

SUGARCANE ENTOMOLOGY

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SUGARCANE ENTOMOLOGY (AICRP)

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RESEARCH HIGHLIGHTS : 2011-12 (AICRP)

- In **IVT (Early)** trial, among all test genotypes, not a single entry recorded less susceptible reaction to early shoot borer as well as mealy bug. However, all test genotypes showed less susceptible reaction to top shoot borer. Six test genotypes each showed less susceptible reaction to internode borer as well as scale insect. All test genotypes showed highly susceptible reaction to mealy bug. The cumulative infestation of early shoot borer ranged from 24.02 (Co 85004) to 53.40 (Co 94008) per cent. The incidence of internode borer ranged from 3.33 (Co 85004) to 36.67 (Co 08001) per cent. The incidence of mealy bug ranged from 63.33 (CoN 08071) to cent per cent (Co 08006, PI 08131 and Co 85004). All test genotypes recorded no incidence except VSI 08121 (13.33%) and Co 94008 (20%), which showed moderately susceptible reaction to scale insect..

- In **AVT Early I Plant** trial, among all test genotypes, not a single entry observed less susceptible reaction to early shoot borer as well mealy bug. All test genotypes showed less susceptible reaction to top shoot borer, moderately susceptible reaction to early shoot borer and highly susceptible reaction to mealy bug. Among all tested genotypes, the 4 and 6 test genotypes showed less susceptible reaction to internode borer and scale insect, respectively. The cumulative infestation of early shoot borer ranged from 15.90 (Co 07015) to 29.01 (PI 07131) per cent. The incidence of internode borer ranged from 3.33 (CoN 07071) to 43.33 (PI 07131) per cent. Regarding top shoot borer, all test genotypes noticed no incidence, and ultimately showed less susceptible reaction. Regarding mealy bug, the incidence ranged from 46.67 (Co 94008) to 93.33 (Co 85004) per cent. The infestation of scale insect ranged from 0 to 13.33 (Co 94008) per cent.

- In **AVT (Early II Plant)** trial, all test genotypes, not a single entry observed less susceptible reaction to early shoot borer as well mealy bug. Among 8 tested genotypes, the 4 and 7 test genotypes showed less susceptible reaction to internode borer and scale insect, respectively. In case of top shoot borer all test genotypes observed less susceptible reaction. The cumulative infestation of early shoot borer ranged from 19.28 (Co 06022) to 39.18 (Co 94008) per cent.

The incidence of internode borer ranged from 6.67 (Co 85004) to 36.67 (CoM 06082) per cent. The incidence of top shoot borer ranged from 0 to 3.33 (Co 94008, Co 06002 and Co 06001). The incidence of mealy bug ranged from 40 (Co 06002) to 93.33 (Co 85004) per cent. The incidence of scale insect ranged from 0 to 13.33 (CoC 671).

- In **AVT Early – Ration** trial, test genotypes found less susceptible reaction to internode borer as well as top shoot borer, whereas highly susceptible reaction to mealy bug. Among 8 genotypes tested, the 7 and 1 test genotypes showed less susceptible reaction to early shoot borer and scale insect, respectively. The Co 85004 observed least infestation of early shoot borer (11.73%) and internode borer (no incidence), whereas highest incidence of mealy bug (cent per cent) and scale insect (53.33 %). The Co 94008 recorded highest incidence of early shoot borer (15.12%) whereas least incidence of mealy bug (63.33) among all tested genotypes. The CoC 671 recorded highest incidence of internode borer (20%), whereas no incidence for scale insect. The cumulative infestation of early shoot borer ranged from 11.73 (Co 85004) to 15.12 (Co 94008) per cent. The incidence of internode borer ranged from 0 (Co 06002 and Co 85004) to 20 (CoC 671) per cent. Regarding mealy bug, the per cent incidence ranged from 63.33 (Co 94008) to cent per cent (CoM 06082 and Co 85004). The incidence of scale insect ranged from 0 (CoC 671) to 53.33 (PI 06132 and Co 85004) per cent.
- In **IVT (Midlate)** trial, all test genotypes showed no incidence regarding top shoot borer, whereas highly susceptible reaction to mealy bug. Among 20 tested genotypes, the 2, 17 and 19 test genotypes showed less susceptible reaction to early shoot borer, internode borer and scale insect, respectively. The entry CoN 08072 recorded least incidence of mealy bug (56.67 %), whereas highest incidence of scale insect (23.33%). The cumulative infestation of early shoot borer ranged from 10.42 (CoVC 08063) to 43.17 (Co 08020) per cent. In case of internode borer, the incidence ranged from 3.33 (Co 08016) to 33.33 (CoR 08141) per cent. Regarding top shoot borer, all test genotypes recorded no incidence and hence ultimately showed less susceptible reaction. Regarding mealy bug, the incidence ranged from 56.67 (CoN 08072) to 96.67 (Co 08018 and CoVSI 08123) per cent. The incidence of scale insect ranged from 0 to 23.33 (CoN 08072) per cent.

- In **AVT (Midlate I Plant)** trial, among all test genotypes, no incidence for top shoot borer, whereas they were highly susceptible reaction to mealy bug. All test genotypes showed less susceptible reaction to internode borer as well as scale insect except Co 07010, which showed moderately susceptible reaction. The Co07010 recorded least incidence of early shoot borer (10.27%) as well as internode borer (6.67%), whereas highest incidence of mealy bug (96.67%). The cumulative infestation of early shoot borer ranged from 10.27 (Co 07007) to 22.35 (Co 86032) per cent. The incidence of internode borer ranged from 6.67 (Co 07007) to 23.33 (Co 07010) per cent. All test genotypes noticed no incidence, and ultimately showed less susceptible reaction for top shoot borer. In case of mealy bug, the incidence ranged from 60 (CoSnk 07103) to 96.67 (Co 07007) per cent. The incidence of scale insect ranged from 0 to 23.33 (Co 07010) per cent.

- In **AVT (Midlate II Plant)** trial, test genotypes recorded no incidence for top shoot borer, whereas highly susceptible reaction to mealy bug. Among 13 tested genotypes, the 7, 9 and 11 test genotypes showed less susceptible reaction to early shoot borer, internode borer and scale insect, respectively. The entry, Co 06013 recorded highest incidence of early shoot borer (29.70%) as well as scale insect (16.67%), whereas lowest incidence of mealy bug (60%) among all tested genotype. The cumulative infestation of early shoot borer ranged from 8.44 (Co 06015) to 29.70 (Co 06013) per cent. The incidence of internode borer ranged from 10 (Co 06007 and Co 06010) to 33.33 (Co 06014) per cent. Regarding top shoot borer, all test genotypes noticed no incidence, and ultimately showed less susceptible reaction. The incidence of mealy bug ranged from 60 (Co 06013) to cent per cent (CoM 06084). Regarding scale insect, The incidence ranged from 0 to 16.67 (Co 06013) per cent.

- In **AVT (Midlate Ratoon)** trial, all test genotypes recorded no incidence for top shoot borer, whereas recorded highly susceptible

reaction to mealy bug. Among 13 tested genotypes, the 10, 12 and 4 test genotypes showed less susceptible to early shoot borer, internode borer and scale insect, respectively. The Co 06007 recorded least incidence to early shoot borer (8.86%) as well as mealy bug (83.33%). The Co 06013 observed least incidence to internode borer (10%) as well as scale insect (no incidence). The CoM 06082 recorded highest incidence of internode borer (30%) as well as mealy bug (cent per cent). The CoSnk 03632 recorded highest incidence to scale insect (66.67%) as well as mealy bug (cent per cent). The cumulative infestation of early shoot borer ranged from 8.86 (Co 06007) to 16.08 (Co 06020) per cent. The incidence of internode borer ranged from 10 (Co 06013, Co 06027 and Co 06015) to 30 (CoM 06082) per cent. All test genotypes noticed no incidence, and ultimately showed less susceptible reaction to top shoot borer. The incidence of mealy bug ranged from 83.33 (Co 06007 and Co 99004) to cent per cent (CoSnk 03632, Co 06014 and CoM 06082). Regarding scale insect, the incidence ranged from 0 (Co 06013) to 66.67 (CoSnk 03632) per cent.

- In case of “**Mass multiplication of potential bio-agents of sugarcane insect pests,**” the activity of *Micromus igorotus* was highest in 37 MW (i.e. 2nd week of September) up to 8-10 numbers/leaf. It was continued up to 43 MW (0-1 per leaf). The activity of *Dipha aphidivora* recorded since 38 MW (i.e. 3rd week of September) to 44 MW (i.e. last week of October, 2011) and it was up to 1-4 numbers/leaf. The activity of syrphid was less and upto 2 numbers/leaf since 39 to 42 MW. The parasite, *Encarsia flavoscutellum* observed up to maximum 11 numbers per leaf. Also, the activity of *Encarsia flavoscutellum* observed on woolly aphid in shade net during August-September, 2011 (upto 11 per leaf).

The bio-agents, particularly *Micromus igorotus* and *Encarsia flavoscutellum* played a pivotal role in suppressing the woolly aphid population in shade net. However, heavy rainfall occurred in 35 MW (1st week of September) (30.8 mm) ; in 35 MW (1st week of September) to 37 MW (3rd week of September) (total 126.1mm) and in 41 and 42 MW (total 49.9 mm) at Central Sugarcane Research Station, Padegaon.

- In case of “**Survey and surveillance of sugarcane insect pests,**” early shoot borer is key pest of this area and percent insect infestation

was highest in *suru* planting than *adsali* and *preseasonal*. The incidence of internode borer was also observed up to 50.00 per cent. During this year (2011-12), the incidence of mealy bug was recorded up to 70.00 %. However, the intensity of mealy bug ranged between 4.74 to 11.76 per cent.

The incidence of top shoot borer, sugarcane woolly aphid, white fly, pyrilla were in traces to low and most fields observed less susceptible reaction to these pests. However, the new scale, *Aclerda* sp. nr. *takahashii* belongs to family Aclerdidae recorded on ratoon crop of sugarcane at Central Sugarcane Research Station, Padegaon.

- In the experiment, “**Monitoring of insect pests and bio-agents in Sugarcane agro-ecosystem**”, The effect of meteorological parameters was studied against early shoot borer and sugarcane woolly aphid. Maximum incidence of early shoot borer was recorded in 18th MW (1st week of March) (25.11%), when the maximum and minimum temperature was 38.1⁰ C and 22.8⁰ C, respectively. In case of sugarcane woolly aphid, the maximum incidence (24.39 woolly aphid/2.5 m²/3leaf) was recorded in 36th MW of 2011, when the maximum and minimum temperatures were 27.7 and 22.0⁰C, respectively. The maximum temperature showed significant negative correlation to woolly aphid (-0.55), while rainfall showed significant positive correlation(0.55). Regarding early shoot borer, the minimum temperature showed significant positive correlation (0.50).
- In the experiment, “**Management of whitefly (*Aleurolobus barodensis*) in sugarcane agro-ecosystem**”, due to negligible incidence of whitefly at Central Sugarcane Research Station, Padegaon the trial is vitiated.
- The studies on, “**Population dynamics of sugarcane borers (early shoot borer, top borer, internode borer and stalk borer) through pheromone trap,**” regarding early shoot borer, the highest number of moth catches were trapped in 25 MW (5 numbers/ trap), when the maximum and minimum temperature was 30.8 and 24.7⁰ C, respectively. Also the maximum average number pheromone traps catches for internode borer (3.5 numbers per trap) were recorded in 22 MW, when the maximum and minimum temperature was 36.1 and 23.6⁰ C, respectively. In case of top shoot borer, the highest number of moth catches were observed in 25 MW (6 number per trap) when the

maximum and minimum temperature was 30.8 and 24.7⁰ C, respectively. The minimum temperature showed positive correlation to early shoot borer (0.42). Regarding top shoot borer, the maximum temperature showed significant negative correlation (-0.54), where as minimum temperature showed significant positive correlation (0.51).

AICRP - ON GOING EXPERIMENTS

Project No. E.4.1 (1)

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 : 09/02/2011

02 Varieties : 05+3=08

03 Fertilizers : 250:115:115 NPK (Kg ha⁻¹)

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 : 31/03/2012

Methods of recording observations :

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 30, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out.

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. 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 statically significant. Regarding top shoot borer all entries observed no incidence.

Early shoot borer (ESB):

The cumulative infestation of early shoot borer ranged from 24.02 (Co 85004) to 53.40 (Co 94008) per cent. Among all test genotypes, not a single entry showed less susceptible reaction to early shoot borer. Among 8 genotypes tested, the 4 test genotypes each showed moderately susceptible as well as highly susceptible reaction to early shoot borer.

Internode borer (IB):

Regarding internode borer, the incidence ranged from 3.33 (Co 85004) to 36.67 (Co 08001) per cent. Among 8 tested genotypes, the 6 and 2 test genotypes showed less susceptible and moderately susceptible reaction to internode borer respectively. The least infestation index of internode borer recorded in Co 85004 (0.01%) followed by CoN 08071 (0.05 %).

Top shoot borer (TSB):

All test genotypes noticed no incidence, and ultimately showed less susceptible reaction for top shoot borer.

Mealy bug (MB):

The incidence of mealy bug ranged from 63.33 (CoN 08071) to cent per cent (Co 08006, PI 08131 and Co 85004). All test genotypes showed highly susceptible reaction to mealy bug. The least intensity index of mealy bug observed in CoN 08071 (4.91%) followed by Co 94008 (7.87 %).

Scale insect (SI):

All test genotypes recorded no incidence except VSI 08121 (13.33%) and Co 94008 (20%), which showed moderately susceptible reaction to scale insect.

Table-1. Reaction of sugarcane genotypes / varieties to major insect pests [IVT- Early].

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
01	Co 08001	39.15 (37.90)	HS	36.67 (36.93)	2.94	1.08	MS	00.00 (00.00)	0.00	LS	83.33 (66.64)	9.17	HS	00.00 (00.00)	0.00	LS
02	Co 08006	35.78 (36.55)	HS	13.33 (21.15)	0.84	0.11	LS	00.00 (00.00)	0.00	LS	100.00 (90.00)	14.89	HS	00.00 (00.00)	0.00	LS
03	CoN 08071	29.29 (32.75)	MS	10.00 (15.00)	0.54	0.05	LS	00.00 (00.00)	0.00	LS	63.33 (53.85)	4.91	HS	00.00 (00.00)	0.00	LS
04	PI 08131	39.33 (38.82)	HS	13.33 (23.85)	0.69	0.09	LS	00.00 (00.00)	0.00	LS	100.00 (90.00)	16.34	HS	00.00 (00.00)	0.00	LS
05	VSI 08121	24.79 (29.75)	MS	13.33 (23.85)	0.70	0.09	LS	00.00 (00.00)	0.00	LS	93.33 (77.71)	12.32	HS	13.33 (17.71)	0.93	MS
06	Co 85004	24.02 (29.16)	MS	03.33 (06.15)	0.32	0.01	LS	00.00 (00.00)	0.00	LS	100.00 (90.00)	19.30	HS	00.00 (00.00)	0.00	LS
07	Co 94008	53.40 (46.97)	HS	13.33 (23.85)	1.02	0.13	LS	00.00 (00.00)	0.00	LS	66.67 (55.08)	7.87	HS	20.00 (16.92)	3.95	MS
08	CoC 671	26.08 (30.69)	MS	33.33 (34.14)	2.92	0.97	MS	00.00 (00.00)	0.00	LS	80.00 (67.86)	8.02	HS	00.00 (00.00)	0.00	LS
S. E. ±		3.72		5.71				--			6.31			6.55		
C.D. at 5 %		11.25		17.30				--			19.11			19.84		
Less Susceptible (LS)		0 – 15		0 – 20				0 – 10			0 – 5			0 – 10		
Moderate Susceptible (MS)		15.1 – 30		20.1 – 40				10.1 – 20			5.1 – 30			10.1 – 35		
High Susceptible (HS)		Above 30		Above 40				Above 20			Above 30			Above 35		

Conclusion :

Among all test genotypes, not a single entry recorded less susceptible reaction to early shoot borer as well as mealy bug. However, all test genotypes showed less susceptible reaction to top shoot borer. Six test genotypes each showed less susceptible reaction to internode borer as well as scale insect. All test genotypes showed highly susceptible reaction to mealy bug. The cumulative infestation of early shoot borer ranged from 24.02 (Co 85004) to 53.40 (Co 94008) per cent. The incidence of internode borer ranged from 3.33 (Co 85004) to 36.67 (Co 08001) per cent. The incidence of mealy bug ranged from 63.33 (CoN 08071) to cent per cent (Co 08006, PI 08131 and Co 85004). All test genotypes recorded no incidence except VSI 08121 (13.33%) and Co 94008 (20%), which showed moderately susceptible reaction to scale insect.

Project No. E.4.1 (2)

Title : **Evaluation of genotypes for their reaction against major insect pests [AVT Early I Plant].**

Objective : To grade the entries in the trial 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 : 04/02/2011

02 Varieties : 04+03=07

03 Fertilizers : 250:115:115 NPK (Kg ha⁻¹)

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 : 31/03/2012

Methods of recording observations :

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 30, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out.

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 2. From the table, it could be 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 statically significant. All entries observed no incidence of top shoot borer.

Early shoot borer (ESB):

The cumulative infestation of early shoot borer ranged from 15.90 (Co 07015) to 29.01 (PI 07131) per cent. Among all test genotypes, not a single entry recorded less susceptible early shoot borer. The all test genotypes showed moderately susceptible to reaction early shoot borer. The least infestation index observed in Co 07015 (15.90%) followed by CoN 07071(16.82 %).

Internode borer (IB):

The incidence of internode borer ranged from 3.33 (CoN 07071) to 43.33 (PI 07131) per cent. Among 7 tested genotypes, the 4, 2 and 1 test genotypes showed less susceptible, moderately susceptible and highly susceptible reaction to internode borer, respectively. The least infestation index recorded in CoN 07071 (0.01 %) followed by Co 85004 (0.09%).

Top shoot borer (TSB):

All test genotypes noticed no incidence, and ultimately showed less susceptible reaction for top shoot borer.

Table-2. Reaction of sugarcane genotypes / varieties to major insect pests [AVT Early- I Plant].

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
01	Co 07012	21.11 (27.28)	MS	23.33 (28.08)	1.09	0.25	MS	00.00 (00.00)	0.00	LS	83.33 (66.15)	10.23	HS	00.00 (00.00)	0.00	LS
02	Co 07015	15.90 (23.35)	MS	20.00 (26.56)	1.15	0.23	LS	00.00 (00.00)	0.00	LS	86.67 (76.92)	14.29	HS	00.00 (00.00)	0.00	LS
03	CoN 07071	16.82 (23.94)	MS	03.33 (6.15)	0.16	0.01	LS	00.00 (00.00)	0.00	LS	90.00 (75.00)	18.21	HS	03.33 (06.15)	0.29	LS
04	PI 07131	29.01 (34.16)	MS	43.33 (40.86)	3.11	1.35	HS	00.00 (00.00)	0.00	LS	76.67 (61.22)	12.26	HS	00.00 (00.00)	0.00	LS
05	Co 85004	22.07 (27.91)	MS	13.33 (17.71)	0.75	0.09	LS	00.00 (00.00)	0.00	LS	93.33 (81.15)	19.26	HS	00.00 (00.00)	0.00	LS
06	Co 94008	21.34 (27.23)	MS	30.00 (33.00)	1.52	0.45	MS	00.00 (00.00)	0.00	LS	46.67 (43.08)	05.18	HS	13.33 (17.22)	0.92	MS
07	CoC 671	27.44 (31.58)	MS	16.67 (23.36)	0.76	0.13	LS	00.00 (00.00)	0.00	LS	76.67 (61.92)	08.93	HS	00.00 (00.00)	0.00	LS
S. E. ±		2.44		6.58				--			7.00			4.59		
C.D. at 5 %		7.50		20.26				--			21.55			14.13		
Less Susceptible (LS)		0 – 15		0 – 20				0 – 10			0 – 5			0 – 10		
Moderate Susceptible (MS)		15.1 – 30		20.1 – 40				10.1 – 20			5.1 – 30			10.1 – 35		
High Susceptible (HS)		Above 30		Above 40				Above 20			Above 30			Above 35		

Mealy bug (MB):

The incidence of mealy bug ranged from 46.67 (Co 94008) to 93.33 (Co 85004) per cent. All test genotypes recorded highly susceptible reaction to mealy bug. However, the least intensity of mealy bug observed in Co 94008 (5.18 %) followed by CoC 671 (8.93%) per cent.

Scale insect (SI):

All test genotype showed less susceptible to scale insect except Co 94008, which showed moderately susceptible reaction to scale insect. The infestation of scale insect ranged from 0 to 13.33 (Co 94008) per cent.

Conclusion:

Among all test genotypes, not a single entry observed less susceptible reaction to early shoot borer as well mealy bug. All test genotypes showed less susceptible reaction to top shoot borer, moderately susceptible reaction to early shoot borer and highly susceptible reaction to mealy bug. Among all tested genotypes, the 4 and 6 test genotypes showed less susceptible reaction to internode borer and scale insect, respectively. The cumulative infestation of early shoot borer ranged from 15.90 (Co 07015) to 29.01 (PI 07131) per cent. The incidence of internode borer ranged from 3.33 (CoN 07071) to 43.33 (PI 07131) per cent. Regarding top shoot borer, all test genotypes noticed no incidence, and ultimately showed less susceptible reaction. Regarding mealy bug, the incidence ranged from 46.67 (Co 94008) to 93.33 (Co 85004) per cent. The infestation of scale insect ranged from 0 to 13.33 (Co 94008) per cent.

Project No. E.4.1 (3)

Title : **Evaluation of genotypes for their reaction against major insect pests [AVT Early (II 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** : 04/02/2011
- 02 Varieties** : 05+03=08
- 03 Fertilizers** : 250:115:115 NPK (Kg ha⁻¹)
- 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 2m
- 08 Design** : RBD
- 09 Replications** : Three
- 10 Harvesting date** : 31/03/2012

Methods of recording observations :

01 Early shoot borer :

The observations on the total number of shoots and number of dead hearts due to the early shoot borer recorded at 30, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out.

02 Internode borer, scale insect and mealy bugs :

The observations 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 3. From the table, it could be 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 statically significant. Regarding top shoot borer all entries observed no incidence.

Early shoot borer (ESB):

The cumulative infestation of early shoot borer ranged from 19.28 (Co 06022) to 39.18 (Co 94008) per cent. Among all test genotypes, not a single entry showed less susceptible reaction to early shoot borer. Among 8 tested genotypes, the 5 and 3 test genotypes showed moderately susceptible and highly susceptible reaction to early shoot borer, respectively.

Table-3. Reaction of sugarcane genotypes / varieties to major insect pests [AVT Early- II Plant].

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
01	Co 06001	20.20 (26.60)	MS	20.00 (21.93)	1.40	0.28	LS	03.33 (06.15)	0.17	LS	76.67 (62.71)	08.68	HS	00.00 (00.00)	0.00	LS
02	Co 06002	23.54 (29.02)	MS	20.00 (25.37)	0.98	0.19	LS	03.33 (06.15)	0.16	LS	40.00 (38.85)	04.85	HS	06.67 (08.85)	0.47	LS
03	Co 06022	19.28 (25.48)	MS	13.33 (21.15)	0.77	0.10	LS	00.00 (00.00)	0.00	LS	73.33 (59.01)	09.10	HS	03.33 (06.15)	0.31	LS
04	CoM 06082	26.68 (31.01)	MS	36.67 (37.22)	2.31	0.85	MS	00.00 (00.00)	0.00	LS	80.00 (63.44)	11.97	HS	00.00 (00.00)	0.00	LS
05	PI 06132	19.73 (26.36)	MS	23.33 (28.29)	1.19	0.28	MS	00.00 (00.00)	0.00	LS	80.00 (68.07)	12.87	HS	00.00 (00.00)	0.00	LS
06	Co 85004	34.31 (35.73)	HS	06.67 (12.29)	0.31	0.02	LS	00.00 (00.00)	0.00	LS	93.33 (97.71)	18.42	HS	00.00 (00.00)	0.00	LS
07	Co 94008	39.18 (38.65)	HS	23.33 (28.78)	1.05	0.24	MS	03.33 (06.15)	0.15	LS	50.00 (45.00)	03.14	HS	00.00 (00.00)	0.00	LS
08	CoC 671	31.95 (34.37)	HS	33.33 (34.92)	2.57	0.86	MS	00.00 (00.00)	0.00	LS	63.33 (52.78)	05.35	HS	13.33 (17.22)	2.09	MS
S. E. ±		2.35		6.12				3.76			6.38			5.14		
C.D. at 5 %		7.11		18.55				11.40			19.35			15.56		
Less Susceptible (LS)		0 – 15		0 – 20				0 – 10			0 – 5			0 – 10		
Moderate Susceptible (MS)		15.1 – 30		20.1 – 40				10.1 – 20			5.1 – 30			10.1 – 35		
High Susceptible (HS)		Above 30		Above 40				Above 20			Above 30			Above 35		

Internode borer (IB):

The incidence of internode borer ranged from 6.67 (Co 85004) to 36.67 (CoM 06082) per cent. Among 8 genotypes tested, the 4 test genotypes each showed less susceptible and moderately susceptible reaction to internode borer. The least infestation index of internode borer recorded in Co 85004 (0.02 %) followed by Co 06022 (0.10%) per cent.

Top shoot borer (TSB):

The incidence of top shoot borer ranged from 0 to 3.33 (Co 94008, Co 06002 and Co 06001). However, all test genotypes showed less susceptible to top shoot borer.

Mealy Bug (MB):

The incidence of mealy bug ranged from 40 (Co 06002) to 93.33 (Co 85004) per cent. However, all test genotypes recorded highly susceptible reaction to mealy bug. The least intensity of mealy bug observed in Co 94008 (3.14 %) followed by Co 06002 (4.85%) per cent.

Scale insect (SI):

The incidence of scale insect ranged from 0 to 13.33 (CoC 671). All test genotype showed less susceptible reaction to scale insect except CoC 671, which showed moderately susceptible reaction.

Conclusion:

Among all test genotypes, not a single entry observed less susceptible reaction to early shoot borer as well mealy bug. Among 8 tested genotypes, the 4 and 7 test genotypes showed less susceptible reaction to internode borer and scale insect, respectively. In case of top shoot borer all test genotypes observed less susceptible reaction. The cumulative infestation of early shoot borer ranged from 19.28 (Co 06022) to 39.18 (Co 94008) per cent. The incidence of internode borer ranged from 6.67 (Co 85004) to 36.67 (CoM 06082) per cent. The incidence of top shoot borer ranged from 0 to 3.33 (Co 94008, Co 06002 and Co 06001). The incidence of mealy bug ranged from 40 (Co 06002) to 93.33 (Co 85004) per cent. The incidence of scale insect ranged from 0 to 13.33 (CoC 671).

Project No. E.4.1 (4)

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 Planting** : 01/04/ 2011
- 02 Varieties** : 05+03=08
- 03 Fertilizers** : 250:115:115 NPK (Kg ha⁻¹)
- 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** : 31/03/2012

Methods of recording observations :

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 30, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out.

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-4. Reaction of sugarcane genotypes / varieties to major insect pests [AVT Early Ratoon].

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
01	Co 06001	12.98 (21.05)	LS	10.00 (15.00)	0.58	0.05	LS	00.00 (00.00)	0.00	LS	93.33 (77.71)	16.10	HS	33.33 (34.22)	3.75	MS
02	Co 06002	12.52 (20.69)	LS	00.00 (00.00)	0.00	0.00	LS	00.00 (00.00)	0.00	LS	80.00 (67.86)	11.82	HS	50.00 (45.00)	5.06	HS
03	Co 06022	14.26 (22.11)	LS	03.33 (06.15)	0.18	0.01	LS	00.00 (00.00)	0.00	LS	90.00 (75.00)	16.28	HS	43.33 (41.07)	5.23	HS
04	CoM 06082	14.56 (22.39)	LS	16.67 (19.92)	1.23	0.20	LS	00.00 (00.00)	0.00	LS	100.00 (90.00)	24.21	HS	36.67 (36.93)	5.40	HS
05	PI 06132	12.16 (20.35)	LS	06.67 (08.85)	0.69	0.04	LS	00.00 (00.00)	0.00	LS	90.00 (75.00)	16.37	HS	53.33 (47.71)	10.32	HS
06	Co 85004	11.73 (20.02)	LS	00.00 (00.00)	0.00	0.00	LS	00.00 (00.00)	0.00	LS	100.00 (90.00)	26.03	HS	53.33 (46.92)	8.75	HS
07	Co 94008	15.12 (22.78)	MS	16.67 (19.92)	1.09	0.18	LS	00.00 (00.00)	0.00	LS	63.33 (53.07)	05.93	HS	16.67 (15.00)	2.79	MS
08	CoC 671	11.91 (20.14)	LS	20.00 (22.14)	1.16	0.23	LS	00.00 (00.00)	0.00	LS	86.67 (76.92)	15.24	HS	00.00 (00.00)	0.00	LS
S. E. ±		1.06		6.62				--			8.06			8.45		
C.D. at 5 %		3.22		20.04				--			24.41			25.61		
Less Susceptible (LS)		0 – 15		0 – 20				0 – 10			0 – 5			0 – 10		
Moderate Susceptible (MS)		15.1 – 30		20.1 – 40				10.1 – 20			5.1 – 30			10.1 – 35		
High Susceptible (HS)		Above 30		Above 40				Above 20			Above 30			Above 35		

Results:

The data is presented in table 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 statically significant. Regarding top shoot borer all entries observed no incidence.

Early shoot borer (ESB):

The cumulative infestation of early shoot borer ranged from 11.73 (Co 85004) to 15.12 (Co 94008) per cent. All entries recorded less susceptible reaction to early shoot borer except Co 94008, which showed moderately susceptible reaction.

Internode borer (IB):

The incidence of internode borer ranged from 0 (Co 06002 and Co 85004) to 20 (CoC 671) per cent. All test genotypes showed less susceptible reaction to internode borer. The least per cent infestation index recorded in Co 06002 and Co 85004.

Top shoot borer (TSB):

Regarding top shoot borer, all test genotypes noticed no incidence, and ultimately showed less susceptible reaction.

Mealy bug (MB):

The per cent incidence of mealy bug ranged from 63.33 (Co 94008) to cent per cent (CoM 06082 and Co 85004). However, all test genotypes recorded highly susceptible reaction to mealy bug. The least intensity of mealy bug observed in Co 94008 (5.93 %) followed by Co 06002 (11.82%) per cent.

Scale insect (SI):

The incidence of scale insect ranged from 0 (CoC 671) to 53.33 (PI 06132 and Co 85004) per cent. Among 8 tested genotypes, the 1, 2 and 5 test genotypes showed less susceptible, moderately susceptible and highly susceptible reaction to scale insect, respectively. The least intensity of scale insect observed in CoC 671 followed by Co 94008 (2.79) and Co 06001 (3.75) per cent.

Conclusion:

All test genotypes less susceptible reaction to internode borer as well as top shoot borer, whereas highly susceptible reaction to mealy bug. Among 8 genotypes tested, the 7 and 1 test genotypes showed less susceptible reaction to early shoot borer and scale insect, respectively. The Co 85004 observed least infestation of early shoot borer (11.73%) and internode borer (no incidence), whereas highest incidence of mealy bug (cent per cent) and scale insect (53.33 %). The Co 94008 recorded highest incidence of early shoot borer (15.12%) whereas least incidence of mealy bug (63.33) among all tested genotypes. The CoC 671 recorded highest incidence of internode borer (20%), whereas no incidence for scale insect. The cumulative infestation of early shoot borer ranged from 11.73 (Co 85004) to 15.12 (Co 94008) per cent. The incidence of internode borer ranged from 0 (Co 06002 and Co 85004) to 20 (CoC 671) per cent. Regarding mealy bug, the per cent incidence ranged from 63.33 (Co 94008) to cent per cent (CoM 06082 and Co 85004). The incidence of scale insect ranged from 0 (CoC 671) to 53.33(PI 06132 and Co 85004) 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** : 09/02/2011
- 02 Varieties** : 18+02=20
- 03 Fertilizers** : 250:115:115 NPK (Kg ha⁻¹)
- 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** : 31/03/2012.

Methods of recording observations :

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 30, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out.

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 5. From the table, it could be 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 statically significant. Regarding top shoot borer all entries observed no incidence.

Early shoot borer (ESB):

The cumulative infestation of early shoot borer ranged from 10.42 (CoVC 08063) to 43.17 (Co 08020) per cent. Only two genotypes viz; CoVC 08063 (10.42 %) and CoVC 08064 (14.46) recorded less susceptible reaction to early shoot borer. The 9 (nine) entries each recorded moderately susceptible and highly susceptible reaction to early shoot borer.

Table-5. Reaction of sugarcane genotypes / varieties to major insect pests [IVT Midlate].

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
01	Co 08007	30.66 (32.68)	HS	16.67 (19.92)	1.12	0.19	LS	00.00 (00.00)	0.00	LS	76.67 (61.22)	6.45	HS	06.67 (08.85)	0.62	LS
02	Co 08008	28.89 (32.09)	MS	10.00 (15.00)	0.45	0.04	LS	00.00 (00.00)	0.00	LS	66.67 (55.08)	6.48	HS	00.00 (00.00)	0.00	LS
03	Co 08009	24.33 (29.36)	MS	06.67 (12.29)	0.31	0.02	LS	00.00 (00.00)	0.00	LS	66.67 (60.00)	5.34	HS	00.00 (00.00)	0.00	LS
04	Co 08016	37.44 (37.34)	HS	03.33 (06.15)	0.16	0.01	LS	00.00 (00.00)	0.00	LS	90.00 (75.00)	13.46	HS	00.00 (00.00)	0.00	LS
05	Co 08018	32.95 (34.69)	HS	13.33 (21.15)	0.77	0.10	LS	00.00 (00.00)	0.00	LS	96.67 (83.55)	15.28	HS	00.00 (00.00)	0.00	LS
06	Co 08019	22.47 (28.12)	MS	16.67 (19.22)	1.30	0.22	LS	00.00 (00.00)	0.00	LS	80.00 (64.63)	6.47	HS	06.67 (08.85)	0.59	LS
07	Co 08020	43.17 (40.96)	HS	13.33 (21.15)	0.64	0.08	LS	00.00 (00.00)	0.00	LS	80.00 (63.93)	6.22	HS	10.00 (11.07)	1.01	LS
08	CoJN 08091	42.17 (40.66)	HS	16.67 (19.22)	0.96	0.16	LS	00.00 (00.00)	0.00	LS	66.67 (60.00)	12.96	HS	00.00 (00.00)	0.00	LS
09	CoM 08081	29.21 (30.79)	MS	26.67 (30.29)	2.49	0.66	MS	00.00 (00.00)	0.00	LS	93.33 (81.15)	10.67	HS	00.00 (00.00)	0.00	LS
10	CoN 08072	31.35 (33.12)	HS	13.33 (21.15)	0.69	0.09	LS	00.00 (00.00)	0.00	LS	56.67 (48.93)	5.49	HS	23.33 (24.15)	1.96	MS
11	CoR 08141	34.22 (35.06)	HS	33.33 (33.93)	3.07	1.02	MS	00.00 (00.00)	0.00	LS	73.33 (60.00)	9.06	HS	00.00 (00.00)	0.00	LS

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
12	CoSnk 08101	21.54 (27.57)	MS	10.00 (18.44)	0.96	0.09	LS	00.00 (00.00)	0.00	LS	80.00 (68.07)	8.45	HS	00.00 (00.00)	0.00	LS
13	CoVC 08061	17.78 (24.83)	MS	16.67 (19.22)	0.75	0.12	LS	00.00 (00.00)	0.00	LS	86.67 (72.78)	13.40	HS	00.00 (00.00)	0.00	LS
14	CoVC 08062	20.18 (26.67)	MS	06.67 (08.85)	0.36	0.02	LS	00.00 (00.00)	0.00	LS	93.33 (81.15)	14.43	HS	00.00 (00.00)	0.00	LS
15	CoVC 08063	10.42 (18.71)	LS	16.67 (19.92)	1.35	0.22	LS	00.00 (00.00)	0.00	LS	70.00 (63.33)	8.91	HS	00.00 (00.00)	0.00	LS
16	CoVC 08064	14.46 (22.32)	LS	13.33 (17.71)	0.68	0.09	LS	00.00 (00.00)	0.00	LS	90.00 (75.00)	9.79	HS	00.00 (00.00)	0.00	LS
17	CoVSI 08122	15.61 (23.22)	MS	10.00 (15.00)	0.52	0.05	LS	00.00 (00.00)	0.00	LS	93.33 (81.15)	13.83	HS	00.00 (00.00)	0.00	LS
18	CoVSI 08123	36.09 (36.84)	HS	06.67 (12.29)	0.49	0.03	LS	00.00 (00.00)	0.00	LS	96.67 (83.85)	23.59	HS	00.00 (00.00)	0.00	LS
19	Co 86032	31.36 (33.62)	HS	26.67 (30.99)	1.51	0.40	MS	00.00 (00.00)	0.00	LS	93.33 (81.15)	12.72	HS	00.00 (00.00)	0.00	LS
20	Co 99004	18.67 (24.50)	MS	20.00 (21.93)	1.21	0.24	LS	00.00 (00.00)	0.00	LS	73.33 (60.00)	7.01	HS	03.33 (06.15)	0.36	LS
S. E. ±		6.49		8.29				--			9.01			4.67		
C.D. at 5 %		17.97		22.94				--			24.93			12.91		
Less Susceptible (LS)		0 – 15		0 – 20				0 – 10			0 – 5			0 – 10		
Moderate Susceptible (MS)		15.1 – 30		20.1 – 40				10.1 – 20			5.1 – 30			10.1 – 35		
High Susceptible (HS)		Above 30		Above 40				Above 20			Above 30			Above 35		

Internode borer (IB):

The incidence of internode borer ranged from 3.33 (Co 08016) to 33.33 (CoR 08141) per cent. The 17 and 3 test genotypes showed less susceptible and moderately susceptible reaction to internode borer, respectively. The least infestation index observed in Co 08016 (0.01) followed by Co 08009 and CoVC 08062 (0.02% each).

Top shoot borer (TSB) :

All test genotypes recorded no incidence and hence ultimately showed less susceptible reaction to top shoot borer.

Mealy bug (MB):

The incidence of mealy bug ranged from 56.67 (CoN 08072) to 96.67 (Co 08018 and CoVSI 08123) per cent. However, all test genotypes recorded highly susceptible reaction to mealy bug. Though, the least incidence was observed in CoN 08072 (56.67 and intensity 5.49 %), the least intensity recorded in Co 08009 (5.34%).

Scale insect (SI):

The incidence of scale insect ranged from 0 to 23.33 (CoN 08072) per cent. The all test genotypes less susceptible reaction except CoN 08072, which showed moderately susceptible reaction to scale insect.

Conclusion:

All test genotypes showed no incidence regarding top shoot borer, whereas highly susceptible reaction to mealy bug. Among 20 tested genotypes, the 2, 17 and 19 test genotypes showed less susceptible reaction to early shoot borer, internode borer and scale insect, respectively. The entry CoN 08072 recorded least incidence of mealy bug (56.67 %), whereas highest incidence of scale insect (23.33%). The cumulative infestation of early shoot borer ranged from 10.42 (CoVC 08063) to 43.17 (Co 08020) per cent. In case of internode borer, the incidence ranged from 3.33 (Co 08016) to 33.33 (CoR 08141) per cent. Regarding top shoot borer, all test genotypes recorded no incidence and hence ultimately showed less susceptible reaction. Regarding mealy bug, the incidence ranged from 56.67 (CoN 08072) to 96.67 (Co 08018 and CoVSI 08123) per cent. The incidence of scale insect ranged from 0 to 23.33 (CoN 08072) per cent.

Project No. E.4.1 (6)

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** : 04/02/2011
- 02 Varieties** : 05+03=08
- 03 Fertilizers** : 250:115:115 NPK (Kg ha⁻¹)
- 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** : 31/03/2012.

Methods of recording observations :

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 30, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out.

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 6. 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 statically significant. Regarding top shoot borer all entries observed no incidence.

Early shoot borer (ESB):

The cumulative infestation of early shoot borer ranged from 10.27 (Co 07007) to 22.35 (Co 86032) per cent. Among 8 tested genotypes, the 6 and 2 test genotypes showed less susceptible and moderately susceptible reaction to early shoot borer, respectively.

Internode borer (IB):

The incidence of internode borer ranged from 6.67 (Co 07007) to 23.33 (Co 07010) per cent. All test genotypes showed less susceptible reaction to internode borer except Co 07010, which showed moderately susceptible reaction. The least infestation index recorded in Co 07007 (0.02%) followed by Co 07009 and Co 99004 (0.05 % each).

Top shoot borer (TSB):

All test genotypes noticed no incidence, and ultimately showed less susceptible reaction for top shoot borer.

Mealy bug (MB):

The incidence ranged from 60 (CoSnk 07103) to 96.67 (Co 07007) per cent for mealy bug. However, all test genotypes showed highly susceptible reaction to mealy bug. The CoSnk 07103 recorded least intensity (5.54%) of mealy bug followed by Co 99004 (6.91 %).

Scale insect (SI):

The incidence of scale insect ranged from 0 to 23.33 (Co 07010) per cent. All test genotypes recorded less susceptible reaction except Co 07010, which recorded moderately susceptible reaction to scale insect.

Conclusion:

Among, all test genotypes, no incidence for top shoot borer, whereas recorded highly susceptible reaction to mealy bug. All test genotypes showed less susceptible reaction to internode borer as well as scale insect except Co 07010, which showed moderately susceptible reaction. The Co 07010

Table 6 Reaction of sugarcane genotypes / varieties to major insect pests [AVT-Midlate I Plant].

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
01	Co 07006	13.60 (21.54)	LS	20.00 (26.07)	0.93	0.18	LS	00.00 (00.00)	0.00	LS	80.00 (68.07)	12.62	HS	00.00 (00.00)	0.00	LS
02	Co 07007	10.27 (18.57)	LS	06.67 (12.29)	0.29	0.02	LS	00.00 (00.00)	0.00	LS	96.67 (83.85)	20.68	HS	00.00 (00.00)	0.00	LS
03	Co 07008	10.99 (18.98)	LS	13.33 (17.22)	0.80	0.11	LS	00.00 (00.00)	0.00	LS	76.67 (66.93)	10.11	HS	06.67 (08.85)	0.80	LS
04	Co 07009	17.56 (24.37)	MS	10.00 (15.00)	0.52	0.05	LS	00.00 (00.00)	0.00	LS	76.67 (66.15)	10.66	HS	03.33 (06.15)	0.71	LS
05	Co 07010	13.83 (21.76)	LS	23.33 (28.78)	1.04	0.24	MS	00.00 (00.00)	0.00	LS	63.33 (52.78)	7.55	HS	23.33 (23.07)	3.38	MS
06	CoSnk 07103	11.31 (19.22)	LS	16.67 (23.85)	0.95	0.16	LS	00.00 (00.00)	0.00	LS	60.00 (51.15)	5.54	HS	00.00 (00.00)	0.00	LS
07	Co 86032	22.35 (28.14)	MS	20.00 (26.07)	1.17	0.23	LS	00.00 (00.00)	0.00	LS	93.33 (81.15)	17.62	HS	06.67 (08.85)	0.64	LS
08	Co 99004	14.90 (22.59)	LS	10.00 (11.07)	0.55	0.05	LS	00.00 (00.00)	0.00	LS	66.67 (54.78)	6.91	HS	00.00 (00.00)	0.00	LS
S. E. ±		2.38		7.13				--			8.75			5.77		
C.D. at 5 %		7.22		21.58				--			2.65			17.49		
Less Susceptible (LS)		0 – 15		0 – 20				0 – 10			0 – 5			0 – 10		
Moderate Susceptible (MS)		15.1 – 30		20.1 – 40				10.1 – 20			5.1 – 30			10.1 – 35		
High Susceptible (HS)		Above 30		Above 40				Above 20			Above 30			Above 35		

recorded least incidence of early shoot borer (10.27%) as well as internode borer (6.67%), whereas highest incidence of mealy bug (96.67%). The cumulative infestation of early shoot borer ranged from 10.27 (Co 07007) to 22.35 (Co 86032) per cent. The incidence of internode borer ranged from 6.67 (Co 07007) to 23.33 (Co 07010) per cent. All test genotypes noticed no incidence, and ultimately showed less susceptible reaction for top shoot borer. In case of mealy bug, the incidence ranged from 60 (CoSnk 07103) to 96.67 (Co 07007) per cent. The incidence of scale insect ranged from 0 to 23.33 (Co 07010) per cent.

Project No. E.4.1 (7)

- Title** : **Evaluation of genotypes for their reaction against major insect pests [AVT (Midlate) II 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 ratooning** : 04/02/2011
- 02 Varieties** : 11+02=13
- 03 Fertilizers** : 250:115:115 NPK (Kg ha⁻¹)
- 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 7 m
- 08 Design** : RBD
- 09 Replications** : Three
- 10 Harvesting date** : 31/03/2012

Methods of recording observations :

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 30, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out.

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 7. 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 statically significant. Regarding top shoot borer all entries observed no incidence.

Early shoot borer (ESB):

The cumulative infestation of early shoot borer ranged from 8.44 (Co 06015) to 29.70 (Co 06013) per cent. The 7 and 6 test genotypes showed less susceptible and moderately susceptible reaction to early shoot borer respectively.

Internode borer (IB):

The incidence of internode borer ranged from 10 (Co 06007 and Co 06010) to 33.33 (Co 06014) per cent. The 9 and 4 test genotypes observed less susceptible and moderately susceptible reaction to internode borer, respectively. Though, the least incidence of internode borer observed in Co 06007 and Co 06010, the least infestation index observed in Co 99004 (0.08 %).

Top shoot borer (TSB):

All test genotypes noticed no incidence, and ultimately showed less susceptible reaction for top shoot borer.

Table 7 Reaction of sugarcane genotypes / varieties to major insect pests [AVT Midlate II Plant].

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
01	Co 06007	22.92 (26.90)	MS	10.00 (15.00)	0.97	0.10	LS	00.00 (00.00)	0.00	LS	80.00 (64.63)	8.54	HS	00.00 (00.00)	0.00	LS
02	Co 06010	12.60 (20.61)	LS	10.00 (15.00)	0.98	0.10	LS	00.00 (00.00)	0.00	LS	86.67 (68.85)	8.91	HS	00.00 (00.00)	0.00	LS
03	Co 06012	14.20 (22.14)	LS	16.67 (23.85)	0.91	0.15	LS	00.00 (00.00)	0.00	LS	70.00 (57.00)	6.75	HS	00.00 (00.00)	0.00	LS
04	Co 06013	29.70 (31.96)	MS	30.00 (27.78)	1.55	0.46	MS	00.00 (00.00)	0.00	LS	60.00 (56.07)	6.90	HS	16.67 (19.92)	2.07	MS
05	Co 06014	17.73 (23.94)	MS	33.33 (35.22)	2.26	0.75	MS	00.00 (00.00)	0.00	LS	63.33 (53.36)	5.52	HS	00.00 (00.00)	0.00	LS
06	Co 06015	08.44 (16.85)	LS	16.67 (19.22)	0.78	0.13	LS	00.00 (00.00)	0.00	LS	93.33 (81.15)	14.07	HS	13.33 (13.08)	1.40	MS
07	Co 06020	29.43 (31.45)	MS	16.67 (23.85)	1.26	0.21	LS	00.00 (00.00)	0.00	LS	83.33 (70.08)	9.94	HS	00.00 (00.00)	0.00	LS
08	Co 06027	25.72 (29.06)	MS	13.33 (17.71)	0.72	0.10	LS	00.00 (00.00)	0.00	LS	76.67 (61.92)	8.06	HS	00.00 (00.00)	0.00	LS

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
09	CoM 06082	18.33 (25.17)	MS	26.67 (30.78)	2.09	0.56	MS	00.00 (00.00)	0.00	LS	86.67 (72.78)	17.30	HS	00.00 (00.00)	0.00	LS
10	CoM 06084	13.80 (21.36)	LS	13.33 (17.71)	0.79	0.10	LS	00.00 (00.00)	0.00	LS	100.00 (90.00)	22.62	HS	00.00 (00.00)	0.00	LS
11	CoSnk 03632	13.92 (21.73)	LS	13.33 (13.08)	1.22	0.16	LS	00.00 (00.00)	0.00	LS	90.00 (71.56)	14.39	HS	6.67 (08.85)	0.77	LS
12	Co 86032	12.22 (19.92)	LS	26.67 (25.78)	1.64	0.44	MS	00.00 (00.00)	0.00	LS	90.00 (75.00)	10.35	HS	00.00 (00.00)	0.00	LS
13	Co 99004	10.38 (18.76)	LS	13.33 (17.71)	0.63	0.08	LS	00.00 (00.00)	0.00	LS	66.67 (55.86)	6.91	HS	00.00 (00.00)	0.00	LS
S. E. ±		5.61		9.61				--			2.48			4.87		
C.D. at 5 %		16.34		28.03				--			8.52			14.20		
Less Susceptible (LS)		0 – 15		0 – 20				0 – 10			0 – 5			0 – 10		
Moderate Susceptible (MS)		15.1 – 30		20.1 – 40				10.1 – 20			5.1 – 30			10.1 – 35		
High Susceptible (HS)		Above 30		Above 40				Above 20			Above 30			Above 35		

Scale insect (SI):

Regarding scale insect, The incidence ranged from 0 to 16.67 (Co 06013) per cent. However, all the test genotypes showed less susceptible to scale insect except Co 06014 and Co 06015, which showed moderately susceptible reaction.

Conclusion:

All test genotypes recorded no incidence for top shoot borer, whereas highly susceptible reaction to mealy bug. Among 13 tested genotypes, the 7, 9 and 11 test genotypes showed less susceptible reaction to early shoot borer, internode borer and scale insect, respectively. The entry, Co 06013 recorded highest incidence of early shoot borer (29.70%) as well as scale insect (16.67%), whereas lowest incidence of mealy bug (60%) among all tested genotype. The cumulative infestation of early shoot borer ranged from 8.44 (Co 06015) to 29.70 (Co 06013) per cent. The incidence of internode borer ranged from 10 (Co 06007 and Co 06010) to 33.33 (Co 06014) per cent. Regarding top shoot borer, all test genotypes noticed no incidence, and ultimately showed less susceptible reaction. The incidence of mealy bug ranged from 60 (Co 06013) to cent per cent (CoM 06084). Regarding scale insect, The incidence ranged from 0 to 16.67 (Co 06013) per cent.

Project No. E.4.1 (8)

Title : **Evaluation of genotypes for their reaction against major insect pests [AVT – Midlate (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 : 01/04/2011

02 Varieties : 11+02=13

03 Fertilizers : 250:115:115 NPK (Kg ha⁻¹)

- 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 7 m
- 08 Design** : RBD
- 09 Replications** : Three
- 10 Harvesting date** : 31/03/2012

Methods of recording observations :

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 30, 60, 90 and 120 days after planting and cumulative per cent infestation was worked out.

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 are presented in table 8. From the table, it could be 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. Among all test genotypes, there was no incidence of top shoot borer.

Early shoot borer (ESB) :

The cumulative infestation of early shoot borer ranged from 8.86 (Co 06007) to 16.08 (Co 06020) per cent. The 10 and 3 test genotypes showed less susceptible and moderately susceptible reaction to early shoot borer respectively. The least incidence recorded in Co 06007(8.86%) followed by CoM 06082 (9.52 %), Co 99004 (9.84%) and Co 06010 (9.88%).

Internode borer (IB) :

The incidence of internode borer ranged from 10 (Co 06013, Co 06027 and Co 06015) to 30 (CoM 06082) per cent. All test genotypes showed less susceptible reaction to internode borer except CoM 06082, which recorded moderately susceptible reaction. However, the least infestation index recorded in Co 06013 and Co 06027 (0.05 % each).

Table 8 Reaction of sugarcane genotypes / varieties to major insect pests [AVT Midlate Ratoon].

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
01	Co 06007	08.86 (16.95)	LS	13.33 (17.71)	0.94	0.12	LS	00.00 (00.00)	0.00	LS	83.33 (70.08)	10.22	HS	10.00 (11.07)	1.51	LS
02	Co 06010	09.88 (18.27)	LS	13.33 (17.22)	0.91	0.12	LS	00.00 (00.00)	0.00	LS	96.67 (83.85)	16.35	HS	26.67 (26.15)	2.89	MS
03	Co 06012	12.13 (20.12)	LS	16.67 (23.85)	0.96	0.16	LS	00.00 (00.00)	0.00	LS	86.67 (72.29)	12.58	HS	43.33 (40.86)	5.96	HS
04	Co 06013	13.89 (21.81)	LS	10.00 (15.00)	0.57	0.05	LS	00.00 (00.00)	0.00	LS	93.33 (70.71)	20.13	HS	00.00 (00.00)	0.00	LS
05	Co 06014	15.04 (22.65)	MS	13.33 (21.15)	0.68	0.09	LS	00.00 (00.00)	0.00	LS	100.00 (90.00)	14.53	HS	10.00 (11.07)	1.36	LS
06	Co 06015	11.20 (19.35)	LS	10.00 (15.00)	0.71	0.07	LS	00.00 (00.00)	0.00	LS	96.67 (83.85)	24.20	HS	46.67 (45.99)	7.03	HS
07	Co 99004	09.84 (17.89)	LS	16.67 (19.92)	1.15	0.19	LS	00.00 (00.00)	0.00	LS	83.33 (70.78)	12.65	HS	10.00 (11.07)	1.61	LS
08	Co 86032	11.33 (19.05)	LS	16.67 (19.92)	0.88	0.15	LS	00.00 (00.00)	0.00	LS	96.67 (83.85)	16.26	HS	40.00 (31.92)	6.31	HS

Sr. No.	Genotypes/ Varieties	Early Shoot Borer		Internode Borer				Top Shoot Borer			Mealy Bug			Scale insect		
		% Cumulative Infestation	Reaction	% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
09	CoSnk 03632	15.07 (22.56)	MS	16.67 (19.92)	0.87	0.14	LS	00.00 (00.00)	0.00	LS	100.00 (90.00)	31.34	HS	66.67 (55.37)	11.74	HS
10	CoM 06084	12.09 (20.15)	LS	13.33 (21.15)	0.72	0.09	LS	00.00 (00.00)	0.00	LS	96.67 (83.85)	40.49	HS	36.67 (36.85)	6.56	HS
11	CoM 06082	09.52 (17.95)	LS	30.00 (33.00)	2.09	0.62	MS	00.00 (00.00)	0.00	LS	100.00 (90.00)	24.36	HS	40.00 (38.85)	4.75	HS
12	Co 06027	14.81 (22.43)	LS	10.00 (15.00)	0.50	0.05	LS	00.00 (00.00)	0.00	LS	90.00 (75.00)	13.17	HS	60.00 (50.85)	10.17	HS
13	Co 06020	16.08 (23.57)	MS	20.00 (26.11)	1.30	0.26	LS	00.00 (00.00)	0.00	LS	86.67 (72.29)	20.64	HS	13.33 (13.08)	1.30	MS
S. E. ±		2.29		6.71				--			5.74			10.31		
C.D. at 5 %		6.68		19.57				--			16.73			30.05		
Less Susceptible (LS)		0 – 15		0 – 20				0 – 10			0 – 5			0 – 10		
Moderate Susceptible (MS)		15.1 – 30		20.1 – 40				10.1 – 20			5.1 – 30			10.1 – 35		
High Susceptible (HS)		Above 30		Above 40				Above 20			Above 30			Above 35		

Top shoot borer (TSB):

All test genotypes noticed no incidence, and ultimately showed less susceptible reaction for top shoot borer.

Mealy bug (MB):

The incidence of mealy bug ranged from 83.33 (Co 06007 and Co 99004) to cent per cent (CoSnk 03632, Co 06014 and CoM 06082). However, all test genotypes recorded highly susceptible reaction to mealy bug. The least intensity observed in Co 06007 (10.22%) followed by Co 06012 (12.58%) per cent.

Scale insect (SI):

The incidence of scale insect ranged from 0 (Co 06013) to 66.67 (CoSnk 03632) per cent. The 4, 2 and 7 test genotypes showed less susceptible, moderately susceptible and highly susceptible reaction to scale insect, respectively. The least intensity recorded in Co 06013 (0%) followed by Co 06020 (1.30%).

Conclusion :

All test genotypes recorded no incidence for top shoot borer, whereas recorded highly susceptible reaction to mealy bug. Among 13 tested genotypes, the 10, 12 and 4 test genotypes showed less susceptible to early shoot borer, internode borer and scale insect, respectively. The Co 06007 recorded least incidence to early shoot borer (8.86%) as well as mealy bug (83.33%). The Co 06013 observed least incidence to internode borer (10%) as well as scale insect (no incidence). The CoM 06082 recorded highest incidence of internode borer (30%) as well as mealy bug (cent per cent). The CoSnk 03632 recorded highest incidence to scale insect (66.67%) as well as mealy bug (cent per cent). The cumulative infestation of early shoot borer ranged from 8.86 (Co 06007) to 16.08 (Co 06020) per cent. The incidence of internode borer ranged from 10 (Co 06013, Co 06027 and Co 06015) to 30 (CoM 06082) per cent. All test genotypes noticed no incidence, and ultimately showed less susceptible reaction to top shoot borer. The incidence of mealy bug ranged from 83.33 (Co 06007 and Co 99004) to cent per cent (CoSnk 03632, Co 06014 and CoM 06082). Regarding scale insect, the incidence ranged from 0 (Co 06013) to 66.67 (CoSnk 03632) per cent.

Experiment No.2 : **Project No. E.27**
Title : **Mass multiplication of potential bio-agents of sugarcane insect pests.**

Objective : To develop an economical mass multiplication technique of promising bio-agents of the area.

Year of start : 2004-05

Duration : Long term

Bio-agent to be multiplied : *Dipha (Conobathra) aphidivora*
Micromus igorotus
Chrysoperla carnea

Methodology :

For this experiment, 6x4 m² area plot of 6-7 months old sugarcane crop was selected. Three shift able iron structure of 6x4x4 m³ were fitted in nut and bolts, which were covered with 50% green shade net. To develop sufficient population of sugarcane woolly aphid tagging of 5-10 infested leaves with thread inside the shade net was done.

Results :

Sufficient urea was applied to make leaves succulent. The infestation of white woolly aphid was inoculated 06/08/2011 (32MW) from farmers field and it was developed up to 30 per cent. The predator, *Micromus igorotus* was observed since 33 MW in 0-1 numbers of infested leaves. But, the population of *Micromus igorotus* was also present in farmers field, while collecting the infested leaves. The activity of *Micromus igorotus* was highest in 37 MW (i.e. 2nd week of September) up to 8-10 numbers/leaf. It was continued up to 43 MW (0-1 per leaf). The activity of *Dipha aphidivora* recorded since 38 MW (i.e. 3rd week of September) to 44 MW (i.e. last week of October, 2011) and it was up to 1-4 numbers/leaf. The activity of syrphid was less and upto 2 numbers/leaf since 39 to 42 MW. The parasite, *Encarsia flavoscutellum* observed up to maximum 11 numbers per leaf.

Also, chrysopidae predator observed in rare during August 2011 on woolly aphid infested sugarcane. Last year, this species was sent at, "National Bureau of Agricultural Important Insects," Bangalore and it was

identified as *Ankylopteryx* sp. (Neuroptera : Chrysopidae). Also, the activity of *Encarsia flavoscutellum* observed on woolly aphid in shade net during August-September, 2011 (upto 11 per leaf).

The bio-agents, particularly *Micromus igorotus* and *Encarsia flavoscutellum* played a pivotal role in suppressing the woolly aphid population in shade net.

However, heavy rainfall occurred in 35 MW (1st week of September) (30.8 mm) ; in 35 MW (1st week of September) to 37 MW (3rd week of September) (total 126.1mm) and in 41 and 42 MW (total 49.9 mm) at Central Sugarcane Research Station, Padegaon. Also, this year the menace of monkey was increased in the experiment. Hence, the activity of woolly aphid as well as predator was in low to traces onward.

Experiment : **Project No. E.28**
No.3

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 2011-12 on farmers field in different villages viz., Padegaon Farm (Phaltan), Padegaon (Khandala), Pimpre kd.(Purandar), Balu Patalachi wadi (Khandala) and Maryaachi wadi (Khandala) etc. In most of the fields, Co 86032 and CoM 0265 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.

Results :

Early shoot borer :

The early shoot borer incidence was highest in *suru* planting which was ranged from 6.25 to 18.67 per cent. Maximum incidence was observed in late planting and in light soils.

In case of Adsali planting, the incidence of early shoot borer ranged from 01.86 to 10.26 per cent. In *preseasonal* planting, incidence of early shoot borer ranged from 2.39 to 6.09 per cent. Hence, to avoid the incidence of early shoot borer, *preseasonal/ adsali* planting of sugarcane is most suitable time.

Internode borer :

The per cent incidence of internode borer in *Adsali* planting ranged from 40.00 to 50.00 per cent, in *preseasonal* planting, it was from 10.00 to 40.00 per cent and in *suru* it was 30.00 to 50.00 per cent. Though, the incidence of internode borer appeared so highly, its intensity ranged from 2.15 to 3.27 per cent in *Adsali*, 1.68 to 3.50 per cent in pre-seasonal and 2.02 to 3.70 per cent in seasonal planting.

Other pests :

The incidence of top shoot borer ranged from low to traces. During this year, the incidence of sugarcane woolly aphid observed only on few stools on sugarcane i.e. 2-3 % in the field are highly infested with sugarcane woolly aphid. The stools, which are infected by sugarcane woolly aphid covered the leaf area up to 70-80% with sugarcane woolly aphid mostly during July to December, 2011. Near water bodies, some plots are infested upto 30 to 40 per cent.

However, very negligible incidence of sugarcane woolly aphid was observed in farmers field. The predators *viz.*, *Dipha aphidivora*, Syrphid and Lady bird beetle observed very rare on sugarcane woolly aphid colonies. However, the predators, *Micromus igorotus* as well as the parasitoid, *Encarsia flavoscutellum* more than the other predator/parasites. During, last year, the predator, *Ankylopteryx sp.* (Neuroptera : Chrysopidae) recorded @ 2-3 per stool in July-August, 2010 in the farmers field of Shri. Raghunath Dhaigude (Khandala).

The incidence of mealy bug ranged from 30 to 70.00 per cent. However, during this year the intensity of mealy bug was ranged with 4.74 to 11.76 per cent. The incidence of scale insect ranged from 0 to 20 per cent. In ratoon crop, the incidence of scale insect and mealy bug was more. However, the new scale, *Aclerda sp. nr. takahashii* belongs to family Aclerdidae recorded on ratoon crop of sugarcane at Central Sugarcane Research Station, Padegaon, which was identified from, “ National Bureau of Agricultural Important Insect, Bangalore, during last year.”

Conclusion:

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 internode borer was also observed up to 50.00 per cent. During this year (2011-12), the incidence of mealy bug was recorded up to 70.00 %. However, the intensity of mealy bug ranged between 4.74 to 11.76 per cent.

The incidence of top shoot borer, sugarcane woolly aphid, white fly, pyrilla were in traces to low and most fields observed less susceptible reaction to these pests. However, the new scale, *Aclerda* sp. nr. *takahashii* belongs to family Aclerdidae recorded on ratoon crop of sugarcane at Central Sugarcane Research Station, Padegaon.

Experiment : Project E 30

No.5

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 percent cumulative infestation and average number of woolly aphid per 2.5 cm² leaf area and meteorological data are presented in table – 10.

Early shoot borer:

The infestation of early shoot borer (0.18%) was noticed in 12 MW (i.e. 3rd week of March). The maximum incidence (25.11%) was noticed in 18 MW (i.e. 1st week of May), when the maximum and minimum temperature were 38.1 and 22.8^oC, respectively. Afterwards, it was decreased gradually upto 27 MW.

Sugarcane woolly aphid:

No incidence of woolly aphid was noticed up to 29th MW. The first incidence of woolly aphid was noticed in 30th MW (1.09 woolly aphid / 2.5 cm² / 3 leaf). The maximum average number of woolly aphid was recorded (24.39) in 36 MW of 2011. Afterwards, incidence shown declined trend due to more rainfall, highly temperature in succeeding meteorological weeks and predator/parasite activity.

During this year, the activity of predators viz., Syrphid, *Dipha aphidivora* and Lady bird beetle were in traces to low. The *Micromus igorotus* observed 9-12 per leaf in 37th MW. The parasitoid *Encarsia flavoscutellum* observed @ 5-18 per stool in August, which is comparatively low than that of November, 2011. *Encarsia flavoscutellum* recorded its peak activity in 46 MW (2nd week of November 2011) @ 10 to 31 numbers per leaf sugarcane having woolly aphid infestation. Due to heavy parasitism of *Encarsia flavoscutellum*, the woolly aphid again disappeared after 48 MW.

The parasitoid, *Encarsia flavoscutellum* played a pivotal role in suppressing the woolly aphid infestation, particularly in November-December months of 2011 at Central Sugarcane Research Station, Padegaon.

Conclusion:

The effect of meteorological parameters was studied against early shoot borer and sugarcane woolly aphid. Maximum incidence of early shoot borer was recorded in 18th MW (1st week of March) (25.11%), when the maximum and minimum temperature was 38.1⁰ C and 22.8⁰ C, respectively. In case of sugarcane woolly aphid, the maximum incidence (24.39 woolly aphid/2.5 m²/3leaf) was recorded in 36th MW of 2011, when the maximum and minimum temperatures were 27.7 and 22.0⁰C, respectively.

Table 9: Incidence of different pests and their natural enemies during 2011-12 at CSRS Padegaon.

Name of the Pest	Infestation (%)	Reaction	Natural Enemies Recorded (Per Leaf)
Early shoot borer	16-18	MS	--
Internode borer	18-20	LS	--
Top shoot borer	In traces- low	LS	--
Mealy bug	20-40	MS to HS	--
Scale insect	In traces to low	LS	
Pyrilla	In traces	LS	<i>Epiricanea melanoleuca</i>
White fly	1-2.5	LS	<i>Ablerus chionaspidis</i> , <i>Encarsia sp.</i> (both Aphelinidae) and <i>Amitus sp.</i> (Platygastridae)
Sugarcane woolly aphid	In traces to highly (on very few stools in field)	LS	<i>Micromus igorotus</i> 33 to 44 MW)(3-5 and 0-1 per leaf, resp.) peak 37 MW (9-12/leaf) ; <i>D. aphidivora</i> (1-4 per leaf in 38 to 46 MW); Syrphid (0-2 per leaf in 38-42 MW) and <i>E. flavoscutellum</i> 5-18 per stool in August, 2011 and peak activity @ 10-31 per leaf in 46 MW ; Lady bird beetle (rare); <i>Ankylopteryx sp.</i> (rare).

Data in Table – 9 indicated that the occurrence of pests *viz.*, top shoot borer, Pyrilla, White fly, Scale insect and Sugarcane woolly aphid were recorded at low levels may be due to presence of natural enemies. The internode borer, recorded less susceptible reaction (18-20%), but mealy bug highly incidence up to 40 per cent.

Table 10: Incidence of climatic factors on the incidence of early shoot borer and woolly aphid.

Meteorolo-gical Week	Temp		RH %		Rainfall (mm)	ESB % infestation	Average Woolly Aphid/ 2.5 c m ² /3 Leaf
	Max	Min	RH1	RH2			
01	25.7	13.0	97	71	000.0	-	-
02	27.8	07.8	97	55	000.0	-	-
03	30.2	09.8	97	60	000.0	-	-
04	30.0	09.9	97	63	000.0	-	-
05	31.0	12.2	98	68	000.0	-	-
06	31.1	11.3	98	72	000.0	-	-
07	30.7	12.4	98	74	000.0	-	-
08	30.4	13.6	98	77	000.0	-	-
09	32.3	16.9	98	77	000.0	-	-
10	35.2	15.4	98	65	000.0	-	-
11	34.6	13.1	98	67	000.0	-	-
12	36.2	16.4	97	58	000.0	0.18	-
13	36.2	18.7	98	59	000.0	1.52	-
14	35.7	17.3	98	58	000.0	4.41	-
15	36.7	20.3	94	43	000.0	7.21	-
16	37.5	22.6	92	50	000.0	9.10	-
17	37.5	23.8	92	55	000.0	9.78	-
18	38.1	22.8	94	57	000.0	25.11	-
19	36.8	21.4	94	62	000.0	17.95	-
20	38.2	23.9	92	54	006.8	14.13	-
21	35.9	23.3	93	66	005.9	13.98	-
22	36.1	23.6	96	65	059.4	11.54	-
23	30.1	24.4	94	89	041.0	10.29	-
24	29.4	23.7	97	86	010.9	15.08	-
25	30.8	24.7	94	86	000.9	8.25	-
26	30.1	24.4	94	87	002.2	8.02	-
Meteorolo-	Temp		RH %		Rainfall	ESB %	Average

gical Week	Max	Min	RH1	RH2	(mm)	infestati on	Woolly Aphid/ 2.5 c m² /3 Leaf
27	30.5	23.8	98	86	001.6	4.14	-
28	28.9	23.3	98	86	027.5	-	-
29	28.4	23.7	98	95	032.0	-	-
30	30.1	22.9	98	92	032.8	-	1.09
31	29.2	22.9	98	91	006.1	-	2.48
32	29.7	23.2	96	79	000.2	-	4.27
33	29.8	22.6	96	72	001.5	-	9.18
34	30.2	22.7	98	77	011.9	-	11.85
35	27.6	22.3	98	87	030.8	-	18.15
36	27.7	22.0	98	86	046.0	-	24.39
37	30.5	21.0	98	76	049.3	-	12.72
38	28.9	20.0	98	76	002.3	-	11.91
39	31.7	20.4	98	69	013.8	-	10.08
40	30.0	21.2	98	73	000.9	-	10.55
41	32.0	22.4	98	74	036.2	-	9.33
42	31.4	21.9	98	71	013.7	-	7.19
43	31.0	18.1	98	67	000.0	-	3.22
44	30.8	18.7	97	73	000.0	-	1.25
45	31.2	16.4	98	70	000.0	-	0.0
46	31.3	15.3	97	71	000.0	-	0.0
47	29.1	12.6	98	76	000.0	-	0.0
48	29.5	18.4	98	81	000.0	-	0.0
49	31.1	13.5	98	67	000.0	-	0.0
50	30.2	12.8	98	74	000.0	-	0.0
51	28.5	10.9	98	81	000.0	-	0.0
52	29.1	10.2	97	80	000.0	-	0.0
01	31.9	14.9	98	84	000.0	-	0.0
02	27.6	08.9	97	85	000.0	-	0.0
03	28.4	08.5	97	86	000.0	-	0.0
04	29.1	13.0	98	85	000.0	-	0.0
05	29.4	11.3	98	76	000.0	-	-
06	30.1	11.1	97	38	000.0	-	-
07	32.8	13.4	95	42	000.0	-	-
08	34.3	14.6	97	55	000.0	-	-
09	34.6	12.1	97	64	000.0	-	-

The correlation of weather parameters with early shoot borer and woolly aphid are presented in Table 11. The maximum temperature showed significant negative correlation to woolly aphid (-0.55), while rainfall showed significant positive correlation(0.55).

Table 11: Correlations of weather parameters with pest incidence

Pest/s	Temperature		Relative Humidity		Rainfall
	Tmax	Tmin	Morning	Evening	
SWA	-0.55*	0.17	0.27	0.12	0.55*
	(r=15 5% (t Value) = 0.51 and 1% (t Value) = 0.64				
ESB	0.19	0.50*	-0.49	-0.03	0.12
	(r=16 5% (t Value) = 0.497 and 1% (t Value) = 0.623				

Table 12: Regression equations of pests

Pest/s	Regression equation	R ²
ESB	Y= -118.69+2.09Tmax+1.47Tmin+0.05RH1+0.28 RH2-0.02RF	0.48
SWA	Y= -60.59-5.39Tmax+1.66Tmin+2.70 RH1-0.92 RH2+0.21RF	0.93

Regarding early shoot borer, the minimum temperature showed significant positive correlation (0.50). The regression equations of early shoot borer and woolly aphid are presented in Table 12.

- Experiment No.6** : **Project E. 31**
- Title** : **Management of whitefly (*Aleurolobus barodensis*) in sugarcane agro-ecosystem.**
- Objective** : To find out effective strategy for the management of sugarcane whitefly and to compare the effectiveness of individual technology evaluated for the control of whitefly.
- Experimental Details** :
- 1 Duration : Long term.

- 2 Year of start : 2006-07
- 3 Season : Suru
- 4 Design : Large plot field trial
- 5 Replications : Four random observations
- 6 Plot size : 20 m x 20m
- 7 Variety : Recommended variety of the location (Co 86032)

Treatment details :

- T₁ Destruction of puparia by removing infested leaves.
- T₂ Removal of infested leaves + Installation of cages @ 15/ha.
- T₃ Removal of infested leaves + Application of Imidacloprid 0.005% along with 2 % urea.
- T₄ Removal of infested leaves + Application of neem based pesticide (Azadirachtin 4 g a.i./ha i.e. 0.0004 %)
- T₅ Control

Methodology : Each treatment as above will be allocated to individual large plot/field. Four spots in each treatment will be randomly selected and marked. Three rows each of three-meter length will be taken per spot and the observation on incidence of whitefly (nymph and puparia) will be recorded before treatment and 7, 15, 21 and 30 days after treatments. Total number of nymphs and puparia will be recorded per 5 x 2 cm (10 sq.cm) from 20 leaves from proximal, middle and distal regions of the leaves. The average per sq. cm will be calculated and reported. The data so obtained will be analyzed using RBD. Yield (t/ha) at harvest will be recorded on whole plot basis.

Results The trial is vitiated due to negligible (rare) incidence of whitefly at Central Sugarcane Research Station, Padegaon.

Experiment No.7 : Project E 32 (New Project):

- Title** : **Population dynamics of sugarcane borers (early shoot borer, top borer, internode borer and stalk borer) through pheromone trap.**
- Objective** : To study the population dynamics of sugarcane borers (early shoot borer, top borer, internode borer and stalk borer) through pheromone trap and influence of weather parameters on moth catches.
- Experimental Details** :
- 1 Year of start : 2008-09
 - 2 Plot size : 1 acre
 - 3 Variety : Recommended variety of the location (Co 86032)
- Treatment details** : Pheromone lures of sugarcane early shoot borer, top borer and stalk borer.
- Methodology** : Three pheromone traps for each pests (early shoot borer, top borer and internode borer) were installed in the 16th MW (i.e. 3rd week of April) till harvest of crop in one acre of Sugarcane crop. The Pheromone lure were changed after 2 months. Observations on number of moths trapped were recorded at weekly interval.
- 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-13. During last year, the observations on trap catches of earlier installed traps did not show any moth catches since 1st to 13th MW. This is due to the traps were in old matured cane field. However, the new

pheromone traps were installed in new planted Sugarcane crop. In that field, the results observed that, the highest number of moth catches in case of early shoot borer were trapped in 25 MW (5 numbers/ trap), when the maximum and minimum temperature was 30.8 and 24.7⁰ C, respectively.

The moth catches decreased gradually up to 32 MW. However, again the moth catches observed in 38-39 MW. Afterwards, there was no moth catches of early shoot borer.

The maximum average pheromone trap catches of internode borer was recorded in 22 MW (3.5 number per trap), when the maximum and minimum temperature was 36.1 and 23.6⁰ C, respectively. Afterwards, the moth catches decreased up to 34th MW. There was no moth catches since 32 to 40 MW except 34 MW. In case of top shoot borer, the highest number of moth catches were observed in 25 MW (6 number per trap), when the maximum and minimum temperature was 30.8 and 24.7⁰ C, respectively. It was followed by 22, 24 and 26 MW in which the 4.5 number/trap moth catches were recorded.

Conclusion : Regarding early shoot borer, the highest number of moth catches were trapped in 25 MW (5 numbers/ trap), when the maximum and minimum temperature was 30.8 and 24.7⁰ C, respectively. Also the maximum average number pheromone traps catches for internode borer (3.5 numbers per trap) were recorded in 22 MW, when the maximum and minimum temperature was 36.1 and 23.6⁰ C, respectively. In case of top shoot borer, the highest number of moth catches were observed in 25 MW (6 number per trap) when the maximum and minimum temperature was 30.8 and 24.7⁰ C, respectively.

Table – 13 The average pheromone trap catches of pests as per meteorological weeks.

Met. Week	Temp		RH %		Rainfall (mm)	ESB	IB	TSB
	Max	Min	RH1	RH2				
01	25.7	13.0	97	71	000.0	-	-	-
02	27.8	07.8	97	55	000.0	-	-	-
03	30.2	09.8	97	60	000.0	-	-	-
04	30.0	09.9	97	63	000.0	-	-	-
05	31.0	12.2	98	68	000.0	-	-	-
06	31.1	11.3	98	72	000.0	-	-	-
07	30.7	12.4	98	74	000.0	-	-	-
08	30.4	13.6	98	77	000.0	-	-	-
09	32.3	16.9	98	77	000.0	-	-	-
10	35.2	15.4	98	65	000.0	-	-	-
11	34.6	13.1	98	67	000.0	-	-	-
12	36.2	16.4	97	58	000.0	-	-	-
13	36.2	18.7	98	59	000.0	-	-	-
14	35.7	17.3	98	58	000.0	1.5	1.5	0
15	36.7	20.3	94	43	000.0	0.5	0.5	0
16	37.5	22.6	92	50	000.0	1	1	0
17	37.5	23.8	92	55	000.0	4	1	1.5
18	38.1	22.8	94	57	000.0	0	0	0
19	36.8	21.4	94	62	000.0	0	0	0
20	38.2	23.9	92	54	006.8	1.5	0.5	0
21	35.9	23.3	93	66	005.9	2.5	0	0
22	36.1	23.6	96	65	059.4	3.5	3.5	4.5
23	30.1	24.4	94	89	041.0	2.5	0.5	2.5
24	29.4	23.7	97	86	010.9	2.5	2.5	4.5
25	30.8	24.7	94	86	000.9	5	3	6
26	30.1	24.4	94	87	002.2	1.5	3	4.5
27	30.5	23.8	98	86	001.6	2.5	1.5	2.5
28	28.9	23.3	98	86	027.5	1	0.5	1
29	28.4	23.7	98	95	032.0	0.5	1.5	1.5
30	30.1	22.9	98	92	032.8	0.5	2	3
31	29.2	22.9	98	91	006.1	0.5	2	4
32	29.7	23.2	96	79	000.2	2	0	2.5
33	29.8	22.6	96	72	001.5	0	0	0
34	30.2	22.7	98	77	011.9	0	0.5	0

Met. Week	Temp		RH %		Rainfall (mm)	ESB	IB	TSB
	Max	Min	RH1	RH2				
35	27.6	22.3	98	87	030.8	0	0	0
36	27.7	22.0	98	86	046.0	0	0	0
37	30.5	21.0	98	76	049.3	0	0	0
38	28.9	20.0	98	76	002.3	1.5	0	0
39	31.7	20.4	98	69	013.8	1	0	0
40	30.0	21.2	98	73	000.9	0	0	0
41	32.0	22.4	98	74	036.2	-	-	-
42	31.4	21.9	98	71	013.7	-	-	-
43	31.0	18.1	98	67	000.0	-	-	-
44	30.8	18.7	97	73	000.0	-	-	-
45	31.2	16.4	98	70	000.0	-	-	-
46	31.3	15.3	97	71	000.0	-	-	-
47	29.1	12.6	98	76	000.0	-	-	-
48	29.5	18.4	98	81	000.0	-	-	-
49	31.1	13.5	98	67	000.0	-	-	-
50	30.2	12.8	98	74	000.0	-	-	-
51	28.5	10.9	98	81	000.0	-	-	-
52	29.1	10.2	97	80	000.0	-	-	-
01	31.9	14.9	98	84	000.0	-	-	-
02	27.6	08.9	97	85	000.0	-	-	-
03	28.4	08.5	97	86	000.0	-	-	-
04	29.1	13.0	98	85	000.0	-	-	-
05	29.4	11.3	98	76	000.0	-	-	-
06	30.1	11.1	97	38	000.0	-	-	-
07	32.8	13.4	95	42	000.0	-	-	-
08	34.3	14.6	97	55	000.0	-	-	-
09	34.6	12.1	97	64	000.0	-	-	-

The correlation of moth catches with weather parameters are presented in table-14. The minimum temperature showed significant positive correlation to early shoot borer (0.42). Regarding top shoot borer, the maximum temperature showed significant negative correlation (-0.54), where as minimum temperature showed significant positive correlation (0.51). The regression equations of moth catches are presented in Table 15.

Table 14: Correlations of weather parameters with moth catches

Pest/s	Temperature		Relative Humidity		Rainfall
	Tmax	Tmin	Morning	Evening	
ESB	0.18	0.42*	-0.38	-0.01	-0.11
	(r=26 5% (t Value) = 0.39 and 1% (t Value) = 0.49)				
IB	0.25	0.24	0.23	0.38	0.35
	(r=21 5% (t Value) = 0.43 and 1% (t Value) = 0.55)				
TSB	-0.54*	0.51*	0.31	0.56*	0.18
	(r=16 5% (t Value) = 0.497 and 1% (t Value) = 0.62)				

Table 15: Regression equations of moth catches

Pest/s	Regression equation	R ²
ESB	Y=2.47 + 0.16Tmax+0.18Tmin - 0.14 RH1+0.04 RH2-0.01RF	0.26
IB	Y=-16.74 + 0.19Tmax+0.04Tmin+0.07 RH1+0.06 RH2+0.01RF	0.24
TSB	Y=-52.61 + 0.16Tmax+1.16Tmin+0.17 RH1+0.08 RH2-0.01RF	0.46

**TECHNICAL PROGRAMME (AICRP)
OF
SUGARCANE ENTOMOLOGY, PADEGAON (2012-13)**

Experiment No.1 (Project E 4.1) :		
Evaluation zonal varieties / genotypes for their reaction against major insect pests.		
	Trials	Entries
1	Evaluation of Initial Varietals Trial – Early [(IVT) Early] genotypes for their reaction against major insect pests.	08+03=11
2	Evaluation of Advanced Varietals Trial – Early (I Plant) genotypes for their reaction against major insect pests.	02+03=05
3	Evaluation of Advanced Varietals Trial – Early (II Plant) genotypes for their reaction against major insect pests.	04+03=07
4	Evaluation of Advanced Varietal Trial – Early Ratoon [AVT- E-Ratoon] genotypes for their reaction against major insect pests.	04+03=07
5	Evaluation of Initial Varietals Trial- Midlate genotypes for their reaction against major insect pests	10+02=12
6	Evaluation of Advanced Varietals Trial-Midlate (I Plant) genotypes for their reaction against major insect pests.	05+02=07
7	Evaluation of Advanced Varietals Trial- Midlate (II Plant) genotypes for their reaction against major insect pests.	06+02=08
8	Evaluation of Advanced Varietals Trial- Midlate [Ratoon] genotypes for their reaction against major insect pests.	06+02=08
	Total	45+20= 65

Experiment No.2 (E 28)	Survey and surveillance of sugarcane insect pests.
Experiment No.3 (E 30)	Monitoring of insect pests and bio-agents in sugarcane agro-ecosystem.
Experiment No.4 (E 33)	Bio-efficacy of insecticides against mealy bugs in sugarcane.
Experiment No.5 (E 34)	Standardization of simple and cost effective techniques for mass multiplication of Sugarcane bio-agents.
Experiment No.6 (E 35)	Management of borer complex of sugarcane through pheromone lures.