

**ANNUAL RESEARCH REPORT OF SUGARCANE ENTOMOLOGY M.S.R.S., N.A.U.
NAVSARI FOR THE YEAR 2014-15**

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** : 2014-15
- 4. Location** : Main Sugarcane Research Station, Navsari.
- 5. No. of replications** : Three
- 6. Plot size** : 6.00 X1.00 M
- 7. Date of planting** : **07.01.2014**
- 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.) & S. N. Gajjar, Assistant Research Scientist (Ento.) w.e.f.01.10.2014

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 pests were recorded in the experimental trial as per details given below.

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 numbers 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:** *Emmalocera depresella* (Swinhoe)

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: *pyrilla perpusilla*

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 every 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 was reported.

Project E.4.1.1 IVT (E) trial:**Table -4.1.1.1 Screening of sugarcane varieties against ESB in IVT early trial at Main Sugarcane Research Station, Navsari (2014-15).**

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 11001	0.00	9.53	(2.87)	9.60	(1.81)	7.73	(1.81)	2.11	3525
2	Co 11004	0.00	8.14	(0.39)	3.85	(1.36)	6.69	(1.36)	1.33	2222
3	Co 11006	0.00	8.45	(1.72)	7.53	(1.86)	7.83	(1.86)	1.32	2194
4	Co 11007	0.00	8.90	(0.43)	4.03	(1.86)	7.85	(1.86)	1.41	2347
5	Co 11018	0.00	9.16	(1.87)	7.82	(2.00)	8.12	(2.00)	1.52	2525
6	CoM 11081	0.00	8.75	(2.67)	9.27	(2.12)	8.37	(2.12)	2.03	3421
7	CoM 11082	0.00	9.37	(2.05)	8.17	(2.06)	8.24	(2.06)	2.50	4167
8	CoM 11083	0.00	8.01	(1.70)	7.50	(1.49)	7.01	(1.49)	1.40	2331
9	CoM 11084	0.00	4.99	(2.05)	8.17	(1.79)	7.68	(1.79)	1.62	2697
10	CoN 11071	0.00	4.42	(1.51)	7.08	(1.65)	7.37	(1.65)	1.17	1956
11	CoN 11072	0.00	4.65	(1.74)	7.58	(1.77)	7.64	(1.77)	1.23	2058
12	CoT 11366	0.00	8.40	(1.71)	7.50	(1.93)	7.98	(1.93)	1.59	2645
13	PI 11131	0.00	10.04	(2.32)	8.67	(1.97)	8.07	(1.97)	1.94	3226
14	Co 85004	0.00	7.88	(1.52)	7.10	(1.61)	7.30	(1.61)	1.36	2262
15	Co 94008	0.00	8.37	(1.77)	7.63	(1.55)	7.15	(1.55)	1.27	2115
16	Co C 671	0.00	8.64	(1.75)	7.59	(1.77)	7.65	(1.77)	1.36	2271
	S.Em.+(T)	-	1.10		0.99		0.85		-	-
	C. D @ 5%	-	3.31		2.99		NS		-	-
	C. V. %	-	19.44		18.82		15.64		-	-

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

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

The data presented in table 4.1.1.1 shows 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 1.17 to 2.50 per cent. The least incidence was observed in CoN 11071 (1.17%) followed by CoN 11072 (1.23%), while maximum incidence was observed in CoM 11082 (2.50 %).

Table -4.1.1.2 Screening of sugarcane varieties against top borer and root borer in IVT early trial at Main Sugarcane Research Station, Navsari (2014-15).

Sr. No.	Genotype	% Incidence of Top Borer						% Root borer Incidence	
		5 th month		7 th month		At harvest			
1	Co 11001	5.73	(1.00)	7.15	(1.55)	7.37	(1.64)	31.0	(26.53)
2	Co 11004	6.17	(1.15)	7.01	(1.49)	7.31	(1.62)	29.0	(23.50)
3	Co 11006	7.56	(1.73)	7.91	(1.89)	8.07	(1.97)	27.0	(20.61)
4	Co 11007	7.76	(1.82)	9.91	(2.96)	8.00	(1.94)	26.0	(19.22)
5	Co 11018	8.08	(1.98)	7.91	(1.89)	8.07	(1.97)	31.0	(26.53)
6	CoM 11081	9.38	(2.65)	10.42	(3.27)	8.42	(2.14)	18.0	(9.55)
7	CoM 11082	9.38	(2.65)	8.27	(2.07)	8.33	(2.10)	20.0	(11.70)
8	CoM 11083	7.21	(1.57)	7.55	(1.73)	7.66	(1.78)	22.0	(14.03)
9	CoM 11084	7.43	(1.67)	7.78	(1.83)	7.98	(1.92)	23.0	(15.27)
10	CoN 11071	6.96	(1.47)	7.51	(1.71)	7.70	(1.79)	22.0	(14.03)
11	CoN 11072	7.10	(1.53)	9.59	(2.77)	7.74	(1.81)	19.0	(10.60)
12	CoT 11366	8.92	(2.41)	9.90	(2.96)	7.95	(1.91)	21.0	(12.84)
13	PI 11131	9.07	(2.48)	8.16	(2.01)	8.28	(2.08)	24.0	(16.54)
14	Co 85004	7.44	(1.68)	7.72	(1.81)	7.80	(1.84)	25.0	(17.86)
15	Co 94008	7.36	(1.64)	7.61	(1.76)	7.71	(1.80)	32.0	(28.08)
16	Co C 671	7.70	(1.79)	7.72	(1.81)	7.80	(1.84)	25.0	(17.86)
	S.Em.+(T)	0.68		0.69		1.06		2.8	
	C. D @ 5%	2.05		2.08		NS		NS	
	C. V. %	12.50		11.80		19.05		15.96	

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 differences in respect of percent incidence of top borer due to various genotypes at 5th month and 7th month were found significant. Whereas, at harvest percent incidence of top borer showed non-significant reaction against all tested genotypes.

On the basis of percent incidence the incidence of top borer at 5th month ranged from 1.00 to 2.65 per cent. The least incidence was observed in Co 11001 (1.00 %) while maximum incidence was observed in CoM 11081 and CoM 11082 (2.65%), respectively.

Whereas, the percent incidence of top borer at harvest reflect that it was ranged from 1.64 to 2.14 per cent. The least incidence was observed in Co 11004 (1.64 %) while, maximum incidence was observed in CoM 11081 (2.65 %). All tested genotypes were found to be less susceptible reaction against top borer

Root borer: *Emmalocera depresella* (Swinhoe)

From the table, it is seen that the differences in respect to per cent incidence in various genotypes in respect to percent incidence of root borer were found non- significant. Percent incidence of root borer was ranged from 9.55 to 28.08 per cent. The least per cent incidence of root borer was

observed in CoM 11081 (9.55%), CoN 11072 (10.60%), CoM 11082 (11.70%) and CoT 11366 (12.84%), respectively. while maximum incidence was observed in Co 94008 (28.08%).

Table -4.1.1.3 Screening of sugarcane varieties against Scales and Mealy bugs in IVT early trial at Main Sugarcane Research Station, Navsari (2014-15).

Sr. No.	Genotype	Scale insects				Mealy bugs			
		% incidence		% intensity		% incidence		% intensity	
1	Co 11001	37.00	(36.22)	27.78	(21.72)	31.00	(26.53)	39.00	39.60)
2	Co 11004	37.00	(36.22)	41.46	(43.84)	53.00	(63.78)	35.00	32.90)
3	Co 11006	47.00	(53.49)	13.79	(5.68)	30.00	(25.00)	19.00	10.60)
4	Co 11007	7.00	(1.49)	4.88	(0.72)	1.00	(0.03)	0.00	0.00)
5	Co 11018	12.00	(4.32)	6.03	(1.10)	25.00	(17.86)	10.00	3.02)
6	CoM 11081	12.00	(4.32)	6.40	(1.24)	1.00	(0.03)	1.00	0.03)
7	CoM 11082	2.00	(0.12)	3.75	(0.43)	30.00	(25.00)	14.00	5.85)
8	CoM 11083	22.00	(14.03)	7.59	(1.74)	14.00	(5.85)	6.00	1.09)
9	CoM 11084	22.00	(14.03)	9.31	(2.62)	5.00	(0.76)	3.00	0.27)
10	CoN 11071	7.00	(1.49)	5.08	(0.78)	12.00	(4.32)	9.00	2.45)
11	CoN 11072	7.00	(1.49)	4.90	(0.73)	15.00	(6.70)	7.00	1.49)
12	CoT 11366	7.00	(1.49)	4.77	(0.69)	2.00	(0.12)	3.00	0.27)
13	PI 11131	27.00	(20.61)	8.69	(2.28)	41.00	(43.04)	20.00	11.70)
14	Co 85004	22.00	(14.03)	8.03	(1.95)	52.00	(62.10)	21.00	12.84)
15	Co 94008	7.00	(1.49)	4.71	(0.67)	31.00	(26.53)	10.00	3.02)
16	Co C 671	2.00	(0.12)	3.75	0.43)	1.00	(0.03)	3.00	0.27)
	S.Em.± (T)	1.71		1.18		1.71		1.51	
	C. D @ 5%	5.16		3.56		5.15		4.56	
	C. V. %	14.27		16.61		11.26		17.25	

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 4.1.1.3 revealed that the differences due to various genotypes in respect of percent incidence of scale insect were observed significant. It is found to be ranged from 0.12 to 36.22 per cent. The least incidence was observed in CoM 11082 (0.12 %), while maximum incidence was observed in Co 11001 and Co 11004 (36.22%), respectively.

Same trend was found in on the basis of percent intensity of scale insects and it is found to be ranged between 0.43 to 21.72 per cent. The least intensity was observed in CoC 671 (0.43 %) while maximum intensity was observed in Co 11001 (21.72 %).

Mealy bugs: *Saccharicoccus sacchari* (Cockerell)

The data are depicted in table 4.1.1.4 shows that the differences due to various genotypes in respect of percent incidence of mealy bugs were found significant. On the basis of that can be see that the percent incidence of mealy bugs ranged from 0.03 to 63.78 per cent. The least incidence was observed in Co 11007, CoM 11081 and CoC 671 (0.03 %), respectively. while maximum incidence was observed in Co 11004 (63.78 %).

While, data on the percent intensity mealy bugs infestation was ranged from 0.00 to 39.60 per cent. The zero percent intensity was observed in Co 11007, while maximum intensity was observed in Co 11001 (39.60 %).

Project E.4.1.2 AVT (E) I P trial:

Table -4.1.2.1 Screening of sugarcane varieties against ESB in AVT (E) I P trial at Main Sugarcane Research Station, Navsari (2014-15).

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 09004	0.00	6.16	(1.15)	7.03	(1.50)	7.10	(1.53)	1.44	2392	
2	Co 09007	0.00	6.33	(1.22)	7.13	(1.54)	7.26	(1.60)	1.52	2525	
3	CoN 09072	0.00	10.68	(3.43)	9.71	(2.85)	7.81	(1.85)	1.89	3155	
4	Co 85004	0.00	8.10	(1.99)	5.98	(1.08)	7.28	(1.61)	1.35	2193	
5	Co 94008	0.00	9.61	(2.79)	7.36	(1.64)	7.88	(1.88)	1.68	2793	
6	CoC 671	0.00	9.82	(2.91)	8.02	(1.95)	8.04	(1.95)	1.74	2898	
	S.Em±(T)	-	0.84		0.56		1.02		-	-	
	C. D @ 5%	-	3.07		2.03		NS		-	-	
	C. V. %	-	14.13		10.45		19.05		-	-	

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 at 60 DAP and 90 DAP were found significant. While, at 120 DAP, these were found non-significant. Based on the cumulative per cent infestation of early shoot borer the least incidence was observed in Co 09004 (1.44 %) while, maximum incidence was observed in CoN 09072 (1.89%).

Table -4.1.2.2 Screening of sugarcane varieties against top borer in AVT (E) I P trial at Main Sugarcane Research Station, Navsari (2014-15).

Sr. No.	Genotype	% Incidence of Top Borer						% Root borer Incidence	
		5 th month		7 th month		At harvest			
1	Co 09004	7.38	(1.65)	8.91	(2.40)	7.66	(1.78)	7.15	(1.55)
2	Co 09007	6.69	(1.36)	7.90	(1.89)	7.78	(1.83)	7.48	(1.70)
3	CoN 09072	8.01	(1.94)	8.85	(2.36)	8.07	(1.97)	8.32	(2.09)
4	Co 85004	7.47	(1.69)	8.41	(2.14)	7.54	(1.72)	6.82	(1.41)
5	Co 94008	8.00	(1.94)	9.68	(2.83)	8.18	(2.02)	8.63	(2.25)
6	CoC 671	8.19	(2.03)	9.24	(2.58)	8.36	(2.11)	9.12	(2.51)
	S.Em± (T)	0.89		0.94		0.83		0.74	
	C. D @ 5%	NS		NS		NS		NS	
	C. V. %	16.56		15.02		14.89		13.13	

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 per cent infestation of top borer at 5th month, 7th month and also at harvest was found non-significant. Based on the per cent incidence of top borer at harvest the least per cent incidence was observed in Co85004 (1.72 %) while maximum incidence was observed in CoC 671 (2.11 %).

Root borer: *Emmalocera depressella* (Swinhoe)

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 root borer was found non-significant. On the basis of the percent incidence of root borer it showed to range from 1.41 to 2.51 per cent. The least incidence was observed in Co 85004 (1.41 %) while maximum incidence was observed in CoC 671 (2.51 %).

Table -4.1.2.3 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	
1	Co 09004	1.60	(0.00)	0.66	(0.0)	15.40	(10.0)	7.47	(2.53)
2	Co 09007	14.89	(10.0)	6.16	(1.8)	35.01	(30.0)	13.50	(5.45)
3	CoN 09072	1.18	(0.0)	0.66	(0.0)	31.95	(28.0)	9.55	(2.75)
4	Co 85004	40.83	(40.0)	16.96	(7.8)	52.88	(60.0)	21.09	(11.82)
5	Co 94008	1.60	(0.0)	0.49	(0.0)	15.40	(10.0)	6.38	(1.76)
6	CoC 671	34.50	(30.0)	14.64	(6.0)	15.40	(10.0)	6.75	(2.00)
	S.Em.\pm (T)	2.21		0.87		4.10		1.78	
	C. D @ 5%	8.03		3.15		14.92		6.45	
	C. V. %	19.80		18.60		19.85		20.00	

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 4.1.2.3 from the table, it is seen that the differences due to various genotypes in respect of percent incidence of scale insects were found significant. On the basis data percent incidence ranged from 0.00 to 40.0 per cent. Zero per cent incidence was observed in Co 09004, CoN 09072 and Co 94008, respectively. Whereas, incase of maximum per cent incidence it was observed in Co 85004 (40.0%).

The data also shows that the differences due to various genotypes in respect of percent intensity of scale insect were found significant. Percent intensity of scale ranged from 0.00 to 7.88 per cent. The zero per cent intensity was observed in Co 09004, CoN 09072 and Co 94008, respectively. Maximum scale insect per cent intensity was observed in Co 85004 (7.88%).

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 significant. Percent incidence of mealy bugs ranged from 10.00 to 60.0 per cent. The least incidence was observed in Co 09004, Co 94008 and CoC671 (10.0 %) respectively. while maximum per cent incidence was observed in Co 85004 (60%).

From the data 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 1.76 to 11.82 per cent. There is least per cent intensity was observed in Co 94008 (1.76%) and maximum per cent intensity was observed in Co 85004 (11.82) followed by CoN 09072 (9.97%) respectively.

Project E.4.1.3 IVT (M):

Table -4.1.3.1 Screening of sugarcane varieties against ESB in IVT (M) at Main Sugarcane Research Station, Navsari (2014-15).

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 11005	0.00	0.55	(0.01)	3.39	(0.35)	7.30	(1.61)	0.67	1119	
2	Co 11007	0.00	6.26	(1.19)	5.14	(0.80)	7.19	(1.57)	1.42	2358	
3	Co 11012	0.00	9.22	(2.57)	8.27	(2.07)	8.23	(2.05)	1.77	2950	
4	Co 11019	0.00	9.38	(2.66)	7.95	(1.91)	8.43	(2.15)	1.76	2933	
5	Co 11020	0.00	5.41	(0.89)	8.48	(2.18)	9.12	(2.51)	1.67	2787	
6	Co 11021	0.00	12.28	(4.52)	8.53	(2.20)	8.87	(2.38)	2.33	3889	
7	Co 11022	0.00	8.62	(2.25)	7.49	(1.70)	7.31	(1.62)	1.51	2513	
8	Co 11023	0.00	9.30	(2.61)	8.12	(2.00)	7.41	(1.66)	1.68	2801	
9	Co 11024	0.00	8.66	(2.27)	7.13	(1.54)	6.63	(1.33)	1.42	2370	
10	CoM 11085	0.00	8.42	(2.15)	7.33	(1.63)	6.64	(1.34)	1.41	2347	
11	CoM 11086	0.00	8.37	(2.12)	7.26	(1.60)	6.05	(1.11)	1.59	2652	
12	CoM 11087	0.00	7.90	(1.89)	7.26	(1.60)	6.01	(1.10)	1.36	2262	
13	CoN 11073	0.00	4.19	(0.53)	7.15	(1.55)	5.97	(1.08)	1.09	1823	
14	CoN 11074	0.00	8.95	(2.42)	8.06	(1.97)	7.13	(1.54)	1.65	2747	
15	Co 85004	0.00	8.93	(2.41)	7.77	(1.83)	7.28	(1.60)	1.35	2193	
16	Co 94008	0.00	4.74	(0.68)	7.96	(1.92)	7.61	(1.75)	1.68	2793	
	S.Em.+(T)	-	0.89		0.85		0.62		-	-	
	C. D @ 5%	-	2.68		2.57		1.87		-	-	
	C. V. %	-	16.63		16.44		11.98		-	-	

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, 90 and 120 DAP were found significant. Based on the cumulative per cent infestation of early shoot borer the least incidence was observed in Co 11005 (0.67%) while, maximum incidence was observed in Co 11021 (2.33%).

Table -4.1.3.2 Screening of sugarcane varieties against top borer in IVT (M) at Main Sugarcane Research Station, Navsari (2014-15).

Sr. No.	Genotype	% incidence of Top Borer						% Root borer	
		5 th month		7 th month		At harvest			
1	Co 11005	6.82	(1.41)	9.23	(2.63)	7.75	(1.82)	25.92	(19.11)
2	Co 11007	6.84	(1.42)	9.23	(2.63)	7.75	(1.82)	31.92	(27.96)
3	Co 11012	7.21	(1.58)	8.01	(1.94)	8.14	(2.00)	31.92	(27.96)
4	Co 11019	8.40	(2.13)	11.37	(3.89)	8.17	(2.02)	25.92	(19.11)
5	Co 11020	9.48	(2.71)	10.17	(3.22)	8.53	(2.20)	31.92	(27.96)
6	Co 11021	7.68	(1.79)	9.72	(2.92)	8.21	(2.04)	23.92	(16.45)
7	Co 11022	7.93	(1.90)	7.52	(1.72)	7.66	(1.78)	13.92	(5.79)
8	Co 11023	7.97	(1.92)	7.79	(1.84)	4.02	(0.98)	23.92	(16.45)
9	Co 11024	6.79	(1.40)	7.36	(1.64)	7.49	(1.70)	27.92	(21.93)
10	CoM 11085	7.92	(1.90)	7.30	(1.61)	7.42	(1.67)	31.92	(27.96)
11	CoM 11086	6.99	(1.48)	8.47	(2.23)	7.13	(1.54)	23.92	(16.45)
12	CoM 11087	8.29	(2.08)	8.37	(2.17)	7.02	(1.49)	31.92	(27.96)
13	CoN 11073	5.94	(1.07)	7.02	(1.49)	7.10	(1.53)	19.92	(11.61)
14	CoN 11074	9.22	(2.57)	9.23	(2.63)	7.79	(1.84)	17.92	(9.47)
15	Co 85004	6.74	(1.38)	7.84	(1.86)	8.02	(1.95)	17.92	(9.47)
16	Co 94008	8.07	(1.97)	7.83	(1.86)	7.94	(1.91)	21.92	(13.94)
	S.Em.+(T)	0.62		1.04		0.99		3.02	
	C. D @ 5%	1.86		NS		NS		9.11	
	C. V. %	11.39		17.19		18.72		16.97	

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 4.1.3.2. From the table, it is seen that the differences due to various genotypes in respect of percent incidence of top borer at 5th month was found significant. Whereas, percent incidence of top borer at 7th month and at harvest shows non-significant reaction.

Based on the percent incidence of top borer infestation was at 5th month ranged from 1.07 to 2.71 per cent. The least incidence was observed in CoN 11073 (1.07 %) while maximum incidence was observed in Co 11020 (2.71%).

Based on the percent incidence of top borer at 7th month the range was ranged from 1.49 to 3.89 per cent. The least incidence was observed in CoN 11.073 (1.49 %) while maximum incidence was observed in Co 11019 (3.89 %).

Based on the percent incidence of top borer at harvest the infestation was ranged from 0.98 to 2.20 per cent. The least incidence was observed in Co 11023 (0.98 %) while maximum incidence was observed in Co 11020 (2.20%).

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 5.79 to 27.96 per cent. The least incidence was observed in Co 11022 (5.79%), while maximum incidence was observed in Co 11007, Co 11012, Co 11020 and CoM 11087 (27.96), respectively.

Table -4.1.3.3 Screening of sugarcane varieties against Scales and Mealy bugs in IVT (M) trial at Main Sugarcane Research Station, Navsari (2014-15).

Sr. No.	Genotype	Scale insects				Mealy bugs			
		% incidence		% intensity		% incidence		% intensity	
1	Co 11005	17.56	(9.10)	5.90	(1.06)	52.62	(63.15)	23.03	(15.30)
2	Co 11007	4.27	(0.55)	2.18	(0.14)	53.18	(64.09)	22.28	(14.37)
3	Co 11012	42.94	(46.41)	23.60	(16.03)	58.95	(73.40)	28.06	(22.12)
4	Co 11019	43.50	(47.39)	19.49	(11.14)	58.95	(73.40)	23.46	(15.85)
5	Co 11020	23.89	(16.40)	12.46	(4.66)	60.14	(75.21)	23.83	(16.32)
6	Co 11021	37.17	(36.51)	16.58	(8.14)	66.47	(84.06)	28.90	(23.35)
7	Co 11022	4.27	(0.55)	2.18	(0.14)	46.85	(53.23)	18.45	(10.01)
8	Co 11023	17.56	(9.10)	8.09	(1.98)	66.47	(84.06)	24.42	(17.09)
9	Co 11024	17.56	(9.10)	8.64	(2.26)	41.08	(43.18)	18.08	(9.63)
10	CoM 11085	4.27	(0.55)	2.18	(0.14)	1.85	(0.10)	0.36	(0.00)
11	CoM 11086	17.56	(9.10)	7.90	(1.89)	72.24	(90.69)	21.90	(13.91)
12	CoM 11087	42.94	(46.41)	19.29	(10.92)	46.85	(53.23)	18.22	(9.77)
13	CoN 11073	23.89	(16.40)	9.63	(2.80)	27.60	(21.45)	22.56	(14.71)
14	CoN 11074	17.56	(9.10)	8.20	(2.03)	29.90	(24.80)	19.67	(11.33)
15	Co 85004	49.27	(57.43)	21.58	(13.53)	41.08	(43.18)	17.68	(9.22)
16	Co 94008	37.17	(36.51)	15.95	(7.55)	41.08	(43.18)	16.74	(8.30)
	S.Em.+(T)	3.56		1.56		6.85		2.71	
	C. D @ 5%	10.72		4.71		20.65		8.18	
	C. V. %	20.05		19.19		19.05		18.75	

*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 4.1.3.3 from the table, it is seen that the differences due to various genotypes in respect of percent incidence of scale insects were found significant. On the basis of data it is shown that percent incidence of scale ranged from 0.55 to 57.43 per cent. The least incidence was observed in Co 11007, Co 11022 and CoM 11085 (0.55 %), while maximum incidence was observed in Co 85004 (57.43%).

The data also shows that the differences due to various genotypes in respect of percent intensity of scale insect were found significant. Percent intensity of scale ranged from 0.14 to 16.03 per cent. The least intensity was observed in Co 11007, Co 11022 and CoM 11085 (0.14 %) respectively, whereas the maximum scale insect per cent intensity was observed in Co 11012 (16.03) followed by Co 85004 (13.53), Co 11019 (11.14) and CoM 11087 (10.92%) respectively.

Mealy bugs: *Saccharicoccus sacchari* (Cockerell)

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 mealy bugs were significant. Percent incidence of mealy bugs ranged from 0.10 to 90.69 per cent. The least incidence was observed in CoM 11085

(0.10%), while maximum per cent incidence was observed in CoM 11086 (90.69%) followed by Co11021 and Co 11023 having (84.06 %), respectively.

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 intensity of mealy bugs were significant. Percent intensity of mealy bugs, ranged from 0.00 to 23.35 per cent. There is zero per cent intensity was observed in CoM 11085. While, maximum per cent intensity was observed in Co 11021 (23.35) followed by Co11012 (22.12%) and Co 11023 (17.09%), respectively.

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	:	2014 – 2015
Location	:	Main 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 2014-15.

Name of pest	Varieties	Location	Per cent Incidence	Remarks
White fly	Co 86032 (ratoon)	Sisodra Ta. Nandod Di: Narmada (Narmada sugar factory)	85 to 90 %	July-Sep-2014
	Co 86032 Planting		60 to 60 %	
	Co 86032	4 to 5 villages surrounding to sisodra	30 to 35 %	July-Sep-2014
	CoM 0265	Umara, Karcheliya, Mahuva Sugar	15 to 20 %	-
	Co 86032 CoM 0265	Mota and Kharvasa village, Bardoli sugar factory	30 to 40 %	-
Early shoot borer & Top borer	CoC 671 Co 86032 CoM 0265 Co 97009	Limodra, Lindiyat and Pipodra village area of Kamrej Sugar Factory	40 to 50 %	-
	Co 97009 (MC- 707) Co 86032 CoC 671 CoM 0265 CoSi 95071	Kharel, Gandeva, Naugama, Gandevi sugar factory	13 to 15 %	-
	Co 86002 Co 97009	Pardi Zankhari, Sandhiyer , Sithan, Olpad and sayan: Sayan sugar factory	30 to 40 % 9 to 12%	-

	(MC- 707)	Chalthan sugar : Mohini, Vaktana, Vanz and vav, Kamrej : Kudsad, Kanyasi	5 to 8 %	
Wooly Aphid	Co 97009 (MC- 707)	Umara, Dholikua (Mahuva), Chalthan and Bardoli sugar factory area	Scattered 1 to 3 %	-
Scale insect	CoN 07072	Mosali, Mangrol, Valiya (Vatariya sugar)	10 to 15%	-
Mealy bugs	Co 86002	Simadi, Simada, Khanpur (Kamrej and Chalthan Sugar factory)	8 to 12%	-

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: Monitoring of insect pests and bio-agents in sugarcane agro ecosystem

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	: M.S.R.S., N.A.U., Navsari
Year of start	: 2014-15
Duration	: Long term
Date of Planting	: 13-12-2014
Variety	: Co 86032
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.

Name of the pest	Mean % incidence	Larva/egg mass collected	Parasitized larva	Bio-agents observed	Per cent parasitism
ESB (<i>Sesamia</i> sp.)	13 to 15 %	48 (L)	3	<i>Telenomus</i> sp.	6.25%
<i>Chilo</i> sp.	8 to 12 %	39 (L)	2	<i>Apanteles</i> sp.	5.13%
Top borer	6-7%	23 (E)	2	<i>Telenomus</i> sp.	8.69%
Internode borer	10 to 12 %	-	-	-	-
Root borer	12 to 15 %	-	-	-	-
Scale insect	3- 5 %	-	-	-	-
Mealy bugs	15 to 20 %	-	-	<i>Chrysoperla carnea</i>	-
Pyrilla	Not found	-	-	<i>Tetrastacus pyrillae</i> <i>Epiricania melanoleuca</i>	-
White fly	Scattered	-	-	Lady bird beetle	-

Result:

During the monitoring period only few natural enemies found in sugarcane ecology amongst them larval parasitism by the *Telenomus* sp. (6.25%) was found on *Sesamia* spp.(ESB), while by the *Apanteles* spp.(5.13%) was found on *Chilo* spp. In case of top borer an egg parasitism (8.69%) was found by the *Telenomus* spp.. The natural enemies of internode borer, Root borer, Scale insect, pyrilla as well as on whitefly was not observed during the monitoring period.

Project No. E. 33

- Project Title** : **Bio-efficacy of insecticides against mealy bugs, *Saccharicoccus sacchari* 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** : 08-02-2014
- 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 (2014-15)

Treatment	% Mealy bug Intensity					Pooled
	Pre-treat	7 DAS	15 DAS	30 DAS	At harvest	
T₁	29.69	21.11	19.54	18.30	25.98	21.88
	(24.53)	(12.97)	(11.19)	(9.86)	(19.19)	(13.88)
T₂	31.14	25.99	25.00	22.94	29.09	27.43
	(26.75)	(19.20)	(17.86)	(15.19)	(23.64)	(21.21)
T₃	29.98	26.94	25.66	24.31	30.27	27.34
	(24.97)	(20.53)	(18.75)	(16.95)	(25.41)	(21.10)
T₄	30.57	26.31	25.00	23.30	29.39	27.42
	(25.86)	(19.64)	(17.86)	(15.64)	(24.08)	(21.21)
T₅	30.28	25.33	23.64	22.23	28.49	26.98
	(25.42)	(18.31)	(16.08)	(14.31)	(22.75)	(20.58)
T₆	32.00	25.66	24.33	22.59	28.79	25.27
	(28.08)	(18.75)	(16.97)	(14.75)	(23.19)	(18.22)
T₇	30.86	27.57	25.99	24.67	30.27	17.62
	(26.31)	(21.42)	(19.20)	(17.42)	(25.41)	(9.16)
T₈	31.44	26.62	25.33	23.64	29.68	30.52
	(27.20)	(20.08)	(18.30)	(16.08)	(24.52)	(25.79)
T₉	32.29	32.85	33.68	34.77	35.58	30.43
	(28.53)	(29.42)	(30.75)	(32.53)	(33.86)	(25.65)
S.Em. ± (T)	1.61	1.28	1.35	1.23	1.36	2.00
C.D. (T)	NS	3.85	4.05	3.69	4.07	6.53
C.V. %	8.02	7.23	7.88	7.44	6.96	10.85

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

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 as well as in pooled analysis.

After 7 days of spraying the lowest (12.97%) mean per cent intensity of mealy bugs was found in T₁ followed by T₅ (18.31%) and it was at par with rest of the treatments except control T₉ (29.42%).

After 15 days the lowest per cent intensity was recorded in treatment T₁ (11.19 %) followed by T₅ (16.08%) and T₆ (16.97%). Maximum intensity was found in the untreated control (30.75%) treatment.

30 days after treatment T₁ (9.86) was found significantly superior over rest of the treatments. The second best treatment is T₅ (14.31%) and its remains at par with T₆ (14.75%), T₂ (15.19%), T₄ (15.64%), T₈ (16.08%), T₃ (16.95%) and T₇ (17.42%), respectively. Whereas maximum per cent intensity was noticed in T₉ (32.53%) untreated control.

At harvest the maximum per cent infestation was found in untreated control (33.86%) while significant lowest per cent intensity was found in treatment T1 (19.19) and it is at par with T5(22.75%) and T6 (23.19%).

Based on the **pooled** analysis treatment T1 (13.88) was found to be most effective in reducing the mealy bugs per cent intensity. Untreated control T9 treatment recorded highest per cent intensity of mealy bug (25.65 %) Table: 1.

Table: 2 Bio-efficacy of insecticides against mealy bugs, *Saccharicoccus sacchari* in sugarcane, trial at Main Sugarcane Research Station, Navsari (2014-15)

Sr. No.	Yield (t/ha)	Quality parameter			
		Brix%	Sucrose%	Purity%	C.C.S.%
T ₁	113.10	22.30	19.89	89.31	13.82
T ₂	94.28	23.47	20.51	87.40	14.11
T ₃	90.13	23.37	20.49	87.08	14.04
T ₄	88.60	23.60	20.81	88.16	14.38
T ₅	108.18	22.63	19.83	88.40	13.67
T ₆	102.41	23.40	20.38	87.08	14.00
T ₇	83.35	21.40	19.37	90.71	13.55
T ₈	112.82	23.13	20.34	87.93	14.04
T ₉	78.35	22.50	19.74	87.68	13.61
S.Em. ± (T)	5.47	0.52	0.38	1.11	0.26
C.D. (T)	16.40	NS	NS	NS	NS
C.V. %	9.79	3.92	3.23	2.18	3.24

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

The highest millable cane yield of sugarcane was recorded in T1 (113.10 t/ha) and it was at par with T5 (108.18 t/ha), T6 (102.41 t/ha) and T8 (112.82 t/ha) .The significant lowest yield was found in T9 untreated control (78.35 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 not produce 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	: 2014-15
Variety	: Co 86032
Location	: Main Sugarcane Research Station, NAU, Navsari
Date of planting	: 23-12-2014
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 2014-2015.

STW	Date	Temperature °C		RH %		Sun shine (hrs/day)	Rain Fall (mm)	Rainy days	ESB	TB	INB
		Max °C	Min °C	Mor.	Eve.						
1	2	3	4	5	6	7	8	9	10	11	12
1	1-7	29.2	14.4	78	39	6.6	0.0	0	2	1	3
2	8-14	28.6	12.6	85	52	7.8	0.0	0	2	2	2
3	15-21	28.3	17.5	83	55	5.4	2.0	1	2	2	2
4	22-28	32.6	15.8	65	28	8.9	0.0	0	2	2	2
5	29-4	29.8	14.0	78	37	8.9	0.0	0	2	3	2
6	5-11	30.1	12.8	91	34	9.4	0.0	0	2	2	2
7	12-18	27.0	13.6	78	33	8.5	0.0	0	1	2	2
8	19-25	31.0	17.3	77	38	8.3	0.0	0	2	2	2
9	26-4	22.6	11.5	58.1	24.3	6.9	0.0	0	3	2	3
10	5-11	32.3	18.0	77.8	43.0	8.2	0.0	0	1	1	2
11	12-18	34.8	18.2	81.2	31.2	8.9	0.0	0	3	3	2
12	19-25	34.1	17.6	84.4	32.6	9.1	0.0	0	2	2	2
13	26-1	14.9	8.8	37.4	26.2	3.8	0.0	0	2	2	2
14	2-8	37.0	21.1	91.2	32.4	8.7	0.0	0	1	2	3
15	9-15	33.0	20.3	87.0	43.8	9.3	0.0	0	3	3	2
16	16-22	33.6	23.8	81.6	50.0	8.3	0.0	0	2	3	2
17	23-29	37.8	23.5	84.0	40.6	9.1	0.0	0	3	2	1
18	30-6	34.0	24.6	88.1	55.1	8.4	0.0	0	3	2	3
19	7-13	34.3	25	81	52.2	10	0.0	0	2	2	2
20	14-20	35.2	25.6	82.8	50.8	9.5	0.0	0	1	2	2
21	21-27	35.7	26.6	86.1	58.5	9.6	0.0	0	3	3	2
22	28-3	34	28	81.1	63.7	9.5	0.0	0	2	2	3
23	4-10	34.3	28.9	85	64.5	9	0.0	0	2	4	2
24	11-17	33.6	26	84.9	69.3	7.6	28	5	1	2	1
25	18-24	32.4	28.3	81.6	65.7	6.1	8	3	2	2	3
26	25-1	33.8	28.2	76	59.3	8.7	0.0	0	3	2	3
27	2-8	33.5	26.5	84.3	65.8	7.4	21	3	2	3	1
28	9-15	31.0	25.1	91.8	74.9	4.8	40.5	6	2	2	2
29	16-22	29.7	26	91.1	84.5	1.2	221.5	6	2	3	2
30	23-29	29.7	24.9	87.2	86.2	1.6	282	7	3	2	2
31	30-5	28.6	25.7	93.4	86.4	1.8	268.5	7	2	3	1
32	6-12	29.7	24.8	92.3	79.3	4.7	64.5	7	2	3	2
33	13-19	30.1	25.3	89.2	77.4	9.4	40	5	3	2	2
34	20-26	32.2	25.6	94.5	77.1	4.7	24	3	3	3	2
35	27-2	29.7	24.3	96.9	85.5	0.7	120	6	3	2	3
36	3-9	29.8	25.3	93.1	83.0	3.5	61.0	6	2	3	3
37	10-16	29.7	24.2	95.9	78.1	2.8	278.0	5	2	2	2
38	17-23	32	24.3	90.5	70.4	6.4	1	1	4	3	3
39	24-30	34.4	24.6	89.8	68.2	6.4	0.0	0	1	2	2
40	1-7	36.7	24.4	83.1	39.9	8.1	0.0	0	2	2	2
41	8-14	36.4	22.5	85.5	42.2	8.6	0.0	0	3	3	2
42	15-21	36.4	22.5	87.8	47.8	9.8	0.0	0	3	2	2
43	22-28	34.6	21.3	75.4	36.2	6.7	0.0	0	4	2	2
44	29-4	35.3	19.4	89.5	42.3	9.0	0.0	0	3	4	3
45	5-11	34.1	18.8	80.2	38.2	8.6	0.0	0	2	1	2
46	12-18	32.7	22.7	90.0	58.2	5.4	67.0	3	2	3	3
47	19-25	33.2	18.9	82.4	43.1	8.7	0.0	0	2	3	2
48	26-2	33	15.5	83.2	32.9	8.8	0.0	0	3	3	3
49	3-9	32.6	15.7	69.4	37	8.8	0.0	0	2	3	2
50	10-16	30.2	14	81.9	47.9	6.6	0.0	0	2	2	2
51	17-23	29.3	13.2	70.5	47.8	7.6	0.0	0	2	3	2
52	24-31	29.0	13	68.7	33.2	8	0.0	0	3	3	4

Table: 1 Correlation between populations of early shoot borer, top borer and internode borer with weather parameters (2014-2015)

Pests	Temperature °C		Relative Humidity %		Rain-Fall (mm)	No. of rainy days	Sun shine hours
	Max.	Min.	Morning	Evening			
1	2	3	4	5	6	7	8
ESB	0.078	0.075	0.033	0.023	-0.023	0.011	-0.022
TB	-0.091	0.160	0.179	0.162	-0.011	0.058	0.092
INB	0.115	-0.115	-0.070	-0.114	-0.006	-0.172	-0.156

Top borer: Maximum moth catches of top borer (4.00) was recorded in 23rd and 44th STW. From the Table-1 it is observed that there is negative correlation between top borer moth catches and maximum temperature (-0.091), rainfall (-0.011), while minimum temperature (0.160), number of rainy days (0.058), morning (0.179) relative humidity, evening (0.162) relative humidity and sunshine hours (0.092) showed positive correlation but were non significant (Table-1).

Early shoot borer: Maximum moth catches of early shoot borer (4.00) was recorded in 38th and 43rd STW. From the Table-1 it is observed that there is positive significant correlation between early shoot borer moth catches with maximum temperature (0.078), minimum temperature (0.075), relative humidity morning (0.033) and evening (0.023), and number of rainy days (0.011) showed non significant positive correlation. It shows non-significant negative correlation with rainfall (-0.023) and sunshine hours (-0.022).

Internode borer: Maximum moth catches of internode borer (4.00) was recorded in 52nd STW. From the Table-1 it is observed that there is non-significant negative correlation between internode borer moth catches and most of the parameters i.e. with minimum temperature (-0.115), morning (-0.070) and evening (-0.114) relative humidity, rain fall (-0.006) and number of rainy days (-0.172), whereas, only maximum temperature (0.115) shows non-significant positive 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	: Co 86032
Location	: Powarkheda, Mandya, Anakapalle, Padegao, VSI, Pune, Navsari and Ludhiana
Design	: RBD
No. of treatment	: 8 (Eight)
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:

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

- 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 table it is 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 3.75 to 12.24 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 (3.75 %). While, maximum incidence was observed in Untreated control (12.24 %).

It is also 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 7.62 to 19.13 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 (7.62%) .While, maximum incidence was observed in Untreated control (19.13 %).

The same trend was observed from the pooled data which indicates 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 6.13 to 16.08 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 (6.13 %) while maximum incidence was observed in Untreated control (16.08 %).

Table -1 Bio-efficacy of new insecticide for the control of sugarcane ESB trial at Main Sugarcane Research Station, Navsari (2014-15).

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	13.68 (5.59)	14.61 (6.36)	16.58 (8.14)	18.30 (9.86)	15.88 (7.49)	18.19
2	Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP	11.17 (3.75)	14.06 (5.9)	15.63 (7.26)	16.02 (7.62)	14.33 (6.13)	12.56
3	Spraying of Chlorantraniliprole 18.5 SC 375 ml/ha at 30 and 60 DAP	14.08 (5.92)	13.79 (5.68)	15.04 (6.73)	17.58 (9.12)	15.18 (6.86)	14.86
4	Spraying of Spinosad 45 SC @ 90 ml/ha at 30 and 60 DAP	15.53 (7.17)	14.77 (6.5)	17.20 (8.74)	19.63 (11.29)	16.87 (8.42)	20.07
5	Spraying of Flubendiamide @ 250 ml/ ha at 30 and 60 DAP	14.96 (6.66)	14.54 (6.3)	16.01 (7.61)	19.12 (10.73)	16.25 (7.83)	19.27
6	Soil application of Phorate 10 G @ 15 kg /ha at the time of planting and 60 DAP	16.30 (7.88)	15.86 (7.47)	18.87 (10.46)	20.66 (12.45)	18.01 (9.56)	22.02
7	Soil application of Carbofuran 3 G @ 33 kg /ha at the time of planting and 60 DAP	16.82 (8.37)	16.98 (8.53)	16.90 (8.45)	20.08 (11.79)	17.75 (9.29)	22.72
8	Untreated control	20.48 (12.24)	23.34 (15.7)	24.55 (17.26)	25.94 (19.13)	23.64 (16.08)	39.58
	S.Em ± (T)	1.02	0.97	0.51	0.69	0.43	-
	C. D @ 5%	3.10	2.93	1.55	2.09	1.26	-
	C. V. %	14.56	11.44	9.47	10.39	9.61	-

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

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 -2 Effect of new insecticide on yield and quality parameter at Main Sugarcane Research Station, Navsari (2014-15).

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	119.74	19.6	18.98	89.6	12.50
2	Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP	127.92	20.3	19.62	89.5	12.67
3	Spraying of Chlorantraniliprole 18.5 SC 375 ml/ha at 30 and 60 DAP	124.62	21.5	20.65	91.2	13.46
4	Spraying of Spinosad 45 SC @ 90 ml/ha at 30 and 60 DAP	116.74	20.5	19.91	89.8	12.83
5	Spraying of Flubendiamide @ 250 ml/ha at 30 and 60 DAP	117.86	21.1	20.13	90.1	13.25
6	Soil application of Phorate 10 G @ 15 kg /ha at the time of planting and 60 DAP	101.42	19.9	19.52	91.5	12.78
7	Soil application of Carbofuran 3 G @ 33 kg /ha at the time of planting and 60 DAP	91.60	21.4	20.98	91.3	13.72
8	Untreated control	77.54	20.9	20.35	91.1	13.37
	S.Em ± (T)	6.47	0.55	0.45	1.14	0.31
	C. D @ 5%	19.62	NS	NS	NS	NS
	C. V. %	10.21	4.58	3.91	2.17	4.09

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

The highest millable cane yield of sugarcane was recorded in T2 (127.92 t/ha) and it was at par with T3 (124.62 t/ha), T1 (119.74), T5 (117.86 t/ha) and T4 (116.74 t/ha). The significant lowest yield was found in untreated control T8 (77.54) 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.
