



**ICAR-SUGARCANE BREEDING INSTITUTE
COIMBATORE, TAMIL NADU – 641007**



ANNUAL REPORT 2016-17 (Entomology)

During 2016-17, Entomological work of AICRP(S) was carried out under the following projects at ICAR-Sugarcane Breeding Institute (ICAR-SBI), Coimbatore, as per the technical program. Separate insecticide free trials were laid out for entomological observations. Incidence of shoot borer (SB) was recorded at 30th, 60th, 90th and 120th day after planting. Internode borer (INB) and top borer (TB) data were recorded in the trials laid out by the breeders as poor growth and termite damage in insecticide free trial completely damaged several entries. For the same reason, root borer (RB) incidence could not be recorded as it involved destructive sampling and in general the borer incidence was in traces as recorded in the monitoring plots.

Project details:

- 1. E 4.1: Evaluation of zonal varieties/genotypes for their reaction against major insect pests**
- 2. E.28 : Survey and surveillance of sugarcane insect pests**
- 3. E.30 : Monitoring of insect pests and bioagents in sugarcane agro-ecosystem**
- 4. E.34: Standardization of simple and cost effective techniques for mass multiplication of sugarcane bio-agents : *Cotesia flavipes***

Detailed report:

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

Shoot borer incidence was recorded on 30th, 60th, 90th and 120th day after planting in a separate trial laid out this year for screening genotypes to major pests. Total number of shoots and shoots with deadhearts were counted in the entire plot and the percent incidence was calculated.

Table 1. Shoot borer incidence in IVT – Early

S. No.	Genotype	% Incidence on days				Cumulative	No. of bored plants/ha	Infestation Grade
		30	60	90	120			
1	Co 13002	3.11	6.38	14.64	14.85	50.49	42593	HS
2	Co 13003	3.41	11.76	18.36	17.11	59.06	36213	HS
3	Co 13004	4.36	10.42	19.45	18.56	65.94	31070	HS
4	CoN 13071	5.60	7.96	10.96	11.30	43.06	31276	HS
5	CoN 13072	2.76	7.87	15.19	14.22	33.66	28395	HS
6	CoSnk 13101	3.60	13.58	17.89	18.00	69.17	34156	HS
7	CoSnk 13102	6.20	21.27	31.61	30.13	77.38	40123	HS
8	MS 13081	2.46	10.90	21.33	25.35	73.66	45473	HS
9	CoC 671	5.03	20.19	20.59	14.01	87.32	25514	HS
10	Co 85004	3.59	11.72	26.60	17.92	91.43	39506	HS

In IVT-Early, all the 10 entries showed highly susceptible reaction to the shoot borer. Overall cumulative incidence of the borer ranged between 33.66% in CoN 13072 and 91.43% in Co 85004. Total number of bored plants / ha ranged between 25,514 in CoC 671 and 45,473 in MS 13081 (Table 1).

Table 2. Shoot borer incidence in AVT – Early (I Plant)

S. No.	Genotype	% incidence on days				Cumulative	No. of bored plants/ha	Infestation Grade
		30	60	90	120			
1	Co 11001	2.89	3.78	8.26	17.09	32.96	30658	HS
2	Co 11004	2.52	11.31	16.94	10.63	50.17	30453	HS
3	CoM 11081	0.80	11.39	32.02	22.04	82.82	44650	HS
4	CoM 11082	1.71	10.29	27.84	20.52	73.95	32716	HS
5	CoM 11084	1.38	9.94	28.92	25.33	87.76	44239	HS

All the entries in AVT-Early (I Plant) were susceptible to shoot borer. Cumulative infestation ranged between 32.96% in Co 11001 and 87.76% in CoM 11084. Total number of bored plants / ha ranged from 30,453 in Co 11004 to 44,650 in CoM 11081 (Table 2).

Table 3. Shoot borer incidence in AVT – Early (II Plant)

S. No.	Genotype	% incidence on days				Cumulative	No. of bored plants/ha	Infestation Grade
		30	60	90	120			
1	Co 10004	3.78	10.53	10.94	13.93	37.25	15637	HS
2	Co 10005	2.56	6.56	13.54	11.96	26.52	17078	HS
3	Co 10006	5.10	50.00	30.00	36.19	36.44	16872	HS
4	Co 10024	1.43	18.99	10.42	15.52	49.75	20164	HS

5	Co 10026	3.94	7.52	15.25	12.01	29.95	21811	HS
6	Co 10027	4.66	14.89	16.42	15.52	53.76	19135	HS
7	CoT 10366	2.54	17.65	25.00	22.91	45.39	13169	HS
8	CoT 10367	2.82	11.34	5.05	8.05	21.40	13169	HS
9	Co 94008	5.74	10.96	18.57	15.32	38.57	16667	HS

In AVT-Early (II Plant), all the nine entries recorded highly susceptible reaction to shoot borer and the infestation ranged between 21.4% in CoT 10367 and 53.76% in Co 10027. Total number of bored plants/ha was minimum in CoT 10366 and CoT 10367 (13,169 plants/ha) and maximum in Co 10026 (21,811 plants/ha) (Table 3).

Table 4. Shoot borer incidence in IVT – Midlate

S. No.	Genotype	% Incidence on days				Cumulative	No. of bored plants/ha	Infestation Grade
		30	60	90	120			
1	Co 13005	2.43	9.61	16.78	15.45	40.23	21193	HS
2	Co 13006	4.08	9.93	15.78	12.34	29.09	16461	HS
3	Co 13008	7.83	10.97	14.10	13.80	40.91	22222	HS
4	Co 13009	2.84	11.81	20.77	21.93	65.31	19753	HS
5	Co 13011	7.74	14.63	21.51	21.26	53.24	15226	HS
6	Co 13013	5.93	19.30	32.67	13.67	49.71	17695	HS
7	Co 13014	0.78	10.14	19.49	17.27	43.21	21605	HS
8	Co 13016	0.59	7.44	14.29	22.38	21.03	11728	HS
9	Co 13018	1.86	5.09	8.31	11.53	23.28	16049	HS
10	Co 13020	1.05	16.23	31.40	19.45	61.97	27160	HS
11	CoM 13082	8.03	11.44	14.84	16.89	46.96	33333	HS
12	CoN 13073	5.28	13.34	21.40	9.73	64.06	28601	HS
13	CoN 13074	5.70	13.93	22.16	45.34	78.87	43004	HS
14	CoSnk 13103	8.80	14.65	20.49	19.72	60.00	28395	HS
15	CoSnk 13104	4.50	-	19.21	23.17	57.69	33951	HS
16	CoSnk 13105	0.76	-	30.37	39.25	45.61	16049	HS
17	CoSnk 13106	1.78	-	20.96	16.82	39.38	18313	HS
18	CoT 13366	7.85	-	16.46	27.93	64.24	21811	HS
19	PI 13131	11.27	-	13.86	6.67	28.16	17901	HS
20	PI 13132	12.58	-	20.59	14.65	58.19	27777	HS

In IVT (Midlate), cumulative incidence ranged between 21.03% in Co 13016 and 78.87% in CON 13074 and all the entries fall under highly susceptible reaction category. Total number of bored plants/ha ranged between 15,226 in Co 13011 and 43,004 in CoN 13074 (Table 4).

Table 5. Shoot borer incidence in AVT – Midlate (I Plant)

S.No	Genotype	% incidence on days				Cumulative	No of bored plants/ha	Infestation Grade
		30	60	90	120			
1	Co 11005	7.16	19.61	22.68	28.97	65.02	59670	HS
2	Co 11007	9.35	19.24	27.30	30.03	78.71	25103	HS
3	Co 11012	2.22	15.29	20.38	25.58	90.95	43416	HS
4	Co 11019	1.17	13.21	15.09	27.07	83.26	40947	HS
5	CoM 11085	1.47	11.29	18.51	21.79	88.41	29835	HS
6	CoM 11086	5.10	14.98	22.89	19.68	71.71	30247	HS

In AVT-Midlate (I Plant) category, all the six entries recorded highly susceptible reaction to shoot borer and the cumulative percent incidence ranged between 65.02% in Co 11005 and 90.95% in Co 11012. Number of bored plants/ha was minimum (25,103 plants/ha) in Co 11007 and maximum (59,670 plants/ha) in the entry Co 11005 (Table 5).

Table 6. Shoot borer incidence in AVT – Midlate (II Plant)

S. No.	Genotype	% Incidence on days				Cumulative	No. of bored plants/ha	Infestation Grade
		30	60	90	120			
1	Co 09009	-	8.10	18.68	11.74	40.90	29629	HS
2	Co 10015	1.49	7.35	12.01	18.37	40.80	29218	HS
3	Co 10017	0.00	10.08	14.02	16.17	49.66	29629	HS
4	Co 10031	4.53	5.08	12.27	11.62	37.08	29629	HS
5	Co 10033	1.60	4.37	15.40	22.98	42.71	34362	HS
6	CoM 10083	4.98	9.39	20.63	12.05	51.79	35802	HS
7	CoT 10368	3.65	2.66	11.70	14.07	39.23	10493	HS
8	CoT 10369	4.93	13.18	15.44	19.94	69.62	48559	HS
9	CoVc 10061	1.34	4.98	13.16	8.59	30.79	19136	HS
10	PI 10131	-	7.80	-	0.00	-	-	-
11	PI 10132	2.10	3.04	12.63	17.31	37.87	28601	HS
12	Co 99004	8.49	7.82	13.65	9.18	47.78	31070	HS

All the entries in AVT-Midlate (II Plant) were highly susceptible to shoot borer and the cumulative percent infestation ranged from 30.79% in CoVc 10061 to 69.62% in CoT 10369. Number of bored plants/ha was the lowest (10,493 plants/ha) in the entry CoT 10368 and the highest (48,559 plants/ha) in the entry CoT 10369. Data could not be recorded in the entry PI 10131 as plants did not survive due to termite attack (Table 6).

Table 7. IVT - Midlate: INB Incidence at harvest

S. No.	Entry	% Incidence	% Intensity	Infestation Index	Infestation Grade
1	Co 13005	72.00	5.23	3.77	HS
2	Co 13006	60.00	7.11	4.27	HS
3	Co 13008	64.00	5.47	3.50	HS
4	Co 13009	46.00	3.06	1.40	HS
5	Co 13011	82.00	5.33	4.37	HS
6	Co 13013	40.00	2.76	1.10	MS
7	Co 13014	74.00	6.38	4.72	HS
8	Co 13016	80.00	5.18	4.14	HS
9	Co 13018	52.00	2.04	1.06	HS
10	Co 13020	70.00	3.82	2.67	HS
11	CoM 13082	76.00	5.60	4.26	HS
12	CoN 13073	52.00	4.15	2.16	HS
13	CoN 13074	80.00	4.70	3.76	HS
14	CoT 13366	44.00	2.33	1.03	HS
15	CoSnk13103	68.00	5.03	3.42	HS
16	CoSnk13104	70.00	6.55	4.59	HS
17	CoSnk13105	60.00	3.74	2.24	HS
18	CoSnk13106	78.00	4.40	3.43	HS
19	PI 13131	50.00	3.03	1.52	HS
20	PI 13132	52.00	3.28	1.71	HS
21	Co 86032	70.00	4.72	3.30	HS
22	Co 99004	54.00	3.67	1.98	HS

Internode borer (INB) incidence in IVT-Midlate ranged from 40% in Co 13013 to 82% in the entry Co13011. All the entries except Co 13013 recorded highly susceptible infestation grade. However, the lowest intensity (2.04) was recorded in the entry Co 13018 and the highest (7.11) in the entry Co 13006. Infestation index was the lowest (1.03) in the entry CoT 13366 and the highest (4.72) in the entry Co 13074 (Table 7).

Table 8. AVT - Early (I Plant) : INB Incidence at harvest

S. No.	Entry	% Incidence	% Intensity	Infestation Index	Infestation Grade
1	Co 11001	68.00	3.92	2.66	HS
2	Co 11004	44.00	2.89	1.27	HS
3	CoM 11081	68.00	5.46	3.71	HS
4	CoM 11082	60.00	3.68	2.21	HS
5	CoM 11084	76.00	5.21	3.95	HS

6	CoC 671	32.00	2.20	0.70	MS
7	Co 85004	36.00	1.62	0.58	MS
8	Co 94008	68.00	5.78	3.93	HS

In AVT-Early (I Plant) category, INB infestation ranged from 32% in CoC 671 to 76% in CoM 11084. Intensity of the borer was the lowest (1.62) in the entry Co 85004 and the highest (5.78) in the entry Co 94008. Infestation index was the lowest (0.58) in the entry Co 85004 and the highest (3.95) in the entry CoM 11084. All entries, except CoC 671 and Co 85004, recorded highly susceptible infestation grade (Table 8).

Table 9. AVT - Midlate (I Plant) : INB Incidence at harvest

S. No.	Entry	% Incidence	% Intensity	Infestation Index	Infestation Grade
1	Co 11005	52.00	3.86	2.01	HS
2	Co 11007	44.00	2.85	1.25	HS
3	Co 11012	40.00	3.65	1.46	MS
4	Co 11019	44.00	3.14	1.38	HS
5	CoM 11085	56.00	2.05	1.15	HS
6	CoM 11086	56.00	3.16	1.77	HS
7	Co 99004	48.00	2.21	1.06	HS
8	Co 86032	46.00	3.72	1.71	HS

In AVT-Midlate (I Plant), INB incidence ranged between 40% in Co 11012 and 56% in two entries CoM 11085 and CoM 11.86. Intensity of the borer was the lowest (2.05) in the entry CoM11085 and the highest (3.86) in the entry Co 11005. Infestation index was the lowest (1.06) in the entry Co 99004 and the highest (2.01) in the entry Co 11005. Except Co 11012, all the entries recorded highly susceptible infestation grade (Table 9).

Table 10. AVT - Midlate (II Plant) : INB Incidence at harvest

S. No.	Entry	% Incidence	% Intensity	Infestation Index	Infestation Grade
1	Co 09009	74.00	4.54	3.36	HS
2	Co 10015	46.00	2.65	1.22	HS
3	Co 10017	48.00	2.03	0.97	HS
4	Co 10031	56.00	3.17	1.78	HS
5	Co 10033	44.00	1.35	0.59	HS
6	CoM 1003	82.00	4.50	3.69	HS
7	CoT 10368	62.00	4.33	2.68	HS

8	CoT 10369	64.00	4.08	2.61	HS
9	CoVc 10061	58.00	2.34	1.36	HS
10	PI 10131	58.00	2.43	1.41	HS
11	PI 10132	68.00	4.50	3.06	HS
12	Co 86032	58.00	4.55	2.64	HS
13	Co 99004	58.00	3.65	2.12	HS

INB incidence in AVT-Midlate (II Plant) was high ranging between 44% in Co 10033 to 82% in CoM 10033. Intensity of attack was the lowest (1.35) in the entry Co 10033 and the entry Co 86032 recorded the highest intensity of 4.55. Co 10033, which recorded the lowest infestation and intensity, has also recorded the lowest infestation index of 0.59. However, all the entries fall under highly susceptible infestation grade (Table 10).

Table 11. IVT – Early : Top borer incidence

S. No.	Entry	% Incidence at		Infestation Grade
		7 th Month	Harvest	
1	Co 13002	0.50	0.50	LS
2	Co 13003	0.10	0.10	LS
3	Co 13004	0.33	0.33	LS
5	CoN 13071	0.72	0.72	LS
6	CoN 13072	0.60	0.60	LS
7	CoSnk 13101	0.32	0.32	LS
8	CoSnk 13102	1.11	1.11	LS
9	MS 13081	1.61	1.61	LS
10	CoC 671	0.95	0.95	LS
11	Co 85004	0.34	0.34	LS

Top borer incidence was recorded in 7th month and at harvest. In IVT-Early category, incidence of the borer was very low (<1%) in all the entries except CoSnk (1.11%) and MS 13081 (1.61%). All entries fall under the least susceptible infestation grade (Table 11).

Table 12. IVT – Midlate : Top borer incidence

S. No.	Entry	% Incidence at		Infestation Grade
		7 th Month	Harvest	
1	Co 13005	1.20	1.20	LS
2	Co 13006	0.51	0.51	LS
3	Co 13008	0.97	0.97	LS
4	Co 13009	0.47	0.47	LS
5	Co 13011	0.16	0.16	LS

6	Co 13013	0.54	0.54	LS
7	Co 13014	0.65	0.65	LS
8	Co 13016	0.68	0.68	LS
9	Co 13018	0.22	0.22	LS
10	Co 13020	0.84	0.84	LS
11	CoM 13082	0.60	0.60	LS
12	CoN 13073	0.16	0.16	LS
13	CoN 13074	0.16	0.16	LS
14	CoSnk 13103	0.47	0.47	LS
15	CoSnk 13104	0.16	0.16	LS
16	CoSnk 13105	0.00	0.00	LS
17	CoSnk 13106	0.17	0.17	LS
18	CoT 13366	0.31	0.31	LS
19	PI 13131	0.50	0.50	LS
20	PI 13132	0.25	0.25	LS
21	Co 86032	0.47	0.47	LS
22	Co 99004	0.45	0.45	LS

In IVT-Midlate category, top borer incidence was very low ranging from nil in CoSnk 13105 to 1.2% in Co 13005. All the entries recorded the least susceptible grade (Table 12).

Table 13. AVT – Early (I Plant): Top borer incidence

S. No.	Entry	% incidence at		Infestation Grade
		7 th Month	Harvest	
1	Co 11001	0.48	0.48	LS
2	Co 11004	1.31	1.31	LS
3	CoM 11081	0.51	0.51	LS
4	CoM 11082	1.73	1.73	LS
5	CoM 11084	0.64	0.64	LS
6	CoC 671	0.85	0.85	LS
7	Co 85004	0.36	0.36	LS
8	Co 94008	0.85	0.85	LS

In AVT-Early (I Plant) category too, the borer incidence was very low ranging from 0.36% in Co 85004 to the maximum of 1.73% in the entry CoM 11084 and thus all the entries fall under the category of least susceptible infestation grade (Table 13).

Table 14. AVT – Early (II Plant): Top borer incidence

S. No.	Entry	% Incidence at		Infestation Grade
		7 th Month	Harvest	
1	Co 10004	0.18	0.18	LS

5	Co 10005	0.22	0.22	LS
2	Co 10006	0.90	0.90	LS
3	Co 10024	0.29	0.29	LS
4	Co 10026	1.03	1.03	LS
6	Co 10027	0.00	0.00	LS
7	CoT 10366	1.46	1.46	LS
8	CoT 10367	0.58	0.58	LS
9	Co 94008	0.54	0.54	LS
10	Co 671	0.47	0.47	LS
11	Co 85004	0.00	0.00	LS

In AVT-Early (II Plant) too, top borer was very low ranging from nil in the two entries Co 10027 and Co 85004 to 1.46% in CoT 10366. All the entries, thus, fall under the category of least susceptible infestation grade (Table 14).

Table 15. AVT – Midlate (I Plant): Top borer incidence

S. No.	Entry	% Incidence at		Infestation Grade
		7 th Month	Harvest	
1	Co 11005	0.74	0.74	LS
2	Co 11007	0.96	0.96	LS
3	Co 11012	1.34	1.34	LS
4	Co 11019	1.82	1.82	LS
5	CoM 11085	1.10	1.10	LS
6	CoM 11086	1.04	1.04	LS
7	Co99004	1.76	1.76	LS
8	Co 86032	1.09	1.09	LS

In AVT-Midlate (I Plant) category, infestation of top borer was very low ranging from 0.74% in the entry Co 11005 to 1.82% in the entry Co 11019 both at 7th month and harvest. All the entries thus fall under the category of least susceptible infestation grade (Table 15).

Table 16. AVT – Midlate (II Plant): Top borer incidence

S. No.	Entry	% Incidence at		Infestation Grade
		7 th Month	Harvest	
1	Co 09009	0.14	0.14	LS
2	Co 10015	0.26	0.26	LS
3	Co 10017	0.00	0.00	LS
4	Co 10031	0.85	0.85	LS
5	Co 10033	1.83	1.83	LS
6	CoM 10083	2.32	2.32	LS

7	CoT 10368	1.78	1.78	LS
8	CoT 10369	0.63	0.63	LS
9	CoVC 10061	0.13	0.13	LS
10	PI 10131	0.81	0.81	LS
11	PI 10132	0.37	0.37	LS
12	Co 99004	0.88	0.88	LS

Top borer incidence in AVT-Midlate (II Plant), as in all other categories, was very low ranging from nil in Co 10017 to the maximum of 2.32% in the entry CoM 10083, both at 7th month and harvest. Infestation grade of all the entries falls under the least susceptible category (Table 16).

Project E.28: Survey and surveillance of sugarcane insect pests

Table 17. Status of sugarcane pests and their natural enemies in and around Coimbatore, Tamil Nadu

S. No.	Variety	Location	Name of pest/ parasitoid	% incidence/population			Remarks
				Min	Max	Average	
1	Co 86032	Annur	Mealybug	5.0	10.0		
			Rat	0.0	1-2 burrows		
2	Co 86032	Telungupalayam	Top borer	0.0	5.0	2.5	
			Woolly aphid				Stray incidence / patchy appearance
			Pyrilla	1 egg mass/40 leaves			
			<i>Cotesia flavipes</i>	0.0	17.0	8.5	On INB
				3.3	15.4	9.4	On SB
			<i>Sturmiopsis inferens</i>	0.0	25.0	12.5	On SB
3	Co 62175		<i>Epiricania melanoleuca</i>	1 cocoon /40 leaves			
4	Co 86032	M/s Amravathi Sugars, Udumalpet	INB	15.0	20.0	17.5	
			RB	0.0	15.0	7.5	
5	Co 86032	M/s Bannari Amman Sugars, Sathyamangalam	INB	0.0	10.0	5.0	
			RB	0.0	15.0	7.5	
			Mealybug	10.0	20.0	15.0	

Project E.30: Monitoring of insect pests and natural enemies of sugarcane

S. No.	Location	Insect pest	Prevalence period	Max. incidence /population	Natural enemy	Prevalence period	Max. parasitization/ population
1	Coimbatore	SB	May	82.2%			
			June	17.0%			
			July	18.32%			
		TB	July	0.44%			
		Termite	July	80.5%			
		<i>Asamangu- lia</i>	July	Traces			
		SB	September	2.05%			
		INB	September	82.51%			
		TB	September	0.51%			
		Whitefly		0.77%			
		Mealybug		1.79%			
		Woolly aphid	November	Average rating 1.77 / leaf	<i>Encarsia flavoscutellum;</i> <i>Micromus</i>	November	
		INB	March	35.0%			

Project E.34: Standardization of simple and cost effective techniques for mass multiplication of sugarcane bio-agents : *Cotesia flavipes*

Group-exposure method for multiplication of *Cotesia flavipes* Cameron (Hymenoptera: Braconidae)

Cotesia flavipes can be multiplied by group-exposure method which was observed to be superior to individual-exposure on table-top in our earlier studies. Parasitoid adults emerging in the early hours from cocoon masses held in glass tubes are sexed based on antennal length. The generally female-biased parasitoid adults are transferred from the glass tubes to glass chimneys with wider end on one side and narrow end on the other side at 50-60 per chimney (\approx 1 lit) and provided with 50:50 honey: water solution impregnated on a cotton swab. After 2 h of mating period, third to fourth instar larvae of internode borer or sorghum borer are placed in the chimney at 1:1 host larvae: parasitoid female ratio, a few shoots of the host are provisioned and both the

ends of the chimney are secured with a double layer of white muslin and black coarse cloth. The chimneys are placed in plastic trays and covered with black cloth. The larvae are collected 24 h later and transferred to small rearing boxes lined with filter paper and provisioned with shoot bits which are changed every other day. Cocoon masses of the parasitoid generally emerge on around 12th day and these are collected from the boxes at changing and held in glass tubes for release in the field or continuation of laboratory culture.