

## SUGARCANE ENTOMOLOGY

### **Project No. E.4.1 (1)**

**Title** : **Evaluation of genotypes for their reaction against major insect pests [AVT (Early) II PI].**

**Objective** : To grade the entries in the trials for their behaviour towards damage by key pest in the area.

**Year of start** : 1985-86

**Duration** : Long term

**Location** : Central Sugarcane Research Station, Padegaon

#### **Experimental Details** :

- 01 Date of Planting** : 13/03/2015
- 02 Varieties** : 03+03=06
- 03 Fertilizers** : 250:115:115 NPK (Kg ha<sup>-1</sup>)
- 04 Intercultural operations** : Weeding as and when required and earthing up after 4.5 months after planting.
- 05 Irrigation** : At an interval of 10-15 days as per availability
- 06 Plant protection measures** : Not applied.
- 07 Plot size** : 6m X 2 m
- 08 Design** : RBD
- 09 Replications** : Three
- 10 Harvesting date** : 19/03/2016

#### **Methodology :**

##### **01 Early shoot borer :**

The observations on the total number of shoots and number of dead hearts due to the early shoot borer were recorded at 45, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out. Number of bored plants/ha was also recorded.

##### **02 Internode borer, scale insect and mealy bugs :**

The observations were recorded at harvest on 25 canes. The per cent incidence and intensity of internode borer, scale insect and mealy bugs were worked out.

#### **Results:**

The data is presented in table 1 to 4. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer, internode borer, mealy bug and scale insect were statistically significant. It was observed that, there was no incidence of top shoot borer in all entries.

**Early shoot borer (ESB) (Table-1) :**

**Table-1. Evaluation of genotypes/varieties for their reaction against early shoot borer.**

Sr. No.	Genotype	Per cent incidence of ESB					Reaction	No. of bored plants/ha (On the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence		
1	Co 09004	1.32	23.02	9.14	1.12	21.33	MS	13333.33
2	Co 09007	6.54	32.41	6.32	3.72	28.46	MS	20000.00
3	CoN 09072	2.91	20.35	2.17	3.49	17.28	MS	14444.44
4	Co 85004	0.00	18.69	4.26	3.62	17.65	MS	15833.33
5	Co 94008	2.27	36.43	16.25	5.39	34.71	HS	23333.33
6	CoC 671	0.00	33.58	4.17	3.13	27.23	MS	16111.11
S. E. ±						3.16		
C.D. at 5 %						9.95		
Less Susceptible (LS)							0 – 15	
Moderate Susceptible (MS)							15.1 – 30	
High Susceptible (HS)							Above 30	

**Table-2. Evaluation of genotypes/varieties for their reaction against internode borer.**

Sr. No.	Genotype	Internode borer			Reaction
		% incidence	% intensity	% Infestation index	
01	Co 09004	43.33 (40.86)	5.23	2.62	HS
02	Co 09007	46.67 (43.08)	3.28	1.53	HS
03	CoN 09072	23.33 (28.29)	1.71	0.40	MS
04	Co 85004	33.33 (35.22)	3.19	1.06	MS
05	Co 94008	43.33 (41.07)	3.99	1.73	HS
06	CoC 671	63.33 (53.15)	5.74	3.63	HS
S. E. ±		6.79			
C.D. at 5 %		21.37			
Less Susceptible (LS)		0 – 20			
Moderate Susceptible (MS)		20.1 – 40			
High Susceptible (HS)		Above 40			

**Table-3. Evaluation of genotypes/varieties for their reaction against mealy bug.**

Sr. No.	Genotype	Mealy bug		Reaction
		% incidence	% intensity	
01	Co 09004	63.33(53.07)	7.12	HS
02	Co 09007	53.33(47.22)	5.28	HS
03	CoN 09072	80.00(68.07)	18.59	HS
04	Co 85004	86.67(72.78)	16.54	HS
05	Co 94008	43.33(40.78)	3.01	HS
06	CoC 671	46.67(43.08)	6.32	HS
S. E. ±		7.58		

	C.D. at 5 %	23.86		
	Less Susceptible (LS)	0 – 5		
	Moderate Susceptible (MS)	5.1 – 30		
	High Susceptible (HS)	Above 30		

**Internode borer (IB) (Table-2) :**

Regarding internode borer, the incidence ranged from 23.33 to 63.33 per cent. Not a single entry recorded less susceptible reaction to internode borer. The 2 and 4 test genotypes recorded moderately susceptible and highly susceptible reaction to internode borer, respectively. The entry CoN 09072 recorded least incidence to internode borer (23.33%) followed by Co 85004 (33.33%).

**Table-4. Evaluation of genotypes/varieties for their reaction against scale insect.**

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
01	Co 09004	00.00(00.00)	0.00	LS
02	Co 09007	50.00(45.00)	6.20	HS
03	CoN 09072	26.67(26.07)	3.97	MS
04	Co 85004	36.67(31.92)	5.71	HS
05	Co 94008	20.00(22.14)	2.37	MS
06	CoC 671	33.33(30.00)	4.32	MS
	S. E. ±	12.87		
	C.D. at 5 %	40.47		
	Less Susceptible (LS)	0 – 10		
	Moderate Susceptible (MS)	10.1 – 35		
	High Susceptible (HS)	Above 35		

**Mealy bug (MB) (Table-3):**

The mealy bug incidence ranged from 43.33 to 86.67 per cent. All test genotypes recorded highly susceptible reaction to mealy bug. The Co 94008 observed least incidence of mealy bug (43.33) with least per cent intensity (3.01%) followed by CoC 671 (46.67 % incidence).

**Scale insect (SI) (Table-4):**

In case of scale insect, the incidence ranged from 0 to 50 per cent. The 1, 3 and 2 test genotypes showed less susceptible, moderately susceptible and highly susceptible reaction to scale insect, respectively. The entry Co 09004 showed no incidence to scale insect, followed by Co 94008 (20%).

**Conclusion :**

In AVT Early II plant, none of the entry showed less susceptible reaction to early shoot borer, internode borer as well as mealy bug, where as only one entry Co 09004 showed less susceptible reaction to scale insect (0%). The entry CoN 09072 showed least incidence to early shoot borer (17.28 %), as well as internode borer (23.33%), where as highest intensity of mealy bug (18.59%). The entry Co 94008 showed highest incidence of early shoot borer (34.71%), where as least incidence of mealy bug (43.33%).

The cumulative per cent infestation of early shoot borer ranged from 17.28 to 34.71 per cent. Regarding internode borer, the incidence ranged from 23.33 to 63.33 per cent. Not a single entry recorded less susceptible reaction to internode borer. It was observed that, there was no incidence of top shoot borer in all entries. The mealy bug incidence ranged from 43.33 to 86.67 per cent. All test genotypes recorded highly susceptible reaction to mealy bug. In case of scale insect, the incidence ranged from 0 to 50 per cent.

**Project No. E.4.1 (2)**

- Title** : Evaluation of genotypes for their reaction against major insect pests [AVT (Early) I PI].
- Objective** : To grade the entries in the trials for their behaviour towards damage by key pest in the area.
- Year of start** : 1985-86
- Duration** : Long term
- Location** : Central Sugarcane Research Station, Padegaon

**Experimental Details**

- 01 Date of Planting** : 13/03/2015
- 02 Varieties** : 08+03=11
- 03 Fertilizers** : 250:115:115 NPK (Kg ha<sup>-1</sup>)
- 04 Intercultural operations** : Weeding as and when required and earthing up after 4.5 months after planting.
- 05 Irrigation** : At an interval of 10-15 days as per availability
- 06 Plant protection measures** : Not applied.
- 07 Plot size** : 6m X 2 m
- 08 Design** : RBD
- 09 Replications** : Three
- 10 Harvesting date** : 19/03/2016

**Methodology :****01 Early shoot borer :**

The observations on the total number of shoots and number of dead hearts due to the early shoot borer were recorded at 45, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out. Number of bored plants/ha was also recorded.

**02 Internode borer, scale insect and mealy bugs :**

The observations were recorded at harvest on 25 canes. The per cent incidence and intensity of internode borer, scale insect and mealy bugs were worked out.

**Table-5. Evaluation of genotypes/varieties for their reaction against early shoot borer.**

Sr. No.	Genotype	Per cent incidence of ESB					Reaction	No. of bored plants/ha (On the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence		
1	Co 10004	0.97	27.40	7.18	1.42	26.76	MS	20833.33
2	Co 10005	0.00	14.77	2.98	1.19	12.63	LS	7222.22
3	Co 10006	0.00	29.35	6.25	4.62	24.39	MS	11111.11
4	Co 10024	0.97	20.11	5.58	2.70	20.00	MS	15000.00
5	Co 10026	0.00	23.71	4.09	1.29	20.21	MS	16111.11
6	Co 10027	5.56	13.95	3.35	0.87	14.34	LS	10555.56

7	CoT 10366	0.00	20.09	2.76	0.46	18.66	MS	13888.89
8	CoT 10367	0.00	30.64	4.12	2.02	25.10	MS	18055.56
9	Co 85004	3.05	24.77	5.86	2.86	23.38	MS	23055.56
10	Co 94008	1.79	36.99	10.12	2.70	30.23	HS	21666.67
11	CoC 671	1.09	28.48	3.48	2.94	22.96	MS	16388.89
S. E. $\pm$						3.81		
C.D. at 5 %						11.21		
Less Susceptible (LS)							0 – 15	
Moderate Susceptible (MS)							15.1 – 30	
High Susceptible (HS)							Above 30	

### Results:

The data is presented in table 5 to 8. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer, internode borer, mealy bug and scale insect were statistically significant. It was observed that, there was no incidence of top shoot borer in all entries.

### Early shoot borer (ESB) (Table-5):

The cumulative per cent infestation of early shoot borer ranged from 12.63 to 30.23 per cent. The 2, 8 and 1 test genotypes observed less susceptible, moderately susceptible & highly susceptible reaction to early shoot borer, respectively. The entry Co 10005 showed least infestation (12.63%) followed by Co 10027 (14.34%).

### Internode borer (IB) (Table-6):

Regarding internode borer, the incidence ranged from 30 to 70 per cent. The variety, Co 85004 showed least incidence of internode borer (30%) followed by, the entry Co 10004 (40%). In all test genotypes, none of entry observed less susceptible reaction to internode borer. The 2 and 9 test genotypes showed moderately susceptible and highly susceptible reaction to internode borer, respectively.

### Mealy bug (MB) (Table-7):

The mealy bug incidence ranged from 46.67 to 90 per cent. In AVT Early I Plant, all test genotypes recorded highly susceptible reaction to mealy bug. The entry Co 10026 recorded least incidence of mealy bug (46.67%), followed by Co 10024 and CoT 10367 (50 per cent each).

### Scale insect (SI) (Table-8):

In case of scale insect, the incidence ranged from 3.33 to 63.33 per cent. The variety, Co 85004 showed least incidence of scale insect (3.33%), followed by Co 10006 (13.33%). The 1, 4 and 6 test genotypes showed less susceptible, moderately susceptible and highly susceptible reaction to scale insect, respectively.

**Table-6. Evaluation of genotypes/varieties for their reaction against internode borer.**

Sr. No.	Genotype	Internode borer			Reaction
		% incidence	% intensity	% Infestation index	
01	Co 10004	40.00(39.06)	2.67	1.06	MS
02	Co 10005	53.33(47.01)	3.52	1.88	HS
03	Co 10006	66.67(54.78)	6.34	4.23	HS
04	Co 10024	66.67(55.08)	5.32	3.55	HS
05	Co 10026	70.00(62.01)	5.17	3.62	HS
06	Co 10027	50.00(44.92)	4.72	2.36	HS

07	CoT 10366	50.00(45.00)	3.93	1.96	HS
08	CoT 10367	50.00(45.08)	4.75	2.37	HS
09	Co 85004	30.00(32.22)	2.30	0.69	MS
10	Co 94008	56.67(48.93)	4.21	2.39	HS
11	CoC 671	56.67(48.93)	4.25	2.41	HS
	S. E. $\pm$	7.05			
	C.D. at 5 %	20.77			
	Less Susceptible (LS)	0 – 20			
	Moderate Susceptible (MS)	20.1 – 40			
	High Susceptible (HS)	Above 40			

**Table-7. Evaluation of genotypes/varieties for their reaction against mealy bug.**

Sr. No.	Genotype	Mealy bug		
		% incidence	% intensity	Reaction
01	Co 10004	76.67(65.85)	7.73	HS
02	Co 10005	56.67(48.93)	4.75	HS
03	Co 10006	60.00(50.77)	5.96	HS
04	Co 10024	50.00(45.00)	4.91	HS
05	Co 10026	46.67(43.08)	3.89	HS
06	Co 10027	83.33(70.08)	10.76	HS
07	CoT 10366	63.33(52.86)	5.44	HS
08	CoT 10367	50.00(45.00)	4.53	HS
09	Co 85004	90.00(75.00)	12.44	HS
10	Co 94008	56.67(50.01)	5.52	HS
11	CoC 671	56.67(48.85)	5.31	HS
	S. E. $\pm$	6.86		
	C.D. at 5 %	20.21		
	Less Susceptible (LS)	0 – 5		
	Moderate Susceptible (MS)	5.1 – 30		
	High Susceptible (HS)	Above 30		

**Table-8. Evaluation of genotypes/varieties for their reaction against scale insect.**

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
01	Co 10004	23.33(24.15)	2.46	MS
02	Co 10005	36.67(37.14)	4.56	HS
03	Co 10006	13.33(13.08)	2.45	MS
04	Co 10024	46.67(43.08)	9.29	HS
05	Co 10026	43.33(41.15)	4.98	HS
06	Co 10027	23.33(24.15)	2.82	MS
07	CoT 10366	63.33(53.07)	11.56	HS
08	CoT 10367	40.00(39.23)	5.20	HS
09	Co 85004	03.33(06.15)	0.32	LS
10	Co 94008	26.67(26.07)	3.22	MS
11	CoC 671	40.00(39.15)	3.89	HS
	S. E. $\pm$	8.32		
	C.D. at 5 %	24.50		
	Less Susceptible (LS)	0 – 10		
	Moderate Susceptible (MS)	10.1 – 35		
	High Susceptible (HS)	Above 35		

**Conclusion :**

In AVT Early I plant trial, no test genotypes observed less susceptible reaction to internode borer as well as mealy bug. However, all test genotypes recorded highly susceptible reaction to mealy bug. In case of early shoot borer infestation only two test genotypes i.e. Co 10005 (12.63%) as well as Co 10027 (14.34%) showed less susceptible reaction. In case of scale insect, the only one variety i.e. Co 85004 (3.33%) showed less susceptible reaction. The Co 10026 showed least incidence of mealy bug (46.67 %), where as highest incidence of internode borer (70%). The variety Co 85004 showed least incidence to internode borer (30%), where as highest incidence of mealy bug (90%).

The cumulative per cent infestation of early shoot borer ranged from 12.63 to 30.23 per cent. Regarding internode borer, the incidence ranged from 30 to 70 per cent. It was observed that, there was no incidence of top shoot borer in all entries. The mealy bug incidence ranged from 46.67 to 90 per cent. In case of scale insect, the incidence ranged from 3.33 to 63.33 per cent.

**Project No. E.4.1 (3)**

- Title** : **Evaluation of genotypes for their reaction against major insect pests [AVT Midlate I Plant].**
- Objective** : To grade the entries in the trials for their behaviour towards damage by key pest in the area.
- Year of start** : 1985-86
- Duration** : Long term
- Location** : Central Sugarcane Research Station, Padegaon

**Experimental Details**

- 01 Date of Planting** : 13/03/2015
- 02 Varieties** : 11+02=13
- 03 Fertilizers** : 250:115:115 NPK (Kg ha<sup>-1</sup>)
- 04 Intercultural operations** : Weeding as and when required and earthing up after 4.5 months after planting.
- 05 Irrigation** : At an interval of 10-15 days as per availability
- 06 Plant protection measures** : Not applied.
- 07 Plot size** : 6m X 2 m
- 08 Design** : RBD
- 09 Replications** : Three
- 10 Harvesting date** : 19/03/2016

**Methodology :****01 Early shoot borer :**

The observations on the total number of shoots and number of dead hearts due to the early shoot borer were recorded at 45, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out. Number of bored plants/ha was also recorded.

**02 Internode borer, scale insect and mealy bugs :**

The observations were recorded at harvest on 25 canes. The per cent incidence and intensity of internode borer, scale insect and mealy bugs were worked out.

**Results:**

The data is presented in table 9 to 12. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer, internode borer, mealy bug and scale insect were statistically significant. It was observed that, there was no incidence of top shoot borer in all entries.

**Early shoot borer (ESB) (Table-9):**

The cumulative per cent infestation of early shoot borer ranged from 15.19 to 32.82 per cent. In AVT ML I Plant, no entry observed less susceptible reaction to early shoot borer. The 10 & 3 test genotypes showed moderately susceptible & highly susceptible reaction to early shoot borer, respectively. The entry Co 10015 recorded least incidence of early shoot borer (15.19%), followed by Co 10017 (19.33%).

**Internode borer (IB) (Table-10):**

Regarding internode borer, the incidence ranged from 36.67 to 80 per cent. In AVT ML I Plant, no entry observed less susceptible reaction to internode borer. The 2 and 11 test genotypes showed moderately susceptible and highly susceptible reaction to internode borer, respectively. The entry Co 10033 (36.67%) recorded least incidence followed by variety Co 99004 (40%).

**Mealy bug (MB) (Table-11):**

The mealy bug incidence ranged from 40 to 96.67 per cent. The all test genotypes showed highly susceptible reaction to mealy bug. The entry Co 09009 showed least incidence of mealy bug (40%), followed by CoVC 10061 (63.33 %) and variety Co 86032 (73.33%).

**Scale insect (SI) (Table-12):**

In case of scale insect, the incidence ranged from 0 to 43.33 per cent. The entries viz, Co 10031, Co 10033, CoM 10083, PI 10132 and variety Co 86032 showed no incidence to scale insect. The 6, 5 and 2 test genotypes showed less susceptible, moderately susceptible and highly susceptible reaction to scale insect, respectively.

**Table-9. Evaluation of genotypes/varieties for their reaction against early shoot borer.**

Sr. No.	Genotype	Per cent incidence of ESB					Reaction	No. of bored plants/ha (On the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence		
1	Co 09009	3.91	24.57	13.97	5.24	32.82	HS	29722.22
2	Co 10015	0.00	14.97	6.09	3.61	15.19	MS	11944.44
3	Co 10017	0.00	13.88	7.47	4.35	19.33	MS	13333.33
4	Co 10031	0.00	26.89	17.12	4.35	29.36	MS	17777.78
5	Co 10033	0.00	17.56	7.66	5.43	21.79	MS	18888.89
6	CoM 10083	2.68	23.78	10.61	2.49	25.76	MS	18888.89
7	CoT 10368	0.00	26.49	10.19	6.48	27.08	MS	20833.33
8	CoT 10369	0.61	21.39	9.34	4.51	23.95	MS	22222.22
9	CoVC 10061	4.84	32.20	7.23	3.43	26.84	MS	15555.56
10	PI 10131	2.89	31.48	8.33	3.23	29.20	MS	27500.00
11	PI 10132	0.88	23.35	8.11	8.98	31.53	HS	19444.44
12	Co 86032	0.00	24.66	10.08	2.88	24.58	MS	24444.44
13	Co 99004	1.28	23.33	16.53	5.76	30.32	HS	15833.33
S. E. ±						4.23		
C.D. at 5 %						12.33		
Less Susceptible (LS)							0 – 15	
Moderate Susceptible (MS)							15.1 – 30	
High Susceptible (HS)							Above 30	

**Table-10. Evaluation of genotypes/varieties for their reaction against internode borer.**

Sr. No.	Genotype	Internode borer			Reaction
		% incidence	% intensity	% Infestation index	
01	Co 09009	70.00(57.78)	6.29	4.40	HS
02	Co 10015	43.33(40.08)	2.67	1.16	HS
03	Co 10017	53.33(47.01)	3.91	2.07	HS
04	Co 10031	60.00(51.15)	4.10	2.46	HS
05	Co 10033	36.67(36.93)	3.01	1.10	MS
06	CoM 10083	56.67(49.63)	5.02	2.84	MS

07	CoT 10368	50.00(45.00)	3.96	1.98	HS
08	CoT 10369	60.00(51.15)	4.73	2.84	HS
09	CoVC 10061	56.67(49.22)	4.49	2.54	HS
10	PI 10131	80.00(63.93)	7.67	6.43	HS
11	PI 10132	46.67(43.08)	2.87	1.34	HS
12	Co 86032	66.67(60.00)	7.53	5.02	HS
13	Co 99004	40.00(38.85)	3.26	1.30	MS
	S. E. $\pm$	8.19			
	C.D. at 5 %	23.87			
	Less Susceptible (LS)	0 – 20			
	Moderate Susceptible (MS)	20.1 – 40			
	High Susceptible (HS)	Above 40			

**Table-11. Evaluation of genotypes/varieties for their reaction against mealy bug.**

Sr. No.	Genotype	Mealy bug		
		% incidence	% intensity	Reaction
01	Co 09009	40.00(38.07)	3.81	HS
02	Co 10015	76.67(65.85)	8.45	HS
03	Co 10017	76.67(61.92)	9.48	HS
04	Co 10031	80.00(68.07)	11.58	HS
05	Co 10033	76.67(66.15)	9.43	HS
06	CoM 10083	93.33(81.15)	18.61	HS
07	CoT 10368	96.67(83.85)	14.94	HS
08	CoT 10369	76.67(66.15)	9.32	HS
09	CoVC 10061	63.33(53.07)	7.82	HS
10	PI 10131	76.67(65.85)	7.72	HS
11	PI 10132	86.67(72.78)	11.84	HS
12	Co 86032	73.33(59.22)	7.44	HS
13	Co 99004	70.00(57.00)	8.57	HS
	S. E. $\pm$	8.99		
	C.D. at 5 %	26.19		
	Less Susceptible (LS)	0 – 5		
	Moderate Susceptible (MS)	5.1 – 30		
	High Susceptible (HS)	Above 30		

**Table-12. Evaluation of genotypes/varieties for their reaction against scale insect.**

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
01	Co 09009	43.33(41.15)	5.78	HS
02	Co 10015	43.33(36.15)	9.22	HS
03	Co 10017	33.33(30.00)	3.97	MS
04	Co 10031	00.00(00.00)	0.00	LS
05	Co 10033	00.00(00.00)	0.00	LS
06	CoM 10083	00.00(00.00)	0.00	LS
07	CoT 10368	26.67(26.15)	3.83	MS
08	CoT 10369	16.67(15.00)	2.12	MS
09	CoVC 10061	20.00(22.14)	2.79	MS
10	PI 10131	10.00(11.07)	1.12	LS
11	PI 10132	00.00(00.00)	0.00	LS
12	Co 86032	00.00(00.00)	0.00	LS

13	Co 99004	16.67(15.00)	1.76	MS
	S. E. $\pm$	10.57		
	C.D. at 5 %	30.79		
	Less Susceptible ( <b>LS</b> )	0 – 10		
	Moderate Susceptible ( <b>MS</b> )	10.1 – 35		
	High Susceptible ( <b>HS</b> )	Above 35		

**Conclusion :**

In AVT Midlate I plant trial, no test genotypes observed less susceptible reaction to early shoot borer, internode borer as well as mealy bug. All test genotypes observed highly susceptible reaction to mealy bug. The entry Co 09009 recorded highest incidence of early shoot borer (32.82%) as well as scale insect (43.33%), whereas least incidence to mealy bug (40%). The entry Co 10015 recorded least incidence to early shoot borer (15.19%), where as highest incidence to scale insect (43.33%). The entry Co 10033 recorded least incidence of internode borer (36.67%), as well as scale insect (no incidence).

The cumulative per cent infestation of early shoot borer ranged from 15.19 to 32.82 per cent. Regarding internode borer, the incidence ranged from 36.67 to 80 per cent. It was observed that, there was no incidence of top shoot borer in all entries. The mealy bug incidence ranged from 40 to 96.67 per cent. In case of scale insect, the incidence ranged from 0 to 43.33 per cent.

**Project No. E.4.1 (4)**

**Title** : **Evaluation of genotypes for their reaction against major insect pests [ IVT (Early) ].**

**Objective** : To grade the entries in the trials for their behaviour towards damage by key pest in the area.

**Year of start** : 1985-86

**Duration** : Long term

**Location** : Central Sugarcane Research Station, Padegaon

**Experimental** :

**Details**

**01 Date of Planting** : 13/03/2015

**02 Varieties** : 12+03=15

**03 Fertilizers** : 250:115:115 NPK (Kg ha<sup>-1</sup>)

**04 Intercultural operations** : Weeding as and when required and earthing up after 4.5 months after planting.

**05 Irrigation** : At an interval of 10-15 days as per availability

**06 Plant protection measures** : Not applied.

**07 Plot size** : 6m X 2 m

**08 Design** : RBD

**09 Replications** : Three

**10 Harvesting date** : 19/03/2016

**Methodology :**

**01 Early shoot borer :**

The observations on the total number of shoots and number of dead hearts due to the early shoot borer were recorded at 45, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out. Number of bored plants/ha was also recorded.

**02 Internode borer, scale insect and mealy bugs :**

The observations were recorded at harvest on 25 canes. The per cent incidence and intensity of internode borer, scale insect and mealy bugs were worked out.

**Results:**

The data is presented in table 13 to 16. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer, internode borer, mealy bug and scale insect were statistically significant. It was observed that, there was no incidence of top shoot borer in all entries.

**Early shoot borer (ESB) (Table-13):**

The cumulative per cent infestation of early shoot borer ranged from 8.26 to 38.28 per cent. In IVT Early trial, 1, 12 and 2 test genotypes showed less susceptible, moderately susceptible & highly susceptible reaction to early shoot borer, respectively. The entry Co 12008 observed least infestation to early shoot borer (8.26%), followed by CoM 12081 (16.62%) and Co 12001 (17.76%).

**Table-13. Evaluation of genotypes/varieties for their reaction against early shoot borer.**

Sr. No.	Genotype	Per cent incidence of ESB					Reaction	No. of bored plants/ha (On the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence		
1	Co 12001	1.39	15.54	7.74	0.00	17.76	MS	27222.22
2	Co 12003	0.70	15.38	14.04	2.50	22.00	MS	15277.78
3	Co 12006	2.29	16.43	14.73	5.91	27.36	MS	23333.33
4	Co 12007	3.18	10.27	9.41	2.48	19.73	MS	16111.11
5	Co 12008	1.56	4.60	4.29	0.45	8.26	LS	5555.56
6	CoM 12081	0.65	11.81	9.19	2.40	16.62	MS	18055.56
7	CoM 12082	0.62	25.47	4.17	0.41	21.43	MS	18333.33
8	CoM 12083	1.20	26.36	8.84	4.93	27.03	MS	13888.89
9	CoN 12071	0.00	21.15	10.77	6.22	26.72	MS	18333.33
10	CoN 12072	0.00	15.23	6.96	4.13	19.44	MS	15555.56
11	CoT 12366	1.49	19.18	6.48	2.76	22.57	MS	19722.22
12	CoT 12367	4.17	19.21	10.36	4.81	27.64	MS	18888.89
13	Co 85004	9.68	30.77	10.19	6.37	33.62	HS	33055.56
14	Co 94008	8.70	28.48	21.47	5.95	38.28	HS	27222.22
15	CoC 671	0.00	20.75	3.87	2.60	19.40	MS	11944.44
S. E. ±						4.56		
C.D. at 5 %						13.19		
Less Susceptible (LS)							0 – 15	
Moderate Susceptible (MS)							15.1 – 30	
High Susceptible (HS)							Above 30	

**Table-14. Evaluation of genotypes/varieties for their reaction against internode borer.**

Sr. No.	Genotype	Internode borer			Reaction
		% incidence	% intensity	% Infestation index	
01	Co 12001	40.00(39.15)	2.82	1.13	MS
02	Co 12003	66.67(54.78)	5.78	3.85	HS
03	Co 12006	53.33(47.22)	3.74	1.99	HS
04	Co 12007	46.67(42.99)	3.89	1.81	HS
05	Co 12008	46.67(43.08)	3.05	1.42	HS
06	CoM 12081	46.67(43.08)	3.87	1.81	HS
07	CoM 12082	43.33(41.07)	3.09	1.34	HS
08	CoM 12083	43.33(41.07)	2.80	1.21	HS
09	CoN 12071	63.33(52.86)	4.45	2.82	HS
10	CoN 12072	43.33(40.86)	3.41	1.48	HS
11	CoT 12366	60.00(51.93)	4.84	2.90	HS
12	CoT 12367	76.67(61.22)	5.72	4.38	HS
13	Co 85004	50.00(44.71)	2.86	1.43	HS
14	Co 94008	36.67(36.85)	3.31	1.21	MS

15	CoC 671	43.33(41.07)	3.05	1.32	HS
	S. E. $\pm$	5.33			
	C.D. at 5 %	15.40			
	Less Susceptible (LS)	0 – 20			
	Moderate Susceptible (MS)	20.1 – 40			
	High Susceptible (HS)	Above 40			

**Internode borer (IB) (Table-14):**

Regarding internode borer, the incidence ranged from 36.67 to 76.67 per cent. In IVT Early, no entry observed less susceptible reaction to internode borer. The 2 and 13 test genotypes showed moderately susceptible and highly susceptible reaction to internode borer, respectively. The entry Co 09072 recorded least incidence to internode borer (36.67%), followed by the entry Co 12001 (40%).

**Mealy bug (MB) (Table-15):**

The mealy bug incidence ranged from 76.67 to cent per cent. The all test genotypes showed highly susceptible reaction to mealy bug. The entry Co 12003 and variety Co 94008 showed least incidence of mealy bug (76.67 per cent each). The entries Co 12001, CoM 12081 and CoT 12367 recorded cent per cent incidence of mealy bug.

**Table-15. Evaluation of genotypes/varieties for their reaction against mealy bug.**

Sr. No.	Genotype	Mealy bug		
		% incidence	% intensity	Reaction
01	Co 12001	100.00(90.00)	15.12	HS
02	Co 12003	76.67(66.15)	9.22	HS
03	Co 12006	90.00(78.93)	14.22	HS
04	Co 12007	93.33(77.71)	13.01	HS
05	Co 12008	93.33(81.15)	12.96	HS
06	CoM 12081	100.00(90.00)	10.90	HS
07	CoM 12082	96.67(83.85)	16.10	HS
08	CoM 12083	93.33(77.71)	13.67	HS
09	CoN 12071	93.33(81.15)	11.35	HS
10	CoN 12072	83.33(70.08)	14.53	HS
11	CoT 12366	90.00(78.93)	11.90	HS
12	CoT 12367	100.00(90.00)	17.08	HS
13	Co 85004	96.67(83.85)	15.36	HS
14	Co 94008	76.67(61.22)	8.08	HS
15	CoC 671	83.33(75.00)	8.54	HS
	S. E. $\pm$	8.04		
	C.D. at 5 %	23.25		
	Less Susceptible (LS)	0 – 5		
	Moderate Susceptible (MS)	5.1 – 30		
	High Susceptible (HS)	Above 30		

**Table-16. Evaluation of genotypes/varieties for their reaction against scale insect.**

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
01	Co 12001	23.33(24.15)	2.10	MS
02	Co 12003	26.67(26.15)	3.55	MS
03	Co 12006	10.00(11.07)	1.42	LS
04	Co 12007	03.33(06.15)	0.50	LS
05	Co 12008	00.00(00.00)	0.00	LS
06	CoM 12081	30.00(28.07)	3.37	MS

07	CoM 12082	26.67(26.15)	3.47	MS
08	CoM 12083	23.33(24.15)	2.75	MS
09	CoN 12071	13.33(13.08)	1.57	MS
10	CoN 12072	50.00(45.00)	5.27	HS
11	CoT 12366	16.67(15.00)	1.79	MS
12	CoT 12367	43.33(41.15)	5.55	HS
13	Co 85004	40.00(39.15)	3.93	HS
14	Co 94008	30.00(28.08)	4.84	MS
15	CoC 671	20.00(21.93)	2.68	MS
	S. E. $\pm$	11.11		
	C.D. at 5 %	32.14		
	Less Susceptible ( <b>LS</b> )	0 – 10		
	Moderate Susceptible ( <b>MS</b> )	10.1 – 35		
	High Susceptible ( <b>HS</b> )	Above 35		

**Scale insect (SI) (Table-16):** In case of scale insect, the incidence ranged from 0 to 50 per cent. The 3, 9 and 3 test genotypes showed less susceptible, moderately susceptible and highly susceptible reaction to scale insect, respectively. The entry Co 12008 showed least incidence to scale insect (no incidence), followed by Co 12007 (03.33%) and Co 12006 (10%).

**Conclusion :**

In IVT Early trial, no test genotypes showed less susceptible reaction to internode borer as well as mealy bug. All test genotypes showed highly susceptible reaction to mealy bug. The entry Co 12008 showed least incidence to early shoot borer (8.26%) as well as scale insect (no incidence). The entry CoT 12367 recorded highest incidence of internode borer (76.67%), mealy bug (cent per cent) as well as highest intensity of scale insect (5.55%). The variety Co 94008 recorded least incidence of internode borer (36.67%) as well as mealy bug (76.67%), where as highest incidence of early shoot borer (38.28 %). The cumulative per cent infestation of early shoot borer ranged from 8.26 to 38.28 per cent. Regarding internode borer, the incidence ranged from 36.67 to 76.67 per cent. It was observed that, there was no incidence of top shoot borer in all entries. The mealy bug incidence ranged from 76.67 to cent per cent. In case of scale insect, the incidence ranged from 0 to 50 per cent.

## **Project No. E.4.1 (5)**

**Title** : **Evaluation of genotypes for their reaction against major insect pests [ IVT Midlate].**

**Objective** : To grade the entries in the trials for their behaviour towards damage by key pest in the area.

**Year of start** : 1985-86

**Duration** : Long term

**Location** : Central Sugarcane Research Station, Padegaon

### **Experimental Details**

- 01 Date of Planting** : 13/03/2015
- 02 Varieties** : 15+02=17
- 03 Fertilizers** : 250:115:115 NPK (Kg ha<sup>-1</sup>)
- 04 Intercultural operations** : Weeding as and when required and earthing up after 4.5 months after planting.
- 05 Irrigation** : At an interval of 10-15 days as per availability
- 06 Plant protection measures** : Not applied.
- 07 Plot size** : 6m X 2 m
- 08 Design** : RBD
- 09 Replications** : Three
- 10 Harvesting date** : 19/03/2016

### **Methodology :**

#### **01 Early shoot borer :**

The observations on the total number of shoots and number of dead hearts due to the early shoot borer were recorded at 45, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out. Number of bored plants/ha was also recorded.

#### **02 Internode borer, scale insect and mealy bugs :**

The observations were recorded at harvest on 25 canes. The per cent incidence and intensity of internode borer, scale insect and mealy bugs were worked out.

### **Results:**

The data is presented in table 17 to 20. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer, internode borer, mealy bug and scale insect were statistically significant. It was observed that, there was no incidence of top shoot borer in all entries.

**Table-17. Evaluation of genotypes/varieties for their reaction against early shoot borer.**

Sr. No.	Genotype	Per cent incidence of ESB					Reaction	No. of bored plants/ha (On the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence		
1	Co 12009	0.00	20.39	9.30	4.17	25.12	MS	15000.00
2	Co 12012	3.60	25.00	8.55	1.75	23.50	MS	23888.89
3	Co 12014	0.79	15.38	8.96	4.89	20.15	MS	15000.00
4	Co 12016	0.78	11.86	9.50	3.49	18.75	MS	14722.22
5	Co 12017	0.88	33.13	11.68	1.55	30.04	HS	22777.78
6	Co 12019	1.88	25.12	15.23	3.32	28.22	MS	29166.67
7	Co 12021	2.75	22.42	5.50	1.91	21.46	MS	15555.56
8	Co 12024	8.09	28.72	10.43	3.77	33.33	HS	28333.33
9	CoM 12084	1.96	22.22	15.71	6.01	30.92	HS	21111.11
10	CoM 12085	0.00	22.31	20.39	5.36	29.65	MS	18611.11
11	CoM 12086	3.00	18.13	12.33	2.14	19.17	MS	18055.56
12	CoN 12073	0.76	15.81	6.61	2.63	16.85	MS	16666.67
13	CoN 12074	0.00	18.06	3.63	1.02	16.02	MS	10277.78
14	CoT 12368	0.00	23.43	5.78	0.96	21.37	MS	15555.56
15	VSI 12121	0.00	13.91	9.72	3.35	19.52	MS	13611.11
16	Co 86032	0.81	31.22	14.05	1.53	29.51	MS	30000.00
17	Co 99004	1.98	23.48	7.58	4.58	26.47	MS	12222.22
S. E. ±						3.69		
C.D. at 5 %						10.21		
Less Susceptible (LS)							0 – 15	
Moderate Susceptible (MS)							15.1 – 30	
High Susceptible (HS)							Above 30	

**Early shoot borer (ESB) (Table-17):**

The cumulative per cent infestation of early shoot borer ranged from 16.02 to 33.33 per cent. In IVT Midlate trial, no entry showed less susceptible reaction to early shoot borer. The 14 & 3 test genotypes observed moderately susceptible & highly susceptible reaction to early shoot borer, respectively. The entry CoM 12074 recorded least incidence of early shoot borer (16.02%), followed by CoN 12073 (16.85%) and Co 12016 (18.75%).

**Table-18. Evaluation of genotypes/varieties for their reaction against internode borer.**

Sr. No.	Genotype	Internode borer			Reaction
		% incidence	% intensity	% Infestation index	
01	Co 12009	36.67(31.15)	2.58	0.94	MS
02	Co 12012	40.00(38.85)	2.16	0.86	MS
03	Co 12014	46.67(43.08)	4.42	2.06	HS
04	Co 12016	40.00(38.85)	2.78	1.11	MS
05	Co 12017	56.67(48.93)	3.14	1.78	HS
06	Co 12019	50.00(42.29)	3.52	1.76	HS
07	Co 12021	40.00(38.85)	3.26	1.30	MS
08	Co 12024	56.67(49.92)	5.09	2.88	HS
09	CoM 12084	73.33(59.71)	5.27	3.86	HS
10	CoM 12085	36.67(37.22)	2.77	1.02	MS
11	CoM 12086	43.33(40.78)	3.37	1.46	HS
12	CoN 12073	50.00(45.00)	3.03	1.51	HS
13	CoN 12074	46.67(42.78)	3.07	1.43	HS
14	CoT 12368	46.67(42.99)	2.76	1.29	HS
15	VSI 12121	53.33(46.92)	4.36	2.32	HS
16	Co 86032	40.00(39.15)	2.24	0.89	MS
17	Co 99004	60.00(50.85)	4.36	2.61	HS
	S. E. $\pm$	6.08			
	C.D. at 5 %	16.82			
	Less Susceptible (LS)	0 – 20			
	Moderate Susceptible (MS)	20.1 – 40			
	High Susceptible (HS)	Above 40			

**Internode borer (IB) (Table-18):**

Regarding internode borer, the incidence ranged from 36.67 to 73.33 per cent. In this trial, no test genotypes showed less susceptible reaction to internode borer. The 6 and 11 test genotypes showed moderately susceptible and highly susceptible reaction to internode borer, respectively. The entries Co 12009 and CoM 12085 showed least incidence to internode borer (36.67% each).

**Mealy bug (MB) (Table-19):**

The mealy bug incidence ranged from 76.67 to cent per cent. All test genotypes showed highly susceptible reaction to mealy bug. The VSI 12121 recorded least incidence to mealy bug (76.67), followed by CoM 12084 (83.33 %).

**Table-19. Evaluation of genotypes/varieties for their reaction against mealy bug.**

Sr. No.	Genotype	Mealy bug		
		% incidence	% intensity	Reaction
01	Co 12009	96.67(83.85)	23.10	HS
02	Co 12012	90.00(78.93)	14.87	HS
03	Co 12014	93.31(81.15)	14.69	HS
04	Co 12016	100.00(90.00)	28.85	HS
05	Co 12017	100.00(90.00)	35.02	HS
06	Co 12019	96.67(83.85)	17.97	HS
07	Co 12021	96.67(83.85)	21.99	HS
08	Co 12024	100.00(90.00)	31.52	HS
09	CoM 12084	83.33(70.78)	18.11	HS
10	CoM 12085	100.00(90.00)	14.39	HS
11	CoM 12086	100.00(90.00)	24.31	HS
12	CoN 12073	100.00(90.00)	22.18	HS
13	CoN 12074	96.67(83.85)	11.87	HS
14	CoT 12368	96.67(83.85)	18.87	HS
15	VSI 12121	76.67(62.71)	8.83	HS
16	Co 86032	93.33(81.15)	13.43	HS
17	Co 99004	100.00(90.00)	18.17	HS
	S. E. ±	5.89		
	C.D. at 5 %	16.31		
	Less Susceptible (LS)	0 – 5		
	Moderate Susceptible (MS)	5.1 – 30		
	High Susceptible (HS)	Above 30		

**Table-20. Evaluation of genotypes/varieties for their reaction against scale insect.**

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
01	Co 12009	20.00(22.14)	2.32	MS
02	Co 12012	43.33(41.15)	4.29	HS
03	Co 12014	13.33(13.08)	1.97	MS
04	Co 12016	00.00(00.00)	0.00	LS
05	Co 12017	26.67(26.07)	3.44	MS
06	Co 12019	00.00(00.00)	0.00	LS
07	Co 12021	16.67(15.00)	1.97	MS
08	Co 12024	16.67(15.00)	2.34	MS
09	CoM 12084	16.67(15.00)	1.78	MS
10	CoM 12085	20.00(16.92)	2.45	MS
11	CoM 12086	13.33(13.08)	1.66	MS
12	CoN 12073	00.00(00.00)	0.00	LS
13	CoN 12074	13.39(13.08)	1.43	MS
14	CoT 12368	43.33(41.15)	5.16	HS
15	VSI 12121	00.00(00.00)	0.00	LS
16	Co 86032	00.00(00.00)	0.00	LS
17	Co 99004	13.39(13.08)	1.08	MS
	S. E. ±	9.21		
	C.D. at 5 %	25.50		
	Less Susceptible (LS)	0 – 10		
	Moderate Susceptible (MS)	10.1 – 35		
	High Susceptible (HS)	Above 35		

**Scale insect (SI) (Table-20):**

In case of scale insect, the incidence ranged from 0 to 43.33 per cent. The 5, 10 and 2 test genotypes showed less susceptible, moderately susceptible and highly susceptible reaction to scale insect, respectively. The entries, viz, Co 12016, CoN 12073, VSI 12121 and variety Co 86032 showed no incidence of scale insect.

**Conclusion :**

In IVT Midlate trial, no test genotypes showed less susceptible reaction to early shoot borer, internode borer as well as mealy bug. All test genotypes recorded highly susceptible reaction to mealy bug. The entry Co 12012 showed least infestation index to internode borer (0.86%), where as highest incidence to scale insect (43.33%). The entry Co 12024 recorded highest incidence to early shoot borer (33.33%), as well as mealy bug (cent per cent). The entry CoM 12085 recorded least incidence to internode borer (36.67%), whereas of highest incidence of mealy bug (cent per cent).

The cumulative per cent infestation of early shoot borer ranged from 16.02 to 33.33 per cent. Regarding internode borer, the incidence ranged from 36.67 to 73.33 per cent. It was observed that, there was no incidence of top shoot borer in all entries. The mealy bug incidence ranged from 76.67 to cent per cent. In case of scale insect, the incidence ranged from 0 to 43.33 per cent.

**Project No. E.4.1 (6)**

**Title** : **Evaluation of genotypes for their reaction against major insect pests [AVT (Early) Ratoon].**

**Objective** : To grade the entries in the trials for their behaviour towards damage by key pest in the area.

**Year of start** : 1985-86

**Duration** : Long term

**Location** : Central Sugarcane Research Station, Padegaon

**Experimental** :

**Details**

- 01 Date of Ratooning** : 03/04/2015
- 02 Varieties** : 03+03=06
- 03 Fertilizers** : 250:115:115 NPK (Kg ha<sup>-1</sup>)
- 04 Intercultural operations** : Weeding as and when required and earthing up after 4.5 months after planting.
- 05 Irrigation** : At an interval of 10-15 days as per availability
- 06 Plant protection measures** : Not applied.
- 07 Plot size** : 6m X 2 m
- 08 Design** : RBD
- 09 Replications** : Three
- 10 Harvesting date** : 21/03/2016

**Methodology :**

**01 Early shoot borer :**

The observations on the total number of shoots and number of dead hearts due to the early shoot borer were recorded at 45, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out. Number of bored plants/ha was also recorded.

**02 Internode borer, scale insect and mealy bugs :**

The observations were recorded at harvest on 25 canes. The per cent incidence and intensity of internode borer, scale insect and mealy bugs were worked out.

**Results:**

The data is presented in table 21 to 24. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer, internode borer, mealy bug and scale insect were statistically significant. It was observed that, there was no incidence of top shoot borer in all entries.

**Table-21. Evaluation of genotypes/varieties for their reaction against early shoot borer.**

Sr. No.	Genotype	Per cent incidence of ESB					Reaction	No. of bored plants/ha (On the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence		
1	Co 09004	4.68	6.86	5.37	4.36	12.03	LS	16041.67
2	Co 09007	5.88	7.21	4.18	3.33	10.83	LS	15416.67
3	CoN 09072	5.59	7.58	6.29	4.03	12.56	LS	17083.33
4	Co 85004	7.35	6.47	5.64	2.35	10.73	LS	12500.00
5	Co 94008	6.29	6.55	5.69	2.85	11.20	LS	15208.33
6	CoC 671	5.10	7.44	6.33	1.39	9.51	LS	10833.33
S. E. $\pm$						0.91		
C.D. at 5 %						2.74		
Less Susceptible (LS)							0 – 15	
Moderate Susceptible (MS)							15.1 – 30	
High Susceptible (HS)							Above 30	

**Early shoot borer (ESB) (Table-21):**

The cumulative per cent infestation of early shoot borer ranged from 9.51 to 12.56 per cent. All test genotypes showed less susceptible reaction to early shoot borer. The variety CoC 671 showed least incidence of early shoot borer (9.51%), followed by Co 85004 (10.73%) and Co 09007 (10.83%).

**Table-22. Evaluation of genotypes/varieties for their reaction against internode borer.**

Sr. No.	Genotype	Internode borer			Reaction
		% incidence	% intensity	% Infestation index	
01	Co 09004	32.50(34.71)	1.58	0.51	MS
02	Co 09007	35.00(36.00)	1.54	0.53	MS
03	CoN 09072	30.00(33.05)	1.85	0.55	MS
04	Co 85004	27.50(31.39)	1.47	0.40	MS
05	Co 94008	45.00(42.11)	2.47	1.11	HS
06	CoC 671	42.50(40.67)	2.91	1.24	HS
S. E. $\pm$		2.96			
C.D. at 5 %		8.92			
Less Susceptible (LS)		0 – 20			
Moderate Susceptible (MS)		20.1 – 40			
High Susceptible (HS)		Above 40			

**Internode borer (IB) (Table-22):**

Regarding internode borer, the incidence ranged from 27.50 to 45 per cent. In this trial, no test genotypes showed less susceptible reaction to internode borer. The 4 and 2 test genotypes showed moderately susceptible and highly susceptible reaction to internode borer, respectively. The variety Co 85004 showed least incidence to internode borer (27.50%), followed by CoN 09072 (30%).

**Table-23. Evaluation of genotypes/varieties for their reaction against mealy bug.**

Sr. No.	Genotype	Mealy bug		
		% incidence	% intensity	Reaction
01	Co 09004	95.00(83.36)	25.24	HS
02	Co 09007	92.50(78.75)	13.62	HS
03	CoN 09072	100.00(90.00)	25.97	HS
04	Co 85004	100.00(90.00)	33.86	HS
05	Co 94008	95.00(80.78)	12.30	HS
06	CoC 671	97.50(85.39)	15.89	HS
	S. E. $\pm$	5.07		
	C.D. at 5 %	15.27		
	Less Susceptible (LS)	0 – 5		
	Moderate Susceptible (MS)	5.1 – 30		
	High Susceptible (HS)	Above 30		

**Table-24. Evaluation of genotypes/varieties for their reaction against scale insect.**

Sr. No.	Genotype	Scale Insect		
		% incidence	% intensity	Reaction
01	Co 09004	87.50(72.11)	23.12	HS
02	Co 09007	97.50(85.39)	31.43	HS
03	CoN 09072	77.50(62.30)	15.95	HS
04	Co 85004	100.00(90.00)	39.06	HS
05	Co 94008	82.50(65.84)	15.83	HS
06	CoC 671	87.50(75.88)	25.22	HS
	S. E. $\pm$	4.52		
	C.D. at 5 %	13.61		
	Less Susceptible (LS)	0 – 10		
	Moderate Susceptible (MS)	10.1 – 35		
	High Susceptible (HS)	Above 35		

**Mealy bug (MB) (Table-23):**

The mealy bug incidence ranged from 92.50 to 95 per cent. All test genotypes showed highly susceptible reaction to mealy bug. The entry Co 09007 showed least incidence to mealy bug (92.50%), followed by Co 09004 and Co 94008 (95 % each).

**Scale insect (SI) (Table-24):**

In case of scale insect, the incidence ranged from 77.50 to cent per cent. All test genotypes showed highly susceptible reaction to scale insect. The CoN 09072 recorded least incidence of scale insect (77.50%), followed by variety Co 094008 (82.50 %).

**Conclusion :** In AVT Early Ratoon trial, no test genotypes showed less susceptible reaction to internode borer, mealy bug as well as scale insect, where as all test genotypes showed less susceptible reaction to early shoot borer. The entry CoN 09072 showed least incidence to scale insect (77.50%), where as highest incidence to early shoot borer (12.56%), as well as mealy bug (cent per cent). The variety Co 85004 showed least incidence to internode borer (27.50%), where as highest incidence to mealy bug as well as scale insect (cent per cent each).

The cumulative per cent infestation of early shoot borer ranged from 9.51 to 12.56 per cent. Regarding internode borer, the incidence ranged from 27.50 to 45 per cent. It was observed that, there was no incidence in top shoot borer in all entries. The mealy bug incidence ranged from 92.50 to 95 per cent. In case of scale insect, the incidence ranged from 77.50 to cent per cent.

- Experiment No.2** : **Project No. E.28**
- Title** : **Survey and surveillance of sugarcane insect pests.**
- Objective** : To identify key insect pests of sugarcane in the area.
- Year of start** : 2004-05
- Duration** : Long term
- Methodology** : Roving survey of sugarcane fields were carried out in 5-8 km area around Central Sugarcane Research Station, Padegaon. Survey was carried out during 2015-16 on farmers field in different villages viz., Nimbut (Baramati), Padegaon (Phaltan), Padegaon (Khandala), Gardadwadi (Baramati), Pimpri etc. In most of the fields, CoM 0265 and Co 86032 varieties were planted. The observations on the incidence of borers on 100 canes were examined at five places and for sucking pests 20 canes were observed as per technical programme.

**Results :**

The incidence of early shoot borer ranged from 09.40 to 38.80 per cent, whereas average incidence was recorded 12.60 per cent. The incidence of early shoot borer was high in suru planting (especially in late suru planting) as compare to adsali and pre-season plantings. The incidence of early shoot borer was highest on March onward plantings due to high temperature. The per cent incidence of internode borer ranged from 15.20 to 24.60 and intensity ranged from 2 to 8 per cent. The incidence of top shoot borer and root borer was in traces to very low level.

Regarding sucking pests, the pyrilla, whitefly, thrips, scale insects was in traces to low level. The incidence of mealy bug was ranged from 20.40 to 25.80 per cent, where as intensity ranged from 2 to 5 per cent. The derbid plant hopper, *Proustista moesta* was recorded from 2.20 to 10.60 per cent. During this year (2015-16), the incidence of sugarcane woolly aphid observed only on few stools on Sugarcane and ranged from 0 to 3.40 per cent. In case of soil pests, the incidence of white grub and termites were in traces.

**Conclusion:**

In the experiments, “Survey and surveillance of sugarcane insect pests” (E.28), Early shoot borer is key pest of this area and per cent insect infestation was highest in *suru* planting than *adsali* and *preseasonal*. The incidence of early shoot borer ranged from 09.40 to 38.80 per cent, where as average incidence was recorded 12.60 per cent. The per cent incidence of internode borer ranged from 15.20 to 24.60 and intensity ranged from 2 to 8 per cent. The incidence of mealy bug was ranged from 20.40 to 25.80 per cent, where as intensity ranged from 2 to 5 per cent. The incidence of top shoot borer, root borer, sugarcane woolly aphid, pyrilla, whitefly, thrips, scale insects, white grub and termites were in traces to low level.

**Table 25 : Survey and surveillance of sugarcane insect pests (2015-16).**

S. N.	Variety	Location	Name of pest	% incidence/Population			Remark
				Min.	Max.	Average	
	CoM 0265 Co 86032	Nimbut (Baramati), Padegaon (Phaltan), Padegaon (Khandala), Gardadwadi (Baramati), Pimpre	Early shoot borer (% incidence)	9.40	38.80	12.60	
Top shoot borer (% incidence)			0	1.20	0.20		
Internode borer -% incidence ( % intensity)			15.20 (2)	24.60 (8)	16.80 (4)		
Stalk borer (% incidence/% intensity)			--	--	--		
Root borer (% incidence)			2.20	5.40	3.20		
Any other borer (% incidence)			--	--	--		
Pyrilla/ leaf			0	01	--	very rare incidence	
<i>Epiricania melanoleuca</i> /plant			5	20	--		
Whitefly (per 2.5 sq.cm.)			0	01	--	very rare incidence	
Woolly aphid (Average grade)			0	03.40	01.60	On very few stools	
Scale insect (% incidence/% intensity)			0	08.20	02.00		
Mealy bug - % incidence / (% intensity)			20.40 (2)	25.80 (5)	22.20		
Black bug/leaf			--	--	--		
Spittle bug (% incidence)			--	--	--		
Thrips (% incidence)			--	--	--	In traces	
Mite (% incidence)			--	--	--		
White grub (No. of grub/ha)			--	--	--	In traces	
Termite (% incidence) At germination/harvest			--	--	--	In traces	
Derbid plant hopper, <i>Proutista moesta</i>			02.20	10.60	04.00	--	
Sugarcane grass hopper, <i>Hieroglyphus banian</i>			--	--	--	In traces	
Any other (New Pest)	--	--	--	--			

**Expt No.3** : **Project E 30**  
**Title** : **Monitoring of insect pests and bio-agents in agro ecosystem.**

**Objective** : To monitor the key insect pests and natural enemies in the area.

**Experimental Details :**

1 Year of start : 2006-07  
 2 Duration : Long term.  
 3 Season : Suru

**Observations :**

1. Observations on incidence of borers were recorded by examining 100 canes at five places (four corners and in the middle), sucking pests by examining 20 canes.
2. Meteorological data (Weekly average) was recorded on temperature (maximum and minimum), relative humidity and total rainfall.

**Results :**

The data regarding monitoring of insect pests and their bio-agents in sugarcane agro-ecosystem are presented in table 26 to 29.

During this year (2015-16) the incidence of early shoot borer ranged from 0.79 to 8.87 per cent. The peak incidence of early shoot borer was observed in 20 MW (14-20 May, 2015) and it was 8.87 per cent (table-26). The parasitism of *T. chilonis* was observed 18 to 28 MW. The incidence of pyrilla per leaf was ranged from 1 to 7. The *T. pyrillae* and *E. melanoleuca* was also observed (table-27). The first incidence of woolly aphid was observed in 29 MW (16 – 22 July, 2015) and it was 0.40 woolly aphid per 2.5 cm<sup>2</sup> leaf area per three leaves (table-28). However, the peak incidence was observed in 33 MW and it was 2.05 woolly aphid per 2.5 cm<sup>2</sup> leaf area per three leaves. Since 37 to 50 MW, there was no incidence of woolly aphid in experimental field. It was again started from 51 MW of 2015 and continued to 2 MW of 2016. The parasitoid, *Encarsia flavoscutellum* was ranged from 0.33 to 2.67 per leaf and peak was observed in 34 MW of 2015 and 1 MW of 2016 (1.33 / leaf). The predator, *Micromus igorotus* was ranged from 0.33 to 2.67 per leaf and peak was observed in 35 MW of 2015. The peak predatism of *D. aphidivora* on woolly aphid was observed in 1 MW of 2016. The chrysopids and syrphids are observed in traces. The mealy bug incidence was ranged from 1 to 9 per cent and peak activity was noticed in 38 MW(table-29).

**Table 26 : Monitoring of insect pests and natural enemies of Sugarcane (ESB)**

Period of observation (2015)	% incidence early shoot borer	% Parasitism (ESB), If Any		
		<i>T. chilonis</i>	<i>E. annulipes</i>	<i>S. inferens</i>
1	2	3	4	5
15 (April 09-15)	--	--	--	--
16 (April 16-22)	5.33	--	--	--
17 (April 23-29)	8.13	--	--	--
18 (April 30- May06)	8.47	1.10	--	--
19 (May 07-13)	6.17	1.00	--	--
20 (May 14-20)	8.87	1.00	--	--
21(May 21-27)	7.54	2.00	--	--

22 (May 28-June 03)	7.99	2.10	--	--
23 (June 04-10)	7.06	2.40	--	--
24 (June 11-17)	7.91	2.00	--	--
25 (June 18-24)	4.69	2.40	--	--
26 (June 25- July01)	5.51	2.10	--	--
27 (July 02-08)	2.04	1.00	--	--
28 (July 09-15)	1.08	0.20	--	--
29 (July 16-22)	0.79	0.00	--	--
30 (July 23-29)	3.15	0.00	--	--
31 (July 30-Aug 05)	--	--	--	--

**Table 27 : Monitoring of insect pests and natural enemies of Sugarcane (pyrilla)**

Period of observation (2015)	Pyrilla / leaf	Pyrilla/leaf				
		<i>T. pyrillae</i>	<i>Cheilon eurus pyrillae</i>	<i>Ooencyrt us papilionis</i>	<i>E. melanoleuca</i>	
					% Parasitism	Egg mass & Cocoon
1	5	6	7	8	9	10
29 (July 16-22)	-	-	-	-	-	1
30 (July 23-29)	0-1	-	-	-	-	0
31 (July 30-Aug 05)	0-1	-	-	-	-	1
32 (Aug 06-12)	1-2	10	-	-	50	1-2
33 (Aug 13-19)	2-3	30	-	-	67	2-3
34 (Aug 20-26)	3-5	20	-	-	80	0-2
35 (Aug 27-Sept 02)	4-7	05	-	-	80	1-2
36 (Sept 03-09)	2-3	-	-	-	60	0-1
37 (Sept 10-16)	1-2	-	-	-	50	0
38 (Sept 17-23)	0	-	-	-	0	0
39 (Sept 24-30)	0	-	-	-	0	0

**Table 28 : Monitoring of insect pests and natural enemies of Sugarcane (Woolly aphid)**

Period of observation	woolly aphid (Av. Grade)	% Parasitism/Predator population per plant (Woolly aphid)				
		<i>Encarsia flavoscutellum</i>	<i>Micromus igorotus</i>	<i>D. aphidivora</i>	Syrphid fly	<i>Chrysoperla zastrowi sillemi</i>
1	2	3	4	5	6	7
28 (July 09-15) 2015	-	-	-	-	-	-
29 (July 16-22)	0.40	-	-	-	-	-
30 (July 23-29)	0.60	0.33/leaf	0.33/leaf	-	-	-
31 (July 30-Aug 05)	1.56	0.33/leaf	1/leaf	-	-	-
32 (Aug 06-12)	1.80	1/leaf	1/leaf	-	-	-
33 (Aug 13-19)	2.05	1.33/leaf	1.33/leaf	-	-	-
34 (Aug 20-26)	1.07	2.67/leaf	3/leaf	-	-	0.67/leaf

35 (Aug 27-Sept 02)	0.73	0.67/leaf	2.67/leaf	-	0.67/leaf	-
36 (Sept 03-09)	0.67	0.67/leaf	1/leaf	0.33/leaf	-	-
37 (Sept 10-16)	Since 37 to 50 MW no woolly aphid incidence in obs. field.					
51 (Dec 17-23)	1.22	1/leaf	1.33/leaf	-	-	0.33/leaf
52 (Dec 24-31)	0.90	2.33/leaf	2/leaf	0.33/leaf	-	0.33/leaf
01 (Jan 01-07) 2016	0.76	2.67/leaf	2.33/leaf	1.33/leaf	-	-
02 (Jan 08-14) 2016	0.40	2/leaf	0.66/leaf	-	-	-
Note : The incidence of woolly aphid was only on few stools in the experimental field. The observations are based on the infested parts of the field.						

**Table 29 : Monitoring of insect pests and natural enemies of Sugarcane (Woolly aphid)**

Period of observation (2015)	% incidence Mealy bug	% Parasitism/Predator population per plant (Mealy bug)			
		<i>Coccinella septempunctata</i>	<i>P. horni</i>	<i>Cheilomenes sexmaculata</i>	<i>C. zastrowi sillemi</i>
1	8	9	10	11	12
35 (Aug 27-Sept 02)	-	-	-	-	-
36 (Sept 03-09)	1	-	-	-	-
37 (Sept 10-16)	4	-	-	-	-
38 (Sept 17-23)	9	1	-	-	-
39 (Sept 24-30)	7	2-3	-	1	11 eggs observed on one clump in 40 and 41 MW
40 (Oct 01-07)	8	1	-	2-3	
41 (Oct 08-14)	5	1	-	0	
42 (Oct 15-21)	3	-	-	1	
43 (Oct 22-28)	1	-	-	-	
44 (Oct 29-Nov 04)	0	-	-	-	-

**Conclusion:**

In “Monitoring of insect pests and bio-agents in agro ecosystem,” the incidence of early shoot borer ranged from 0.79 to 8.87 per cent. The peak incidence of early shoot borer was observed in 20 MW (14-20 May, 2016) The incidence of pyrilla per leaf was ranged from 1 to 7. The first incidence of woolly aphid was observed in 29 MW (16 – 22 July, 2015) and it was 0.40 woolly aphid per 2.5 cm<sup>2</sup> leaf area per three leaves. However, the peak incidence was observed in 33 MW and it was 2.05 woolly aphid per 2.5 cm<sup>2</sup> leaf area per three leaves. The parasitoid, *Encarsia flavoscutellum* was ranged from 0.33 to 2.67 per leaf. The predator, *Micromus igorotus* was ranged from 0.33 to 2.67 per leaf and peak was observed in 35 MW of 2015. The mealy bug incidence was ranged from 1 to 9 per cent and peak activity was noticed in 38 MW.

**Expt No.4** : **Project E.34**  
**Title** : **Standardization of simple, cost effective techniques for mass multiplication of sugarcane bioagents.**

**Objective** : To develop simple and cost effective mass multiplication techniques of promising bio- agents of the area.

**Experimental Details :**

- 1 Location : Padegaon
- 2 Season : 2015-16
- 3 Year of Start : 2012-13
- 4 Bio-agent to be : ➤ *Chrysoperla carnae* multiplied

**Methodology** : Simple and cost effective host insect/media for multiplication of parasitoid/predator and insect pathogen/parasite.

**Results** : The allotted bio-agent for multiplication is *Chrysoperla carnae*. This bio-agent was tried to multiply on sugarcane woolly aphid in field. The experiment was planted on 21.03.2015 with regular variety Co 86032. This year (2015-16), the incidence of woolly aphid was occurred in 29 MW i.e. 16-22 July (0.40 woolly aphid / 2.5 cm<sup>2</sup> / 3 leaves) and it was continued up to 36 MW. There was no incidence of woolly aphid since 37 to 50 MW. This may be due to heavy rainfall in 37(122.4mm), 40(59.5 mm), 41(69.6mm) and 47 MW (45.8mm) (Annexure –I). However the inundative releases of woolly aphid was done with sufficient application of urea. The incidence was again started in 51 MW of 2015 and continued up to 2 MW of 2016.

The bio agent, which was to be mass multiplied (i.e. *Chrysoperla carnea*) was released in field. However, it was developed at low level in the experimental field. This may be due to presence of other predator's viz., *Micromus igorotus* and *Encarsia flavoscutellum*.

**Note** : As per suggestion by the Principal Investigator (Entomology) during last workshop (14-16 Dec. 2015 at Pusa – Bihar), the laboratory study of feeding potential of *Chrysoperla carnea* against sugarcane woolly aphid was started in last week of December, 2015. The neonate larvae of chrysopids were collected from the field and they were started feeding of woolly aphids from 1<sup>st</sup> week of January, 2016 in lab. However, the incidence of woolly aphid was very less during I fortnight of January, 2016 and it was vanished completely in third week of January, 2016. Therefore, the corresponding lab study will be conducted since July 2016, after start of woolly aphid incidence.

**Conclusion** : In the experiment, “Standardization of simple, cost effective techniques for mass multiplication of sugarcane bio-agents (E.34),” the bio – agents particularly *Micromus igorotus*, *Encarsia flavoscutellum* and *Chrysoperla carnea* played a pivotal role in suppressing sugarcane woolly aphid.

- Expt No.5** : **Project E 36 (New Project):**  
**Title** : **Management of borer complex of sugarcane through lures.**  
**Objective** : To manage sugarcane borers (early shoot borer, top borer, internode borer and stalk borer) through pheromone traps.  
**Experimental Details** :  
1 Season : 2015-16  
2 Plot size : 0.5 acre each  
3 Variety : CoM 0265
- Treatment details** : Three pheromone lures of sugarcane early shoot borer, internode borer and top shoot borer in ½ acre of CoM 0265 plot.
- Plot Size** : Two blocks, each of minimum half acre. In first block, traps were installed as per treatment details, whereas the second plot was kept as such (i.e. without pheromone traps -control). In between both blocks, one acre sugarcane crop was taken as such to avoid the pheromone effect.
- Methodology** :  
➤ In *Peninsular Zone*, the test insect-pests are *early shoot borer, top borer and internode borer*.  
➤ Three pheromone traps for each pests were installed in the second fortnight of February (i.e. third week of February – i.e. in 8 MW) till harvest of crop in half acre of sugarcane crop.  
➤ The pheromone lures were changed after 21-30 days for early shoot borer as well as top shoot borer and 45-60 days for internode borer, according to climate.
- Observation to be recorded** :  
➤ Observations on number of moths trapped was recorded at weekly interval.  
➤ The mean number of moth capture was worked out.  
➤ The correlation and regression of moth captures were worked out with weekly meteorological parameters.  
➤ Infestation of each borer was recorded in both blocks.

**Table-30. The average pheromone trap catches of pests as per meteorological weeks (Year 2015).**

Met. Week	Temp		RH %		Rainfall (mm)	ESB	IB	TSB
	Max	Min	RH1	RH2				
01	25.9	14.1	97	57	000.0	-	-	-
02	27.9	06.8	92	39	000.0	-	-	-
03	28.7	10.0	92	39	000.0	-	-	-
04	29.4	12.8	96	49	000.0	-	-	-
05	30.1	11.9	96	48	000.0	-	-	-
06	31.3	12.4	88	52	000.0	-	-	-
07	33.2	12.0	94	53	000.0	-	-	-
08	34.0	13.3	85	39	000.0	0	0	0
09	30.5	13.0	92	55	043.8	0	0	0

Met. Week	Temp		RH %			ESB	IB	TSB
	Max	Min		RH1	RH2			
10	32.1	14.4	88	49	00.00	1	0	0
11	33.1	17.2	95	64	001.8	0	0	0
12	36.6	19.7	80	41	00.00	3	0	0
13	37.6	19.8	83	39	00.00	4	0	0
14	37.7	17.8	79	40	00.00	3	0	0
15	35.1	19.7	87	43	002.2	5	0	0
16	37.4	23.0	77	36	00.00	9	1	0
17	39.0	22.3	72	35	00.00	7	3	0
18	40.3	22.5	93	49	000.6	10	4	0
19	38.7	24.1	85	49	007.9	10	6	0
20	36.6	24.6	85	45	000.0	7	3	1
21	38.2	23.8	83	44	000.0	5	1	1
22	38.0	23.8	83	41	013.0	3	4	2
23	35.8	21.9	88	50	091.1	4	2	0
24	32.4	23.2	90	62	001.4	2	1	1
25	28.7	22.2	95	84	053.3	1	1	0
26	31.0	23.4	87	68	000.0	3	0	0
27	32.7	22.2	82	66	000.0	1	4	1
28	31.0	24.3	80	59	000.0	0	1	0
29	30.9	23.0	84	66	003.5	0	2	1
30	30.3	22.8	84	74	001.1	2	0	0
31	29.6	22.4	92	73	002.4	1	2	0
32	30.0	18.8	91	78	000.0	0	1	0
33	32.0	22.5	96	81	000.0	1	0	0
34	31.3	22.1	90	80	000.0	0	4	0
35	31.8	21.7	85	79	000.0	0	2	0
36	32.6	21.3	85	57	006.8	0	1	0
37	30.8	21.1	93	80	122.4	0	2	0
38	29.7	21.2	95	81	006.9	0	0	0
39	32.5	21.5	97	86	000.0	0	1	0
40	31.8	21.8	90	64	059.5	0	1	0
41	32.9	21.7	95	63	069.6	0	3	0
42	33.8	20.9	94	80	001.8	0	0	0
43	32.7	20.7	93	73	000.0	0	2	0
44	32.1	19.2	94	79	000.0	0	5	0
45	31.9	19.0	94	76	000.0	0	1	0
46	31.8	15.4	94	74	000.0	0	0	0
47	30.0	19.3	96	79	045.8	0	0	0
48	31.3	18.4	96	79	000.0	0	0	0
49	31.4	16.3	97	77	000.0	0	0	0
50	33.2	18.1	98	75	000.0	0	0	0
51	32.2	15.4	97	69	000.0	0	0	0
52	30.6	9.0	94	78	000.0	0	0	0

**Table - 31 : Impact of pheromone traps on the incidence of early shoot borer, internode borer and yield.**

Treatment/s	Per cent incidence of early shoot borer					% reduction over control
	45 DAP	60 DAP	90 DAP	120 DAP	Cumulative %	
Pheromone trap @ 15 / ha (i.e. 3 per ½ acre )	3.28	3.52	2.56	1.60	<b>9.05</b>	57.51
Plot without Pheromone trap	9.83	12.51	4.89	2.68	<b>21.30</b>	--
Treatment/s	Internode Borer (%)		Cane yield (t/ha)	% Increase over control (Yield)	Remarks	
	Incidence (Intensity)	% redct <sup>n</sup> over control				
Pheromone trap @ 15 / ha (i.e. 3 per ½ acre )	30.00 (2.30)	34.07 %	91.60	11.11		
Plot without Pheromone trap	45.50 (7.10)		82.44			

**Results:**

The data regarding meteorological week wise weather parameters with moth catches of early shoot borer, internode borer and top shoot borer are presented in table- 30.

The highest number of moth catches in case of early shoot borer were trapped in 18 and 19 MW (10 numbers/ 3 traps), when the maximum and minimum temperature was 40.3 and 22.5<sup>0</sup> C, respectively. The moth catches decreased gradually up to 27 MW. However, again the moth catches observed in 30, 31 and 33 MW. Afterwards, there was no moth catches of early shoot borer. The maximum pheromone trap catches of internode borer was recorded in 19 MW (6 numbers per 3 traps), when the maximum and minimum temperature was 38.7 and 24.1<sup>0</sup> C, respectively. These moth catches were continued up to 45 MW. Afterwards, there were no moth catches of internode borer. In case of top shoot borer, the highest number of moth catches were observed in 22 MW (2 numbers per 3 traps), when the maximum and minimum temperature was 38 and 23.8<sup>0</sup> C, respectively. However, the top shoot borer trap catches were very low and it was observed between 20 to 29 MW. The impact of pheromone traps on the incidence of pests and yield (table -31) revealed that, the treatment with pheromone trap @ 15 / ha recorded 9.05 per cent cumulative infestation of early shoot borer as compare to untreated control (21.30 %). The installation of pheromone trap reduced 57.51 per cent cumulative infestation of early shoot borer. Regarding internode borer, the plot with pheromone trap @ 15 / ha observed 30 per cent incidence as compare to control plot (45.50 %) and reduced the infestation up to 34.07 per cent. In case of top shoot borer, the moth catches and incidence was rare.

The treated plot recorded 91.60 t/ha sugarcane yield as compare to untreated plot (82.44 t/ha), which showed 11.11 per cent increase of yield over control plot.

**Conclusion:**

In the experiment, “Management of borer complex of sugarcane through lures (E.36),” the highest number of moth catches in case of early shoot borer (10 numbers/ 3 traps), internode borer (6 numbers per 3 traps) and top shoot borer (2 numbers per 3 traps) were trapped in 18, 19 and 22MW, respectively. The installation of pheromone traps @ 15 per ha reduced the incidence of 57.51 and 34.07 per cent of early shoot borer and internode borer, respectively and increased 11.11 per cent sugarcane yield over untreated control.

**Expt No.6** :  
**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.

**Experimental Details** :

- 1 Year of start : 2013-14
- 2 Design : RBD
- 3 Replications : Three
- 4 Plot size : 6.0 x 5.4 m Gross (Net : 6X3.6m)
- 5 Planting date : 13/03/2015
- 6 Variety : Co 86032
- 7 No. of treatments : 8
- 8 Harvesting date : 20/03/2016

**Treatment details** :

- | <b>Tr No.</b> | <b>Name of the treatment</b>  |
|---------------|---|
| 1             | : Soil application of Fipronil 0.3 G @ 25 Kg/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 & 60 DAP                              |
| 4             | : Spraying of Spinosad 45 SC @ 90 ml/ha at 30 & 60 DAP  |
| 5             | : Spraying of Flubendiamide @ 250 ml/ha at 30 & 60 DAP  |
| 6             | : Soil application of Phorate 10G @15 kg/ha at the time of planting and 60 DAP                    |
| 7             | : Soil application of Carbofuron 3G @ 33 kg/ha at the time of planting and 60 DAP                 |
| 8             | : Untreated Control   |

## Methodology :

### Early Shoot borer:

- ESB infestation was recorded by counting number of dead hearts easily pulled out and emitting offensive odour as well as the total number of shoots/plant in each net plot on 45, 60, 90 and 120 DAP.
- The per cent incidence of shoot borer was 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 was worked out by taking progressive total of infested shoots in proportion to total shoot formed.
- Number of millable cane and cane yield.

### Results:

Data recorded on per cent incidence of early shoot borer (ESB), total number of millable canes (000 per ha) and yield (t/ha) are presented in table 32.

After 45 days of planting, the differences regarding incidence of early shoot borer were statistically significant. The soil application of chlorantraniliprole 0.4 G @ 22.5 kg / ha (T<sub>2</sub>) showed least incidence (10.71%) of early shoot borer and it was at par with spraying of chlorantraniliprole 18.5 SC @ 375 ml / ha (13.70 %)(T<sub>3</sub>). However, these treatments were significantly superior over rest of the treatments.

After 60 days of planting, Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP (T<sub>2</sub>) observed significantly superior over rest of the treatments and observed 12.18 per cent ESB incidence except T<sub>3</sub> (Spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 and 60 DAP ), which recorded 13.98 per cent incidence of early shoot borer. However, these treatments were significantly superior over rest of the treatments.

**Table -7. Effect of new insecticides against early shoot borer, *Chilo infuscatellus*.**

Tr No	Treatments	Mean Early Shoot Borer Incidence (%) (Days After Planting)					Average Millable Canes (000/ha)	Average Cane Yield (t/ha)
		45	60	90	120	Cumulative incidence		
T1	Soil application of Fipronil 0.3 G @ 25 Kg/ha at the time of planting and 60 DAP	17.87	19.50	10.55	9.39	26.00	85.65	115.74
T2	Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP	10.71	12.18	9.14	7.16	18.36	92.32	128.89
T3	Spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60 DAP	13.70	13.98	13.12	9.16	23.23	87.42	117.50
T4	Spraying of Spinosad 45 SC @ 90 ml/ha at 30 & 60 DAP	22.41	18.53	13.79	8.66	28.66	81.39	93.89
T5	Spraying of Flubendiamide @ 250 ml/ha at 30 & 60 DAP	17.93	21.46	10.82	8.25	27.35	83.61	108.33
T6	Soil application of Phorate 10G @15 kg/ha at the time of planting and 60 DAP	20.19	21.14	15.60	9.99	28.87	78.15	93.42
T7	Soil application of Carbofuron 3G @ 33 kg/ha at the time of planting and 60 DAP	18.25	20.67	12.69	9.39	27.41	82.96	100.18
T8	Untreated Control	19.69	25.72	16.72	12.93	32.37	73.98	92.78
	<b>S. E. ±</b>	1.02	1.27	0.94	0.61	1.56	3.07	5.60
	<b>C.D. at 5 %</b>	3.08	3.84	2.85	1.84	4.73	9.30	16.96
	<b>CV</b>	10.02	11.47	12.72	11.25	10.20	6.40	9.12

After 90 days of planting, the treatment T<sub>2</sub> (Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP) showed significantly superior over rest of treatments (9.14 % incidence of ESB). However, it was at par with T<sub>1</sub> (Soil application of Fipronil 0.3 G @ 25 Kg/ha at the time of planting and 60 DAP) and T<sub>5</sub>, which recorded 10.55 and 10.82 per cent incidence of early shoot borer, respectively.

After 120 days of planting, the treatment T<sub>2</sub> (Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP) showed least incidence of early shoot borer (7.16%). However, it was at par with the treatments T<sub>5</sub> and T<sub>4</sub>.

The data on cumulative per cent incidence of early shoot borer revealed that, the treatment with Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP (T<sub>2</sub>) was significantly superior over rest of the treatments and recorded 18.36 per cent ESB incidence. It was followed by T<sub>3</sub> (Spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60 DAP), which recorded 23.23 per cent early shoot borer incidence. However, it was at par with T<sub>1</sub> (Soil application of Fipronil 0.3 G @ 25 Kg/ha at the time of planting and 60 DAP), T<sub>5</sub> (Spraying of Flubendiamide @ 250 ml/ha at 30 & 60 DAP) and T<sub>7</sub> (Soil application of Carbofuron 3G @ 33 kg/ha at the time of planting and 60 DAP) which recorded 26, 27.35 and 27.41 per cent incidence of early shoot borer, respectively.

The treatment with Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP (T<sub>2</sub>) observed significantly superior millable canes (92.32 thousand / ha). However, it was at par with T<sub>3</sub> (Spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60 DAP ), T<sub>1</sub> (Soil application of Fipronil 0.3 G @ 25 Kg/ha at the time of planting and 60 DAP), and T<sub>5</sub> (Spraying of Flubendiamide @ 250 ml/ha at 30 & 60 DAP), which recorded 87.42, 85.65 and 83.61 average millable canes, respectively.

Regarding yield, the treatment with Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP (T<sub>2</sub>) observed significantly superior yield (128.89 t / ha) over rest of the treatments. However, it was at par with T<sub>3</sub> (Spraying of Chlorantraniliprole 18.5 SC @ 375 ml/ha at 30 & 60 DAP ) (90.67 t / ha) and T<sub>1</sub> (Soil application of Fipronil 0.3 G @ 25 Kg/ha at the time of planting and 60 DAP), which recorded 117.50 and 115.74 t / ha, respectively.

### **Conclusion:**

In the experiment, “Bio-efficacy of newer insecticide for the control of sugarcane early shoot borer,” the treatment with Soil application of Chlorantraniliprole 0.4 G @ 22.5 kg / ha at the time of planting and 60 DAP (T<sub>2</sub>) was found most effective against early shoot borer, *Chilo infuscatellus* on sugarcane, which observed least cumulative incidence of early shoot borer (18.36 per cent ) and recorded highest yield (128.89 t / ha) over rest of the treatments.

## Annexure I

MW	PERIODS	Temp		RH %		Rainfall
		Max	Min	RH1	RH2	(mm)
01	Jan 01-07	25.9	14.1	97	57	000.0
02	Jan 08-14	27.9	06.8	92	39	000.0
03	Jan 15-21	28.7	10.0	92	39	000.0
04	Jan 22-28	29.4	12.8	96	49	000.0
05	Jan 29-04 Feb	30.1	11.9	96	48	000.0
06	Feb 05-11	31.3	12.4	88	52	000.0
07	Feb 12-18	33.2	12.0	94	53	000.0
08	Feb 19-25	34.0	13.3	85	39	000.0
09	Feb 26-Mar 04	30.5	13.0	92	55	043.8
10	Mar 05-11	32.1	14.4	88	49	00.00
11	Mar 12-18	33.1	17.2	95	64	001.8
12	Mar 19-25	36.6	19.7	80	41	00.00
13	Mar 26- April 01	37.6	19.8	83	39	00.00
14	April 02-08	37.7	17.8	79	40	00.00
15	April 09-15	35.1	19.7	87	43	002.2
16	April 16-22	37.4	23.0	77	36	00.00
17	April 23-29	39.0	22.3	72	35	00.00
18	April 30- May06	40.3	22.5	93	49	000.6
19	May 07-13	38.7	24.1	85	49	007.9
20	May 14-20	36.6	24.6	85	45	000.0
21	May 21-27	38.2	23.8	83	44	000.0
22	May 28-June 03	38.0	23.8	83	41	013.0
23	June 04-10	35.8	21.9	88	50	091.1
24	June 11-17	32.4	23.2	90	62	001.4
25	June 18-24	28.7	22.2	95	84	053.3
26	June 25- July01	31.0	23.4	87	68	000.0
27	July 02-08	32.7	22.2	82	66	000.0
28	July 09-15	31.0	24.3	80	59	000.0
29	July 16-22	30.9	23.0	84	66	003.5
30	July 23-29	30.3	22.8	84	74	001.1
31	July 30-Aug 05	29.6	22.4	92	73	002.4
32	Aug 06-12	30.0	18.8	91	78	000.0
33	Aug 13-19	32.0	22.5	96	81	000.0
34	Aug 20-26	31.3	22.1	90	80	000.0
35	Aug 27-Sept 02	31.8	21.7	85	79	000.0
36	Sept 03-09	32.6	21.3	85	57	006.8
37	Sept 10-16	30.8	21.1	93	80	122.4
38	Sept 17-23	29.7	21.2	95	81	006.9
39	Sept 24-30	32.5	21.5	97	86	000.0
40	Oct 01-07	31.8	21.8	90	64	059.5
41	Oct 08-14	32.9	21.7	95	63	069.6
42	Oct 15-21	33.8	20.9	94	80	001.8
43	Oct 22-28	32.7	20.7	93	73	000.0
44	Oct 29-Nov 04	32.1	19.2	94	79	000.0
45	Nov 05-11	31.9	19.0	94	76	000.0
46	Nov 12-18	31.8	15.4	94	74	000.0
47	Nov 19-25	30.0	19.3	96	79	045.8
48	Nov 26-Dec 02	31.3	18.4	96	79	000.0
49	Dec 03-09	31.4	16.3	97	77	000.0
50	Dec 10-16	33.2	18.1	98	75	000.0
51	Dec 17-23	32.2	15.4	97	69	000.0
52	Dec 24-31	30.6	9.0	94	78	000.0

