ANNUAL RESEARCH REPORT OF SUGARCANE ENTOMOLOGY M.S.R.S., N.A.U. NAVSARI FOR THE YEAR 2015-16

Project no. E.4.1:

1. **Title** : **Evaluation of zonal verities/ 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** : 2015-16
4. **Location** : Main Sugarcane Research Station, Navsari.
5. **No. of replications** : Three
6. **Plot size** : 6.00 X1.00 M
7. **Date of planting** : 06.01.2015
8. **Verities** : IVT/AVT
9. **Signature of the scientist in charge of the experiment** :
10. **Name and designation** : S. N. Gajjar, Assistant Research Scientist

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:

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

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. Stalk borer: ***Diatraea saccharalis*** **(Fabricius) 4. Internode borer:** *Chilo sacchariphagous indicus* (Kapur) and **5**. **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.

6. 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.

8. 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.

9. 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 (E) trial at Main Sugarcane Research Station, Navsari (2015-16).

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 12001	0.00	1.18	(6.24)	0.93	(5.53)	0.84	(5.26)	2.11	3525
2	Co 12003	0.00	0.00	(0.00)	0.00	(0.00)	0.73	(4.90)	1.33	2222
3	Co 12006	0.00	3.06	(10.07)	1.55	(7.15)	0.72	(4.87)	1.32	2194
4	Co 12007	0.00	0.00	(0.00)	0.00	(0.00)	0.88	(5.38)	1.41	2347
5	Co 12008	0.00	0.00	(0.00)	0.00	(0.00)	1.09	(5.99)	1.52	2525
6	Co M 12081	0.00	0.00	(0.00)	1.50	(7.03)	1.44	(6.89)	2.03	3421
7	Co M 12082	0.00	0.00	(0.00)	1.67	(7.43)	0.78	(5.07)	2.50	4167
8	Co M 12083	0.00	0.00	(0.00)	0.00	(0.00)	0.76	(5.00)	1.40	2331
9	Co N 12071	0.00	4.48	(12.22)	2.00	(8.13)	0.91	(5.47)	1.62	2697
10	Co N 12072	0.00	3.89	(11.38)	1.65	(7.38)	0.85	(5.29)	1.47	2697
11	Co T 12366	0.00	3.19	(10.29)	0.00	(0.00)	0.00	(0.00	1.17	1956
12	Co T 12367	0.00	4.51	(12.26)	2.58	(9.24)	0.61	(4.48)	1.23	2058
13	Co 85004	0.00	3.13	(10.19)	5.37	(13.40)	1.29	(6.52)	4.09	38889
14	Co 94008	0.00	0.95	(5.59)	5.30	(13.31)	2.17	(8.47)	2.56	20370
15	Co C 671	0.00	7.45	(15.84)	0.81	(5.16)	1.50	7.03)	2.43	18520
	S.Em.+(T)	-	0.31		0.27		0.23		-	-
	C. D @ 5%	-	0.90		0.80		0.67		-	-
	C. V. %	-	8.55		8.32		6.94		-	-

Figures in the parenthesis are arcsine transformed values and those outside are original 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, 90 and 120DAP, The cumulative per cent infestation of early shoot borer ranged from 1.17 to 4.09 per cent. The least incidence was observed in CoT 12366 (1.17%) followed by Co T 12367 (1.23%), while maximum incidence was observed in standard check Co 85004 (4.09 %).

Table -4.1.1.2 Screening of sugarcane varieties against Top borer in IVT (E) trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	% Incidence of Top Borer					
		5th month		7th month		At harvest	
1	Co 12001	2.70	(9.46)	2.91	(9.82)	3.09	(10.12)
2	Co 12003	1.61	(7.29)	1.69	(7.47)	2.65	(9.37)
3	Co 12006	2.34	(8.80)	3.20	(10.30)	2.56	(9.21)
4	Co 12007	1.94	(8.01)	1.94	(8.01)	3.03	(10.02)
5	Co 12008	3.49	(10.77)	1.15	(6.16)	3.70	(11.09)
6	Co M 12081	1.56	(7.17)	1.59	(7.24)	4.20	(11.83)
7	Co M 12082	1.71	(7.51)	0.87	(5.35)	1.83	(7.77)
8	Co M 12083	1.63	(7.34)	1.67	(7.43)	2.63	(9.33)
9	Co N 12071	2.00	(8.13)	2.04	(8.21)	2.13	(8.39)
10	Co N 12072	1.94	(8.01)	1.67	(7.43)	1.83	(7.77)
11	Co T 12366	1.63	(7.34)	1.60	(7.27)	2.56	(9.21)
12	Co T 12367	1.33	(6.62)	1.38	(6.75)	2.26	(8.65)
13	Co 85004	0.70	(4.80)	1.45	(6.92)	1.52	(7.08)
14	Co 94008	1.57	(7.20)	0.78	(5.07)	1.63	(7.34)
15	Co C 671	1.67	(7.43)	1.65	(7.38)	1.72	(7.54)
	S.Em.+(T)	0.43		0.68		0.52	
	C. D @ 5%	1.25		1.99		1.52	
	C. V. %	9.05		14.62		10.47	

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

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

From the table 4.1.1.2, it is seen that the differences in respect of per cent incidence of top borer due to various genotypes at 5th month, 7th month and at harvest were found significant against all tested genotypes.

Per cent incidence of top borer at 5th month ranged from 0.70 to 3.49 per cent. The least incidence was observed in Co 85004 (0.70 %), while maximum incidence was observed in Co 12008 (3.49) and Co 12001 (2.70%), respectively.

Whereas, Data on the per cent incidence of top borer at harvest reflect that it was ranged from 1.52 to 4.20 per cent. The least incidence was observed in Co 85004 (1.52 %) while, maximum incidence was observed in CoM 12081 (4.20 %). All tested genotypes were found to be less susceptible reaction against top borer

Table -4.1.1.3 Screening of sugarcane varieties against Stalk, Internode and Root borer in IVT (E) trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Stalk Borer			Internode Borer			Root Borer % incidence	
		% incidence	% intensity	% Infestation index	% incidence	% intensity	% Infestation index		
1	Co 12001	4.00	0.45	0.02	4.00	0.45	0.02	16.0	(23.58)
2	Co 12003	16.00	1.99	0.32	0.00	0.00	0.00	12.0	(20.27)
3	Co 12006	12.00	1.51	0.18	8.00	1.01	0.08	24.0	(29.33)
4	Co 12007	12.00	1.34	0.16	12.00	1.34	0.16	28.0	(31.95)
5	Co 12008	12.00	1.66	0.20	8.00	1.10	0.09	16.0	(23.58)
6	Co M 12081	16.00	1.91	0.31	8.00	0.96	0.08	20.0	(26.57)
7	Co M 12082	12.00	1.68	0.20	12.00	1.68	0.20	16.0	(23.58)
8	Co M 12083	8.00	1.19	0.10	8.00	1.19	0.10	20.0	(26.57)
9	Co N 12071	16.00	2.42	0.39	12.00	1.82	0.22	12.0	(20.27)
10	CoN 12072	8.00	1.20	0.11	4.00	0.83	0.08	12.0	(20.27)
11	Co T 12366	12.00	1.40	0.17	12.00	1.40	0.17	16.0	(23.58)
12	Co T 12367	20.00	2.62	0.52	8.00	1.05	0.08	16.0	(23.58)
13	Co 85004	16.00	2.12	0.34	16.00	2.12	0.34	20.0	(26.57)
14	Co 94008	28.00	3.59	1.01	12.00	1.54	0.18	20.0	(26.57)
15	Co C 671	20.00	2.33	0.47	16.00	1.86	0.30	20.0	(26.57)
	S.Em.+(T)	**0.88**	**0.13**	**0.03**	**0.92**	**0.08**	**0.02**	**1.39**	
	C. D @ 5%	**2.57**	**0.39**	**0.08**	**2.68**	**0.22**	**0.06**	**4.05**	
	C. V. %	**10.21**	**11.21**	**13.99**	**15.11**	**10.08**	**18.68**	**13.58**	

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

Stalk borer: *Diatraea saccharalis* (Fabricius)

From the table, it is seen that the differences in per cent incidence in various genotypes in respect to per cent incidence of stalk borer was found significant. Per cent incidence of Stalk borer was ranged from 4.00 to 28.00 per cent. The least per cent incidence of stalk borer was observed in Co 12001 (4.00%), while maximum incidence was observed in Co 94008 (28.00%).

Per cent intensity of stalk borer was ranged from 0.45 % (Co 12001) to 3.59 %(Co 94008). Incase of per cent infestation index it ranged from 0.02% (Co 12001) to 1.01% (Co 94008).

Internode borer: *Chilo sacchariphagous indicus* (Kapur)

From the table, it is seen that the differences in per cent incidence in various genotypes in respect to per cent incidence of internode borer was found significant. Per cent incidence of internode borer was ranged from 0.00 % to 16 % per cent. The least per cent incidence of internode borer was observed in Co 12003(0.00%), while maximum incidence was observed in Co 85004 and CoC 671 (16.00%).

Per cent intensity of internode borer was ranged from 0.00 % (Co 12003) to 2.12 % (Co 85004). Incase of per cent infestation index it ranged from 0.00% (Co 12003) to 0.34% (Co 85004).

Root borer: *Emmalocera depresella* (Swinhoe)

From the table, it is seen that the differences in respect to per cent incidence in various genotypes were found significant. Per cent incidence of root borer was ranged from 12.00 to 28.00 per cent. The least per cent incidence of root borer was observed in Co 12003 and CoN 12072 (12.00%), while maximum incidence was observed in Co 12007 (28.00%).

Table -4.1.1.4 Screening of sugarcane varieties against Scales and Mealy bugs in IVT- E trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Scale insects				Mealy bugs			
		% incidence		% intensity		% incidence		% intensity	
1	Co 12001	0.00	(0.00)	0.00	(0.00)	16.00	(23.58)	18.47	(25.45)
2	Co 12003	0.00	(0.00	0.00	(0.00)	20.00	(26.57)	19.90	(26.49)
3	Co 12006	4.00	(11.54)	0.50	(4.05)	16.00	(23.58)	20.10	(26.64)
4	Co 12007	0.00	(0.00)	0.00	(0.00)	20.00	(26.57)	17.41	(24.66)
5	Co 12008	0.00	(0.00)	0.00	(0.00)	20.00	(26.57)	15.47	(23.16)
6	Co M 12081	0.00	(0.00)	0.00	(0.00)	20.00	(26.57)	13.40	(21.47)
7	Co M 12082	0.00	(0.00)	0.00	(0.00)	20.00	(26.57)	21.23	(27.44)
8	Co M 12083	0.00	(0.00)	0.00	(0.00)	24.00	(29.33)	15.48	(23.17)
9	Co N 12071	0.00	(0.00)	0.00	(0.00)	16.00	(23.58)	16.97	(24.33)
10	Co N 12072	0.00	(0.00)	0.00	(0.00)	16.00	(23.58)	16.97	(24.33)
11	Co T 12366	0.00	(0.00)	0.00	(0.00)	28.00	(31.95)	11.68	(19.98)
12	Co T 12367	36.00	(36.87)	4.71	(12.53)	28.00	(31.95)	11.52	(19.84)
13	Co 85004	20.00	(26.57)	46.34	(42.90)	24.00	(29.33)	14.15	(22.10)
14	Co 94008	20.00	(26.57)	40.18	(39.34)	28.00	(31.95)	13.39	(21.46)
15	Co C 671	20.00	(26.57)	0.00	(0.00)	20.00	(26.57)	16.86	(24.24)
	S.Em.± (T)	1.23		0.95		1.15		1.51	
	C. D @ 5%	3.59		2.75		3.34		4.67	
	C. V. %	13.33		14.60		9.37		11.27	

Figures in the parenthesis are arcsine transformed values and those outside are original 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 per cent incidence of scale insect were found significant. It was ranged from 0.00 to 36.00 per cent. The least incidence (0.00 %) was observed in 10 genotypes out of 15 including checks, while maximum incidence was observed in Co T 12367 (36.0%).

Same trend was observed in per cent intensity of scale insects and it is found to be ranged from 0.00 to 46.34 per cent. The least intensity (0.00%) was observed in 10 genotypes while maximum intensity was observed in Co 85004 (46.34 %).

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 per cent incidence of mealy bugs were found significant. On the basis of that it can be seen that the per cent incidence of mealy bugs ranged from 16.00 to 28.00 per cent. The least incidence was observed in Co 12001, Co12006, Co N 12071 and Co N 12072 (16.00 %), respectively. while maximum incidence was observed in CoT 12366, CoT 12367 and Co 94008 (28.00 %), respectively.

Same trend was observed in per cent intensity of mealy bug and it is found to be ranged from11.52 to 21.23 per cent. The least intensity was observed in CoT 12367 (11.52 %) while maximum intensity was observed in Co M 12082 (21.23%).

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 plant trial at Main Sugarcane Research Station, Navsari (2015-16).

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	11.15	(19.51)	10.20	(18.63)	9.94	(18.38)	6.02	7407
2	Co 10005	0.00	12.35	(20.57)	11.60	(19.91)	10.25	(18.67)	6.55	9259
3	Co 10006	0.00	9.40	(17.85)	8.75	(17.21)	7.90	(16.32)	5.80	5556
4	Co 10024	0.00	4.65	(12.45)	5.92	(14.08)	0.61	(4.48)	2.99	29630
5	Co 10026	0.00	9.45	(17.90)	7.84	(16.26)	9.25	(17.71)	2.56	20370
6	Co 10027	0.00	2.80	(9.63)	0.00	(0.00)	0.00	(0.00)	2.00	16667
7	CoT 10366	0.00	0.00	(0.00)	2.52	(9.13)	0.78	(5.07)	1.00	7407
8	CoT 10367	0.00	10.35	(18.77)	11.55	(19.87)	10.12	(18.55)	1.11	11112
9	Co 85004	0.00	3.13	(10.19)	5.37	(13.40)	1.29	(6.52)	4.09	38889
10	Co 94008	0.00	0.95	(5.59)	5.30	(13.31)	2.17	(8.47)	2.56	20370
11	CoC 671	0.00	7.45	(15.84)	0.81	(5.16)	1.50	(7.03)	2.43	18520
	S.Em±(T)	-	0.60		1.33		1.37		-	-
	C. D @ 5%	-	1.77		3.91		4.03		-	-
	C. V. %	-	7.66		16.50		18.47		-	-

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

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

The data on per cent incidence, cumulative per cent incidence and number of bored plant per ha. 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, 90 DAP and 120 DAP were found significant. Based on the cumulative per cent incidence of early shoot borer the least incidence was observed in CoT 10366 (1.00 %) while, maximum incidence was observed in Co 10005 (6.55%).

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					
		5th month		7th month		At harvest	
1	Co 10004	7.25	15.62	9.40	17.85	10.25	(18.67)
2	Co 10005	11.39	19.72	9.65	18.10	9.80	(18.24)
3	Co 10006	9.45	17.90	9.80	18.24	10.15	(18.58)
4	Co 10024	0.66	4.66	0.68	4.73	1.55	(7.15)
5	Co 10026	7.60	16.00	8.00	16.43	7.95	(16.38)
6	Co 10027	0.79	5.10	1.72	7.54	1.82	(7.75)
7	CoT 10366	0.84	5.26	0.87	5.35	1.83	(7.77)
8	CoT 10367	10.25	18.67	9.35	17.80	10.35	(18.77)
9	Co 85004	0.70	4.80	1.45	6.92	1.52	(7.08)
10	Co 94008	1.57	7.20	0.78	5.07	1.63	(7.34)
11	CoC 671	1.67	7.43	1.65	7.38	1.72	(7.54)
	S.Em.± (T)	0.47		0.64		0.73	
	C. D @ 5%	1.37		1.87		2.14	
	C. V. %	6.98		9.45		10.05	

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

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

From the data presented in table 4.1.2.2 it can be concluded that the per cent infestation of top borer at 5th month, 7th month and also at harvest was found significant. Based on the per cent incidence of top borer at harvest the least per cent incidence was observed in Co 85004 (1.52 %), while maximum incidence was observed in CoT 10367 (10.35 %).

Table -4.1.2.3 Screening of sugarcane varieties against Stalk, Internode and Root borer in AVT E-I trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Stalk Borer			Internode Borer			Root Borer % incidence	
		% incidence	% intensity	% Infestation index	% incidence	% intensity	% Infestation index		
1	Co 10004	12.00	1.58	0.19	20.25	10.65	2.16	23.65	(29.10)
2	Co 10005	16.00	2.23	0.36	16.30	7.85	1.28	21.45	(27.59)
3	Co 10006	20.00	2.78	0.56	17.70	9.10	1.61	24.56	(29.71)
4	Co 10024	16.00	2.12	0.34	16.00	2.12	0.34	23.65	(29.10)
5	Co 10026	12.00	1.67	0.20	16.30	2.78	0.45	21.45	(27.59)
6	Co 10027	16.00	2.05	0.33	16.00	2.05	0.33	24.56	(29.71)
7	CoT 10366	8.00	0.93	0.07	8.00	0.93	0.07	23.65	(29.10)
8	CoT 10367	12.00	1.44	0.17	9.00	5.85	0.53	22.75	(29.10)
9	Co 85004	16.00	1.95	0.31	16.00	2.12	0.34	20.0	(26.57)
10	Co 94008	12.00	1.34	0.16	12.00	1.54	0.18	20.0	(26.57)
11	CoC 671	16.00	2.33	0.37	16.00	1.86	0.30	20.0	(26.57)
	S.Em.±(T)	0.87	1.15	1.24	1.09	1.44	1.11	1.37	
	C. D @ 5%	2.56	3.38	3.65	3.20	4.24	3.27	NS	
	C. V. %	9.91	18.00	20.39	12.55	21.73	18.69	13.63	

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

Stalk borer: *Diatraea saccharalis* (Fabricius)

From the table, it is seen that the differences in per cent incidence in various genotypes in respect to per cent incidence of stalk borer was found significant. Per cent incidence of Stalk borer was ranged from 8.00 to 20.00 per cent. The least per cent incidence of stalk borer was observed in CoT 10366 (8.00%), while maximum incidence was observed in Co 10006 (20.00%).

Per cent intensity of stalk borer was ranged from 0.93 % (CoT 10366) to 2.78 % (Co).Where as per cent infestation index ranged from 0.07 (CoT 10366) to 0.56 per cent %. (Co 10006)

Internode borer: *Chilo sacchariphagous indicus* (Kapur)

From the table, it is seen that the differences in per cent incidence in various genotypes in respect to per cent incidence of internode borer was found significant. Per cent incidence of internode borer was ranged from 8.00 % to 20.25 % per cent. The least per cent incidence of internode borer was observed in CoT 10366 (8.00%), while maximum incidence was observed in Co 10004 (20.25%).

Per cent intensity of internode borer was ranged from 0.93 % (CoT 10366) to 10.65 % (Co 10004). Incase of per cent infestation index it ranged from 0.07% (CoT 10366) to 2.16 % (Co 10004).

Root borer: *Emmalocera depresella* (Swinhoe)

From the table, it is seen that the differences in respect to per cent incidence in various genotypes were found non significant. Per cent incidence of root borer was ranged from 20.00 to 24.65 per cent. The least per cent incidence of root borer was observed in Co 85004, Co 94008 and CoC 671 (20.00%), while maximum incidence was observed in Co 10006 and Co 10027 (24.65%).

Table -4.1.2.4 Screening of sugarcane varieties against Scales and Mealy bugs in AVT (E) I P trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Scale insects				Mealy bugs			
		% incidence		% intensity		% incidence		% intensity	
1	Co 10004	24.00	(29.33)	3.16	(10.24)	16.00	(23.58)	2.11	(8.35)
2	Co 10005	24.00	(29.33)	3.35	(10.55)	16.00	(23.58)	2.23	(8.59)
3	Co 10006	20.00	(26.57)	2.78	(9.60)	12.00	(20.27)	1.67	(7.43)
4	Co 10024	0.00	(0.00)	2.65	(9.37)	40.00	(39.23)	5.29	(13.30)
5	Co 10026	12.00	(20.27)	1.67	(7.43)	20.00	(26.57)	2.78	(9.60)
6	Co 10027	0.00	(0.00)	0.00	(0.00)	60.00	(50.77)	7.69	(16.10)
7	CoT 10366	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	4.65	(12.45)
8	CoT 10367	12.00	(20.27)	1.44	(6.89)	16.00	(23.58)	1.92	(7.96)
9	Co 85004	40.00	(39.23)	4.88	(12.76)	60.00	(50.77)	7.32	(15.70)
10	Co 94008	40.00	(39.23)	4.46	(12.19)	72.00	(58.05)	8.04	(16.47)
11	CoC 671	0.00	(0.00)	0.00	(0.00)	20.00	(26.57)	2.91	(9.82)
	S.Em.±(T)	1.24		0.99		2.01		1.37	
	C. D @ 5%	3.66		2.92		5.94		4.04	
	C. V. %	11.05		20.02		9.68		18.63	

Figures in the parenthesis are arcsine transformed values and those outside are original 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 per cent incidence of scale insects were found significant. On the basis data per cent incidence ranged from 0.00 to 40.0 per cent. Zero per cent incidence was observed in Co 10024, Co10027, CoT 10366 and Co 671 respectively. Whereas, incase of maximum per cent incidence (40.0%) was observed in Co85004 and Co94008.

The data also shows that the differences due to various genotypes in respect of per cent intensity of scale insect were found significant. Per cent intensity of scale ranged from 0.00 to 4.88 per cent. The zero per cent intensity was observed in Co 10027, CoT 10366 and Co 671. Maximum scale insect per cent intensity was observed in Co 85004 (4.88%).

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 per cent incidence of mealy bugs were significant. Per cent incidence of mealy bugs ranged from 16.00 to 72.0 per cent. The least incidence was observed in Co 10006. while maximum per cent incidence was observed in Co 94008 (72 %).

From the data it is seen that the differences due to various genotypes in respect of per cent intensity of mealy bugs were significant. Per cent intensity of mealy bugs, ranged from 1.67 to 8.04

per cent. Least per cent intensity was observed in Co10006 (1.67%) and maximum per cent intensity was observed in Co 94008 (8.04) followed by Co 10027 (7.69%) respectively.

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

Table -4.1.3.1 Screening of sugarcane varieties against ESB in AVT (E) II P trial at Main Sugarcane Research Station, Navsari (2015-16).

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	12.98	(21.12)	1.33	(6.62)	0.64	(4.59)	3.81	37037
2	Co 09007	0.00	0.83	(5.23)	2.13	(8.39)	1.35	(6.67)	1.21	11112
3	CoN 09072	0.00	5.05	(12.99)	1.23	(6.37)	1.20	(6.29)	1.77	18519
4	Co 85004	0.00	3.13	(10.19)	5.37	(13.40)	1.29	(6.52)	4.09	38889
5	Co 94008	0.00	0.95	(5.59)	5.30	(13.31)	2.17	(8.47)	2.56	20370
6	CoC 671	0.00	7.45	(15.84)	0.81	(5.16)	1.50	(7.03)	2.43	18520
	S.Em±(T)	-	0.74		0.69		0.53		-	-
	C. D @ 5%	-	2.34		2.17		1.68		-	-
	C. V. %	-	10.14		13.01		12.80		-	-

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

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

From the table 4.1.3.1., the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer at 60 DAP, 90 DAP and 120 DAP were found significant. Based on the cumulative per cent incidence of early shoot borer the least incidence was observed in Co 09007 (1.21 %) while, maximum incidence was observed in Co 85004 (4.09%).

Table -4.1.3.2 Screening of sugarcane varieties against Top Borer in AVT (E) II P trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	% Incidence of Top Borer					
		5th month		7th month		At harvest	
1	Co 09004	1.37	(6.72)	0.00	(0.00)	1.47	(6.96)
2	Co 09007	1.53	(7.11)	0.78	(5.07)	1.68	(7.45)
3	CoN 09072	0.69	(4.76)	0.72	(4.87)	1.52	(7.08)
4	Co 85004	0.70	(4.80)	1.45	(6.92)	1.52	(7.08)
5	Co 94008	1.57	(7.20)	0.78	(5.07)	1.63	(7.34)
6	CoC 671	1.67	(7.43)	1.65	(7.38)	1.72	(7.54)
	S.Em.± (T)	0.67		0.58		0.46	
	C. D @ 5%	2.11		1.82		1.46	
	C. V. %	16.30		17.60		13.20	

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

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

From the data presented in table 4.1.3.2 it can be concluded that the per cent infestation of top borer at 5th month, 7th month and also at harvest was found significant. Based on the per cent incidence

of top borer at harvest the least per cent incidence was observed in Co 09004 (1.47 %) while maximum incidence was observed in CoC 671 (1.72 %).

Table-4.1.3.3 Screening of sugarcane varieties against Stalk borer, Internode borer and Root borer in AVT (E) II P trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Stalk Borer			Internode Borer			Root Borer % incidence	
		% incidence	% intensity	% Infestation index	% incidence	% intensity	% Infestation index		
1	Co 09004	20.00	3.18	0.64	12.00	1.91	0.23	20.0	(26.57)
2	Co 09007	12.00	1.33	0.16	12.00	1.33	0.16	20.0	(26.57)
3	CoN 09072	16.00	2.20	0.35	16.00	1.54	0.18	16.0	(23.58)
4	Co 85004	16.00	1.95	0.31	16.00	2.12	0.34	20.0	(26.57)
5	Co 94008	12.00	1.34	0.16	12.00	2.20	0.35	20.0	(26.57)
6	Co C 671	16.00	2.33	0.37	16.00	1.86	0.30	20.0	(26.57)
	S.Em.±(T)	1.03	0.23	0.05	1.15	0.25	0.02	1.71	
	C. D @ 5%	3.25	0.73	0.16	NS	0.78	0.06	NS	
	C. V. %	10.54	14.62	19.60	13.98	18.71	9.21	10.06	

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

Stalk borer: *Diatraea saccharalis* (Fabricius)

It is seen that difference in per cent incidence of various genotypes of stalk borer was found significant. Per cent incidence was ranged from 12 to 20.00 per cent. The least per cent incidence of stalk borer was observed in Co 09007 and Co 94008 (12.00%), while maximum incidence was observed in Co 09004 (20.00%).

Per cent intensity of stalk borer was ranged from 1.33 % (Co 09007) to 3.18 % (Co 09004). Incase of per cent infestation index it ranged from 0.16 % (Co 94008) to 0.64 % (Co 09004).Where as per cent infestation index ranged from 0.16 to 0.64 %.

Internode borer: *Chilo sacchariphagous indicus* (Kapur)

It is seen from the data differences in per cent incidence of various genotypes was found none significant. Per cent incidence of internode borer was ranged from 12.00 % to 16 % per cent.

Per cent intensity of internode borer was ranged from 1.33 % (Co 09007) to 2.20 % (Co 94008). Incase of per cent infestation index it ranged from 0.16 % (Co 09007) to 0.35 % (Co 94008).

Root borer: *Emmalocera depresella* (Swinhoe)

From the data it is seen that differences in respect to per cent incidence in various genotypes were found none significant. Per cent incidence of root borer was ranged from 16.00 to 20.00 per cent. The least per cent incidence of root borer was observed in CoN 09072, while rest of the genotype exhibit maximum incidence (20.00%).

Table -4.1.3.4 Screening of sugarcane varieties against Scales and Mealy bugs in AVT (E) II P trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Scale insects				Mealy bugs			
		% incidence		% intensity		% incidence		% intensity	
1	Co 09004	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	6.37	(14.62)
2	Co 09007	4.00	(11.54)	0.44	(3.80)	40.00	(39.23)	4.42	(12.14)
3	CoN 09072	0.00	(0.00)	0.00	(0.00)	20.00	(26.57)	2.75	(9.55)
4	Co 85004	40.00	(39.23)	4.88	(12.76)	60.00	(50.77)	7.32	(15.70)
5	Co 94008	40.00	(39.23)	4.46	(12.19)	72.00	(58.05)	8.04	(16.47)
6	CoC 671	0.00	(0.00)	0.00	(0.00)	20.00	(26.57)	2.91	(9.82)
	S.Em.± (T)	0.79		0.55		2.30		0.94	
	C. D @ 5%	2.49		1.73		7.25		2.97	
	C. V. %	8.50		17.76		8.91		10.30	

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

Scale insects, *Melanaspis glomerata* (Green)

Differences in respect of per cent incidence of scale insects of various genotypes were found significant. On the basis of data presented per cent incidence ranging from 0.00 to 40.0 per cent. Zero per cent incidence was observed in Co 09004, CoN 09072 and CoC 671 respectively. Whereas, maximum per cent incidence (40.0%) was observed in Co 85004 and Co 94008

The data shows that per cent intensity of various genotypes against scale insect was found significant. Per cent intensity of scale insect ranged from 0.00 to 4.88 per cent. The zero per cent intensity was observed in Co 09004, CoN 09072 and CoC 671 respectively. Maximum scale insect per cent intensity was observed in Co 85004 (4.88%).

Mealy bugs: *Saccharicoccus sacchari* (Cockerell)

The data are presented in table indicate that per cent incidence of mealy bugs in various genotypes were significant. Per cent incidence ranged from 20.00 to 72.0 per cent. The least incidence (20.00 %) was observed in CoN 09072 and CoC 671, respectively. Maximum per cent incidence was observed in Co 94008 (72 %).

From the data it is seen that differences due to various genotypes in respect of per cent intensity of mealy bugs were significant. Per cent intensity of mealy bugs, ranged from 2.75 to 8.04 per cent. Least per cent intensity was observed in CoN 09072 (2.75%) and maximum per cent intensity was observed in Co 94008 (8.04) followed by Co 85004 (7.32 %) respectively

Project E.4.1.4 IVT (ML):

Table -4.1.4.1 Screening of sugarcane varieties against ESB in IVT (ML) at Main Sugarcane Research Station, Navsari (2015-16).

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 12009	0.00	0.00	(0.00)	2.83	(8.25)	1.74	(7.58)	1.43	9259
2	Co 12012	0.00	0.00	(0.00)	0.81	(0.00)	0.75	(4.97)	0.49	3704
3	Co 12014	0.00	8.60	(17.05)	4.00	(9.68)	1.46	(6.94)	3.62	27778
4	Co 12016	0.00	8.26	(16.70)	4.29	(5.16)	1.35	(6.67)	3.66	31481
5	Co 12017	0.00	9.72	(18.17)	8.91	(11.54)	3.64	(11.00)	6.21	37037
6	Co 12019	0.00	4.17	(11.78)	1.89	(11.95)	0.88	(5.38)	0.89	5556
7	Co 12024	0.00	11.34	(19.68)	3.31	(17.37)	1.50	(7.03)	4.02	31481
8	Co M 12084	0.00	1.22	(6.34)	0.00	(7.90)	0.88	(5.38)	0.57	3704
9	Co M 12085	0.00	0.00	(0.00)	0.00	(10.48)	0.85	(5.29)	0.28	1852
10	Co M 12086	0.00	0.00	(0.00)	1.64	(0.00)	0.76	(5.00)	0.88	5556
11	Co N 07072	0.00	1.30	(6.55)	2.75	(0.00)	0.87	(5.35)	1.44	9259
12	CoN 12073	0.00	6.25	(14.48)	0.00	(7.36)	0.88	(5.38)	3.28	20370
13	CoN 12074	0.00	3.70	(11.09)	7.50	(9.55)	1.57	(7.20)	3.65	25926
14	CoT 12368	0.00	2.80	(9.63)	3.91	(0.00)	2.22	(8.57)	2.54	20370
15	VSI 12121	0.00	3.90	(11.39)	0.00	(15.89)	1.83	(7.77)	1.49	9259
16	Co 99004	0.00	9.17	(17.63)	3.27	(11.40)	0.00	(0.00)	3.34	31481
17	Co 86032	0.00	2.06	(8.25)	0.74	(0.00)	0.72	(4.87)	0.20	7407
	S.Em.+(T)	-	1.08		0.76		0.82		-	-
	C. D @ 5%	-	3.11		2.19		2.36		-	-
	C. V. %	-	17.71		15.70		19.63		-	-

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

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

From the table, it is seen that differences in respect of cumulative per cent infestation of early shoot borer in various genotypes 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 86032 (0.20 %) while, maximum incidence was observed in Co 12017 (6.21 %).

Table -4.1.4.2 Screening of sugarcane varieties against top borer in IVT (M) at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	% incidence of Top Borer					
		5th month		7th month		At harvest	
1	Co 12009	0.00	(0.00)	2.83	(9.68)	4.00	(11.54)
2	Co 12012	0.00	(0.00)	0.81	(5.16)	8.00	(16.43)
3	Co 12014	8.60	(17.05)	4.00	(11.54)	8.00	(16.43)
4	Co 12016	8.26	(16.70)	4.29	(11.95)	4.00	(11.54)
5	Co 12017	9.72	(18.17)	8.91	(17.37)	8.00	(16.43)
6	Co 12019	4.17	(11.78)	1.89	(7.90)	4.00	(11.54)
7	Co 12024	11.34	(19.68)	3.31	(10.48)	8.00	(16.43)
8	Co M 12084	1.22	(6.34)	0.00	(0.00)	4.00	(11.54)
9	Co M 12085	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)
10	Co M 12086	0.00	(0.00)	1.64	(7.36)	8.00	(16.43)
11	Co N 07072	1.30	(6.55)	2.75	(9.55)	8.00	(16.43)
12	CoN 12073	6.25	(14.48)	0.00	(0.00)	8.00	(16.43)
13	CoN 12074	3.70	(11.09)	7.50	(15.89)	4.00	(11.54)
14	CoT 12368	2.80	(9.63)	3.91	(11.40)	8.00	(16.43)
15	VSI 12121	3.90	(11.39)	0.00	(0.00)	8.00	(16.43)
16	Co 99004	2.03	(8.19)	2.03	(8.19)	8.00	(16.43)
17	Co 86032	1.54	(7.13)	1.56	(7.17)	8.00	(16.43)
	S.Em.+(T)	0.77		0.79		0.99	
	C. D @ 5%	2.21		2.29		2.85	
	C. V. %	15.58		17.78		12.55	

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

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

The data are presented in table **4.1.4.2** shows that difference in respect of per cent incidence of top borer in various genotypes at 5th, 7th month and at harvest shows significant reaction.

Per cent incidence of top borer infestation at 5th month ranged from 0.00 to 11.34 per cent. Maximum incidence was observed in Co 12034 (11.34 %). Whereas, at 7th month per cent incidence ranged from 0.00 to 8.91 per cent. Highest incidence was observed in Co 12017 (8.91 %).

Based on the data per cent incidence of top borer at harvest was ranged from 0.00 to 8.00 per cent.

Table -4.1.4.3 Screening of sugarcane varieties against Stalk borer, Internode borer and Root borer in IVT (ML) trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Stalk Borer			Internode Borer			Root Borer % incidence	
		% incidence	% intensity	% Infestation index	% incidence	% intensity	% Infestation index		
1	Co 12009	16.00	1.94	0.31	8.00	0.97	0.08	16.00	(23.58)
2	Co 12012	20.00	2.40	0.48	12.00	1.44	0.17	20.00	(26.57)
3	Co 12014	16.00	1.83	0.29	4.00	0.46	0.02	16.00	(23.58)
4	Co 12016	20.00	2.56	0.51	12.00	1.54	0.18	20.00	(26.57)
5	Co 12017	16.00	2.00	0.32	16.00	2.00	0.32	16.00	(23.58)
6	Co 12019	16.00	2.15	0.34	8.00	1.08	0.09	16.00	(23.58)
7	Co 12024	24.00	2.84	0.68	12.00	1.42	0.17	24.00	(29.33)
8	Co M 12084	16.00	2.06	0.33	8.00	1.03	0.08	16.00	(23.58)
9	Co M 12085	16.00	1.86	0.30	8.00	0.93	0.07	16.00	(23.58)
10	Co M 12086	24.00	3.08	0.74	12.00	1.54	0.18	24.00	(29.33)
11	Co N 07072	16.00	2.19	0.35	16.00	2.19	0.35	16.00	(23.58)
12	CoN 12073	16.00	1.76	0.28	8.00	0.88	0.07	16.00	(23.58)
13	CoN 12074	16.00	2.01	0.32	8.00	1.01	0.08	16.00	(23.58)
14	CoT 12368	24.00	2.76	0.66	12.00	1.38	0.17	24.00	(29.33)
15	VSI 12121	16.00	1.78	0.28	4.00	0.44	0.02	16.00	(23.58)
16	Co 99004	24.00	3.08	0.74	4.00	0.51	0.02	20.00	(26.57)
17	Co 86032	20.00	2.42	0.48	12.00	1.45	0.17	20.00	(26.57)
	S.Em.±(T)	1.23	0.30	0.07	0.81	0.10	0.05	1.33	
	C. D @ 5%	3.53	0.87	0.21	2.34	0.30	0.14	3.83	
	C. V. %	15.30	19.77	17.40	13.07	14.63	15.69	14.42	

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

Stalk borer: *Diatraea saccharalis* (Fabricius)

From data, it is seen that difference in per cent incidence of various genotypes against stalk borer was found significant. Per cent incidence was ranged from 16.00 to 24.00 per cent. Maximum per cent incidence was observed in Co 12024, CoM 12086, CoT 12368 and Co 99004 (24.00%), respectively.

Per cent intensity of stalk borer was ranged from 1.76 % (CoN 12073) to 3.08 % (CoM 12086 and Co 99004). Incase of per cent infestation index it ranged from 0.28% (VSI 12121) to 0.74 % (Co M 12086) Table-**4.1.4.3**.

Internode borer: *Chilo sacchariphagous indicus* (Kapur)

It is seen from the data difference in per cent incidence of various genotypes was found significant. Per cent incidence of internode borer was ranged from 4.00 % to 12.00 % per cent.

Per cent intensity of internode borer was ranged from 0.44 % (VSI 12121) to 2.19 % (Co N 07072). Incase of per cent infestation index it ranged from 0.02 to 0.35 %.

Root borer: *Emmalocera depresella* (Swinhoe)

The data are presented in table **4.1.4.3** shows that differences in respect of per cent incidence of root borer in various genotypes were significant. Per cent incidence of root borer ranged from 16.00 to 24.00 per cent. Highest per cent incidence was observed in Co 12024, Co M 12086 and CoT 12368 (24.00 %), respectively.

Table -4.1.4.4 Screening of sugarcane varieties against Scales and Mealy bugs in IVT (M) trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Scale insects				Mealy bugs			
		% incidence		% intensity		% incidence		% intensity	
1	Co 12009	0.00	(0.00)	0.00	(0.00)	20.00	(26.57)	2.43	(8.97)
2	Co 12012	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	4.81	(12.67)
3	Co 12014	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	4.59	(12.37)
4	Co 12016	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	5.13	(13.09)
5	Co 12017	0.00	(0.00)	0.00	(0.00)	60.00	(50.77)	7.50	(15.89)
6	Co 12019	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	5.38	(13.41)
7	Co 12024	0.00	(0.00)	0.00	(0.00)	20.00	(26.57)	2.37	(8.86)
8	Co M 12084	0.00	(0.00)	0.00	(0.00)	36.00	(36.87)	4.64	(12.44)
9	Co M 12085	4.00	(11.54)	0.47	(3.93)	40.00	(39.23)	4.65	(12.45)
10	Co M 12086	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	5.13	(13.09)
11	Co N 07072	0.00	(0.00)	0.00	(0.00)	36.00	(36.87)	4.92	(12.82)
12	CoN 12073	0.00	(0.00)	0.00	(0.00)	28.00	(31.95)	3.08	(10.11)
13	CoN 12074	0.00	(0.00)	0.00	(0.00)	28.00	(31.95)	3.52	(10.81)
14	CoT 12368	0.00	(0.00)	0.00	(0.00)	32.00	(34.45)	3.69	(11.07)
15	VSI 12121	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	4.44	(12.16)
16	Co 99004	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	5.13	(13.09)
17	Co 86032	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	4.83	(12.70)
	S.Em.±(T)	0.11		0.08		2.46		0.64	
	C. D @ 5%	0.32		0.23		7.08		1.84	
	C. V. %	27.31		25.81		16.98		8.18	

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

Scale insects, *Melanaspis glomerata* (Green)

Data (**Table -4.1.4.4)** shows significance difference in respect of per cent incidence of scale insects in various genotypes. Per cent incidence of scale insect varies from 0.00 to 4.00 per cent. Maximum incidence was observed in CoM 12085 (4.00%).

Data also shows difference in various genotypes in respect of per cent intensity of scale insect was significant. Per cent intensity of scale ranged from 0.00 to 0.47 per cent. Highest per cent intensity was observed in CoM 12085 (0.47%).

Mealy bugs: *Saccharicoccus sacchari* (Cockerell)

Per cent incidence of mealy bugs among various genotypes was found significant. It is ranged from 20.00 to 60.00 per cent. Maximum per cent incidence was observed in Co 12017 (60.00%)

Data on per cent intensity of mealy bugs were found significant and ranged from 2.43 (Co 12009) to 7.50 (Co 12017).

Project E.4.1.5 AVT (ML):

Table -4.1.5.1 Screening of sugarcane varieties against ESB borer in AVT (ML) I Plant at Main Sugarcane Research Station, Navsari (2015-16).

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	0.00	(0.00)	6.38	(14.63)	1.33	(6.62)	2.23	20370
2	Co 10031	0.00	0.00	(0.00)	1.44	(6.89)	0.68	(4.73)	0.65	5556
3	Co 10033	0.00	1.96	(8.05)	0.00	(0.00)	1.49	(7.01)	0.95	7407
4	Co T 10368	0.00	7.78	(16.20)	1.59	(7.24)	0.75	(4.97)	2.49	18520
5	Co T 10369	0.00	0.78	(5.07)	2.03	(8.19)	0.00	(0.00)	1.20	11112
6	PI 10131	0.00	3.39	(10.61)	9.59	(18.04)	1.94	(8.01)	4.18	38889
7	PI 10132	0.00	4.76	(12.60)	5.36	(13.39)	1.65	(7.38)	2.74	22222
8	Co 99004	0.00	2.06	(8.25)	0.74	(4.93)	0.71	(4.83)	0.92	7407
9	Co 86032	0.00	9.17	(17.63)	3.27	(10.42)	0.63	(4.55)	3.34	31481
	S.Em.+(T)	-	0.64		1.02		0.48		-	-
	C. D @ 5%	-	1.92		3.05		1.43		-	-
	C. V. %	-	12.25		17.84		13.07		-	-

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

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

From the table - **4.1.5.1**, it is concluded that cumulative per cent infestation of early shoot borer in various genotypes at 60, 90 and 120 DAP were found significant. Data of cumulative per cent infestation shows that least incidence was observed in Co 10031 (0.65 %). Whereas, incidence was observe maximum in PI 10131 (4.18 %).

Table -4.1.5.2 Screening of sugarcane varieties against Top Borer in AVT (ML) I Plant at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	% incidence of Top Borer					
		5th month		7th month		At harvest	
1	Co 09009	1.48	(6.99)	0.75	(4.97)	0.78	(0.78)
2	Co 10031	0.75	(4.97)	1.52	(7.08)	2.46	(2.46)
3	Co 10033	0.84	(5.26)	1.69	(7.47)	1.75	(1.75)
4	Co T 10368	1.67	(7.43)	1.68	(7.45)	0.88	(0.88)
5	Co T 10369	2.24	(8.61)	1.53	(7.11)	1.59	(1.59)
6	PI 10131	0.71	(4.83)	2.16	(8.45)	0.76	(0.76)
7	PI 10132	1.79	(7.69)	1.80	(7.71)	1.89	(1.89)
8	Co 99004	1.54	(7.13)	1.56	(7.17)	1.65	(1.65)
9	Co 86032	2.03	(8.19)	2.03	(4.97)	0.78	(1.41)
	S.Em.+(T)	0.66		0.63		0.22	
	C. D @ 5%	1.99		1.88		0.65	
	C. V. %	19.06		18.17		20.33	

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

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

Data are presented in table **4.1.5.2** shows that difference in respect of per cent incidence of top borer in various genotypes at 5th and 7th month and at harvest shows significant reaction.

Per cent incidence of top borer infestation at 5th month ranged from 0.71 (PI 10131) to 2.24 (Co T 10369) per cent. Whereas, at 7th month per cent incidence ranged from 0.75 to 2.16 per cent. Highest incidence was observed in PI 10131 (2.16 %).

Based on the per cent incidence of top borer at harvest infestation was ranged from 0.78 to 2.46 per cent.

Table -4.1.5.3 Screening of sugarcane varieties against Stalk borer, Internode and Root borer in AVT (ML) I Plant trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Stalk Borer			Internode Borer			Root Borer % incidence	
		% incidence	% intensity	% Infestation index	% incidence	% intensity	% Infestation index		
1	Co 09009	24.00	3.05	0.73	16.00	7.88	1.26	24.00	(29.33)
2	Co 10031	20.00	2.67	0.53	16.00	7.48	1.20	20.00	(26.57)
3	Co 10033	12.00	1.67	0.20	16.00	7.20	1.15	24.00	(29.33)
4	Co T 10368	16.00	2.16	0.35	8.00	3.70	0.30	20.00	(26.57)
5	Co T 10369	16.00	1.79	0.29	0.00	0.00	0.00	16.00	(23.58)
6	PI 10131	32.00	3.40	1.09	8.00	4.70	0.38	24.00	(29.33)
7	PI 10132	16.00	2.12	0.34	8.00	3.78	0.30	20.00	(26.57)
8	Co 99004	24.00	3.08	0.74	4.00	1.95	0.08	20.00	(26.57)
9	Co 86032	20.00	2.42	0.48	12.00	6.21	0.75	20.00	(26.57)
	S.Em.±(T)	1.20	0.23	0.07	0.76	0.52	0.07	1.50	
	C. D @ 5%	3.60	0.70	0.21	2.29	1.56	0.21	4.49	
	C. V. %	10.38	14.90	17.29	12.80	20.14	20.50	16.09	

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

Stalk borer: *Diatraea saccharalis* (Fabricius)

Data presented in table **4.1.5.3** indicate that difference in per cent incidence of various genotypes again stalk borer was found significant. Per cent incidence was ranged from 16.00 to 32.00 per cent. Maximum per cent incidence was observed in PI 10131 (32.0%).

Per cent intensity of stalk borer was ranged from 1.67 % (Co 10033) to 3.40 % (PI 10131). Incase of per cent infestation index it is ranged from 0.20% (Co 10033) to 1.09 % (PI 10131).

Internode borer: *Chilo sacchariphagous indicus* (Kapur)

It is seen from the data (**Table -4.1.5.3)** difference in per cent incidence of various genotypes was found significant. Per cent incidence of internode borer was ranged from 0.00 % to 16.00 % per cent.

Per cent intensity of internode borer was ranged from 0.00 % (Co T 10369) to 7.88 % (Co 09009). Incase of per cent infestation index same genotype exhibit minimum and maximum per cent 0.00 to 1.26 %.

Root borer: *Emmalocera depresella* (Swinhoe)

The data presented in table **- 4.1.5.3** shows differences in per cent incidence of root borer in various genotypes were significant. Per cent incidence of root borer ranged from 16.00 to 24.00 per cent. Highest per cent incidence was observed in Co 09009, Co 10033 and PI 10131 (24.00 %), respectively.

Table -4.1.5.4 Screening of sugarcane varieties against Scales and Mealy bugs in AVT (ML) I Plant trial at Main Sugarcane Research Station, Navsari (2015-16).

Sr. No.	Genotype	Scale insects				Mealy bugs			
		% incidence		% intensity		% incidence		% intensity	
1	Co 09009	0.00	(0.00)	0.00	(0.00)	40.00	((39.23)	5.08	13.03)
2	Co 10031	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	5.35	13.37)
3	Co 10033	40.00	(39.23)	5.56	(13.64)	40.00	(39.23)	5.56	13.64)
4	Co T 10368	40.00	(39.23)	5.41	(13.45)	40.00	(39.23)	5.41	13.45)
5	Co T 10369	40.00	(39.23)	4.48	(12.22)	40.00	(39.23)	4.48	12.22)
6	PI 10131	40.00	(39.23)	4.26	(11.91)	40.00	(39.23)	4.26	11.91)
7	PI 10132	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	5.29	13.30)
8	Co 99004	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	5.13	13.09)
9	Co 86032	0.00	(0.00)	0.00	(0.00)	40.00	(39.23)	4.83	12.70)
	S.Em.±(T)	1.28		1.28		-		0.73	
	C. D @ 5%	3.83		3.83		NS		NS	
	C. V. %	12.28		12.28		-		9.09	

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

Scale insects, *Melanaspis glomerata* (Green)

The data (**Table -4.1.5.4)** shows significance difference in respect of per cent incidence of scale insects in various genotypes. Per cent incidence of scale insect varies from 0.00 to 40.00 per cent. Maximum incidence was observed in Co 10033, Co T 10368, CoT 10369 and PI 10131 (40.00%).

The data also shows difference in various genotypes in respect of per cent intensity of scale insect was significant. Per cent intensity of scale ranged from 0.00 to 5.56 per cent. Highest per cent intensity was observed in Co 10033 (5.56 %).

Mealy bugs: *Saccharicoccus sacchari* (Cockerell)

Per cent incidence as well as per cent intensity of mealy bugs among various genotypes was found non significant. Per cent incidence was observed 40.00 % in all the genotypes. Per cent intensity of mealy bug ranged from 4.26 to 5.56 %.

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	:	2015 – 2016
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 2015-16.

Name of pest	Varieties	Location	Per cent Incidence	Remarks
White fly	Co 86032 (ratoon)	Nava Rajuvadia Ta. Nandod Di: Narmada (**Narmada sugar factory**)	70 to 90 %	March - 2015
	Co 86032 Planting		45to 60 %	
	Co 86032	Other villages surrounding sisodra **Narmada sugar factory**	30 to 35 %	March-2015
	Co 86032	Valvada, Vanskui of **Mahuva Sugar**	5 to 15 %	-
	Co 86032 Co86002 CoM 0265	Dungar, Chikhali, Ten,Movas and Kharvasa village, **Bardoli sugar factory**	25 to 35 %	-
	Co 86032 CoM 0265	Mohni,Niyol,Magob and surrounding villages of **Chalthan Sugar factory**	20 to 40 %	May-2015
Early shoot borer & Top borer	Co 97009 (MC- 707) CoC 671 Co 86032 Co 86002 CoM 0265 CoSi 95071	Sisodra, Khergam,Naugama and Surkhai **Gandevi sugar factory**	7 to 12 %	-
Root borer	Co 86002 Co 97009 (MC- 707) Co86032	Sayan, Velanja, Sandhiyer, Aerthan and Simarthu : **Sayan sugar factory** **Chalthan sugar :** Mohni,Niyol,Magob and surrounding villages Vihan, Rundh Vaktana, Vanz and vav, **Kamrej:** Choryasi, Navi Pardi, Antroli, Limodra and Ghala	30 to 40 % 9 to 12% 5 to 8 %	-

Result:-

In South Gujarat incidence of insect pest was fond moderate during the period of survey incidence of early shoot borer and top borer was ranged 7% to 12 % in Co 86032, Co 97009, CoC 671, Co 86032, Co 86002, CoM 0265, and CoSi 95071respectively. White fly incidence varies from 5 to 60 % in planted sugarcane and in ratoon it ranged from 70 to 90 %. Incidence of root borer found to be increased in the area and varies from 5 to 40 %. Rodent damage found to be ranging from was 5-10% irrespective of sugarcane variety and factory area.

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	**:** 2015-16
Duration	**:** Long term
Date of Planting	**:** 13-01-2015
Variety	**:** Co 86032
Methodology	**:** 1. Planting of sugarcane variety recommended for the region in 0.2 ha. area.
	: 2. All recommended agronomical practices was followed without 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.

A. Early shoot borer (ESB)

Period of Observation (SMW)	**% incidence of ESB**	**% Parasitism**		
		T. Chilonis	***E. annulipes***	***S. inferens***
7	3.79	13.19	-	-
11	3.49	8.59	-	-
16	1.71	8.77	-	-

Incidence of early shoot borer in 7, 11 and 16 SMW is 3.79, 3.49 and 1.71 respectively. During period of study only *T. chilonis* was fond to parasitized early shoot borer. Parasitism ranged from 8.59 to 13.19 per cent.

B. Top Shoot borer (TSB)

Period of Observation (SMW)	% incidence of TSB	% Parasitism			
		T. japonicum	*T. Chilonis*	*Apanteles flavipes*	*B. bassiana*
20	2.51	7.97	3.98	4.12	2.78
28	2.29	6.55	4.37	3.7	1.99
50	3.41	2.93	2.34	2.15	1.47

Incidence of top shoot bore in 20, 28 and 50 SMW is 2.51, 2.29 and 3.41 respectively. During period of study per cent parasitism by *T. japonicum* was 7.97, 6.55 and 2.93, respectively. Whereas *T. chilonis* found to be parasitizing at the rate of 3.98, 4.37 and 2.34 per cent, Parasitism done by *Apanteles flavipes* was ranged from 2.015 to 4.12 per cent. Incase of fungus parasitism ranged from 1.47 to 2.78 % caused by *B. bassiana.*

C. Stalk borer (SB)

Period of Observation (SMW)	% incidence of SB	% Parasitism	
		A. flavipes	*B. bassiana*
Average of All SMW	17.09	3.42	2.11

Average incidence of stalk borer was 17.09 per cent and only two parasite fond parasitizing it during the period of study. Among them parasitism done by *Apanteles flavipes* was 3.42 per cent. Whereas incase of fungus parasitism it was 2.11 % which is caused by *B. bassiana.*

D. Root borer (RB)

Period of Observation (SMW)	% incidence of SB	% Parasitism	
		G. indicus	*B. bassiana*
50	19.55	12.78	1.02

Average of root borer incidence at harvest (50 STW) was 19.55 per cent and only two parasites fond to be parasitizing it during the period of study. Among them parasitism done by *G. indicus* was 12.78 per cent. While, fungus parasite *B. bassiana* parasitize 1.02 per cent root borer.

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	**:** 2015-16
Variety	**:** Co 86032
Location	**:** Main Sugarcane Research Station, NAU, Navsari
Date of planting	**:** 25.01.2015
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	**:** 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 with weekly meteorological parameters was worked out. 4. Each borer infestation 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 2015-2016.

STW	Date	Temperature ^{0}C		RH %		Sun shine (hrs/day)	Rain Fall (mm)	Rainy days	ESB	TB	INB
		Max ^{0}C	Min ^{0}C	Mor.	Eve.						
1	2	3	4	5	6	7	8	9	10	11	12
1	**1-7**	28.11	13.89	85.55	38.39	7.47	0.00	0.00	**2**	**2**	**1**
2	**8-14**	30.11	9.77	72.10	32.40	8.99	0.00	0.00	**2**	**2**	**0**
3	**15-21**	29.64	12.66	82.40	33.19	8.46	0.00	0.00	**1**	**2**	**0**
4	**22-28**	28.01	14.51	82.98	45.90	7.00	0.00	0.00	**1**	**3**	**0**
5	**29-4**	29.84	14.03	78.45	36.58	8.94	0.00	0.00	**2**	**3**	**0**
6	**5-11**	31.97	14.93	85.12	37.05	8.77	0.00	0.00	**1**	**4**	**0**
7	**12-18**	32.43	13.76	86.17	40.53	9.79	0.00	0.00	**1**	**2**	**0**
8	**19-25**	34.39	16.06	90.49	37.88	9.61	0.00	0.00	**0**	**4**	**0**
9	**26-4**	27.09	14.79	85.67	50.98	8.73	6.00	1.00	**0**	**3**	**0**
10	**5-11**	32.71	15.24	81.46	41.58	8.93	0.00	0.00	**0**	**2**	**0**
11	**12-18**	32.51	18.51	84.92	48.85	8.77	4.00	1.00	**0**	**5**	**0**
12	**19-25**	33.14	19.04	82.79	39.50	9.09	0.00	0.00	**0**	**4**	**1**
13	**26-1**	35.29	21.49	90.13	44.28	7.70	0.00	0.00	**0**	**7**	**2**
14	**2-8**	32.19	21.21	87.16	55.22	8.41	0.00	0.00	**0**	**4**	**0**
15	**9-15**	30.53	22.24	89.14	54.01	6.06	0.50	0.00	**0**	**3**	**0**
16	**16-22**	36.71	23.83	87.43	46.05	9.30	0.00	0.00	**0**	**3**	**0**
17	**23-29**	33.47	24.44	87.53	59.08	10.17	0.00	0.00	**0**	**6**	**0**
18	**30-6**	34.71	24.19	85.63	60.95	10.24	0.00	0.00	**0**	**7**	**0**
19	**7-13**	36.43	25.26	84.74	47.08	10.07	0.00	0.00	**0**	**10**	**1**
20	**14-20**	35.53	26.56	82.72	56.84	10.46	0.00	0.00	**0**	**13**	**1**
21	**21-27**	33.86	28.37	78.82	63.72	9.80	0.00	0.00	**0**	**18**	**0**
22	**28-3**	33.64	28.03	80.46	63.12	8.67	0.00	0.00	**0**	**20**	**0**
23	**4-10**	34.60	25.73	81.21	57.73	7.79	21.00	3.00	**0**	**28**	**0**
24	**11-17**	30.10	24.01	93.78	79.45	4.34	182.50	5.00	**0**	**9**	**1**
25	**18-24**	31.31	25.27	87.86	78.79	3.90	149.00	3.00	**0**	**8**	**2**
26	**25-1**	30.97	27.09	88.04	86.44	5.01	27.00	1.00	**0**	**7**	**3**
27	**2-8**	31.86	27.41	81.90	72.68	6.33	2.00	0.00	**0**	**15**	**2**
28	**9-15**	31.79	26.94	85.33	70.58	4.10	6.50	1.00	**2**	**19**	**4**
29	**16-22**	30.93	26.03	90.49	81.03	1.91	70.00	4.00	**2**	**23**	**5**
30	**23-29**	28.56	24.40	92.51	86.24	0.07	238.50	7.00	**2**	**15**	**7**
31	**30-5**	29.97	26.44	86.11	77.92	2.74	4.20	0.00	**4**	**21**	**15**
32	**6-12**	30.36	25.14	93.82	74.25	2.33	9.80	1.00	**2**	**11**	**12**
33	**13-19**	30.29	25.30	92.88	75.44	4.36	49.00	4.00	**2**	**9**	**13**
34	**20-26**	30.86	25.36	85.61	71.35	6.34	5.00	1.00	**3**	**8**	**10**
35	**27-2**	31.36	24.56	90.80	69.07	6.40	7.00	1.00	**3**	**7**	**15**
36	**3-9**	32.43	23.21	86.62	58.86	7.71	0.00	0.00	**2**	**6**	**18**
37	**10-16**	31.24	23.49	95.05	74.02	2.91	106.00	6.00	**1**	**5**	**20**
38	**17-23**	28.51	24.01	94.67	87.28	1.66	328.00	4.00	**2**	**3**	**3**
39	**24-30**	31.96	22.67	91.67	56.01	8.44	0.00	0.00	**3**	**3**	**4**
40	**1-7**	35.11	24.60	89.01	50.53	7.89	0.00	0.00	**2**	**4**	**2**
41	**8-14**	34.70	24.06	92.30	57.72	6.41	3.00	1.00	**2**	**5**	**2**
42	**15-21**	37.53	22.56	84.89	34.57	9.31	0.00	0.00	**2**	**5**	**2**
43	**22-28**	35.93	22.17	86.19	43.53	7.24	0.00	0.00	**3**	**3**	**1**
44	**29-4**	34.07	20.73	77.03	43.80	8.41	0.00	0.00	**1**	**3**	**1**
45	**5-11**	34.89	19.86	81.86	33.07	8.29	0.00	0.00	**2**	**4**	**1**
46	**12-18**	34.79	20.53	75.21	37.81	8.44	0.00	0.00	**3**	**6**	**2**
47	**19-25**	33.57	21.61	72.01	45.90	5.70	0.00	0.00	**2**	**3**	**2**
48	**26-2**	33.29	18.61	76.15	36.86	5.90	0.00	0.00	**3**	**3**	**1**
49	**3-9**	33.60	14.87	72.60	33.56	8.79	0.00	0.00	**2**	**15**	**1**
50	**10-16**	30.39	13.57	75.05	36.97	8.07	0.00	0.00	**2**	**16**	**1**
51	**17-23**	29.73	11.27	70.97	24.53	8.64	0.00	0.00	**2**	**12**	**1**
52	**24-31**	30.91	13.89	62.22	23.06	8.89	0.00	0.00	**2**	**18**	**1**

Table: 1 Correlation between populations of early shoot borer, top borer and internode borer with weather parameters (2015-2016)

Pests	Temperature ^{0}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	-0.5758**	-0.7177**	-0.4735**	-0.6057**	0.7088**	-0.0715	-0.1451
TB	0.4382**	0.7273**	-0.1895	0.5821**	0.0312	0.0308	0.1412
INB	0.2131	0.1983	0.3235**	0.0575	0.0414	-0.2079	0.2549*

*** Significant at 0.05 (0.2262), ** Significant at 0.01 (0.3158)**

ESB=Early shoot borer, TB= Top borer and INB=Internode borer

Early shoot borer: Maximum (4.00) moths of early shoot borer were catches in 31th SMW. From the Table-1 it is observed that there is negative significant correlation between early shoot borer and maximum temperature (-0.5758), minimum temperature (-0.7177), relative humidity % at morning (-0.4735) and evening (-0.6075). ESB shows negative non significant correlation with number of rainy days (-0.0715) and sunshine hours (-01451). Where as it shows positive significant correlation with rain fall (0.7088)

Top borer: Maximum moths (28) of top borer were catches during 23rd SMW. From the Table-1 it is raveled that there is positive significant correlation between top borer and maximum temperature (0.4882), minimum temperature (0.7273) and evening relative humidity. Whereas, it is shows positive non significant correlation with rainfall (0.0312), rainy days (0.0308) and Sunshine hours (0.1412). Morning relative humidity (-0.1895) shows negative non significant correlation t (Table-1).

Internode borer: Maximum number of moth (20) was catched during 37th SMW. From the Table-1 it is concluded that there is positive non-significant correlation between internode borer moth catches and most of the parameters i.e. maximum temperature (0.2131), minimum temperature (0.1893), evening relative humidity (0.0575) and rainfall (0.0414). Only morning relative humidity (0.3235) and sunshine hours (0.2549) exhibit positive significant correlation. Whereas, number of rainy days (-0.2079) shows negative non-significant 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 : MSRS farm, Navsari Agricultural University Navsari.

Design **:** RBD

No. of treatment **:** 8 (Eight)

No. of replication : 3 (Three)

Date of Planting : 04.02.2015

Plot size : Gross plot: 6.0 m x 5.4 m

Net: 5.0 m x 4.5 m

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

Seed rate **:** Recommended

Fertilizer application : Recommended dose

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 in table 1 revealed that difference due to application of various insecticides in respect of per cent incidence of early shoot borer at 45 DAS, 60 DAP, 90 DAP and 120 DAP were found significant. Incidence of early shoot borer at 45 DAP was ranged from 20.52 to 28.34 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 (20.52%).

Incidence of early shoot borer was ranged at 60 DAP (23.16 to 30.44 per cent) and 90 DAP (24.50 to 32.29 per cent) respectively. It is also seen from the table per cent incidence of early shoot borer at 120 DAS was found significant and ranged from 24.82 to 32.29 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 (24.82 per cent).

The same trend was observed in pooled data, indicates differences between various treatment of insecticide in respect of per cent incidence of early shoot borer were significant. The per cent incidence of early shoot borer was ranged from 23.39 to 30.66 per cent. The least incidence was observed in Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting (23.39 %) while maximum incidence was observed in Untreated control (30.66 %).

Table -1 Bio-efficacy of new insecticide for the control of sugarcane ESB trial at Main Sugarcane Research Station, Navsari (2015-16).

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	15.05	16.07	18.24	20.13	17.47	20.01
		(22.82)	(23.63)	(25.28)	(26.66)	(24.71)	
2	Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP	12.29	15.47	17.19	17.62	15.76	13.82
		(20.52)	(23.16)	(24.50)	(24.82)	(23.39)	
3	Spraying of Chlorantraniliprole 18.5 SC 375 ml/ha at 30 and 60 DAP	15.49	15.17	16.54	19.34	16.70	16.35
		(23.18)	(22.92)	(24.00)	(26.09)	(24.12)	
4	Spraying of Spinosad 45 SC @ 90 ml/ha at 30 and 60 DAP	17.08	16.25	18.92	21.59	18.56	22.08
		(24.41)	(23.77)	(25.78)	(27.69)	(25.52)	
5	Spraying of Flubendiamide @ 250 ml/ ha at 30 and 60 DAP	16.46	15.99	17.61	21.03	17.88	21.20
		(23.93)	(23.57)	(24.81)	(27.30)	(25.01)	
6	Soil application of Phorate 10 G @ 15 kg /ha at the time of planting and 60 DAP	17.93	17.45	20.76	22.73	19.81	24.22
		(25.05)	(24.69)	(27.10)	(28.47)	(26.43)	
7	Soil application of Carbofuran 3 G @ 33 kg /ha at the time of planting and 60 DAP	18.50	18.68	18.59	22.09	19.53	24.99
		(25.48)	(25.61)	(25.54)	(28.03)	(26.22)	
8	Untreated control	22.53	25.67	27.01	28.53	26.00	34.54
		(28.34)	(30.44)	(31.31)	(32.29)	(30.66)	
	S.Em ± (T)	1.12	1.08	0.56	0.75	0.48	-
	C. D @ 5%	3.41	3.22	1.71	2.30	1.39	-
	C. V. %	16.02	12.58	10.42	11.43	10.57	-

* Figures in the parenthesis are arcsine transformed values and those outside are original 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 (13.82%). while, maximum cumulative per cent incidence (34.54%) was recorded in 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	117.74	20.43	17.92	87.86	12.35
2	Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg/ha at the time of planting and 60 DAP	125.79	20.60	18.16	88.24	12.56
3	Spraying of Chlorantraniliprole 18.5 SC 375 ml/ha at 30 and 60 DAP	122.54	21.10	18.36	87.14	12.61
4	Spraying of Spinosad 45 SC @ 90 ml/ha at 30 and 60 DAP	114.79	21.67	18.70	86.30	12.79
5	Spraying of Flubendiamide @ 250 ml/ ha at 30 and 60 DAP	115.90	19.77	17.46	88.48	12.08
6	Soil application of Phorate 10 G @ 15 kg /ha at the time of planting and 60 DAP	99.73	21.57	18.44	85.48	12.55
7	Soil application of Carbofuran 3 G @ 33 kg /ha at the time of planting and 60 DAP	90.07	21.80	19.85	89.68	13.83
8	Untreated control	76.25	21.80	18.77	86.12	12.83
	S.Em ± (T)	6.32	1.36	1.40	3.21	2.05
	C. D @ 5%	NS	NS	NS	NS	NS
	C. V. %	21.37	10.30	11.00	12.60	18.18

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

The highest millable cane yield of sugarcane was recorded in T2 (125.49 t/ha) and it was at par with T3 (122.54 t/ha), T1 (117.74), T5 (115.90 t/ha) and T4 (114.79 t/ha). The significant lowest yield was found in untreated control T8 (76.25) 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.

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