	0.00	8.79(1.33)	10.11(2.11)	8.73(1.30)	4.62	7700
7	CoM 10082	0.00	11.06(2.70)	9.31(1.62)	8.33(1.20)	5.26	8767
8	CoN 10071	0.00	10.92(2.64)	8.05(1.04)	9.15(1.53)	4.90	8167
9	CoN 10072	0.00	7.88(0.95)	10.30(2.24)	8.70(1.29)	4.17	6950
10	CoT 10366	0.00	8.88(1.53)	11.97(3.40)	8.30(1.18)	5.42	9033
11	CoT 10367	0.00	11.77(3.27)	11.10(2.73)	7.96(0.99)	6.12	10200
12	Co 85004	0.00	10.70(2.49)	10.46(2.34)	7.87(0.95)	5.38	8967
13	Co 94008	0.00	8.46(1.28)	11.29(2.90)	11.03(2.69)	6.32	10533
14	CoC 671	0.00	11.35(2.91)	11.10(2.75)	8.09(1.07)	6.06	10100
	S.Em.+(T)		1.05	0.79	0.75		
	C. D @ 5%		3.07	2.29	NS		
	C. V. %		18.05	13.11	14.31		

Figures in the parenthesis are original values and those outside are arcsine transformed values

Early shoot borer, *Chilo infuscatellus* (S.):

The data are presented in table 4.1.2.1. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer were significant at 60 DAP and 90 DAP, while, 120 DAP was found non significant. Based on the cumulative per cent infestation of early shoot borer, the range was from 4.00 to 8.61 per cent. The least incidence was observed in Co 10024 (4.00 %) followed by CoN 10072 (4.17%), while maximum incidence was observed in Co 10005 (8.61%).

Table -4.1.2.2 Screening of sugarcane varieties against top boer in IVT early trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Top Borer		
		5 th month	7 th month	At harvest
1	Co 10004	8.86(1.52)	10.43(2.15)	12.74(3.91)
2	Co 10005	12.91(4.12)	10.75(2.49)	10.65(2.43)
3	Co 10024	8.26(1.16)	9.86(1.94)	9.58(1.77)
4	Co 10026	7.91(0.97)	7.99(1.01)	8.83(1.53)
5	Co 10027	10.92(2.63)	9.31(1.62)	10.97(2.67)
6	CoM 10081	8.97(1.44)	9.09(1.50)	9.18(1.55)
7	CoM 10082	11.31(2.87)	8.20(1.13)	11.57(3.05)
8	CoN 10071	8.05(1.04)	8.05(1.04)	9.46(1.71)
9	CoN 10072	10.02(2.31)	9.00(1.45)	8.80(1.51)
10	CoT 10366	11.99(3.35)	8.92(1.56)	12.34(3.66)
11	CoT 10367	11.19(2.79)	9.69(1.84)	11.49(2.99)
12	Co 85004	9.12(1.52)	10.00(2.06)	10.96(2.66)
13	Co 94008	12.68(4.03)	8.38(1.23)	9.87(1.95)
14	CoC 671	8.24(1.15)	8.31(1.19)	9.72(1.85)
	S.Em.+(T)	1.15	0.92	0.80
	C. D @ 5%	3.33	NS	2.33
	C. V. %	19.78	17.37	13.27

Figures in the parenthesis are original values and those outside are arcsine transformed values

Top borer: - *Scirpophaga excerptalis* (Wlk):

The data are presented in table 4.1.2.2. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of top borer at 5th month and at harvest were found significant. While percent incidence of top borer at 7th month was found non significant.

Based on the percent incidence of top borer at 5th month ranged from 0.97 to 4.12 per cent. The least incidence was observed in Co 10026 (0.97 %) while maximum incidence was observed in Co 10005 (4.12 %).

Based on the percent incidence of top borer at harvest ranged from 1.51 to 3.91 per cent. The least incidence was observed in CoN 10072 (1.51 %) while maximum incidence was observed in Co 10004 (3.91 %). All test genotypes were observed less susceptible.

Table -4.1.2.3 Screening of sugarcane varieties against internodes borer and root borer in IVT early trial at Main Sugarcane Research Station, Navsari (2013-14).)

Sr. No.	Genotype	Internode Borer			% Root borer
		% incidence	% intensity	% Infestation index	
1	Co 10004	24.35 (16.00)	10.94 (2.61)	0.42	28.18 (21.33)
2	Co 10005	17.46 (8.00)	8.00 (0.94)	0.08	22.05 (13.33)
3	Co 10024	22.05 (13.33)	10.23 (2.15)	0.29	23.94 (16.00)
4	Co 10026	22.21 (13.33)	10.08 (2.08)	0.28	17.46 (8.00)
5	Co 10027	22.21 (13.33)	9.56 (1.78)	0.24	22.05 (13.33)
6	CoM 10081	22.21 (13.33)	8.70 (1.31)	0.17	22.05 (13.33)
7	CoM 10082	17.46 (8.00)	8.10 (0.98)	0.08	17.46 (8.00)
8	CoN 10071	17.46 (8.00)	7.81 (0.85)	0.07	22.05 (13.33)
9	CoN 10072	22.05 (13.33)	9.09 (1.51)	0.20	23.94 (16.00)
10	CoT 10366	22.05 (13.33)	9.46 (1.7)	0.23	22.05 (13.33)
11	CoT 10367	14.43 (5.33)	7.05 (0.53)	0.03	22.05 (13.33)
12	Co 85004	5.74 (0.00)	5.74 (0.00)	0.00	17.46 (8.00)
13	Co 94008	17.46 (8.00)	7.83 (0.86)	0.07	17.46 (8.00)
14	CoC 671	22.05 (13.33)	11.03 (2.66)	0.36	22.05 (13.33)
	S.Em.+(T)	1.43	0.34		2.10
	C. D @ 5%	4.17	1.00		6.12
	C. V. %	12.92	6.77		16.99

Figures in the parenthesis are original values and those outside are arcsine transformed values

Internode borer : *Chilo sacchariphagous indicus* (Kapur)

The data are presented in table 4.1.2.3. From the table, it is seen that the differences due to various genotypes in respect of percent incidence and percent intensity of internode borer were found significant. Based on the percent incidence and percent intensity of internode borer the range was from 0.00 to 16.00 per cent and 0.00 to 2.66 per cent respectively. The least percent incidence and percent intensity of internode borer were observed in Co 85004 (0.00%), while maximum percent incidence and percent intensity were observed in Co 10004 (16% and 2.66%) respectively.

Root borer : *Emmalocera depresella* (Swinhoe)

The data are presented in table 4.1.2.3. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of root borer were significant. Percent incidence of root borer was rang from 8.00 to 21.33 per cent. The least incidence was observed in Co 10026 (8.00 %), CoM 10082 (8.00 %), Co 85004 and Co 94008 recorded 8 % incidence of early shoot borer. while maximum incidence was observed in Co 10004 (21.33 %).

Table -4.1.2.4 Screening of sugarcane varieties against Scales and Mealy bugs in IVT early trial at Main Sugarcane Research Station, Navsari (2013-14).)

Sr. No.	Genotype	Scale insects		Mealy bugs	
		% incidence	% intensity	% incidence	% intensity
1	Co 10004	28.12 (21.33)	11.58 (3.04)	28.12 (21.33)	16.94 (7.49)
2	Co 10005	28.12 (21.33)	11.5 (2.99)	13.55 (5.33)	6.71 (0.38)
3	Co 10024	13.55 (5.33)	7.84 (0.86)	5.74 (0.00)	5.74 (0.00)
4	Co 10026	13.55 (5.33)	6.3 (0.21)	17.46 (8.00)	7.99 (0.93)
5	Co 10027	17.46 (8.00)	8.4 (1.25)	22.05 (13.33)	14.89 (5.61)
6	CoM 10081	24.35 (16.00)	9.12 (1.53)	22.05 (13.33)	11.92 (3.28)
7	CoM 10082	22.05 (13.33)	9.21 (1.75)	38.23 (37.33)	20.28 (11.03)
8	CoN 10071	24.35 (16.00)	9.01 (1.64)	14.43 (5.33)	5.74 (0.00)
9	CoN 10072	13.55 (5.33)	8.66 (1.41)	20.98 (12.00)	7.84 (0.87)
10	CoT 10366	13.55 (5.33)	6.35 (0.23)	30 (24.00)	11.95 (3.52)
11	CoT 10367	23.94 (16.00)	13.63 (4.56)	24.35 (16.00)	9.03 (1.47)
12	Co 85004	28.12 (21.33)	10.01 (2.02)	38.23 (37.33)	16.26 (6.96)
13	Co 94008	28.12 (21.33)	11.15 (2.75)	5.74 (0.00)	5.74 (0.00)
14	CoC 671	17.46 (8.00)	8.27 (1.08)	5.74 (0.00)	5.74 (0.00)
	S.Em.+(T)	2.07	0.74	1.71	0.68
	C. D @ 5%	6.01	2.15	4.97	1.98
	C. V. %	16.92	13.67	14.45	11.23

Figures in the parenthesis are original values and those outside are arcsine transformed values

Scale insects, *Melanaspis glomerata* (Green)

The data are presented in table 4.1.2.4. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of scale were observed significant. Incidence of scale ranged from 5.33 to 21.33 per cent. The least incidence was observed in Co 10024 (5.33 %) while maximum incidence was observed in Co 10004 (21.33 %).

Based on the percent intensity of scale ranged from 0.21 to 4.56 per cent. The least intensity was observed in Co 10026 (0.21 %) while maximum intensity was observed in CoT 10367 (4.56 %).

Mealy bugs:- *Saccharicoccus sacchari* (Cockerell)

The data are presented in table 4.1.2.4. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of mealy bugs were found significant. Based on the percent incidence of mealy bugs ranged from 0.00 to 37.33 per cent. The least incidence was observed in Co 10024 (0.00 %) while maximum incidence was observed in CoM 10082 (37.33 %).

Based on the percent intensity mealy bugs infestation was ranged from 0.00 to 11.03 per cent. The least intensity was observed in Co 10024 (0%). while maximum intensity was observed in CoM 10082 (11.03 %).

Project E.4.1.3 AVT (E) I P trial:

Table -4.1.3.1 Screening of sugarcane varieties against ESB in AVT (E) I P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Early shoot borer				Cumulative % incidence	No.of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP		
1	Co 09002	0.00	7.73(0.87)	7.77(0.89)	12.03(3.36)	4.98	8300
2	Co 09003	0.00	8.97(1.43)	8.89(1.39)	11.06(2.68)	5.22	8700
3	Co 09004	0.00	8.04(1.03)	9.05(1.48)	8.94(1.42)	3.69	6150
4	Co 09005	0.00	5.73(0.00)	10.81(2.52)	13.93(4.80)	7.03	11717
5	Co 09006	0.00	9.47(1.71)	8.06(1.05)	8.04(1.03)	3.47	5783
6	Co 09007	0.00	9.41(1.67)	8.11(1.08)	10.80(2.56)	4.93	8217
7	CoN 09071	0.00	9.08(1.50)	8.95(1.43)	10.45(2.35)	4.82	8033
8	CoN 09072	0.00	7.70(0.86)	8.70(1.29)	10.05(2.07)	4.10	6833
9	Co 85004	0.00	9.45(1.70)	8.13(1.08)	10.86(2.57)	5.03	8383
10	Co 94008	0.00	9.91(1.97)	9.69(1.84)	8.34(1.20)	4.47	7450
11	CoC 671	0.00	8.39(1.23)	9.61(1.79)	11.15(2.78)	5.43	9050
	S.Em.+(T)	-	0.97	0.68	0.71		
	C. D @ 5%	-	NS	NS	2.10		
	C. V. %	-	18.34	13.33	11.72		

Figures in the parenthesis are original values and those outside are arcsine transformed values

Table -4.1.3.2 Screening of sugarcane varieties against top borer in AVT (E) I P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Top Borer		
		5 th month	7 th month	At harvest
1	Co 09002	10.57(2.40)	9.30(1.62)	9.08(1.49)
2	Co 09003	9.00(1.45)	10.85(2.58)	10.67(2.47)
3	Co 09004	13.08(4.36)	11.20(2.82)	9.35(1.64)
4	Co 09005	11.04(2.67)	11.23(2.80)	11.48(2.97)
5	Co 09006	11.84(3.34)	11.27(2.88)	8.35(1.21)
6	Co 09007	10.93(2.65)	9.30(1.62)	8.19(1.12)
7	CoN 09071	9.07(1.49)	8.75(1.47)	10.85(2.59)
8	CoN 09072	10.45(2.33)	9.00(1.45)	9.05(1.48)
9	Co 85004	9.44(1.70)	9.57(1.77)	9.57(1.76)
10	Co 94008	11.65(3.14)	9.91(1.97)	11.58(3.06)
11	CoC 671	9.60(1.79)	9.68(1.83)	9.84(1.92)
	S.Em.+(T)	0.82	0.69	0.71
	C. D @ 5%	2.42	NS	2.08
	C. V. %	13.38	11.97	12.46

Figures in the parenthesis are original values and those outside are arcsine transformed values

Early shoot borer, *Chilo infuscatellus* (S.):

The data are presented in table 4.1.3.1. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer at 60 DAP and 90 DAP were found non significant. While, at 120 DAP, it was found significant. Based on the cumulative per cent infestation, early shoot borer infestation was ranged from 3.47 to 7.03 per cent. The least incidence was observed in Co 09006 (3.47 %) while maximum incidence was observed in Co 09005 (7.03%).

Top borer: - *Scirpophaga excerptalis* (Wlk):

The data are presented in table 4.1.3.2. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of top borer at 5th month and at harvest were found significant. While percent incidence of top borer at 7th month was found non significant.

Based on the percent incidence of top borer infestation was at 5th month ranged from 1.45 to 4.36 per cent. The least incidence was observed in Co 09003 (1.45 %) while maximum incidence was observed in Co 09004 (4.36 %).

Based on the percent incidence of top borer at 7th month the range was ranged from 1.45 to 2.88 per cent. The least incidence was observed in CoN 09072 (1.45 %) while maximum incidence was observed in Co 09006 (2.88 %).

Based on the percent incidence of top borer at harvest the infestation was ranged from 1.21 to 4.51 per cent. The least incidence was observed in Co 09006 (1.21 %) while maximum incidence was observed in Co 94008 (4.51 %).

Internode borer : *Chilo sacchariphagous indicus* (Kapur)

The data are presented in table 4.1.3.3. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of internode borer were found significant. Based on the percent incidence of internode borer the range was from 5.33 to 16.00 per cent. The least incidence was observed in Co 09007 (5.33 %) while maximum incidence was observed in Co 09002 (16 %).

The percent intensity of internode borer was ranged from 0.52 to 2.89 per cent. The least intensity was observed in Co 09007 (0.52 %) while maximum intensity was observed in Co 09004 (2.89 %).

Root borer : *Emmalocera depresella* (Swinhoe)

The data are presented in table 4.1.3.3. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of root borer were observed significant. Based on the percent incidence of root borer ranged from 8.00 to 16.00 per cent. The least

incidence was observed in Co 09002 (8.00 %) while maximum incidence was observed in Co 09006 (16 %).

Table -4.1.3.3 Screening of sugarcane varieties against internodes borer and root borer in AVT (E) I P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Internode Borer			% Root borer
		% incidence	% intensity	% Infestation index	
	Co 09002	24.35 (16.00)	9.62 (1.79)	0.29	17.46 (8.00)
2	Co 09003	17.46 (8.00)	7.8 (0.84)	0.07	17.46 (8.00)
3	Co 09004	24.35 (16.00)	11.37 (2.89)	0.46	22.05 (13.33)
4	Co 09005	22.21 (13.33)	9.26 (1.59)	0.21	17.46 (8.00)
5	Co 09006	17.46 (8.00)	9.01 (1.47)	0.12	24.35 (16.00)
6	Co 09007	14.43 (5.33)	7.02 (0.52)	0.03	22.05 (13.33)
7	CoN 09071	22.21 (13.33)	8.72 (1.31)	0.17	17.46 (8.00)
8	CoN 09072	22.05 (13.33)	9.35 (1.67)	0.22	22.05 (13.33)
9	Co 85004	17.46 (8.00)	7.61 (0.75)	0.06	17.46 (8.00)
10	Co 94008	22.05 (13.33)	8.79 (1.35)	0.18	22.05 (13.33)
11	CoC 671	22.05 (13.33)	8.81 (1.36)	0.18	17.46 (8.00)
	S.Em.+(T)	1.24	0.43		1.39
	C. D @ 5%	3.67	1.27		4.09
	C. V. %	10.48	8.41		12.15

Figures in the parenthesis are original values and those outside are arcsine transformed values

Table -4.1.3.4 Screening of sugarcane varieties against Scales and Mealy bugs in AVT (E) I P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Scale insects		Mealy bugs	
		% incidence	% intensity	% incidence	% intensity
	Co 09002	30.00 (24.00)	12.68 (3.82)	17.46 (8.00)	6.65 (0.35)
2	Co 09003	28.12 (21.33)	8.79 (1.34)	17.46 (8.00)	6.62 (0.34)
3	Co 09004	13.55 (5.33)	6.76 (0.39)	5.74 (0.00)	5.74 (0.00)
4	Co 09005	28.12 (21.33)	10.21 (2.22)	36.65 (34.67)	12.01 (3.34)
5	Co 09006	17.46 (8.00)	8.52 (1.33)	35.06 (32)	12.44 (3.64)
6	Co 09007	30.00 (24.00)	19.44 (10.09)	17.46 (8.00)	6.89 (0.47)
7	CoN 09071	13.55 (5.33)	7.00 (0.51)	18.68 (9.33)	8.68 (1.28)
8	CoN 09072	5.74 (0.00)	5.74 (0.00)	14.43 (5.33)	8.08 (0.98)
9	Co 85004	5.74 (0.00)	5.74 (0.00)	39.82 (40.00)	14.13 (4.96)
10	Co 94008	5.74 (0.00)	5.74 (0.00)	17.46 (8.00)	6.57 (0.32)
11	CoC 671	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
	S.Em.+(T)	1.83	0.62	0.76	0.35
	C. D @ 5%	5.40	1.83	2.24	1.04
	C. V. %	18.96	12.26	6.41	7.17

Figures in the parenthesis are original values and those outside are arcsine transformed values

Scale insects, *Melanaspis glomerata* (Green)

The data are presented in table 4.1.3.4. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of scale were significant. Based on the percent incidence of scale ranged from 0.00 to 24.00 per cent. The least incidence was observed in CoN 09072 (0.00 %) while maximum incidence was observed in Co 09002 (24 %).

The percent intensity of scale was ranged from 0.00 to 10.09 per cent. The least intensity was observed in CoN 09072 (0.00 %) while maximum intensity was observed in Co 09007 (10.09 %).

Mealy bugs:- *Saccharicoccus sacchari* (Cockerell)

The data are presented in table 4.1.3.4. It is seen from the table that the differences due to various genotypes in respect of percent incidence of mealy bugs were found significant. Based on the percent incidence of mealy bugs ranged from 0.00 to 40.00 per cent. The least incidence was observed in Co 09004 (0.00 %) while maximum incidence was observed in Co 85004 (40 %). Based on the percent intensity of mealy bugs ranged from 0.00 to 4.96 per cent. The least intensity was observed in Co 09004 (0.00 %) while maximum intensity was observed in Co 85004 (4.96 %).

Project E.4.1.4 AVT (M) I P trial:

Table -4.1.4.1 Screening of sugarcane varieties against ESB in AVT (M) I P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Early shoot borer				Cumulative % incidence	No. of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP		
1	Co 09009	0.00	8.59(1.37)	7.93(0.98)	8.84 (1.36)	3.54	5900
2	Co 09012	0.00	8.31(1.19)	11.12(2.77)	10.95 (2.64)	6.15	10250
3	Co 09013	0.00	10.19(2.16)	7.63(0.82)	9.82 (1.93)	4.55	7583
4	Co 09014	0.00	10.68(2.44)	8.67(1.40)	8.48 (1.28)	4.43	7383
5	Co 02040	0.00	7.83(0.92)	10.36(2.26)	8.77 (1.32)	4.26	7100
6	CoN 09073	0.00	8.73(1.46)	7.87(0.95)	9.00 (1.45)	3.77	6283
7	CoN 09074	0.00	9.01(1.45)	7.89(0.95)	7.84 (0.93)	3.10	5167
8	CoSnk 05102	0.00	7.86(0.94)	7.71(0.86)	10.10 (2.10)	4.13	6883
9	CoVSI 09121	0.00	10.97(2.64)	8.12(1.08)	7.82 (0.92)	4.23	7050
10	Co 86032	0.00	9.17(1.54)	9.05(1.48)	11.35 (2.87)	5.58	9300
11	Co 99004	0.00	8.88(1.53)	8.75(1.45)	10.00 (2.01)	5.19	8650
	S.Em.+(T)	-	0.97	0.99	0.60		
	C. D @ 5%	-	NS	NS	1.77		
	C. V. %	-	18.34	19.76	11.09		

Figures in the parenthesis are original values and those outside are arcsine transformed values

Early shoot borer, *Chilo infuscatellus* (S.):

The data are presented in table 4.1.4.1. It is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer at 60 DAP and 90 DAP were found non significant. While, at 120 DAP, it was found significant. Based on the cumulative per cent infestation of early shoot borer the range was from 4.87 to 10.14 per cent. The least incidence was observed in Co 8001 (4.87 %) while maximum incidence was observed in CoC 671 (10.14%).

Table -4.1.4.2 Screening of sugarcane varieties against top borer in AVT (M) I P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Top Borer		
		5 th month	7 th month	At harvest
1	Co 09009	11.49 (3.06)	9.27 (1.60)	8.14 (1.09)
2	Co 09012	11.16 (2.80)	11.28 (2.87)	9.63 (1.80)
3	Co 09013	8.89 (1.39)	9.08 (1.49)	8.88 (1.55)
4	Co 09014	8.65 (1.39)	12.44 (3.69)	10.36 (2.24)
5	Co 02040	10.95 (2.69)	8.90 (1.40)	10.54 (2.38)
6	CoN 09073	10.88 (2.60)	10.99 (2.68)	9.40 (1.67)
7	CoN 09074	9.22 (1.57)	11.02 (2.71)	11.00 (2.68)
8	CoSnk 05102	8.90 (1.40)	10.58 (2.41)	9.08 (1.49)
9	CoVSI 09121	11.03 (2.72)	8.07 (1.05)	9.14 (1.74)
10	Co 86032	9.50 (1.73)	8.03 (1.03)	9.22 (1.57)
11	Co 99004	11.57 (3.53)	12.61 (3.84)	12.58 (3.81)
	S.Em.+(T)	0.71	0.66	0.98
	C. D @ 5%	2.08	1.94	NS
	C. V. %	11.87	11.15	17.27

Figures in the parenthesis are original values and those outside are arcsine transformed values

Top borer: - *Scirpophaga excerptalis* (Wlk):

The data are presented in table 4.1.4.2. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of top borer at 5th month and 7th month were found significant while percent incidence of top borer at harvest was found non significant.

The range of percent incidence of top borer at 5th month was from 1.39 to 3.60 per cent. The least incidence was observed in Co 09013 (1.39 %) while maximum incidence was observed in Co 99004 (3.6 %).

The percent incidence of top borer infestation at 7th month was ranged from 1.03 to 3.84 per cent. The least incidence was observed in Co 86032 (1.03 %) while maximum incidence was observed in Co 99004 (3.84 %).

Based on the percent incidence the top borer infestation at harvest was ranged from 1.09 to 3.81 per cent. The least incidence was observed in Co 09009 (1.09 %) while maximum incidence was observed in Co 99004 (3.81 %).

Table -4.1.4.3 Screening of sugarcane varieties against internodes borer and root borer in AVT (M) I P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Internode Borer			% Root borer
		% incidence	% intensity	% Infestation index	
1	Co 09009	30.00 (24.00)	11.24 (2.80)	0.67	22.05 (13.33)
2	Co 09012	14.43 (5.33)	7.07 (0.54)	0.03	17.46 (8.00)
3	Co 09013	22.05 (13.33)	8.97 (1.45)	0.19	28.12 (21.33)
4	Co 09014	24.35 (16.00)	9.36 (1.65)	0.26	22.05 (13.33)
5	Co 02040	17.46 (8.00)	7.81 (0.85)	0.07	17.46 (8.00)
6	CoN 09073	22.05 (13.33)	9.67 (1.82)	0.24	24.35 (16.00)
7	CoN 09074	14.43 (5.33)	7.29 (0.65)	0.03	17.46 (8.00)
8	CoSnk 05102	17.46 (8.00)	7.82 (0.85)	0.07	24.35 (16.00)
9	CoVSI 09121	17.46 (8.00)	7.94 (0.91)	0.07	22.05 (13.33)
10	Co 86032	14.43 (5.33)	7.24 (0.62)	0.03	17.46 (8.00)
11	Co 99004	17.46 (8.00)	8.94 (1.43)	0.11	22.05 (13.33)
	S.Em.₊(T)	1.08	0.47		1.16
	C. D @ 5%	3.20	1.38		3.43
	C. V. %	9.75	9.54		9.43

Figures in the parenthesis are original values and those outside are arcsine transformed values

Internode borer : *Chilo sacchariphagous indicus* (Kapur)

The percent incidence of internode borer was range from 5.33 to 24.00 per cent. The least incidence was observed in Co 09012 (5.33 %) while maximum incidence was observed in Co 09009 (24 %).

The percent intensity of internode borer was range from 0.54 to 2.80 per cent. The least intensity was observed in Co 09012 (0.54 %) while maximum intensity was observed in Co 09009 (2.8 %).

Root borer : *Emmalocera depresella* (Swinhoe)

The data are presented in table 4.1.4.3. It is seen that the differences due to various genotypes in respect of percent incidence of root borer was found significant. Based on the percent incidence of root borer ranged from 8.00 to 21.33 per cent. The least incidence was observed in Co 09012 (8.00 %) while maximum incidence was observed in Co 09013 (21.33 %).

Table -4.1.4.4 Screening of sugarcane varieties against internodes borer and root borer in AVT (M) I P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Scale insects		Mealy bugs	
		% incidence	% intensity	% incidence	% intensity
1	Co 09009	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
2	Co 09012	5.74 (0.00)	5.74 (0.00)	28.12 (21.33)	10.59 (2.46)
3	Co 09013	5.74 (0.00)	5.74 (0.00)	28.12 (21.33)	10.92 (2.61)
4	Co 09014	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
5	Co 02040	28.12 (21.33)	12.1 (3.4)	5.74 (0.00)	5.74 (0.00)
6	CoN 09073	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
7	CoN 09074	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
8	CoSnk 05102	17.46 (8.00)	6.65 (0.34)	5.74 (0.00)	5.74 (0.00)
9	CoVSI 09121	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
10	Co 86032	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
11	Co 99004	22.05 (13.33)	8.56 (1.27)	17.46 (8.00)	7.08 (0.52)
	S.Em.+(T)	0.85	0.31	0.82	0.42
	C. D @ 5%	2.51	0.91	2.43	1.25
	C. V. %	14.27	8.05	13.11	10.86

Figures in the parenthesis are original values and those outside are arcsine transformed values

Scale insects, *Melanaspis glomerata* (Green)

The data are presented in table 4.1.4.4. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of scale were found significant. The percent incidence of scale was range from 0.00 to 21.33 per cent. The least incidence was observed in Co 09009 (0.00 %) while maximum incidence was observed in Co 02040 (21.33 %).

Based on the percent intensity, scale infestation was ranged from 0.00 to 3.40 per cent. The least intensity was observed in Co 09009 (0.00 %) while maximum intensity was observed in Co 02040 (3.4 %).

Mealy bugs:- *Saccharicoccus sacchari* (Cockerell)

The data are presented in table 4.1.4.4. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of mealy bugs were found significant. Based on the percent incidence of mealy bugs, the ranged from 0.00 to 21.33 per cent. The least incidence was observed in Co 09009 (0.00 %) while maximum incidence was observed in Co 09012 (21.33 %).

The percent intensity of mealy bugs was ranged from 0.00 to 2.61 per cent. The least intensity was observed in Co 09009 (0.00 %) while maximum intensity was observed in Co 09013 (2.61 %).

Project E.4.1.5 AVT (M) II P trial:

Table -4.1.5.1 Screening of sugarcane varieties against ESB in AVT (M) II P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Early shoot borer				Cumulative % incidence	No. of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP		
1	Co 08008	0.00	8.10(1.07)	9.29(1.61)	11.38(2.95)	5.45	9083
2	Co 08009	0.00	8.58(1.35)	8.43(1.26)	9.07 (1.68)	4.00	6667
3	Co 08016	0.00	12.30(3.55)	10.19(2.17)	10.63(2.47)	7.51	12517
4	Co 08020	0.00	7.78(0.90)	7.84(0.93)	8.75(1.32)	3.02	5033
5	CoSnk 08101	0.00	10.35(2.28)	11.12(2.73)	8.37(1.24)	5.93	9883
6	Co 86032	0.00	8.94(1.42)	10.34(2.25)	8.73(1.30)	5.02	8367
7	Co 99004	0.00	10.44(2.30)	8.46(1.28)	12.13(3.52)	6.45	10750
	S.Em.+(T)	-	0.86	0.89	1.09		
	C. D @ 5%	-	2.65	NS	NS		
	C. V. %	-	15.68	16.44	19.11		

Figures in the parenthesis are original values and those outside are arcsine transformed values

Early shoot borer, *Chilo infuscatellus* (S.):

The data are presented in table 4.1.5.1. It is observed from table that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer at 60 DAP, it was found significant While, at 90 DAP and 120 DAP were found non significant. Based on the cumulative per cent infestation of early shoot borer ranged from 3.02 to 7.51 per cent. The least incidence was observed in Co 08020 (3.02 %) while maximum incidence was observed in Co 08016 (7.51%).

Table -4.1.5.2 Screening of sugarcane varieties against top borer in AVT (M) II P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Top Borer		
		5 th month	7 th month	At harvest
1	Co 08008	8.37(1.23)	9.74(1.87)	9.57(2.03)
2	Co 08009	12.29(3.63)	11.72(3.17)	9.90(1.96)
3	Co 08016	10.41(2.30)	8.97(1.44)	8.75(1.48)
4	Co 08020	9.09(1.50)	10.84(2.57)	11.83(3.35)
5	CoSnk 08101	9.15(1.53)	11.01(2.71)	9.29(1.61)
6	Co 86032	10.77(2.53)	10.82(2.56)	8.90(1.57)
7	Co 99004	12.11(4.05)	10.51(2.34)	10.57(2.37)
	S.Em.+(T)	0.86	0.65	0.97
	C. D @ 5%	2.65	NS	NS
	C. V. %	14.42	10.68	16.99

Figures in the parenthesis are original values and those outside are arcsine transformed values

Top borer: - *Scirpophaga excerptalis* (Wlk):

The data are presented in table 4.1.5.2. It is seen that the differences due to various genotypes in respect of percent incidence of top borer at 5th month were found significant. While percent incidence of top borer at 7th month and at harvest were found non significant.

The percent incidence of top borer at 5th month was ranged from 1.23 to 3.63 per cent. The least incidence was observed in Co 08008 (1.23 %) while maximum incidence was observed in Co 08009 (3.63 %).

Based on the percent incidence of top borer at 7th month ranged from 1.44 to 3.17 per cent. The least incidence was observed in Co 08016 (1.44 %) while maximum incidence was observed in Co 08009 (3.17 %).

The percent incidence of top borer at harvest was ranged from 1.49 to 3.35 per cent. The least incidence was observed in Co 08016 (1.49 %) while maximum incidence was observed in Co 08020 (3.35 %).

Table -4.1.5.3 Screening of sugarcane varieties against internodes borer and root borer in AVT (M) II P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Internode Borer			% Root borer
		% incidence	% intensity	% Infestation index	
1	Co 08008	28.18 (21.33)	10.35 (2.24)	0.48	28.12 (21.33)
2	Co 08009	22.21 (13.33)	10.11 (2.14)	0.29	17.46 (8.00)
3	Co 08016	24.35 (16.00)	10.39 (2.25)	0.36	22.05 (13.33)
4	Co 08020	28.18 (21.33)	10.79 (2.51)	0.53	17.46 (8.00)
5	CoSnk 08101	24.35 (16.00)	9.3 (1.62)	0.26	23.94 (16.00)
6	Co 86032	28.18 (21.33)	10.83 (2.53)	0.54	17.46 (8.00)
7	Co 99004	22.21 (13.33)	8.87 (1.40)	0.19	22.05 (13.33)
	S.Em.+(T)	0.48	0.51		1.90
	C. D @ 5%	1.48	NS		5.85
	C. V. %	3.28	8.71		15.49

Figures in the parenthesis are original values and those outside are arcsine transformed values

Internode borer : *Chilo sacchariphagous indicus* (Kapur)

The data are presented in table 4.1.5.3. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of inter node borer were found significant. Based on the percent, incidence of internode borer was range from 13.33 to 21.33 per cent. The least incidence was observed in Co 08009 (13.33 %) while maximum incidence was observed in Co 08008 (21.33 %).

The percent intensity of internode borer ranged from 1.40 to 2.53 per cent. The least intensity was observed in Co 99004 (1.4 %) while maximum intensity was observed in Co 86032 (2.53 %).

Root borer : *Emmalocera depressella* (Swinhoe)

The data are presented in table 4.1.5.3. It is observed that the differences due to various genotypes in respect of percent incidence of root borer were found significant. Based on the percent incidence of root borer ranged from 8.00 to 21.33 per cent. The least incidence was observed in Co 08009 (8.00 %) while maximum incidence was observed in Co 08008 (21.33 %).

Table -4.1.5.4 Screening of sugarcane varieties against Scales and Mealy bugs in AVT (M) II P trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Scale insects		Mealy bugs	
		% incidence	% intensity	% incidence	% intensity
1	Co 08008	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
2	Co 08009	30 (24.00)	11.48 (2.97)	5.74 (0.00)	5.74 (0.00)
3	Co 08016	5.74 (0.00)	5.74 (0.00)	28.12 (21.33)	9.35 (1.64)
4	Co 08020	17.46 (8.00)	7.14 (0.55)	5.74 (0.00)	5.74 (0.00)
5	CoSnk 08101	5.74 (0.00)	5.74 (0.00)	24.35 (16.00)	9.05 (1.51)
6	Co 86032	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
7	Co 99004	26.23 (18.67)	10.33 (2.23)	17.46 (8.00)	6.6 (0.33)
	S.Em.+(T)	0.71	0.27	0.71	0.31
	C. D @ 5%	2.19	0.84	2.19	0.96
	C. V. %	8.93	6.40	9.29	7.88

Figures in the parenthesis are original values and those outside are arcsine transformed values

Scale insects, *Melanaspis glomerata* (Green)

The data are presented in table 4.1.5.4. From the table, it is observed that the differences due to various genotypes in respect of percent incidence of scale were found significant. Based on the percent incidence of scale ranged from 0.00 to 24.00 per cent. The least incidence was observed in Co 08008 (0.00 %) while maximum incidence was observed in Co 08009 (24 %).

The per cent intensity of scale was ranged from 0.00 to 2.97 per cent. The least intensity was observed in Co 08008 (0.00 %) while maximum intensity was observed in Co 08009 (2.97 %).

Mealy bugs:- *Saccharicoccus sacchari* (Cockerell)

The data are presented in table 4.1.5.4. it is seen from the table that the differences due to various genotypes in respect of percent incidence of mealy bugs were found significant. Based on the percent incidence of mealy bugs ranged from 0.00 to 21.33 per cent. The least incidence

was observed in Co 08008 (0.00 %) while maximum incidence was observed in Co 08016 (21.33 %).

The percent intensity of mealy bugs was ranged from 0.00 to 1.64 per cent. The least intensity was observed in Co 08008 (0.00 %) while maximum intensity was observed in Co 08016 (1.64 %).

Project E.4.1.6 IVT (M) trial:

Table -4.1.6.1 Screening of sugarcane varieties against ESB in IVT (M) trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Early shoot borer				Cumulative % incidence	No.of bored plants/ha
		30 DAP	60 DAP	90 DAP	120 DAP		
1	Co 10015	0.00	8.19(1.12)	8.28(1.17)	8.22 (1.13)	3.17	5283
2	Co 10031	0.00	11.12(2.77)	10.91(2.63)	9.17 (1.54)	6.34	10567
3	Co 10033	0.00	8.26(1.16)	9.21(1.57)	9.13 (1.52)	3.94	6567
4	CoM 10083	0.00	11.32(2.89)	8.05(1.04)	9.22 (1.57)	5.03	8383
5	CoM 10084	0.00	11.80(3.22)	9.63(1.80)	9.53 (1.74)	6.08	10133
6	CoN 10073	0.00	8.52(1.31)	9.81(1.91)	11.39 (2.93)	5.78	9633
7	CoT 10368	0.00	11.20(2.81)	8.06(1.05)	8.03 (1.03)	4.55	7583
8	CoT 10369	0.00	10.84(2.57)	5.73(0.00)	10.59 (2.42)	4.65	7750
9	CoVC 10061	0.00	8.70(1.42)	13.9(4.78)	9.55 (1.76)	7.07	11783
10	CoVSI 10121	0.00	9.52(1.74)	9.32(1.63)	9.14 (1.52)	4.43	7383
11	CoVSI 10122	0.00	8.74(1.45)	8.94(1.42)	10.86 (2.57)	5.10	8500
12	PI 10131	0.00	8.56(1.33)	8.54(1.32)	11.49 (3.02)	5.26	8767
13	PI 10132	0.00	9.74(1.860)	8.26(1.16)	9.42 (1.68)	4.35	7250
14	Co 86032	0.00	7.98(1.00)	10.98(2.66)	8.73 (1.30)	4.22	7033
15	Co 99004	0.00	11.28(2.94)	10.01(2.02)	12.13 (3.52)	7.64	12733
	S.Em.+(T)		1.06	0.71	0.65		
	C. D @ 5%		NS	2.05	1.89		
	C. V. %		18.84	13.14	11.55		

Figures in the parenthesis are original values and those outside are arcsine transformed values

Early shoot borer, *Chilo infuscatellus* (S.):

The data are presented in table 4.1.6.1. It is seen from the table that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer at 60 DAP were found non significant. While, at 90 DAP and 120 DAP, it was found significant. Based on the cumulative per cent infestation of early shoot borer ranged from 3.17 to 7.64 per cent. The least incidence was observed in Co 10015 (3.17 %) while maximum incidence was observed in Co 99004 (7.64 %).

Table -4.1.6.2 Screening of sugarcane varieties against top borer in IVT (M) trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	% incidence of Top Borer		
		5 th month	7 th month	At harvest
1	Co 10015	11.52(3.06)	8.23(1.14)	11.68(3.18)
2	Co 10031	9.30(1.61)	9.03(1.66)	9.46(1.70)
3	Co 10033	12.31(3.71)	11.39(2.96)	11.52(3.03)
4	CoM 10083	10.96(3.03)	8.45(1.27)	9.93(1.97)
5	CoM 10084	12.04(3.42)	9.91(1.97)	9.83(2.21)
6	CoN 10073	10.04(2.04)	8.67(1.40)	10.26(2.17)
7	CoT 10368	8.30(1.18)	11.54(3.05)	11.77(3.22)
8	CoT 10369	11.80(3.29)	9.44(1.70)	9.57(1.77)
9	CoVC 10061	8.40(1.24)	9.65(1.82)	11.47(2.99)
10	CoVSI 10121	9.41(1.68)	11.23(2.84)	11.42(2.98)
11	CoVSI 10122	8.01(1.02)	10.93(2.64)	9.50(1.73)
12	PI 10131	8.56(1.34)	11.81(3.27)	9.89(1.96)
13	PI 10132	9.36(1.88)	11.74(3.19)	10.94(2.64)
14	Co 86032	10.77(2.53)	10.82(2.56)	8.90(1.57)
15	Co 99004	12.11(4.05)	10.51(2.34)	10.57(2.37)
	S.Em._±(T)	0.98	0.85	0.95
	C. D @ 5%	2.84	2.48	NS
	C. V. %	16.56	14.47	15.67

Figures in the parenthesis are original values and those outside are arcsine transformed values

Top borer: - *Scirpophaga excerptalis* (Wlk):

The data are presented in table 4.1.6.2. It is seen that the differences due to various genotypes in respect of percent incidence of top borer at 5th month and 7th month were found significant. While percent incidence of top borer at harvest was found non significant.

The percent incidence of top borer at 5th month was ranged from 1.02 to 3.71 per cent. The least incidence was observed in CoVSI 10122 (1.02 %) while maximum incidence was observed in Co 10033 (3.71 %). Based on the percent incidence of top borer at 7th month ranged from 1.14 to 3.27 per cent. The least incidence was observed in Co 10015 (1.14 %) while maximum incidence was observed in PI 10131 (3.27 %).

Table -4.1.6.3 Screening of sugarcane varieties against internodes borer and root borer in IVT (M) trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Internode borer			% Root borer
		% incidence	% intensity	% Infestation index	
1	Co 10015	22.21 (13.33)	9.5 (1.76)	0.23	22.05 (13.33)
2	Co 10031	5.74 (0.00)	5.74 (0.00)	0.00	28.12 (21.33)
3	Co 10033	5.74 (0.00)	5.74 (0.00)	0.00	17.46 (8.00)
4	CoM 10083	24.35 (16.00)	9.79 (1.9)	0.30	22.05 (13.33)
5	CoM 10084	22.21 (13.33)	9.59 (1.78)	0.24	17.46 (8.00)
6	CoN 10073	30.00 (24.00)	12.43 (3.64)	0.87	17.46 (8.00)
7	CoT 10368	5.74 (0.00)	5.74 (0.00)	0.00	17.46 (8.00)
8	CoT 10369	22.21 (13.33)	8.80 (1.36)	0.18	23.94 (16.00)
9	CoVC 10061	22.21 (13.33)	10.06 (2.05)	0.27	22.05 (13.33)
10	CoVSI 10121	5.74 (0.00)	5.74 (0.00)	0.00	22.05 (13.33)
11	CoVSI 10122	22.21 (13.33)	8.96 (1.45)	0.19	17.46 (8.00)
12	PI 10131	24.35 (16.00)	10.18 (2.13)	0.34	17.46 (8.00)
13	PI 10132	22.05 (13.33)	9.64 (1.8)	0.24	22.05 (13.33)
14	Co 86032	17.46 (8.00)	7.24 (0.62)	0.05	17.46 (8.00)
15	Co 99004	24.35 (16.00)	8.94 (1.43)	0.23	22.05 (13.33)
	S.Em._±(T)	0.75	0.41		1.77
	C. D @ 5%	2.18	1.19		5.12
	C. V. %	7.07	8.31		14.99

Figures in the parenthesis are original values and those outside are arcsine transformed values

Internode borer : *Chilo sacchariphagous indicus* (Kapur)

The data are presented in table 4.1.6.3. the perusal of the table revealed that the differences due to various genotypes in respect of percent incidence of internode borer were significant. The percent incidence of internode borer was ranged from 0.00 to 24.00 per cent. The least incidence was observed in Co 10031 (0.00 %) while maximum incidence was observed in CoN 10073 (24 %). The percent intensity of internode borer was ranged from 0.00 to 3.64 per cent. The least intensity was observed in Co 10031(0.00 %) while maximum intensity was observed in CoN 10073 (3.64 %).

Root borer : *Emmalocera depresella* (Swinhoe)

The data are presented in table 4.1.6.3. perusing the table, it is seen that the differences due to various genotypes in respect of percent incidence of root borer were found significant. The percent incidence of root borer was ranged from 8.00 to 21.33 per cent. The least incidence was observed in Co 10033 (8.00 %) while maximum incidence was observed in Co 10031 (21.33 %).

Table -4.1.6.4 Screening of sugarcane varieties against Scales and Mealy bugs in IVT (M) trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Genotype	Scale insects		Mealy bugs	
		% incidence	% intensity	% incidence	% intensity
1	Co 10015	17.46 (8.00)	7.45 (0.73)	5.74 (0.00)	5.74 (0.00)
2	Co 10031	28.12 (21.33)	19.3 (9.92)	5.74 (0.00)	5.74 (0.00)
3	Co 10033	28.12 (21.33)	12.4 (3.64)	5.74 (0.00)	5.74 (0.00)
4	CoM 10083	17.46 (8.00)	8.4 (1.13)	5.74 (0.00)	5.74 (0.00)
5	CoM 10084	28.12 (21.33)	9.97 (2.00)	28.12 (21.33)	10.78 (2.52)
6	CoN 10073	5.74 (0.00)	5.74 (0.00)	20.98 (12.00)	7.88 (0.89)
7	CoT 10368	5.74 (0.00)	5.74 (0.00)	28.12 (21.33)	11.6 (3.04)
8	CoT 10369	5.74 (0.00)	5.74 (0.00)	28.12 (21.33)	9 (1.47)
9	CoVC 10061	5.74 (0.00)	5.74 (0.00)	24.35 (16.00)	8.59 (1.23)
10	CoVSI 10121	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)	5.74 (0.00)
11	CoVSI 10122	22.05 (13.33)	7.88 (0.96)	5.74 (0.00)	5.74 (0.00)
12	PI 10131	13.55 (5.33)	6.31 (0.21)	17.46 (8.00)	6.56 (0.32)
13	PI 10132	17.46 (8.00)	7.17 (0.59)	22.05 (13.33)	8.98 (1.45)
14	Co 86032	17.46 (8.00)	6.4 (0.25)	17.46 (8.00)	6.7 (0.38)
15	Co 99004	5.74 (0.00)	5.74 (0.00)	17.46 (8.00)	6.62 (0.34)
	S.Em._±(T)	1.41	0.47	1.17	0.27
	C. D @ 5%	4.09	1.37	3.38	0.78
	C. V. %	16.36	10.24	12.71	6.31

Figures in the parenthesis are original values and those outside are arcsine transformed values

Scale insects, *Melanaspis glomerata* (Green)

The data are presented in table 4.1.6.4. It is seen that the differences due to various genotypes in respect of percent incidence of scale were found significant. Based on the percent incidence of scale ranged from 0.00 to 21.33 per cent. The least incidence was observed in CoN 10073 (0.00 %) while maximum incidence was observed in Co 10031(21.33 %). The percent intensity of scale was ranged from 0.00to 9.92per cent.The least intensity was observed in CoN 10073 (0.00 %) while maximum intensity was observed Co 10031 (9.92 %).

Mealy bugs:- *Saccharicoccus sacchari* (Cockerell)

The data are presented in table 4.1.6.4. perusal of the data revealed that the differences due to various genotypes in respect of percent incidence of mealy bugs was found significant. Based on the percent incidence of mealy bugs ranged from 0.00 to 21.33 per cent. The least incidence was observed in Co 10015 (0.00 %) while maximum incidence was observed in CoM 10084 (21.33 %). The percent intensity of mealy bugs was ranged from 0.00to 3.04 per cent. The least intensity was observed in Co 10015 (0.00 %) while maximum intensity was observed in CoT 10368 (3.04 %).

Project E. 28:

Title : Survey and surveillance of Sugarcane insect pests.

Objectives : To identify key insect pests of Sugarcane in the area.

Duration : Long term.

Year of start : 2013--2014

Location : Regional Sugarcane Research Station N.A.U, Navsari and South Gujarat area.

Methodology Roving Survey was carried out of sugarcane fields South Gujarat. Observations on incidence of sugarcane borer pests and sucking pests were recorded.

Table 1: Survey and surveillance of insect pests of sugarcane in South Gujarat during 2013-

14.

Name of pest	Varieties	Location	Per cent Incidence
Top borer	Co 97009 Co 86032 CoN 07072	Kumbharfaliya(Nagdhara)Ta. Navsari, Fudvel Ta:Chikhali, Devadha Ta. Gandevi Di: Navsari (Gandevi Sugar) Pathari Ta.&Di.: Valsad (Valsad sugar)	10-11%
White fly	Co 0265	Kothamdi Ta. Jalalpore Di: Navsari (Gundevi sugar), Kolasana (Maroli sugar factory)	4-5%
Wooly Aphid	Co 97009	Vankal Ta. Chikhali Di.:Navsari (Gandevi Sugar)	3-4%
Yellow mite	CoN 05071	Vedchha Ta: Jalalpore Di.:Navsari (Gandevi Sugar)	5-6%
Scale insect	CoN 07072	Pathari Ta.&Di.: Valsad (Valsad sugar)	7-8%
Mealy bugs	Co 86002	Kosmadi Ta: Kamrej Di: Surat Chalthan Sugar factory.	12-14%
Rodents	CoC 671	Sitapur Ta.Vansada Di.:Navsari (Gandevi Sugar)	8-10%

Result:-

In South Gujarat insect pest incidence was moderate to traces. The incidence of top borer was 10-12% on Co 86032, Co 97009 and CoN 07072, White fly incidence 4-5% on CoM 0265, wooly aphid incidence 3-4% was found on Co 97009, incidence of yellow mite was 5-6% on CoN 05071, the incidence of scale insect 7-8% on CoN 07072, incidence of mealy bugs was 12-14% on Co 86002 and the rodent damage was 8-10% on CoC 671. The early shoot borer, root borer, thrips and pyrilla were found in traces.

Project No. E. 30

Title	: Monitoring of insect pests and bio-agents in sugarcane agro- ecosystem.
Objective	: To monitor the key insect pests and natural enemies in the area.
Locations	: R.S.R.S., N.A.U., Navsari
Year of start	: 2013-14
Duration	: Long term
Date of Planting	:18-12-2012
Variety	: CoN 08072
Methodology	: 1. Planting of sugarcane variety recommended for the region in 0.2 ha area.
	: 2. All recommended practices was followed except application of insecticide
Observations were recorded	: 1. Observations on incidence of borers were recorded by examining 20 canes at five places (four corners and in the middle), sucking pests by examining 25 canes.
	2. Observations for all the bio-agents were recorded.

Monitoring of insect pests and bio-agents in sugarcane

Name of the pest	Mean per cent incidence	Larva/egg mass collected	Parasitised larva	Bio-agents observed	Per cent parasitism
<i>ESB Sesamia sp.</i>	9-10%	36(L)	2	<i>Telenomus sp.</i>	5.55%
<i>Chilo sp.</i>		68(L)	3	<i>Apanteles sp.</i>	5.41%
Top borer	6-7%	30(E)	2	<i>Telonomus sp.</i>	6.66%
Internode borer	13-14	-	-	-	-
Root borer	11-12	-	-	-	-
Scale insect	3-4%	-	-	-	-
Mealy bugs	25-27%	-	-	<i>Chrysoperla carnea</i>	-
Pyrilla	Not found	-	-	<i>Tetrasticus pyrillae</i> <i>Epiricania melanoleuca</i>	-
White fly	Not found	-	-	Lady bird beetle	-

Result:

Per cent larval parasitism by the *Telonomus sp.* (5.55%) was found on *Sesamia spp.*(ESB), while by the *Apanteles spp.*(5.41%) was found on *Chilo spp.* On top borer egg parasitism (6.66%) was found by the *Telonomus spp.* bio agents. The percent parasitism on internode borer, Root borer, Scale insect, pyrilla and whitefly was not found by the natural enemies.

Project No. E. 33

Project Title : **Bio-efficacy of insecticides against mealy bugs, *Saccharicoccus sacchari* in sugarcane.**

Objective : To evaluate efficacy of insecticide against mealy bugs in sugarcane.

Year of start : 2013-14

Variety : CoN 05071

Location : Main Sugarcane Research Station, NAU, Navsari

Date of planting : 18-02-2013

Design : RBD.

Replications : Three.

No. of treatments : Nine.

T1: Sett treatment of Imidacloprid 70 WG/SP 25 g a.i./ ha+ spraying of Imidacloprid 17.8SL 0.005 %.

T2: Sett treatment of Imidacloprid 70 WG/SP 25 g a.i./ ha+ spraying of Thiamethoxam 25 WG 0.004 %.

T3: Sett treatment of Imidacloprid 70 WG/SP 25 g a.i./ ha+ spraying of Clothianidin 50 WSG 0.004 %.

T4: Sett treatment of Imidacloprid 70 WG/SP 25 g a.i./ ha+ spraying of Acetamiprid 20 SP 0.004 %.

T5: Sett treatment of Thiamethoxam 70 WG/SP 10 g a.i./ ha+

spraying of Imidacloprid 17.8SL 0.005 %.

T6: Sett treatment of Thiamethoxam 70 WG/SP 10 g a.i./ ha+

spraying of Thiamethoxam 25 WG 0.004 %.

T7: Sett treatment of Thiamethoxam 70 WG/SP 10 g a.i./ ha+

spraying of Clothianidin 50 WSG 0.004 %.

T8: Sett treatment of Thiamethoxam 70 WG/SP 10 g a.i./ ha+

spraying of Acetamiprid 20 SP 0.004 %.

T9: Untreated control.

Plot size : 6.0 m x 5.4 m.

Method of application : Dose of a.i. is based on 35000 three eye bud setts. Sett treatment was given at the time of planting. Spraying was not done due to not observing mealy bugs infestation.

Observations recorded : Germination percentage at 30 and 45 DAP.

Randomly selected 10 canes from 3 meter row length and count number of infested internodes out of total number of internodes.

1. before spraying and 7, 15 and 30 DAS and at harvest.

2. Yield (t/ha) and quality parameters at harvest was recorded.

Table:1 Bio-efficacy of insecticides against mealy bugs, *Saccharicoccus sacchari* in sugarcane, trial at main sugarcane Research Station, Navsari(2013-14)

Treatment						Pooled
	Pre-treat	7 DAS	15 DAS	30 DAS	At harvest	
T1	33.66 (29.78)	25.98 (18.22)	24.64 (16.44)	23.64 (15.11)	30.17 (24.44)	26.96 (19.67)
T2	35.04 (32.00)	30.28 (24.45)	29.39 (23.11)	27.54 (20.44)	33.14 (28.89)	30.14 (24.22)
T3	33.90 (30.22)	31.12 (25.78)	29.99 (24.00)	28.78 (22.22)	34.24 (30.66)	31.08 (25.67)
T4	34.52 (31.11)	30.54 (24.89)	29.34 (23.11)	27.88 (20.89)	33.41 (29.33)	30.37 (24.56)
T5	34.22 (30.67)	29.70 (23.56)	28.20 (21.33)	26.86 (19.56)	32.57 (28.00)	29.4 (23.11)
T6	35.84 (33.33)	29.98 (24.00)	28.81 (22.22)	27.27 (20.00)	32.86 (28.44)	29.78 (23.67)
T7	34.75 (31.56)	31.67 (26.67)	30.27 (24.45)	29.04 (22.67)	34.24 (30.66)	31.35 (26.11)
T8	35.28 (32.45)	30.84 (25.33)	29.55 (23.55)	28.20 (21.33)	33.58 (29.77)	30.64 (25)
T9	36.11 (33.78)	36.66 (34.67)	37.46 (36.00)	38.51 (37.78)	39.30 (39.11)	37.99 (36.89)
S.Em. \bar{y} (T)	1.61	1.28	1.35	1.23	1.36	0.93
S.Em. \bar{y} (T X P)	---					3.54
C.D. (T)	NS	3.85	4.05	3.69	4.07	2.67
C.D. (T X P)	---					4.70
C.V. %	8.02	7.23	7.88	7.44	6.96	7.17

Results:

There was no significant variation among different treatments in the pre-spraying mealy bugs infestation. The mealy bugs infestation *Saccharicoccus sacchari* (COCK) was found significant at 7 DAS, 15 DAS, 30 DAS, at harvest and pooled analysis.

After 7 days of spraying the lowest (18.22%) mean per cent intensity of mealy bugs was found in T1 and it was at par with T5 (23.56%). The maximum per cent intensity was found in untreated control (34.67%).

After 15 days the lowest per cent intensity was recorded in treatment T1 (16.44%) and it was at par with the treatment T5 (21.33%). Maximum intensity was found in the untreated control (36.00%) treatment.

After 30 days the treatment T1 (15.11%) was found significantly superior over control (37.78%) and it was at par with T5 (19.56%), T6 (20.00%) treatments.

At harvest the maximum per cent intensity was found in untreated control (39.11%) while significant lowest intensity was found in treatment Untreated check (24.44%) and it was at par with T5(28.00%) , T6(28.44%), T2(28.89%), T4(29.33%) and T8 (29.77%) treatments.

Based on the **pooled** analysis treatment T1 (19.67%) was found most effective in reducing the mealy bugs per cent intensity and it was at par with the T5 (23.11%) treatment. The control treatment recorded highest mealy bugs per cent intensity (36.89%). Interaction between Treatment x Period was found significant (Table: 1).

Table: 2 Bio-efficacy of insecticides against mealy bugs, *Saccharicoccus sacchari* in sugarcane, trial at Main Sugarcane Research Station, Navsari (2013-14)

Treat.	Yield(t/ha)	Quality parameters			
		Brix%	Sucrose%juice	Purity%	C.C.S.%
T1	11.40 (130.06)*	19.97	19.08	90.22	13.67
T2	10.81 (117.96)	21.57	19.40	90.72	13.53
T3	10.19 (104.18)	22.03	19.29	90.39	13.29
T4	9.97 (99.52)	20.33	19.45	91.20	13.94
T5	11.16 (125.79)	20.77	19.06	91.16	13.42
T6	11.09 (123.28)	21.60	19.46	90.83	13.59
T7	9.86 (97.62)	21.03	18.83	92.14	13.11
T8	10.69 (115.05)	21.03	19.66	91.24	13.95
T9	8.83 (78.05)	21.50	19.37	90.80	13.53
S. Em	0.47	0.45	0.34	0.50	0.38
CD	1.40	NS	NS	NS	NS
CV %	7.75	3.66	3.02	0.96	4.90

*Figures in the parenthesis are original value and those outside are SQRT transformed values

Yield and Quality parameters viz., Brix %, Sucrose %, Purityv %, C.C.S %

The highest millable cane yield of sugarcane was recorded in T1 (130.06 t/ha) treatment and it was at par with T5 (125.79 t/ha) , T6(123.28 t/ha), T2(117.96 t/ha) , T3 (104.18 t/ha) and T8 (115.05 t/ha) treatment. The significant lowest yield was found in untreated control (78.05 t/ha) treatment.

The Brix per cent, Sucrose per cent, Purity per cent and C.C.S per cent was found non significant. The treatment did non produced any significant difference in quality parameter.

Project No. E. 36

Project Title	: Management of borer complex of sugarcane through lures
Objective	: To manage sugarcane borers (Early shoot borer, top borer, and internode borer) through pheromone traps and influence of weather parameters on moth catches.
Year of start	: 2013-2014
Variety	: CoN 08072
Location	: Main Sugarcane Research Station, NAU, Navsari
Date of planting	: 18-12-2012
Treatments	: Pheromone lures of sugarcane early shoot borer, top borer, and internode borer
Plot size	: 1 acre
Methodology	: The test insect- pests were early shoot borer, top borer, and internode borer. Three pheromone traps for each pest were installed in the second fortnight of the February till harvest of crop in one acre of sugarcane crop. The pheromone lure was changed after 2 months.
Observation to be recorded	: <ol style="list-style-type: none">1. Observation on number of moths trapped was recorded at weekly interval.2. The mean number of moth capture was worked out.3. The correlation and regression of moth captures was worked out with weekly meteorological parameters.4. Infestation of each borer was recorded in both blocks.

Table: A The meteorological data recorded at Meteorological observatory College farm, N.M.C.A., N.A.U., Navsari for the crop year 2013-2014.

Std. Week No.	Meteorological week	Temperature C ⁰		Relative Humidity %		Rain-Fall (mm)	No. of rainy days	Sun shine hours	ESB	TB	INB
		Maxi.	Mini.	Morning	Evening						
1	2	3	4	5	6	7	8	9	10	11	12
1	1-7	28.2	9.9	87.2	41.4	0.0	0.0	6.9	0.33	0.67	0.00
2	8-14	30.4	12.7	72.8	38.1	0.0	0.0	9.0	0.33	0.33	0.00
3	15-21	29.0	11.9	87.7	48.2	0.0	0.0	7.9	0.33	0.67	0.00
4	22-28	30.4	14.0	75.9	36.2	0.0	0.0	8.0	0.67	0.33	0.00
5	29-4	31.7	15.9	87.3	37.7	0.0	0.0	6.1	0.67	0.67	0.00
6	5-11	29.5	15.2	72.0	32.6	0.0	0.0	7.4	1.00	0.67	0.00
7	12-18	32.5	17.9	71.3	27.0	0.0	0.0	7.6	1.00	1.00	0.00
8	19-25	32.8	15.1	70.4	24.8	0.0	0.0	9.7	1.00	0.67	0.00
9	26-4	29.8	13.3	55.9	26.6	0.0	0.0	8.3	1.00	1.00	0.00
10	5-11	38.1	17.7	52.4	20.1	0.0	0.0	8.7	1.00	0.67	0.00
11	12-18	34.4	18.8	84.2	34.6	0.0	0.0	8.5	1.00	0.67	0.00
12	19-25	34.7	19.3	85.7	27.9	0.0	0.0	8.5	0.33	1.00	0.00
13	26-1	33.6	20.2	81.4	35.1	0.0	0.0	7.3	0.67	0.00	0.00
14	2-8	33.9	20.9	82.9	40.3	0.0	0.0	9.0	0.33	0.00	0.00
15	9-15	35.2	21.9	83.5	40.4	0.0	0.0	7.3	0.67	0.00	0.00
16	16-22	30.8	23.8	83.8	64.3	3.2	1	8.7	1.00	0.00	0.00
17	23-29	37.2	22.8	87.0	33.4	0.0	0.0	10.6	0.67	0.00	0.00
18	30-6	36.4	25.3	83.6	50.0	0.0	0.0	10.8	0.67	0.00	0.00
19	7-13	34.2	26.5	83.5	55.6	0.0	0.0	9.9	1.00	0.33	0.00
20	14-20	33.7	26.9	82.1	65.9	0.0	0.0	9.2	0.67	0.33	0.00
21	21-27	34.3	28.0	86.5	72.1	0.4	1	9.5	0.67	0.67	0.00
22	28-3	35.2	28.4	87.8	64.9	0.0	0.0	9.7	0.67	0.67	0.33
23	4-10	33.5	26.6	95.1	83.9	227.0	2	4.6	0.33	0.00	0.33
24	11-17	30.2	24.8	93.5	87.7	133.4	7	1.2	0.33	0.00	0.67
25	18-24	30.1	25.6	92.7	81.7	156.0	6	2.8	0.33	0.00	0.33
26	25-1	30.2	25.9	91.9	84.2	53.0	6	1.1	0.00	0.00	0.33
27	2-8	31.4	24.9	93.7	81.8	39.0	5	1.3	0.00	0.33	0.67
28	9-15	31.1	25.1	90.9	88.7	225.0	7	2.1	0.00	0.33	0.67
29	16-22	29.5	25.3	92.9	90.3	290.0	6	0.3	0.00	0.67	0.67
30	23-29	28.9	25.3	95.2	86.7	261.0	7	0.1	0.00	1.00	0.33
31	30-5	28.2	24.6	95.6	89.2	183.0	7	1.6	0.00	1.00	0.67
32	6-12	29.3	25.2	91.1	85.7	37.0	4	2.1	0.00	0.00	1.00
33	13-19	29.1	25.1	90.5	82.0	60.0	6	2.0	0.00	0.00	0.67
34	20-26	28.9	25.4	88.2	80.6	38.0	4	1.7	0.00	0.00	0.33
35	27-2	30.2	24.5	91.7	72.5	49.0	4	6.6	0.00	0.00	0.33
36	3-9	29.9	24.2	91.5	73.6	23.0	4	4.4	0.00	0.00	0.67
37	10-16	32.4	24.7	92.8	73.1	70.0	4	3.5	0.00	0.00	0.33
38	17-23	31.0	25.2	92.3	78.3	107.0	2	4.1	0.00	0.00	1.00
39	24-30	28.3	24.0	90.7	83.1	443.0	4	3.2	0.00	0.00	0.33
40	1-7	30.6	25.0	92.4	78.0	32.0	1	4.4	0.00	0.00	1.00
41	8-14	30.8	24.2	91.6	73.6	11.0	2	4.7	0.00	0.00	0.67
42	15-21	34.3	22.7	84.0	42.9	2.0	1	8.0	0.00	0.00	0.67
43	22-28	34.9	20.6	76.2	42.9	0.0	0.0	9.7	0.00	0.00	0.67
44	29-4	34.4	19.1	80.5	31.7	0.0	0.0	9.6	0.00	0.00	1.33
45	5-11	34.4	19.9	80.0	36.7	0.0	0.0	8.1	0.00	0.00	0.67
46	12-18	32.1	18.8	72.2	34.5	0.0	0.0	7.8	0.00	0.00	0.67
47	19-25	33.7	17.7	65.9	46.5	0.0	0.0	9.3	0.00	0.00	0.33
48	26-2	33.8	21.5	68.5	38.7	0.0	0.0	8.1	0.00	0.00	1.00
49	3-9	32.5	16.8	74.8	34.3	0.0	0.0	7.7	0.00	0.33	0.67
50	10-16	31.2	12.9	94.1	44.1	0.0	0.0	8.9	0.00	0.33	0.67
51	17-23	29.9	12.1	88.9	72.1	0.0	0.0	8.3	0.00	0.67	0.67
52	24-31	29.4	15.2	80.9	44.6	0.0	0.0	5.9	0.00	1.00	0.67

Table: 1 Correlation between populations of early shoot borer, top borer and internode borer with weather parameters (2013-2014)

Pests	Temperature C ⁰		Relative Humidity %		Rain-Fall	No. of rainy days	Sun shine hours
	Maxi.	Mini.	Morning	Evening	(mm)		
	2	3	4	5	6	7	
ESB	0.379**	-0.183	-0.464**	-0.494**	-0.333**	-0.460**	0.514**
TB	-0.156	-0.403**	-0.205	-0.229	-0.015	-0.115	0.068
INB	-0.222	0.228	0.291**	0.386**	0.197	0.332**	-0.395**

*significant at 5 % level ($r = \pm 0.2306$); **significant at 1 % level ($r = \pm 0.2732$)

Top borer: Maximum catches of top borer (1.00) was recorded in 2011-12 of 7th, 9th, 12th, 30th, 31st and 52nd met. week. From the Table-1 it is observed that there is negative correlation between top borer moth catches and maximum temperature (-0.156), minimum temperature (-0.403), rainfall (-0.015), number of rainy days (-0.115), morning (-0.205) relative humidity and evening (-0.229) relative humidity while sunshine hours (0.068) showed positive correlation but were non significant (Table-1).

Early shoot borer: Maximum catches of Early shoot borer (1.00) was recorded in 2013-14 of 6th to 11th, 16th and 19th met. week. From the Table-1 it is observed that there is positive significant correlation between early shoot borer moth catches with maximum temperature (0.379) and sunshine hours (0.514). while relative humidity morning (-0.464) and evening (-0.494), rainfall (-0.333) and number of rainy days (-0.460) showed significantly negative correlation. Whereas, It showed non-significant negative correlation with minimum temperature (-0.183) .

Internode borer: Maximum catches of Internode borer (1.33) was recorded in 2013-14 of 44th met week. From the Table-1 it is observed that there is significant negative correlation between internode borer moth catches with sunshine hours (-0.395). While, significant positive correlation with number of rainy days (0.332), morning (0.291) and evening (0.386) relative humidity with internode borer moth catches. Whereas, rain fall (0.197), minimum temperature (0.228) shows non significant positive correlation and maximum temperature (-0.222) show non significant negative correlation.

Project E. 37 :

Title: Bio-efficacy of new insecticides for the control of sugarcane early shoot borer

Objective : To find out effective strategy for the management of sugarcane early shoot borer

Yearly of started : Recommended variety of the location

Location : Powarkheda, Mandya, Anakapalle, Padegao, VSI, Pune, Navsari and Ludhiana

Design : RBD

No. of treatment : 9 (Nine)

No. of replication : 3 (Three)

Plot size : Gross plot : 6m x 5.4m
Net: 6m x 6.3m

Spacing : Between two row; 0.9m (R-R)

Seed rate : As per the recommendation

Fertilizer application : As per the recommendation

Treatment detail :

1. Soil application of Fipronil 0.3 G @ 25 kg a.i./ha at the time of planting and 60 DAP
2. Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP
3. Spraying of Chlorantraniliprole 18.5 SC 375 ml/ha at 30 and 60 DAP
4. Spraying of Spinosad 45 SC @ 90 ml/ha at 30 and 60 DAP
5. Spraying of Flubendiamide @ 250 ml/ ha at 30 and 60 DAP
6. Soil application of Phorate 10 G @ 15 kg /ha at the time of planting and 60 DAP
7. Soil application of Carbofuran 3 G @ 33 kg /ha at the time of planting and 60 DAP
8. Untreated control

Observation were recorded

(A) Early shoot borer:

- ESB infestation will be recorded by counting number of dead hearts easily pulled out and emitting offensive odour as well as total number of shoots/plant in each net plot on 45, 60, 90, and 120 DAP.

- The per cent incidence of shoot borer will be worked out by following formula:

$$\text{Per cent incidence} = \frac{\text{Number of dead hearts}}{\text{Total number of shoots}} \times 100$$

- The cumulative per cent infestation will be worked out by taking progressive total of infested shoots in proportion to total of infested shoots in proportion to total shoot formed.

Yield, Growth and quality parameter:

- (a) Germination (%)
- (b) Tillering per cent at 120 DAP
- (c) Number of millable cane
- (d) Cane yield (kg/ha)
- (e) Growth parameter [total cane height (cm), Millable cane height (cm), number of internodes (10 canes / treatment/replication) and girth of cane (10 canes/ treatment/replication).
- (f) Quality parameters.

Research result

The data are presented in table 1. From the study of table revealed that the differences due to application of different insecticide in respect of percent incidence of early shoot borer at 45 DAS was found significant. The percent incidence of early shoot borer was ranged from 0.00 to 8.49 per cent. The least incidence was observed in Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP (0.00 %) while maximum incidence was observed in Untreated control (8.49 %).

The data are presented in table 1. It is seen, from the table, that the differences due to application of different insecticide in respect of percent incidence of early shoot borer at 120 DAS were found significant. The percent incidence of early shoot borer was ranged from 3.87 to 15.38 per cent. The least incidence was observed in Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP (3.87 %) while maximum incidence was observed in Untreated control (15.38 %).

The data are presented in table 1. It is seen from the the differences due to application of different insecticide in respect of percent incidence of early shoot borer were significant. The percent incidence of early shoot borer was ranged from 2.38 to 12.33 per cent. The least incidence was observed in Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP (2.38 %) while maximum incidence was observed in Untreated control (12.33 %).

On the basis of cumulative per cent incidence the treatment Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP recorded minimum cumulative per cent incidence (8.81%). while, maximum cumulative per cent incidence (35.83%) was recorded in treatment of Untreated control.

Table -1 Bio-efficacy of new insecticide for the control of sugarcane ESB trial at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No	Treatments	% incidence of Early shoot borer				Pooled	Cumulative % incidence
		45 DAP	60 DAP	90 DAP	120 DAP		
1	Soil application of Fipronil 0.3 G @ 25 kg a.i./ha at the time of planting and 60 DAP	9.37 (1.84)	10.9 (2.61)	13.42 (4.39)	15.45 (6.11)	12.55 (3.74)	14.44
2	Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP	5.74 (0.00)	10.19 (2.15)	12.2 (3.51)	12.69 (3.87)	10.59 (2.38)	8.81
3	Spraying of Chlorantraniliprole 18.5 SC 375 ml/ha at 30 and 60 DAP	10.26 (2.17)	9.85 (1.93)	11.5 (2.98)	14.6 (5.37)	11.70 (3.11)	11.11
4	Spraying of Spinosad 45 SC @ 90 ml/ha at 30 and 60 DAP	12.05 (3.42)	11.09 (2.75)	14.15 (4.99)	16.99 (7.54)	13.77 (4.67)	16.32
5	Spraying of Flubendiamide @ 250 ml/ ha at 30 and 60 DAP	11.31 (2.91)	10.82 (2.55)	12.73 (3.86)	16.38 (6.98)	13.02 (4.08)	15.52
6	Soil application of Phorate 10 G @ 15 kg /ha at the time of planting and 60 DAP	13.09 (4.13)	12.51 (3.72)	16.01 (6.71)	18.1 (8.7)	15.12 (5.81)	18.27
7	Soil application of Carbofuran 3 G @ 33 kg /ha at the time of planting and 60 DAP	13.6 (4.62)	13.54 (4.78)	13.79 (4.7)	17.46 (8.04)	14.80 (5.54)	18.97
8	Untreated control	17.86 (8.49)	21.07 (11.95)	22.36 (13.51)	23.87 (15.38)	21.41 (12.33)	35.83
	S.Em.+(T)	1.14	1.06	0.66	0.71	0.35	
	C. D @ 5%	3.45	3.22	2.00	2.15	1.08	
	C. V. %	16.89	14.71	7.87	7.24	4.35	

*Figures in the parenthesis are original value and those outside are Arcsine transformed values

Table -2 Effect of new insecticide on yield and quality parameter at Main Sugarcane Research Station, Navsari (2013-14).

Sr. No.	Treatments	Yield (t/ha)	Quality parameter			
			Brix%	Sucrose%	Purity%	C.C.S.%
1	Soil application of Fipronil 0.3 G @ 25 kg a.i./ha at the time of planting and 60 DAP	10.87 (118.24)	20.15	19.19	90.73	13.76
2	Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP	11.17 (125.08)	21.96	20.00	90.86	14.00
3	Spraying of Chlorantraniliprole 18.5 SC 375 ml/ha at 30 and 60 DAP	10.99 (121.21)	21.46	19.71	91.13	13.87
4	Spraying of Spinosad 45 SC @ 90 ml/ha at 30 and 60 DAP	10.72 (115.22)	21.13	19.14	90.96	13.40
5	Spraying of Flubendiamide @ 250 ml/ha at 30 and 60 DAP	10.77 (116.65)	21.16	19.55	91.09	13.80
6	Soil application of Phorate 10 G @ 15 kg /ha at the time of planting and 60 DAP	9.94 (99.16)	21.07	18.93	91.64	13.20
7	Soil application of Carbofuran 3 G @ 33 kg /ha at the time of planting and 60 DAP	9.47 (90.27)	20.92	20.12	90.87	14.46
8	Untreated control	8.48 (73.49)	20.98	19.46	90.85	13.77
	S.Em.+(T)	0.51	0.31	0.31	1.71	0.36
	C. D @ 5%	1.54	NS	NS	NS	NS
	C. V. %	8.56	2.52	2.71	3.25	4.47

*Figures in the parenthesis are original value and those outside are SQRT transformed values

Yield and Quality parameters viz., Brix %, Sucrose %, Purity %, C.C.S %

The highest millable cane yield of sugarcane was recorded in T2 (125.08 t/ha) treatment and it was at par with T3(121.21 t/ha), T1 (118.24 t/ha), T5 (116.65 t/ha) and T4(115.22 t/ha) treatment. The significant lowest yield was found in untreated control (73.49 t/ha) treatment. The Brix per cent, Sucrose per cent, Purity per cent and C.C.S per cent were found non significant. The treatment did not produce any significant difference in quality parameter.

-----XXXXXXXXXXXXXXXXX-----

