ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

YEAR- 2013-14

ENTOMOLOGY

U.P. COUNCIL OF SUGARCANE RESEARCH, SHAHJAHANPUR

PROJECT	**E. 4.1**
TITLE	EVALUATION OF VARIETIES FOR THEIR REACTION AGAINST MAJOR INSECT PESTS.
OBJECTIVE	TO GRADE THE VARIETIES IN ZONAL VARIETAL TRIALS FOR THEIR BEHAVIOUR TOWARDS DAMAGES BY KEY PESTS IN THE AREA.
YEAR OF COMMENCEMENT	REGULAR FEATURE
LOCATION	SHAHJAHANPUR

AVT (MID LATE) I PLANT

Under AVT (mid late) I plant, total 5 varieties were evaluated viz Co 09022, CoS 09232,CoH 09264,CoLk 09204, CoPb 09214 along with three standards (checks) CoS 767, CoS 8436 and CoPant 97222 against major insect pests of the area.

During hot weather, only the variety CoPb 09214 (16.87%) was recorded moderate susceptible reaction to shoot borer while rest of the varieties including standard showed less susceptible reaction. Based on cumulative incidence of 3rd and 4th brood of top borer the variety CoLk 09204 (10.35%), CoPb 09214 (13.48%) including standard CoS 8436 (12.01%) and CoPant 87222 (14.46%) showed moderate susceptible reaction while rest of the varieties including standard CoS 767 (7.53%) showed less susceptible reaction to top borer. Regarding the stalk borer infestation, the variety Co 09022 (2.09) showed moderate susceptible reaction while rest of the varieties including standard showed less susceptible reaction to stalk borer.

The infestation index of stalk borer ranged from 0.71 in CoH 09264 to 2.09 in Co 09022(Table 1a).

AVT (MID LATE) II PLANT

Under AVT (Midlate) II plant, total 6 varieties viz; CoPb 08217, CoS 08234, CoS 08235, CoH 08262, CoH 08263, CoH 08264 along with three standards (checks) CoS 767, CoS 8436 and CoPant 87222 were evaluated against major insect pests of the area.

During hot weather, only the variety CoPb 08217 (17.15%) showed moderate susceptible reaction while rest of the varieties including standard showed less susceptible reaction to shoot borer. It ranged from 4.84% in CoS 08234 to 17.15% in CoPb 08217. Based on cumulative incidence of of 3rd and 4th brood of top borer, only CoPb 08217 (20.20%) showed highly susceptible reaction, the varieties viz; CoS 08234 (10.24%), CoS 08235 (12.25%) CoH 08262 (11.30%), CoH 08263 (12.59%) including standard CoS 8436 (11.58%) and CoPant 87222 (13.83%) showed moderate susceptible reaction while CoH 08264 (9.49%) including standard CoS 767 (8.60%) showed less susceptible reaction to top borer. Regarding the stalk borer infestation, the varieties CoPb 08217 (2.07), CoS 08234 (2.12), including standard CoPant 87222 (2.08) showed moderate susceptible reaction to stalk borer while rest of the varieties including standard CoS 767 (1.90) and CoS 8436 (1.36) showed less susceptible reaction to stalk borer. The infestation index of stalk borer ranged from 1.05 in CoS 08235 to 2.12 in CoS 08234 (Table 1b).

AVT (EARLY) I PLANT

Under AVT (early) I plant, total 5 varieties viz; CoPb 09181, CoLk 09202, CoS 09246, CoH 09262, CoH 09263, along with two standards (check) CoJ 64 and CoPant 84211 were evaluated against major insect pests of the area.

During hot weather, only CoPb 09181 (16.03%) showed moderate susceptible reaction while rest of the varieties including standards showed less susceptible reaction to shoot borer. It ranged from 5.68% in CoLk 09202 to 16.03 in CoPb 09181. Based on cumulative incidence of 3rd and 4th brood of top borer, only standard variety CoJ 64 (10.92) showed moderate susceptible reaction while rest of the varieties including standards CoPant 84211 (9.06%) showed less susceptible reaction to top borer. Regarding the stalk borer infestation the variety CoH 09263 (2.13) including standard CoPant 84211 (2.48) showed moderate susceptible reaction to stalk borer while rest of the varieties showed less susceptible reaction to stalk borer. The infestation index of stalk borer ranged from 1.27 in CoLk 09202 to 2.48 in CoPant 84211 (Table 1c).

AVT (EARLY) II PLANT

Under AVT (early) II plant three varieties viz; CoPb 08211, CoPb 08212 and CoS 08233 along with two standards CoJ 64 and CoPant 84211 were evaluated against major insect pests of the area.

During hot weather, only the variety CoPb 08211 (20.60%) showed moderate susceptible reaction while rest of the varieties including standards CoJ 64 (9.73%) and CoPant 84211 (10.18%) showed less susceptible reaction to shoot borer. Based on cumulative incidence of 3rd and 4th brood of top borer, the varieties CoPb 08212 (16.99%) and CoS 08233 (14.62%) including standard CoPant 84211 (10.42%) showed moderate susceptible reaction while rest of the varieties including standard CoJ 64 (9.74%) showed less susceptible reaction to top borer. Regarding the stalk borer infestation index, only the variety CoPb (2.11) showed moderate susceptible reaction to stalk borer while rest of the varieties including standards CoJ 64 (1.05) and CoPant 84211 (1.73) showed less susceptible reaction to stalk borer infestation. It's infestation index ranged from 1.05 in CoJ 64 to 2.11 in CoPb 08212 (Table:1d).

AVT (EARLY) RATOON

Under AVT (early) ratoon, three varieties viz; CoPb 08211, CoPb 08212, and CoS 08233 along with two standards CoJ 64 and CoPant 84211 were evaluated against major insect pests of the area.

During hot weather, all the varieties including standards showed less susceptible reaction to shoot borer. It ranged from 9.51 % in CoPant 84211 (standard) to 13.01% in CoPb 08211. Based on cumulative incidence of 3rd and 4th brood of top borer the variety CoPb 08211 (12.58%) including standard CoPant 84211 (11.32%) showed moderate susceptible reaction while rest of the varieties including standard CoJ 64 (8.85%) showed less susceptible reaction to top borer infestation. Regarding the stalk borer infestation, only the variety CoPb 08211 (3.31) showed moderate susceptible reaction while rest of the varieties including standards showed less susceptible reaction to stalk borer. It ranged from 1.16 in CoS 08233 to 3.31 in CoPb 08211 (Table: 1 e)

AVT (MID LATE) RATOON

Under AVT (mid late) ratoon, total six varieties viz; CoPb 08217, CoS 08234, CoS 08235, CoH 08262, CoH 08263, CoH 08264 along with three standards (checks) CoS 767, CoS 8436 and CoPant 87222 were evaluated against major insect pests of the area.

During hot weather, all the varieties including standards showed less susceptible to shoot borer. It ranged from 4.84% in CoH 08264 to 11.47% in CoPant 87222 (standard). Based on cumulative incidence of 3rd and 4th brood of top borer the varieties CoPb 08217 (14.12%), CoH 08262 (11.13%), CoH 08264 (12.33%) including standards CoS 767 (10.84%), CoS 8436 (13.02%)and CoPant 87222 (15.62%) showed moderate susceptible reaction while rest of the varieties showed less susceptible reaction to top borer. Regarding the stalk borer infestation only the standard variety CoS 767 (2.06) showed moderate susceptible reaction while rest of the varieties including standards showed less susceptible reaction to stalk borer. It's infestation index ranged from 1.57 in CoS 8436 (standard) to 2.06 in CoS 767 (standard) (Table:1f).

Project	**E. 28**
Title	Survey and surveillance of sugarcane insect pests.
Objective	To identify insect pests of sugarcane in the area.
Year of commencement	Regular feature
	Different factory zones of U.P.

Conclusion

Sugarcane fields around sugar factory area were surveyed to know the major insect pests of the area. During hot weather, the incidence of early shoot borer was moderate to high. It ranged from 16-18 % (minimum) around Biswan factory zone, while maximum 28-32% around Balrampur followed by Maqsudapur (25-28%) and Nigohi (23-25%). The maximum no. of pyrilla population / plant (15-20) was recorded at Sultanpur, followed by 12-16 pyrilla / leaf at Roza; 10-15 pyrilla / leaf at Nigohi and 8-10 pyrilla / leaf at Gola factory zones. The percent incidence of top borer was recorded low to moderate in all surveyed factory zones. It's infestation was recorded minimum 9-13% around Tilhar factory zone while maximum 12-16% around Maqsudapur factory zone. The infestation of stalk borer was ranged from 8-13% around sultanpur to 16-20% in Biswan factory zones.

Project	**E. 30**
Title	Monitoring of insect pests and bio-agents in sugarcane agro-ecosystem.
Objective	To monitor the key insect pests and natural enemies in the area.
Year of commencement	2006-07
Location	Shahjahanpur

Conclusion

An experiment was conducted on 0.2 ha area planted with CoS 07250 cultivars at Shahjahanpur to monitor the key insect pests and natural enemies. The incidence of early shoot borer was recorded 14.80 % in the month of May. The incidence of 2nd and 3rd brood of top borer was recorded as 3.20% and 5.00%, respectively. The cumulative incidence of top borer was recorded 15.40 % at harvest. The stalk borer infestation index was 2.31 at experimental plot.

- *Isotima javensis, Rhaconotus spp; Stenobracon deezae, telenomus beneficiens* were recorded major parasitoids of top borer. *Epiricania melanoleuca* was recorded as ectoparasitoid of *pyrilla perpusilla.* Minimum parasitisation 2.90% by *Isotima javensis* was recorded in the month of May. It increases gradually upto maximum 17.37 % in the month of August, thereafter it decreases upto 9.52% in the month of September. The parasitisation of top borer by *Rhaconotus spp*. Was observed with minimum 2.00 % in the month of June which increases upto 10.40 % in the month of August. The parasitisation of *Stenobracon deezae* was ranged from 2.23% (July) to 6.33 % in the month of September. *Telenomus beneficiens*, an egg parasitoid of top borer was recorded maximum 17.47 % in the month of July and reduces upto 4.26 % in the month of August. The parasitisation of pyrilla by *Epiricania melanoleuca* was increases from 14.00% in the month of June which gradually increases maximum upto 75.30% in the month of September.

Project	**E. 32**
Title	Management of borer complex of sugarcane through lures.
Objective	To manage sugarcane borers (early shoot borer, top borer and stalk borer) through pheromone trap.
Year of commencement	2012-13
Location	Shahjahanpur

Conclusion

The experiment was conducted on 0.4 ha area with CoS 07250 cultivar at Shahjahanpur; to study the management of borer complex of sugarcane (early shoot, top and stalk borer) through pheromone trap and influence of weather parameters on moth catches. Three pheromone traps for each pest were installed during 9th MW till the harvest of the crop. Total no. of moth trapped were recorded at weekly intervals. The mean no. of moth captured was worked out. The pheromone lure was changed after two month intervals.

Study reveals that highest no. (5.66 moths/trap) of shoot borer was recorded during 16th and 24th MW followed by 23th MW (4.66 moths/trap) and 15th MW (4.33 moths/trap); respectively. Top borer moth catches were recorded maximum (4.33 moths/trap) during 27th MW followed by 28th MW (3.66 moths/trap). The peak activity of stalk borer was observed maximum (4.33 moths/trap) during 38th MW followed by 3.66 moths/trap during 39th MW and 3.33 moths/trap during 27th MW respectively.

Moth catches of shoot borer was positively associated with maximum (r= 0.4660) and minimum temperature (r= 0.0180) while negatively correlated with morning and evening humidity (r= -0.4321, r= -0.4622). Top borer moth catches were found positively correlated with maximum (r= 0.0268) and minimum temperature (r= 0.1378), relative humidity (r= 0.0241; evening), while negatively associated with relative humidity (r=-0.0377; morning). The moth catches of stalk borer was observed

positively correlated with minimum temperature (r= 0.2980); relative humidity (r= 0.2841; morning). (r= 0.3432; evening). While negatively correlated with maximum temperature (r= -0.1381).

Incidence percent was also observed in treated (application of pheromone trap) and untreated plots (without pheromone trap). The incidence percent of shoot, top and stalk borer was recorded 12.00%, 4.50% (2nd brood), 5.35 % (3rd brood), 11.50% (at harvest) and 1.85 (infestation index of stalk borer) in treated plot respectively. While it was 14.60%, 5.80 % (2nd brood), 7.65 % (3rd brood), 13.10 % (at harvest) and 2.45 (infestation index of stalk borer) in untreated plots respectively.

TABLE- 1 a: AVT (MID LATE) I PLANT (2013-14)

S N.	VARIETIES	% INCIDENCE AT HOT WEATHER	% INCIDENCE AT HARVEST	
		SHOOT BORER	TOP BORER CUMULATIVE (3^{RD} and 4^{TH})	STALK BORER (INFESTATION INDEX)
1	Co 92022	7.39	7.73	2.09
2	CoS 09232	9.88	8.59	1.10
3	CoH 09264	9.62	9.15	0.71
4	CoLk 09204	8.87	10.35	1.04
5	CoPb 09214	16.87	13.48	1.09
6	CoS 767	10.44	7.53	1.01
7	CoS 8436	12.07	12.01	1.77
8	CoPant 87222	14.18	14.46	1.56

TABLE- 1 b: AVT (MIDLATE) II PLANT (2013-14)

S N	VARIETIES	% INCIDENCE AT HOT WEATHER	% INCIDENCE AT HARVEST	
		SHOOT BORER	TOP BORER CUMULATIVE (3RD AND 4TH)	STALK BORER (INFESTATION INDEX)
1	CoPb 08217	17.15	20.20	2.07
2	CoS 08234	4.84	10.27	2.12
3	CoS 08235	7.69	12.25	1.05
4	CoH 08262	13.12	11.30	1.41
5	CoH 08263	6.70	12.59	1.93
6	CoH 08264	6.33	9.49	1.39
7	CoS 767	5.19	8.60	1.90
8	CoS 8436	7.15	11.58	1.36
9	CoPant 87222	9.11	13.83	2.08

TABLE- 1 c: AVT (EARLY) I PLANT (2013-14)

S N	VARIETIES	% INCIDENCE AT HOT WEATHER	% INCIDENCE AT HARVEST	
		SHOOT BORER	TOP BORER CUMULATIVE (3RD and 4TH)	STALK BORER (INFESTATION INDEX)
1	CoPb 09181	16.03	8.65	1.53
2	CoLk 09202	5.68	6.34	1.27
3	CoS 09246	7.73	7.60	1.46
4	CoH 09262	7.75	6.03	1.46
5	CoH 09263	6.54	7.18	2.13
6	CoJ 64	6.53	10.92	1.42
7	CoPant 84211	8.67	9.06	2.48

TABLE- 1 d: AVT (EARLY) II PLANT (2013-14)

S N	VARIETIES	% INCIDENCE AT HOT WEATHER	% INCIDENCE AT HARVEST	
		SHOOT BORER	TOP BORER CUMULATIVE (3^{RD} and 4^{TH})	STALK BORER (INFESTATION INDEX)
1	CoPb 08211	20.60	8.97	1.78
2	CoPb 08212	13.39	16.99	2.11
3	CoS 08233	9.35	14.62	1.45
4	CoJ 64	9.73	9.74	1.05
5	CoPant 84211	10.18	10.42	1.73

TABLE- 1 e: AVT (EARLY) RATOON (2013-14)

S N	VARIETIES	% INCIDENCE AT HOT WEATHER	% INCIDENCE AT HARVEST	
		SHOOT BORER	TOP BORER CUMULATIVE (3^{RD} AND 4^{TH})	STALK BORER (INFESTATION INDEX)
1	CoPb 08211	13.01	12.58	3.31
2	CoPb 08212	11.09	9.88	1.33
3	CoS 08233	12.46	6.50	1.16
4	CoJ 64	11.88	8.85	1.43
5	CoPant 84211	9.51	11.32	1.46

TABLE- 1 f: AVT (MIDLATE) RATOON (2013-14)

S N	VARIETIES	% INCIDENCE AT HOT WEATHER	% INCIDENCE AT HARVEST	
		SHOOT BORER	TOP BORER CUMULATIVE (3^{RD} and 4^{TH})	STALK BORER (INFESTATION INDEX)
1	CoPb 08217	8.19	14.12	1.59
2	CoS 08234	7.31	9.40	1.86
3	CoS 08235	7.45	8.06	1.81
4	CoH 08262	9.47	11.13	1.92
5	CoH 08263	8.05	9.56	1.74
6	CoH 08264	4.84	12.33	1.63
7	CoS 767	7.67	10.84	2.06
8	CoS 8436	8.31	13.02	1.57
9	CoPant 87222	11.47	15.62	1.73

Table 2: Percent incidence of major insect pests in different factory zones of U.P.2013-14

SN	Name of factory zone	At hot weather		At harvest	
		Shoot borer (%)	Pyrilla/ leaf	Top borer (%)	Stalk Borer (%)
1	Azabapur (Kheri)	18-20	-	10-14	13-16
2	Biswan (Sitapur)	16-18	-	9-14	16-20
3	Gola (Kheri)	20-22	8-10	12-15	11-14
4	Roza (Shahjahanpur)	17-20	12-16	8-14	16-18
5	Nigohi (SPN)	23-25	10-15	11-14	15-17
6	Maqsudapur (SPN)	25-28	-	12-16	12-15
7	Sultanpur	16-20	15-20	9-14	8-13
8	Balrampur (Gonda)	28-32	-	11-15	9-14
9	Tilhar (SPN)	18-22	-	9-13	12-16

TABLE-3: NATURAL ENEMIES OF MAJOR INSECT PESTS OF SUGARCANE, PARASITISATION ALONG WITH METEOROLOGICAL DATA (COS 07250) 2013-14

Months	Temperature ^{0}C		R.H.%		Rain fall (mm)	No of rainy days-s	TOP BORER (PARASITIZED BY)				PYRILLA PARASITIZED BY
	Max..	Min.	F.N.	A.N.			*Isotima Javensis* %	*Rhaconotus* Sp. %	*Stenobracon deesae* %	*telenomus beneficiens*	*Epiricania melanoleuca*
April,13	36.80	20.20	57.53	29.70	4.0	2	-	-	-	-	-
May, 13	40.00	25.37	52.77	28.58	8.2	1	2.90	-	-	2.48	-
June,13	34.10	25.50	65.60	79.23	285.0	11	5.24	2.00	-	3.66	14.0
July, 13	32.80	26.30	79.03	86.61	490.0	17	13.42	6.44	2.23	17.47	25.30
Aug.,13	33.00	26.00	87.00	81.00	274.0	20	17.37	10.40	3.20	4.26	65.13
Sep.,13	33.40	24.90	84.40	74.93	89.8	8	9.52	3.36	6.33	-	75.30
Oct.,13	31.26	20.21	84.68	64.23	27.0	3	-	-	-	-	-

INCIDENCE OF MAJOR INSECT PESTS	**AT HARVEST**
(AT HOT WEATHER)	TOP BORER (CUMULATIVE)- 15.40%,
SHOOT BORER – 14.80%	STALK BORER (INFESTATION INDEX)- 2.31%
TOP BORER (2ND BROOD) – 3.20%, (3RD BROOD) – 5.00%	

TABLE 4: EFFECT OF PHEROMONE TRAP ON MOTH TRAPPING (2013-14)

Met. Week	Date	Shoot borer	Top borer	Stalk borer	Temperature ^{0}C		R.H. %		Rain fall(mm)/ days
					Max.	Min.	F.N.	A.N.	
9	26Mar'2013	0.33	0.66	0.66	26.20	12.00	81.10	56.40	-
10	5-11	1.33	1.00	1.00	30.00	14.40	87.70	48.80	-
11	12-18	1.66	2.00	1.33	30.40	15.50	80.70	39.40	-
12	19-25	2.66	1.66	2.33	31.50	17.50	73.40	44.70	1.6/1
13	26-01 APRIL	2.33	0.33	0.66	31.00	16.30	71.70	43.80	2.8/1
14	2-8	1.66	0.66	0.66	35.22	18.10	57.85	32.00	-
15	9-15	4.33	0.66	0.33	38.15	20.64	61.42	27.00	2.4/1
16	16-22	5.66	0.33	0.33	35.60	19.37	57.42	33.00	1.6/1
17	23-29	3.33	0.33	0.33	38.07	22.25	54.00	27.71	-
18	30-06 MAY	1.33	2.66	1.33	38.98	23.21	41.57	23.14	-
19	7-13	2.00	3.00	1.33	39.51	25.30	41.57	24.85	-
20	14-20	3.00	2.33	0.66	40.25	22.02	56.14	28.28	-
21	21-27	3.33	0.66	0.33	41.74	28.20	63.85	34.00	-
22	28-03 JUNE	1.66	0.33	2.66	37.00	25.15	66.71	43.85	8.2/1
23	04-10	4.66	0.33	3.00	36.52	26.22	74.57	53.71	16.2/1
24	11-17	5.66	0.66	2.33	33.84	24.91	76.28	67.00	121.2/5
25	18-24	2.33	0.20	2.00	33.30	25.47	82.42	68.00	94.4/2
26	25-01 JULY	0.66	0.66	0.66	33.92	25.48	88.00	80.57	62.7/4
27	2-8	1.33	4.33	2.33	32.11	26.68	86.57	81.71	185.6/3

28	9-15	1.66	3.66	2.66	32.92	25.61	89.28	69.57	49.2/3
29	16-22	2.33	1.66	1.33	32.24	25.95	90.14	84.84	189.4/5
30	23-29	2.33	0.66	0.66	33.75	26.62	81.42	75.71	62.0/4
31	30-05 AUG	0.66	0.66	0.33	34.07	26.42	81.85	74.14	13.8/5
32	06-12	0.66	1.00	0.66	31.60	25.74	92.00	87.71	93.4/6
33	13-19	1.00	2.00	1.33	32.82	25.15	90.71	80.00	109.3/6
34	20-26	1.00	1.66	2.00	34.43	26.81	81.57	79.57	15.6/2
35	27-02 SEP	0.33	1.66	1.66	32.24	25.50	91.28	88.00	52.2/6
36	03-09	0.33	0.33	1.00	33.32	25.11	84.00	73.71	20.6/1
37	10-16	-	0.33	2.33	34.07	24.05	83.85	74.28	38.0/1
38	17-23	-	0.66	4.33	33.22	24.64	82.42	68.57	1.0/1
39	24-30	-	0.66	3.66	33.05	25.01	89.42	81.00	22.4/3
40	01-07 OCT	-	-	2.00	30.27	22.84	84.57	73.71	16.0/2
41	08-14	-	-	2.33	32.58	22.07	83.57	67.14	10.6/1
42	15-21	-	-	1.00	31.44	20.14	84.42	65.57	-
43	22-28	-	-	0.66	31.12	17.75	88.71	55.71	-

CORRELATION COEFFICIENT

	Shoot borer	Top Borer	Stalk borer
Max Tem	0.4660	0.0268	-0.1381
Min Tem	0.0180	0.1378	0.2980
RH% FN	-0.4321	-0.0377	0.2841
RH% AN	-0.4622	0.0241	0.3432

% incidence of insect pest		
Insect-Pest	Treated (pheromone trap)	Untreated (without pheromone trap)
Shoot borer	12.00	14.60
Top borer (2nd brood)	4.50	5.80
Top borer (3nd brood)	5.35	7.65
Top borer (at harvest)	11.50	13.10
Stalk borer (infestation index)	1.85	2.45