

**DETAILED REPORT
AICRP ON SUGARCANE**

Project No. E.4.1 (1)

- 1. Title** : **Evaluation of genotypes for their reaction against major insect pests [MYT (Early)].**
- 2. Objective** : To grade the entries in the trials for their behaviour towards damage by key pest in the area.
- 3. Year of start** : 1990-91
- 4. Duration** : Recurring study
- 5. Location** : Regional Agricultural Research Station, Anakapalle
- 6. Project leader and her associates** : Dr. B. Bhavani, Senior Scientist (Entomology)
Dr. M. Visalakshi, Senior Scientist (Entomology)
Dr. K. Prasada Rao, Principle Scientist (sugarcane)

Experimental Details :

- a Date of Planting** : 26/02/2013
- b Varieties** : 9+4=13
(Co C 10 336, Co A 11 321, Co A 11 322, Co A 11 323, 2009 A 302, 2009 A 107, 2009 A 235, 2009 A 399, 2009 A 288 and Standards: 93 A 145 (Co A 99082), Co 7219, 83 V 15 and Co86249)
- c Fertilizers** : 112:100:120 NPK (Kg ha⁻¹)
- d Intercultural operations** : Weeding as and when required and earthing up after 4 months after planting.
- e Irrigation** : At an interval of 10-15 days as per requirement
- f Plant protection measures** : Not applied.
- g Plot size** : Gross : 6m X 0.8 m X 4R= 19.2m²
- h Design** : RBD
- i Replications** : Three
- j Harvesting date** : 29/01/2014

7. Methods of recording observations :

a Early shoot borer :

The observations on the total number of shoots and number of dead hearts caused by the early shoot borer were recorded at 45, 60, 90 and 120 days after planting and cumulative per cent incidence was worked out.

b Internode borer :

The observations were recorded at harvest on 25 canes of each entry per replication. The per cent incidence and intensity of internode borer were worked out.

8. Results of the previous year:

During 2013-14, among three test entries, Co A 10 321 recorded less incidence of early shoot borer (3.25% DH) and highest was recorded in Co Or 10346 (21.79%) as against 15.92% DH in the check, 93 A 145. The incidence of internode borer was also less (20.97%) in Co A 10 321 whereas 51.22 % was recorded in the check, Co 86249. However, all the test entries showed least susceptible reaction towards early shoot borer (<15% DH). Among the test entries, Co C 10 336 recorded highest per cent sucrose (16.26%) whereas 17.21% was recorded in the checks, 83 V 15 and 93 A 145 whereas scale insect incidence was not recorded due to heavy rainfall received during October month, 2012 due to neelam thufan.

9. Results of the current year with tables, clearly indicating the details regarding name of the pest, insecticidal sprays etc., :

The data is presented in table 1 and 1a indicated that the differences due to various genotypes in respect of cumulative per cent incidence of early shoot borer and internode borer were statistically significant.

Among nine Main Yield Trial (early) entries, 2009 A 302 recorded lowest cumulative incidence of early shoot borer (5.81% DH) and highest incidence was recorded in Co C 10 336 (16.38% DH) as against 17.22% DH in the susceptible check, 93 A 145. However, all the test entries, except Co C 10 336 (16.38%) showed least susceptible reaction towards early shoot borer (<15% DH). The incidence and intensity of internode borer were less (39.39%; 2.46%) in Co A 11 322 whereas highest were recorded in two genotypes, Co C 10 336 (81.90 %; 7.64%) and 2009 A 302 (80%; 8.43%) respectively. Among the test entries, Co A 11 323 recorded highest per cent sucrose (18.05%) whereas 17.54 % and 17.98% were recorded in the checks, 93 A 145 and 87 A 298, respectively. Among test entries, 2009 A 302 showed least susceptible reaction against early shoot borer and Co A 11 322 showed less susceptible reaction against internode borer (Table 1a & 1b).

. Table 1a. Per cent incidence of early shoot borer in MYT (early) entries at different stages of crop growth

Genotype	45 DAP	60 DAP	90DAP	120 DAP	Cumulative up to 120 DAP	Grading	No. of bored plants/ ha
Co C 10 336	0.81 (5.11)	15.67(16.67)	3.48(10.75)	0.69(4.72)	16.38(23.74)	MS	66204
Co A 11 321	0.23 (2.90)	8.50(13.74)	4.98(12.77)	2.55(9.03)	12.50(20.67)	LS	43981
Co A 11 322	0.00(2.03)	5.76(17.92)	5.07(12.97)	1.08(5.92)	9.23(17.60)	LS	30093
Co A 11 323	0.90(5.36)	10.14(7.86)	3.47(10.64)	0.00(2.03)	11.33(19.55)	LS	51852
2009 A 302	0.21(2.82)	1.89(11.46)	4.05(11.54)	0.00(2.03)	5.81(13.92)	LS	19444
2009 A 107	0.83(4.95)	3.96(9.38)	3.20(10.26)	0.00(2.03)	6.53(14.80)	LS	25926
2009 A 235	0.40(3.64)	2.68(11.16)	4.93(12.76)	0.39(3.43)	7.50(15.84)	LS	28241
2009 A 399	1.01(5.69)	3.75(9.10)	3.72(11.06)	0.00(2.03)	6.34(14.57)	LS	21296
2009 A 288	1.13(6.07)	5.83(13.93)	3.92(11.33)	0.00(2.03)	8.79(17.18)	LS	34722
93 A 145 (Sus.c)	1.01(5.68)	7.55(15.72)	4.96(11.69)	1.08(5.96)	17.22(19.48)		43056
Co C 010 61 (c)	0.86(5.29)	5.00(12.69)	3.21(10.28)	0.00(2.03)	7.10(15.45)		32407
87 A 298 (c)	0.54	2.61(9.23)	2.32(8.76)	0.76(4.25)	5.43(13.42)		21296
Co 6907 (c)	1.69	9.44(17.86)	3.20(10.21)	0.00(2.03)	10.32(18.56)		
CD(p=0.05)	1.83	3.61	2.66	2.12	3.68		
CV%	23.11	15.43	14.14	34.36	12.63		

(Figures in parenthesis are transformed values)

0 - 15%	Least Susceptible (LS);	15.1-30.0%	Moderately susceptible (MS)
>30 %	Highly susceptible (HS)		

Table 1b. Incidence of internode borer, scale insect and % sucrose in different IVT(mid-late) entries

Genotype	Incidence of INB (%)	Intensity of INB(%)	Infestation index	Grade	% sucrose
Co C 10 336	81.90	7.64	6.26	HS	16.74
Co A 11 321	62.83	5.19	3.26	HS	17.64
Co A 11 322	39.39	2.46	0.97	MS	14.79
Co A 11 323	47.22	5.06	2.39	HS	18.05
2009 A 302	80.00	8.43	6.74	HS	13.43
2009 A 107	68.78	5.46	3.76	HS	16.53
2009 A 235	56.82	3.91	2.22	HS	16.33
2009 A 399	77.88	6.31	4.91	HS	15.64
2009 A 288	64.34	4.88	3.14	HS	15.65
93 A 145 (c)	50.23	3.42	1.72	HS	17.54
Co C 010 61 (c)	39.90	3.35	1.34	MS	17.14
87 A 298 (c)	74.44	5.97	4.44	HS	17.98
Co 6907 (c)	58.48	5.24	3.06	HS	14.45
CD(p=0.05)	23.37	2.03			2.56
CV%	22.80	23.66			9.33

0 - 20%	Less susceptible (LS);	20.1-40%	Moderately susceptible	(MS)
>40 %	Highly susceptible (HS)			

Project No 1	:	E 4.1 (2)
1.Title	:	Evaluation of genotypes for their reaction against major insect pests [MYT(mid-late)].
2.Objective	:	To grade the entries in the trial for their behaviour towards damage by key pest in the area.
3.Year of start	:	1990-91
4.Duration	:	Long term
5.Location	:	Regional Agricultural Research Station, Anakapalle
6.Project leader and her associates	:	Dr. B.Bhavani,Senior Scientist (Entomology) Dr. M.Visalakshi, Senior Scientist (Entomology) Dr. K.Prasada Rao, Principle Scientist (Sugarcane)

Experimental Details :

A Date of Planting	:	26/02/2013
B Varieties	:	06+04 =10 2009 A 385, 2009 A 377, 2009 A 290, 2009 A 271, 2009 A 123 and 2009 A 252 Susceptible check, 93 A 145 (Co A 99082), Co 7219, 83 V15 and Co 86249
C Fertilizers	:	112:100:120 NPK (Kg ha ⁻¹)
D Intercultural operations	:	Weeding as and when required and earthing up after 4 months after planting.
E Irrigation	:	At an interval of 10-15 days as per requirement
F Plant protection measures	:	Not applied.
G Plot size	:	Gross : 6m X 0.9 m X 4R = 21.6m ²
H Design	:	RBD
I Replications	:	Three
J Harvesting date	:	29/01/2014

7. Methods of recording observations :

1 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.

2 Internode borer and scale insect:

The observations were recorded at harvest on 25 canes in each genotype per replication. The per cent incidence and intensity of internode borer and scale insect were worked out.

3. Per cent Juice Sucrose:

The per cent juice sucrose was recorded during juice analysis before harvest of the cane.

8.Results of the previous year:

During 2012-13, all the nine test entries showed least susceptible reaction against early shoot borer. Among the test entries, 2008 A 105 recorded lowest cumulative incidence of early shoot borer (0.93% DH) as against 16.97% recorded in the susceptible check, 93 A 145. The per cent incidence of internode borer was ranged between 33.10 (2008 A 387) to 63.34 (2008 A 458) in test entries where as in check it was 34.91% (93 A 145) (Table 1 & 1a). Except two entries, all the test entries recorded zero per cent incidence of scale insect. The entry, 2008 A 387 recorded highest incidence of scale insect (21.05%). Among the test entries, 2008 A 466 recorded highest per cent sucrose (19.38%) and lowest was recorded in 2008 A 160 (15.39%).

9.Results of the current year with tables, clearly indicating the details regarding name of the pest, insecticidal sprays etc., :

The data were presented in table 1c and 1d. From the table, it is seen that the differences due to various genotypes in respect of cumulative per cent infestation of early shoot borer and internode borer were statistically significant. It was observed that, there was no incidence of scale insects in all entries (Table1c & 1d).

In Main Yield Trial (mid-late), out of six test entries, lowest cumulative per cent incidence of early shoot borer was recorded in two genotypes viz., 2009 A 290 (7.29%DH) and 2009 A 385(7.51%) whereas highest incidence was recorded in genotype, 2009 A 252 (22.42%DH). However, all the test entries, except 2009 A 252 showed least susceptible reaction towards early shoot borer as compared to the susceptible check, 93 A 145 (19.79%). The per cent incidence of internode borer was ranged between 53.44% (2009 A 385) to 83.33% (2009 A 123) in test entries where as in checks, it was 32.07% (83 V 15) to 74.82% (Co7219). All the entries showed highly susceptible reaction towards internode borer. Among the test entries, 2009 A 252 recorded highest per cent sucrose (20.12%) and lowest was recorded in 2009 A 377 (15.04%) (Table 1c & 1d).

Table 1c. Per cent incidence of early shoot borer in MYT (mid-late) entries						Grade	No. of bored plants/ ha
Genotype	45 DAP	60 DAP	90DAP	120 DAP	Cumulative upto 120 DAP		
2009 A385	0.24(2.80)	4.90(12.77)	3.48(10.65)	0.29(3.14)	7.51(19.07)	LS	26389
2009 A 377	0.00(2.03)	4.13(11.09)	8.77(17.14)	0.34(3.28)	10.27(18.09)	LS	33796
2009 A 290	0.00(2.03)	1.74(4.67)	4.72(12.42)	1.87(7.80)	7.29(15.53)	LS	24537
2009 A 271	1.15(5.97)	5.38(11.69)	5.29(13.28)	0.26(3.05)	9.66(18.04)	LS	42593
2009 A 123	0.65(4.63)	5.24(12.42)	5.97(14.10)	0.00(2.03)	10.51(28.02)	LS	34722
2009 A 252	1.41(6.80)	13.41(21.36)	10.18(18.59)	5.11(13.05)	22.42(26.37)	MS	86574
93 A 145 (Sus.c)	1.20(6.32)	13.13(20.15)	9.38(17.82)	2.06(8.20)	19.79(23.10)		78704
Co 7219 (c)	0.38(3.12)	13.37(21.43)	6.01(10.01)	0.30(3.16)	15.46(23.10)		57407
83 V 15 (c)	0.62(5.51)	5.80(13.12)	2.97(9.92)	0.00(2.03)	8.23(16.67)		23148
Co 86249 (c)	0.00(2.03)	1.24(5.47)	4.47(12.13)	1.10(6.00)	6.42(14.52)		14352
CD(p=0.05)	1.45	2.07	2.54	2.47	4.46		
CV%	20.50	34.62	10.56	27.92	13.53		

(Figures in parenthesis are transformed values)

Table 1d. Incidence and intensity of Internode borer and % sucrose in MYT (mid-late) entries

Genotype	%incidence of INB	% intensity of INB	Infestation index	Grade	% sucrose
2009 A385	53.44	3.79	2.06	HS	17.22
2009 A 377	63.64	6.72	4.28	HS	15.04
2009 A 290	69.8	6.66	4.65	HS	15.52
2009 A 271	56.67	5.58	3.16	HS	16.21
2009 A 123	83.33	9.00	7.50	HS	15.53
2009 A 252	60.35	4.19	2.53	HS	20.12
93 A 145 (c)	57.50	3.67	2.11		17.56
Co 7219 (c)	74.82	6.63	4.96		16.54
83 V 15 (c)	32.07	1.60	0.51		16.53
Co 86249 (c)	46.81	4.17	1.95		15.74
CD(p=0.05)	9.00	2.07			1.77
CV%	8.77	23.29			6.20

II

- 1.Experiment No.2 : Project E 28**
2. Title : **Survey and surveillance of sugarcane insect pests.**
3. Objective : To identify key insect pests of sugarcane in the area.
4. Project leader and her associates : Dr. B.Bhavani,Senior Scientist (Entomology)
Dr. M.Visalakshi, Senior Scientist (Entomology)
5. Year of start : 2003-04
6. Duration : Long term.
- Experimental Details :**
- a. Season : 2013-14

7. Methodology & observations recorded :

Roving survey of sugarcane fields at 5-8km distance and different sugar factory operational areas in Andhra Pradesh.

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. Sucking pests were recorded by examining 20 canes

8.Results of the previous year :

During 2012-13, sugarcane crop was infested by early shoot borer, internode borer, pink mealybug, leaf mealy bug, yellow mite and red mite in many pockets of sugarcane growing areas in A.P. Root borer *Emmalocera depressella* Swinhoe incidence was noticed in Samalkot sugar factory area along with wilt disease after Neelam thoofan during October, 2012. A new species of cane fly, *Proutista moesta* Westw.(Derbidae) was observed along with *Pyrilla perpusilla* population in sugarcane fields in operational areas of different sugar factories in AP from June- September, 2012.

9. Results of the current year with tables, clearly indicating the details regarding name of the pest, insecticidal sprays etc., :

The early shoot borer incidence was highest in March-May planting which was ranged from 3.50 to 56.40 per cent. Maximum incidence was observed in late planted crop and in light soils due to high temperatures coupled with low relative humidity, unavailability of irrigation water and late onset of monsoon. The per cent incidence of internode borer in early planting ranged from 15.40 to 85 per cent. Though, the incidence of internode borer appeared so highly, its intensity ranged from 2.66-10.50 per cent only. Moderate to severe incidence of red mite (3.66 to 57 %) was observed during the months of May, June and July months due to high temperature and late onset of monsoons. The incidence of leafhoppers, *Pyrilla perpusilla* (4-11 A & N / leaf) and *Proutista moesta* (3-10/ leaf) were observed from June to September months. Whitefly population (5.33-27.66/square inch) was observed in some pockets of sugarcane growing area due to inundation of flood water. The incidence of scale insect ranged from low to traces during 2013 due to high rainfall received after cane formation stage. The stools, which are infected by sugarcane woolly aphid covered the leaf area up to < 25% with sugarcane woolly aphid mostly during August to October, 2013. Top shoot borer incidence was ranged between 0.20 to 3.0 % in different sugar factory areas of Andhra Pradesh during 2013-14 (Table2).

Table 2. Survey and surveillance of insect pests of sugarcane

Sl. no.	Variety	Location	Name of the pest	% incidence or population			Remarks
				Min.	Max.	Ave.	
2	87 A 298, 93 A 145, 83 V 15, 2001 A 63, Co A 7602	Anakapalle, Kasimkota and Thimmaraju peta, Bheemasingi sugar factory operational area	Early shoot borer	3.50%	56.40%	29.95%	Plant & ratoon crop
	Co7219, Co6907, 97 A 85	Chodavaram sugar factory operational area, Visakhapatnam dt.	Red mite	3.66%	57.0%	30.33%	Plant crop
3	83 V 15, 87 A 298	Yeditha, Sithnagaram , Muramanda and Dulla of East Godavari dt.	Top shoot borer	0.20%	3.00%	1.6%	incidence was observed at maturity stage
4	Co7219, 86 V 96, 87 A 298, 83 V15	Peravaram Jaggampeta Yeditha, Sithnagaram , Muramanda and Dulla of East Godavari dt.	Root borer	0.10%	2.00%	1.05%	Observed during August-September
5	Co7219, 86 V 96, 83 V 15, 87 A 298	Yeditha, Sithnagaram , Muramanda and Dulla of East Godavari dt.	Pyrilla per leaf	3 A&N/ leaf	16 A&N/ leaf	9.5	Incidence noticed from Sep. month onwards

6	87 A 298, 93 A 145, 83 V 15, 2001 A 63	Peravaram, Jaggampeta, Simhadripuram, Yeditha, Sithnagaram, Muramanda villages	Derbid plant hopper	2adults/plant	19.67 adults/plant	10.5	
7	87 A 298, 93 A 145, 83 V 15, 2001 A 63	Peravaram, Jaggampeta, Simhadripuram	Scale insect	1.60%	6.20%	3.9%	Washed out during cyclonic rains
8	87 A 298, 86 V96, 83 V125, 2001 A 63 2003 V46 and Co A 86032	Chelluru sugar factory operational area, East Godavari Ramabhadrapuram, Rajupeta, Pulaparthi of Etikoppaka sugar factory, Visakha dt.	Internode borer <i>C. Sacharip hagus indicus</i>	15.40%	85%	50%	Recent years becoming severe
9	87 A 298, 93 A 145, 2001 A 63	Bheemasingi sugar factory opearational area	Whitefly	5.33N&P/2.5sq.cm	27.66N&P/2.5sq.cm	16.50N&P/2.5sq.cm	Observed after cyclonic rains during October
10	93 A 145, 87 A 298, Co7219, 93 A 145, 81 V 48	Anakapalle, Thummapala, Thimmaraju peta, Kasimkota	Sugarcane aphids	0	<25% of leaf area	1 grade	

- 1.Experiment No.3** : **Project E 3**
- 3. Title** : **Monitoring of insect pests and bio-agents in agro ecosystem.**
- 4. Objective** : To monitor the key insect pests and natural enemies in the area.
- 5. Project leader and her associates** : Dr. B.Bhavani,Senior Scientist (Entomology)
Dr. M.Visalakshi, Senior Scientist (Entomology)
6. Year of start : 2006-07
7. Duration : Long term.

- Experimental Details** :
- 1 Season : 2013-14
- 2 Plot size : 0.5ac
- 3 Design : Bulk plot

Observations recorded :

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.

8.Results of the previous year :

In monitoring of insect pests and natural occurring bio-agents, the infestation of early shoot borer (5.0%) was noticed on 15 SW (i.e. 1st week of April). Red mite infestation (3.0-40.0%) was observed from 17th SW (last week of April) to 23rd SW (Last week of June). The maximum incidence (48.20%) was noticed in 17 SW (i.e. last week of April). Incidence of internode borer was noticed at 26th SW(2.6%). The maximum incidence of internode borer was noticed in 49th SW (56.40%). Scale insect incidence was observed from 52th SW (0.33%) and highest incidence was observed during last week of February (22%). The bio-agents viz., *Euborellia annulipes*, an earwig (Ord. Dermaptera) was predatory on eggs and early instar larvae of early shoot borer was noticed on plant and ratoon crop in the early stage. *Chrysoperla carnea* (neuropteran) and *Pharoscymus horni*, a coccinellid predator were also noticed in the leaf sheaths infested with pink mealy bug, *Saccharicoccus sacchari*. *Coccinella septempunctata*. Certain natural collections of *T.chilonis* was also found in the ecosystem. In case of sugarcane woolly aphid, the maximum incidence (26 woolly aphid/2.5 m²/3leaf) was recorded during the months of September and October, 2012.

The bioagents viz., *Micromus igorotus* @ 2-3 per leaf observed during Dec-January, Syrphid population was observed in traces whereas *Encasia flavoscutellum* @ 3-4 per stool were observed during December and 1-3 per leaf during January and Lady bird beetles were noticed 2-5/ leaf during August along with other natural enemies viz., *Chrysoperla carnea*, *Pharoscymus horni* and *Cheilomenes sexmaculata*. The data 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. During 2012-13, the incidences of early shoot borer, red mite and internode borer were moderate to severe but the scale insect incidence was low due to high rainfall received after cane formation stage.

Table 3b. Incidence of insect pests and bio-agents in Sugarcane agro-ecosystem

Period of observation	Red mite incidence (% incidence)	Mealybug		Pyrilla (population/leaf)	<i>Epiricania melanoleuca</i>	Derbid (population/leaf)	White fly (population/2.5sq.cm)	<i>Ascharsonia</i> sp.
		% incidence	% intensity					
March,13	3.0%	-	-	--	-	-	-	-
April,13	5.60	-	-	-	-	-	-	-
May,13	13.20	--	-	-	-	-	-	-
June, 13	40.00	1.0	0.30%	-	-	1-3A	-	-
July,13	12.30	1.0	0.1%	3(E) +6 (N+A)	Traces	5-8A	-	-
August	6.50	Traces	Traces	3(E) +6(N+A)	1.5	5-10A	-	-
Sep,13	--	-	-	3(E) +10(N+A)	2.3	8-12A	-	-
October,13	-	-	-	-	3.2	-	-	-
November,13	-	-	-	-	Traces	-	10.66 puparia	Traces
December,13	-	-	-	-	-	-	18.30 puparia	Traces
January	-	--	-	-	-	-	-	--

A=Adults; N= nymph; E= Egg mass

IV

- Experiment No. 4** : Project E. 33
- 1.Title** : Bio-efficacy of insecticides against mealy bugs in sugarcane
- 2.Objective** : To evaluate efficacy of insecticides against mealy bugs in sugarcane.
- 3. Project leader and her associates** : Dr. B.Bhavani, Senior Scientist (Entomology)
Dr. M.Visalakshi, Senior Scientist (Entomology)
- 4. Year of start** : 2011-12
- 5. Location** : Regional Agricultural Research Station, Anakapalle
- 6. Experimental Details** :
- a. **Design** : RBD
- b. **Replications** : Three
- c. **Plot size** : 6.0 x 5.4 m
- d. **Planting date** : 17/3/2012
- e. **Variety** : 93 A 145 (Co A 99082)
- f. **No. of treatments** : 9

Treat No.	Name of the treatment
1	Sett treatment of imidacloprid 70 WG / SP 25 g a.i./ha + spraying of imidacloprid 17.8 SL 0.005%
2	Sett treatment of imidacloprid 70 % WG / SP 25 g a.i./ha + spraying of thiamethoxam 25WG 0.004%
3	Sett treatment of Imidacloprid 70 % WG / SP 25 g a.i./ha + spraying of clothianidin 50 WSG 0.004%
4	Sett treatment of imidacloprid 70 % WG / SP 25 g a.i./ha + spraying of acetamaprid 20 SP 0.004%
5	Sett treatment of thiamethoxam 70 WG / SP 10 g a.i./ha + spraying of imidacloprid 17.8 SL 0.005%
6	Sett treatment of thiamethoxam 70 WG / SP 10 g a.i./ha + spraying of thiamethoxam 25 WG 0.004%
7	Sett treatment of thiamethoxam 70 WG / SP 10 g a.i./ha + spraying of clothianidin 50 WSG 0.004%
8	Sett treatment of thiamethoxam 70 WG / SP 10 g a.i./ha + spraying of acetamaprid 20 SP 0.004%
9	Untreated Control

Method of Application :

Dose of a.i. is based on 35000 three eye bud setts. Spraying will be done at the time of cane formation (Approximately 4-5 months after planting).

7. Method of observation :

- Germination percentage at 35 DAP
- Randomly select 10 canes from 3 meter row length and count number of infested internodes out of total number of internodes.
- Before spraying and 7, 15 and 30 DAS and harvest.
- Yield and quality parameters.

8. Results of previous year:

During 2012-13, sett treatment was done with different test insecticides before planting and the per cent germination was ranged from 87.82 to 92.50 in different insecticidal treatments whereas in untreated control it was 73.90%. Mealybug incidence was not observed in experimental field due to heavy down pore after cane formation stage due to neelam thufan. Hence, the trial is vitiated at Regional Agricultural Research Station, Anakapalle

9. Results of the current year with tables, clearly indicating the details regarding name of the pest, insecticidal sprays etc., :

The per cent germination at 35 days after planting was ranged between 69.27 (untreated control) to 80.86 9 (sett treatment with imidacloprid 70SP). (Table 4). Due to heavy rainfall received during October month the mealybug population was washed-out. Hence, the trial was vitiated.

Table 4 Impact of sett treatment with different insecticides on the per cent germination of sugarcane

S.No.	Treatment	Germination (%)
1	Sett treatment with imidacloprid 70% SP @ 25 g a.i./ha + spraying of imidacloprid 17.8SL @ 0.005%	80.25
2	Sett treatment with imidacloprid 70% SP @ 25 g a.i./ ha + spraying of thiamethoxam 25 WG @ 0.004%	80.35
3	Sett treatment with imidacloprid 70% SP @ 25 g a.i./ ha + spraying of clothianidin 50 WSG @ 0.004%	80.19
4	Sett treatment with imidacloprid 70% SP @25 g a.i./ ha + spraying of acetamiprid 20 SP @ 0.004%	80.86
5	Sett treatment with thiomethoxam 70%SP @ 10 g a.i./ ha + spraying of imidacloprid 17.8SL @ 0.005%	79.38
6	Sett treatment with thiamethoxam 70%SP @ 10 g a.i./ ha + spraying of thiamethoxam 25 WG @ 0.0045%	79.52
7	Sett treatment with thiamethoxam 70%SP@ 10 g a.i./ ha + spraying of clothianidin 50 WSG @ 0.004%	79.76
8	Sett treatment with thiamethoxam 70%SP @ 10 g a.i./ha + spraying of acetamiprid 20 SP @ 0.004%	81.63
9	Untreated control	69.27
	SEd	1.54
	CD (0.05)	5.51
	CV%	15.09

- Expt No.5** : **Project E.34**
- 1.Title** : Standardization of simple, cost effective techniques for mass multiplication of sugarcane bioagents (*Beauveria bassiana*).
- 2.Objective** : To develop simple and cost effective mass multiplication techniques of promising bio- agents of the area.
- 3. Year of start** : **2012-13**
- 4 .Location** : Regional Agricultural Research Station, Anakapalle
- 5. Project leader and her associates** : Dr. B. Bhavani, Senior Scientist (Entomology)
Dr. N.Raj Kumar, Scientist (Plant Pathology)
Dr. M.Visalakshi, senior Scientist (Entomology)

6.Experimental Details :

7. Methodology adopted :

Simple and cost effective host media for multiplication of insect pathogen, *Beauveria bassiana*

Mycelial discs of *Beauveria* were inoculated in PDA broth supplemented with 1% yeast extract and incubated at 26 °C for 48 h with shaking at 180 rev min⁻¹.

The mass culturing of *Beauveria* is being done on yeast broth as well as on solid medium (whole grains) supplemented with 1% yeast extract.

Yeast broth was made by mixing 20g of brewer's yeast and 20g of sucrose in one liter of water. The mixture was dispensed into 250ml conical flasks and three replications (flasks) maintained then plugged loosely with a bung of non-absorbent cotton wool and autoclaved at 121⁰ C, 15 psi for 40 minutes. After cooling, each flask was inoculated with loopful spores from *B. bassiana* culture and were then incubated at room temperature (25 ± 5⁰C), on a rotary shaker revolving at 150 rpm for 72 hours as described (Jenkins *et al.* 1998) for production of spores.

Whole grain media

Grains are cheap, easily available and act a best nutritive media for the mass multiplication of many micro and macro organisms. Hence, five whole grains *viz.*, rice, ragi, sorghum, pearl millet and maize are used for estimating the sporulation of *B. bassiana* at 28⁰ c. 100 g of each grain are washed well and soaked in water overnight except rice and pearl millet which are soaked for 2-3 hours prior to starting the experiment. The excess water is drained by decanting and shade drying it for half an hour to further remove the excess moisture. Three replications maintained for each grain. The grains are packed separately in individual 500 ml flask for *B. bassiana*. They are plugged with cotton wool and autoclaved at 15psi for 1 hour. After cooling, 1ml of the spore suspension of fungal pathogen is inoculated in to each bottle, separately. All these procedures are done under laminar air flow chamber. They are incubated in BOD incubator at 28⁰c for 15 days. To avoid clumping, after 7 days of inoculation, the flasks and bottles are shaken vigorously to separate the grain and to break the mycelia mat. After 15 days of incubation,10g homogenous grain sample drawn from each replicate uniformly sporulating bottle/ flasks are transferred to 100 ml sterilized distilled water containing Tween 80 (0.05%) solution in 250 ml conical flasks. The flasks are shaken in mechanical shaker for 10 min. The suspension is made after the serial dilution

of the suspension using double ruled Neubauer hemocytometer for determining the number of conidia in 1 g of the cereal grains.

8. Results of previous year: New study

9. Results of the current year with tables, clearly indicating the details regarding name of the pest, insecticidal sprays etc., :

The results presented in Table -5 revealed that among the whole grains tested, *B. bassiana* spore production was significantly higher on rice (11.28×10^8) and found to be the suitable media for the spore production followed by ragi (10.76×10^8) and sorghum (10.28×10^8) and lowest spore production was recorded in maize (9.48×10^8).

Table 5. Spore ($\times 10^8$) and biomass production (g) of entomopathogenic fungi, *B. bassiana* on different whole grains.

Media	Spore count ($\times 10^8$) per 100gm	Biomass (g) per 100gm
Rice	11.28	0.15
Sorghum	10.28	0.45
Pearl millet	9.82	0.51
Ragi	10.76	0.68
Maize	9.48	0.60
Rice bran	6.35	0.28
CD(p=0.05)	0.072	0.045
CV%	1.03	1.14

- Expt No.6** : **Project E 36**
1.Title : **Management of borer complex of sugarcane through lures.**
- 2. Objective** : To manage sugarcane borers (early shoot borer, top borer, internode borer and stalk borer) through pheromone traps.
- 3.Year of start** : **2012-13**
- 4.Location** : Regional Agricultural Research Station, Anakapalle
- 5. Project leader and her associates** : Dr. B. Bhavani, Senior Scientist (Entomology)
Dr. M.Visalakshi, Senior Scientist (Entomology)
- 6.Experiemment details :**
- 1 Year of start : 2012-13
 - 2 Plot size : 1 acre
 - 3 Variety : 93 A 145 (Co A 99082)
 - 4 Planting Date : 30-3- 2012
 - 5 Harvesting Date : 22-1-2013
- Treatment details** : Pheromone lures of sugarcane early shoot borer and internode borer
- Plot Size** : Two blocks, each of minimum half acre. In first block, trap should installed and the second be kept a such (control). In between both blocks, at least one acre sugarcane crop should be taken to avoid the pheromone effect.
- Methodology adopted** : ➤ The test insect pests at RARS, Anakapalle were early shoot borer and internode borer,.
➤ Five pheromone traps for ESB and internode borer were installed in the second fortnight of March till harvest of crop in one acre of sugarcane crop.
➤ The pheromone lures were changed after 1 month.
- Observation recorded** : ➤ Observations on number of moths trapped recorded at weekly interval.
➤ The mean number of moths captured were worked out.
➤ The correlation of moth captures were worked out with weekly meteorological parameters.
➤ Infestations of each borer were recorded in both blocks.

8. Results of the Previous year:

The plot with pheromone traps installed @ 10traps/acre + Trichocards released at 7 days interval for six times (T1) recorded lowest cumulative incidence of early shoot borer (4.69%) as against 36.34% in untreated control (T2). Low per cent incidence (24%) and intensity (5.85%) of internode borer with lowest infestation index (1.4) was recorded in T1 whereas T2 (untreated plot) recorded 54.2% incidence and 17.74% intensity of internode borer with highest infestation index (9.61). Superior cane yield (99.15 t/ha) was recorded with 21.58% sucrose in T1 as compared to untreated control (75.74t/ha; 18.54%).

The maximum average pheromone trap catches of ESB moth catches were started from 15th MW, and the highest number of moth catches (36.2 moths per trap) were recorded when the maximum, minimum temperature was 36.9C and 24.5C and at 84% RH, respectively, there after the moth catch was reduced gradually due to scattered rainfall received from last week of May to September, 2012 and high rainfall received during October month due to Neelam thufan. Correlation studies on the ESB moth catch in relation to weather parameters indicated that the maximum (r: 0.69) and minimum (r : 0.58) temperatures as well as evaporation (0.78) showed positive correlation whereas morning relative humidity showed negative correlation (r: -0.62) with ESB moth catch in pheromone traps (Table 7b). The internode borer (INB) moth catch was started in 24th MW (4 number per trap) and the maximum INB moth catch was recorded in 29th MW (12 number/trap) when the maximum and minimum temperature was 31.4 and 22.6^o C, respectively. Afterwards, the moth catches decreased up. There was no moth catches during 42nd to 50th MW.

9. Results of the current year with tables, clearly indicating the details regarding name of the pest, insecticidal sprays etc.,

The plot with pheromone traps installed @ 10traps/acre + Trichocards released at 7 days interval for six times (T2) followed by T1 (where pheromone traps @ 10traps/acre were installed for mass trapping of adult moths of ESB as well as INB) recorded lowest cumulative incidence of early shoot borer (3.92%, 8.33%) as against 26.94% in untreated control (T3). Low per cent incidence (6.33%, 11.30%) and intensity (3.66%, 5.40%) of internode borer was recorded in T2 and T1 compared to untreated plot (84.2% incidence and 15.40% intensity of internode borer). Highest cane yield was recorded in plot with pheromone traps @10/acre + Trichocards@20,000/ac (96.42t/ha) followed by pheromone traps@10/acre alone (89.50t/ha) as compared to control plot (85.50t/ha)(Table 6a).

Table 6a. Impact of mass trapping of ESB moths and Trichocard releases at weekly intervals for four times on the incidences of ESB and INB

Treatment	Incidence of early shoot borer upto 120 DAP					Incidence of INB (%)	Intensity of INB (%)	Infestation index	Sucrose (%)	Cane yield (t/ha)
	45 DAP	60 DAP	90 DAP	120 DAP	Cumulative upto 120 DAP					
T1 Pheromone traps@ 10traps/acre	2.60	6.40	2.00	1.33	8.33	11.30	5.40	0.61	19.50	89.50
T2 - Pheromone traps installed@ 10traps/acre + Trichocards release from 35 DAP for six times	0.30	2.20	0	0	3.92	6.33	3.66	0.23	20.17	96.42
T3- Untreated Control	15.30	13.60	4.60	0	26.94	84.2%	15.40	12.97	17.60	85.50

Table 6b. Association of Weekly moth catches of ESB with weather parameters

Standard week	Date	Pheromone trap catches/week		Temperature (°C)		Relative humidity (%)		Evoporation (mm)	Rainy days	Rain fall (mm)	Sunshine hours
		ESB	INB	Max	Min	Morning	Evening				
12	19.3.13	0	0	34.4	19.4	90	43	5.3	-	-	-
13	26.3.13	68	0	36	20	91	48	5.8	-	-	-
14	02.4.13	96	0	35.8	21.3	90	48	5.8	-	-	-
15	9.4.13	90	0	36	21.7	91	49	6	-	-	-
16	16.4.13	88	0	34.6	20.6	87	63	5.5	-	-	-
17	23.4.13	97	0	34	21.8	73	60	4.4	-	-	-
18	30.4.13	100	0	36.6	24.3	86	56	6.4	-	-	-
19	7.5.13	124	0	37.2	25.1	87	55	6.4	-	-	-
20	14.5.13	143	0	36.8	24.4	90	59	5.1	-	-	-
21	21.5.13	134	1	40.3	25.7	83	47	7.2	-	-	-
22	28.5.13	71	1	36.4	25.2	80	58	5.6	-	-	-
23	4.6.13	59	2	35.2	23.8	84	57	5	-	-	-

24	11.6.13	24	1	34.1	23.6	73	59	4.7	-	-	-
25	18.6.13	13	2	35	23.4	89	66	4.1	-	-	-
26	25.6.13	29	3	35	24.5	87	55	5.8	-	-	-
27	2.7.13	17	5	33.9	23.5	82	64	5.4	-	-	-
28	9.7.13	7	8	31.9	23	89	71	3.6	-	-	-
29	16.7.13	10	10	32.6	23	95	68	4.1	-	-	-
30	23.7.13	3	13	33.3	23.2	86	60	4.5	-	-	-
31	30.7.13	1	15	32.8	23	85	71	5	-	-	-
32	6.8.13	0	39	32.2	23	93	68	3.7	-	-	-
33	13.8.13	1	68	30.7	22.3	91	76	2.7	-	-	-
34	20.8.13	0	131	33.8	23.3	88	61	5	-	-	-
35	27.8.13	1	123	33.9	22.8	89	64	3.9	-	-	-
36	3.9.13	0	92	32.8	21.8	90	69	2.8	4	45.4	4.8
37	10.9.13	0	86	32.3	21.9	93	65	3.1	1	6	7.1
38	17.9.13	0	65	31.7	21.6	95	72	1.8	4	88.4	1.8
39	24.9.13	0	30	34.3	21.5	93	60	3.2	1	9.4	6.1
40	1.10.13	0	23	31.8	21.5	62	67	2.5	1	23.8	4
41	8.10.13	0	34	31.4	22.1	89	67	2.6	1	7.8	3.8
42	15.10.13	0	23	32.6	21.3	91	68	3.7	1	9.6	6.9
43	22.10.13	0	25	25.3	20.3	98	93	0.8	6	532.4	0.5
44	29.10.13	0	14	31.5	20.1	90	57	3.3	-	-	6.8
45	5.11.13	0	14	30.6	17.1	88	61	3.1	-	-	7.9
46	12.11.13	0	15	30.3	16	88	65	3.3	-	-	8.2
47	19.11.13	0	7	28.2	17.6	94	74	2.3	-	-	3.8
48	26.11.13	0	8	30.5	18.1	93	66	2.7	-	-	6.2
49	3.12.13	0	6	29.6	13.9	94	54	3.3	-	-	6.8

50	10.12.13	0	6	29.6	16.2	87	53	3.6	-	-	5.5
51	17.12.13	0	6	29	13.5	89	52	2.9	-	-	7.5
52	24.12.13	-	7	29.3	13.4	89	52	3.2	-	-	7.6
1	1.1.14	-	8	29.8	13.5	92	50	2.9	-	-	7.2
2	8.1.14	-	6	29.7	15.2	97	56	2.8	-	-	5.7
3	15.1.14	4	-	29.3	15.5	95	56	2.8	-	-	5.2
4	22.1.14	2	-	29.2	14.9	95	52	3	-	-	5.5
5	29.1.14	5	-	30.2	13.6	94	43	3.1	-	-	6.9
6	8.2.14	20	-	32.5	13.3	96	38	3.9	-	-	7.9
7	12.2.14	12	-	31.1	15.2	93	46	3.9	-	-	7.4
8	19.2.14	8	-	29.9	13.8	93	48	4.1	-	-	7.9

Table 6c Association between weekly ESB moth catches in pheromone traps and weather parameters

Weather parameters	Correlation coefficient (r)
Rainfall	-0.24
No. of rainy days	-0.27
Max. temp (°) C	0.70
Min. temp (°) C	0.60
Morning RH (%)	-0.60
Evening RH (%)	-0.33
wind velocity(kmph)	-0.14
No. of bright sunshine hours	-0.19
Evaporation (mm)	0.80

- Expt No.6** : **Project E 37**
1.Title : **Bioefficacy of new insecticides for the control of sugarcane early shoot borer**
- 2. Objective** : To find out effective strategy for the management of sugarcane early shoot borer.
- 3. Year of start** : **2013-14**
- 4. Location** : **Regional Agricultural Research Station, Anakapalle**
- 5. Project leader and her Associates** : Dr. B. Bhavani, Senior Scientist (Entomology)
Dr. M.Visalakshi, Senior Scientist (Entomology)

6 Experimental detail :

- a. Year of start** : 2013-14
b. Design : RBD
c. Plot size : 6 X 0.9m X6R (Gross plot size)
d. Variety : 93 A 145 (Co A 99082)
e. Date of Planting : 23-3-2013
f. Date of harvesting : 4-3-2014
g. Treatments : 9

1. Soil application of fiprilonil 0.3G @25kg/ha at the time of planting and 60 DAP
2. Soil application of chlorantraniprole 0.4G@22.5kg/ha at the time of planting and 60 DAP
3. Spraying of chlorantraniprole18.5SC @375ml/ha at 30 and 60 DAP
4. Spraying of spinosad 45SC @90ml/lt at 30 and 60DAP
5. Spraying of flubendiamide 20 SC @250ml/ha at 30 and 60 DAP
6. Soil application of phorate 10G @15kg/ha at the time of planting and 60 DAP
7. Soil application of carbofuran3G @33kg/ha at the time of planting and 60 DAP
8. Untreated control

7. Observation recorded:

- a. Data on germination recorded at 30 DAP
- b. Incidence of early shoot borer recorded at 30, 45, 60, 90 and 120 days after planting.
- c. Tillering per cent at 120 DAP
- d. Data on internode borer damage recorded at harvest from 25 canes per treatment and calculated per cent incidence , intensity and infestation index.
- e. Data on single cane weight, cane height & girth were recorded.
- f. Data on number of millable canes, cane yield and juice quality were also recorded at harvest

8. Results of the previous year: New study

9. Results of the current year with tables, clearly indicating the details regarding name of the pest, insecticidal sprays etc.,

Among the test insecticides, soil application of chlorantraniliprole 0.4G (Ferterra) @22.5kg/ha at the time of planting and 60 DAP recorded less cumulative incidence of ESB (14.86%) as compared to untreated control (43.15%)(Table 7a). The per cent intensity of internode borer was less in spraying of chlorantraniliprole 18.5SC@375ml/ha (6.20%) followed by soil application of chlorantraniliprole 0.4G (Ferterra) @ 22.5kg/ha at the time of planting and 60 DAP (6.26%) as compared to untreated control (20.01%). Single cane weight was more in spray of flubendiamide 20 SC @ 250ml/ha at 30 & 60 DAP (1.46 kg/cane) followed by 1.45kg/cane was recorded in T2 (chlorantraniliprole 0.4G (Ferterra) @ 22.5kg/ha), T3 (chlorantraniliprole 18.5SC @375ml/ha) and T1(fipronil 0.3G @ 25kg/ha) (1.45kg/cane). Cane girth was more in carbofuran3G @ 33kg/ha (2.62cm/cane) followed by fipronil 0.3G @ 25kg/ha (2.58cm/cane), chlorantraniprole 0.4G @ 22.5kg/ha (2.52cm/cane) and chlorantraniliprole 18.5SC @375ml/ha (2.52cm/cane). Cane height was more in chlorantraniprole 0.4G @ 22.5kg/ha (2.63mt/cane) and chlorantraniliprole 18.5SC @375ml/ha (2.62mt/cane). Highest cane yield was recorded in chlorantraniprole 0.4G@22.5kg/ha (99.10t/ha) followed by chlorantraniliprole 18.5SC @375ml/ha (97.78t/ha), fipronil 0.3G @ 25kg/ha (97.74t/ha) and flubendiamide 20 SC @250ml/ha (97.54t/ha) and T3, T1 and T5 are significantly on par with each other(Table 7b).

Table 7a. Impact of different treatments on the early shoot borer incidence

Treatment	45 DAP	60DAP	90DAP	120DAP	Cumulative upto 120 DAP	No .of bored plants/ha
T1-Fipronil 0.3G @25kg/ha	3.48 (10.67)	20.00 (26.56)	8.57 (16.78)	4.62 (12.38)	21.17 (27.39)	99383
T2- Chlorantraniliprole 0.4G@22.5kg/ha	1.88 (7.75)	11.54 (19.85)	4.96 (12.76)	0.17 (2.72)	14.86 (22.66)	66975
T3-Chlorantraniliprole18.5SC @375ml/ha	3.85 (11.12)	23.66 (290.04)	4.11 (11.68)	0.37 (3.37)	21.61 (27.70)	91049
T4- Spinosad 45SC @90ml/lt	4.55 (16.13)	20.31 (26.68)	7.03 (14.80)	1.04 (5.45)	22.23 (28.11)	100926
T5-Flubendiamide 20 SC @250ml/ha	5.60 (13.67)	20.10 (26.61)	5.07 (12.99)	0.35 (3.42)	24.78 (29.66)	112346
T6-Phorate 10G @15kg/ha	9.73 (9.29)	21.78 (29.71)	20.51 (23.13)	8.39 (18.34)	41.09 (39.86)	188642
T7- Carbofuran3G @33kg/ha	2.62 (9.53)	24.66 (27.80)	15.48 (26.64)	4.50 (12.18)	35.99 (36.86)	169753
T8- Untreated control	11.24 (18.52)	27.88 (31.84)	21.56 (27.64)	9.98 (15.62)	43.15 (41.05)	210802
CD(p=0.05)	2.69	3.16	5.57	3.53	4.15	
CV %	13.25	6.61	17.37	21.83	7.48	

(Figures in parenthesis are transformed values)

Table 7b. Impact of different treatments on the internode borer incidence and growth parameters

Treatment	Intensity of internode borer (%)	% sucrose	Cane wight (kg)	Cane height (mt)	Cane girth(cm)	Cane yield (t/ha)	NMC/ha
T1-Fipronil 0.3G @25kg/ha	11.60	20.16	1.45	2.38	2.58	97.74	95884
T2- Chlorantraniliprole 0.4G@22.5kg/ha	6.12	20.01	1.45	2.63	2.52	99.10	96870
T3-Chlorantraniliprole18.5SC @375ml/ha	6.20	20.41	1.45	2.62	2.52	97.78	95997
T4- Spinosad 45SC @90ml/lt	8.97	20.46	1.42	2.38	2.51	88.30	85114
T5-Flubendiamide 20 SC @250ml/ha	10.25	20.61	1.46	2.65	2.51	97.54	95988
T6-Phorate 10G @15kg/ha	9.22	19.97	1.13	1.92	2.36	85.67	87866
T7- Carbofuran3G @33kg/ha	11.56	19.85	1.42	2.44	2.62	92.64	87866
T8- Untreated control	20.01	19.82	1.00	1.92	2.19	64.35	59137
CD (p=0.05)	3.55	NS	0.38	0.29	0.29	2.20	
CV%	19.30		16.50	7.15	6.75	12.18	

**TECHNICAL PROGRAMME (AICRP ON SUGARANE)
OF ENTOMOLOGY DISCIPLINE, RARS, ANAKAPALLE(2014-15)**

Experiment No.1 (Project E 4.1) :		
Evaluation zonal varieties / genotypes for their reaction against major insect pests		
	Trials	Entries
1	Evaluation of main yield trial – Early [MYT-Early] genotypes for their reaction against major insect pests.	05+04=09
2	Evaluation of Main Yield Trial –Midlate (MYT- Midlate) genotypes for their reaction against major insect pests.	09+04=13
	Total	9+13= 22
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 36)	Management of borer complex of sugarcane through pheromone lures.	
Experiment No.7 (E 37)	Bio-efficacy of newer insecticide for the control of sugarcane early shoot borer.	

