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ALL INDIA CO-ORDINATED RESEARCH PROJECT

ON

SUGARCANE

(INDIAN COUNCIL OF AGRICULTURE RESEARCH)

TECHNICAL REPORT

OF

SUGARCANE ENTOMOLOGY

(2014-15)

CENTRE: PUSA (BIHAR)

SUGARCANE RESEARCH INSTITUTE
RAJENDRA AGRICULTURAL UNIVERSITY
BIHAR, PUSA (SAMASTIPUR)-848125

Annual Report of All India Co-ordinated Research Project on Entomology
Department of Entomology, Sugarcane Research Institute
Rajendra Agricultural University, Bihar, Pusa-848125
(2014-15)

Project No. E. 4.1

(i)	Project Title	:	Evaluation of zonal varieties/genotypes for their reaction against major insect pests of sugarcane.
(ii)	Objective	:	To grade entries in the zonal varietal trials for their behaviour towards damage by key pests in the areas.
(iii)	Period under report	:	2014-15
(iv)	Year of Start	:	1985-86
(v)	Location	:	Sugarcane Research Institute, Pusa, Bihar
(vi)	Technical Programme	:	2014-15
(vii)	Replication	:	03
(viii)	Plot Size	:	06 Meter long.
(ix)	Row to row	:	90 cm (Spacing)

Technical Summary

forty three (33) varieties/genotypes comprising of 6 IVT E, 6 IVT M II P, 10 IVT M, 6 AVT M II P and 5AVT M II P including standard check were evaluated against Root borer, Shoot borer, Top borer and Stalk borer at SRI, Pusa (Table 1a-c).

The cumulative incidence of early shoot borer was recorded as lowest (5.51 %) in varietyCoSe 09452 IVT E and highest (12.64%) in variety CoP 9301 Std. IVT M. The genotype tested under different maturity groups are graded under less susceptible reaction against early shoot borer. While, incidence of Root borer was found minimum (3.48%) in variety CoSe 11456 IVT M and maximum (9.62%) in variety CoSe 10453 AVT M I P graded as less susceptible reaction. The incidence of Top borer was recorded as low to moderate which varied 5.12% in varietyCoP 11438 IVT E and 10.69% in variety CoP 9301 Std.IVT M against 3rd brood, while 8.28% in variety CoP 11438 IVT E and 13.24% in variety CoSe 11454 IVT M against 4th brood of top borer. All the genotypes evaluated under different maturity groups exhibited less to moderately susceptible reaction against Top borer based on 4th brood incidence. The Stalk borer infestation index was varied from untraceable to 0.06 per cent and showed less susceptible reaction for all tested genotype.

Table 1a. E. 4.1. Evaluation of Zonal variety/genotype of reaction against borer pest of sugarcane.

S.N.	Varieties/ genotypes	Early shoot borer (% incidence)						Top borer (% incidence)			Stalk borer				Root borer % incidence	Reaction
		30 DAP	60 DAP	90 DAP	120 DAP	Cumm.	Reaction	III Brood 5th month	IV Brood 7th month	Reaction *	% incid-ence	% intensity	Infestation on index	Reaction		
IVT (Early)																
1	CoSe 11451	3.12	6.38	1.02	2.22	11.22	LS	7.05	10.88	MS	1.33	0.15	0.001	LS	9.32	LS
2	CoP 11436	0.00	5.12	9.81	3.96	8.73	LS	7.81	10.24	MS	0.00	0.00	0.00	LS	8.69	LS
3	Cop 11437	2.70	6.25	5.17	3.09	10.27	LS	7.31	10.14	MS	2.66	0.41	0.01	LS	7.39	LS
4	Cop 11438	0.00	5.00	3.40	2.96	8.24	LS	5.12	8.28	LS	0.00	0.00	0.00	LS	9.33	LS
5	BO 130 Std.	2.56	3.94	4.08	3.08	8.72	LS	6.40	8.58	LS	0.00	0.00	0.00	LS	5.33	LS
6	CoSe 95422	0.00	3.84	3.62	1.88	6.02	LS	7.34	10.69	MS	4.00	0.30	0.01	LS	5.93	LS
IVT Midlate 11 P																
1	BO 153	2.32	4.05	5.22	3.57	9.49	LS	7.47	10.17	MS	8.00	0.48	0.03	LS	7.35	LS
2	CoP 08436	0.00	6.52	2.94	2.98	7.14	LS	5.94	9.92	LS	5.33	0.67	0.03	LS	6.11	LS
3	CoSe 09452	0.00	2.85	3.63	3.22	5.51	LS	6.63	10.20	MS	0.00	0.00	0.00	LS	9.57	LS
4	UP 09453	3.12	5.0	5.31	1.58	8.14	LS	5.27	9.52	LS	0.00	0.00	0.00	LS	9.42	LS
5	BO 130 Std.	0.00	10.0	4.04	2.40	8.95	LS	8.05	9.20	LS	0.00	0.00	0.00	LS	7.86	LS
6	CoSe 95422 Std.	0.00	10.86	2.98	2.33	7.22	LS	6.73	10.77	MS	6.66	0.58	0.03	LS	9.12	LS

* Based on fourth brood % incidence

Table 1b. E. 4.1. Evaluation of Zonal variety/genotype of reaction against borer pest of sugarcane.

S.N.	Varieties/ genotypes	Early shoot borer (% incidence)						Top borer (% incidence)			Stalk borer				Root borer % incidence	Reaction
		30 DAP	60 DAP	90 DAP	120 DAP	Cumm.	Reaction	III Brood 5th month	IV Brood 7th month	Reaction *	% incidence	% intensity	Infestation on index	Reaction		
IVT Midlate																
1	BO 155	5.71	10.00	2.77	2.80	7.96	LS	7.62	10.41	MS	4.00	0.60	0.02	LS	8.47	LS
2	CoP 11439	4.76	7.69	2.43	2.52	8.28	LS	7.06	11.35	MS	9.33	0.36	0.03	LS	9.33	LS
3	CoP 11440	4.26	11.11	4.91	2.15	6.84	LS	6.27	9.11	LS	0.00	0.00	0.00	LS	6.67	LS
4	CoSe 11453	2.70	6.97	4.10	2.45	9.65	LS	9.16	11.20	MS	8.00	0.46	0.03	LS	8.79	LS
5	CoSe 11454	5.88	3.89	3.54	1.77	6.21	LS	7.25	13.24	MS	9.33	0.75	0.04	LS	9.12	LS
6	CoSe 11455	3.03	6.06	2.05	3.40	8.10	LS	7.79	11.65	MS	0.00	0.00	0.00	LS	7.25	LS
7	CoSe 11456	0.00	5.97	2.14	1.25	5.98	LS	9.42	10.80	MS	0.00	0.00	0.00	LS	3.48	LS
8	BO 91 Std.	4.08	5.93	3.33	2.27	9.47	LS	8.55	8.81	LS	0.00	0.00	0.00	LS	8.86	LS
9	CoP 9301 Std.	6.12	4.59	4.61	1.29	12.64	LS	10.69	9.79	LS	0.00	0.00	0.00	LS	5.68	LS
10	CoSe 92423 Std.	3.70	10.20	3.24	2.59	8.25	LS	9.36	11.32	MS	1.33	0.41	0.005	LS	7.37	LS

* Based on fourth brood % incidence

Table 1c. E. 4.1. Evaluation of Zonal variety/genotype of reaction against borer pest of sugarcane.

S.N.	Varieties/ genotypes	Early shoot borer (% incidence)						Top borer (% incidence)			Stalk borer				Root borer % incidence	Reaction
		30 DAP	60 DAP	90 DAP	120 DAP	Cumm.	Reaction	III Brood 5th month	IV Brood 7th month	Reaction *	% incidence	% intensity	Infestation on index	Reation		
AVT Midlate 1 P																
1	CoSe 10451	3.22	10.0	2.58	1.91	7.22	LS	8.84	11.55	MS	8.00	.083	0.06	LS	7.45	LS
2	CoSe 10452	6.06	6.45	2.04	1.64	6.28	LS	7.31	9.52	LS	0.00	0.00	0.00	LS	6.88	LS
3	CoSe 10453	5.40	6.25	3.38	2.45	7.51	LS	8.44	11.81	MS	5.33	0.58	0.03	LS	9.62	LS
4	BO91 Std.	3.12	7.04	1.97	3.22	11.76	LS	7.23	9.52	LS	0.00	0.00	0.00	LS	7.73	LS
5	Cop 9301 Std.	3.22	6.25	2.91	2.70	6.73	LS	6.94	10.34	MS	0.00	0.00	0.00	LS	5.43	LS
6	CoSe 95423 Std.	4.65	9.83	2.27	3.01	11.00	LS	8.82	11.00	MS	2.66	0.67	0.01	LS	7.23	LS
AVT Midlate 11 P																
1	BO 154	5.40	7.04	1.48	3.38	8.06	LS	9.81	9.90	LS	0.00	0.00	0.00	LS	6.39	LS
2	CoP 09437	7.69	7.63	3.41	2.50	8.75	LS	8.18	10.75	MS	2.66	0.50	0.01	LS	8.48	LS
3	BO 91 Std.	0.00	5.17	4.22	3.07	6.66	LS	8.12	10.46	MS	1.33	0.36	0.004	LS	5.36	LS
4	CoP 9301 Std.	4.76	9.37	5.35	3.12	9.70	LS	9.94	10.16	MS	4.00	0.53	0.02	LS	8.21	LS
5	CoSe 95423Std	0.00	8.10	6.39	3.09	9.23	LS	8.35	9.29	LS	0.00	0.00	0.00	LS	7.78	LS

* Based on fourth brood % incidence

Project No. E-28

(i)	Project Title	:	Survey and surveillance of sugarcane insect pests.
(ii)	Objective	:	To identify key insect pests of sugarcane in the area.
(iii)	Period under report	:	2014-15 :
(iv)	Year of Start	:	2003-04
(v)	Location	:	Sugarcane Research Institute, Pusa, Bihar
(vi)	Technical Programme	:	2014-15

Technical summary

A Survey was conducted on the insect pests of sugarcane under the reserved area ofHarinagar, Narkitayaganj, Sidhwaliaand Hasanpur sugar factory during cropping season 2014-15. The percent incidence of early shoot borer (3 to 16%), Root borer (2 to 9%), Top borer (5 to 15%), Stalk borer below 5%, and Pyrilla (15 to 70) per leaf were observed as the key pests of Sugar Factories reserved area of sugarcane .The incidence of other pest like Plassey borer, Mealy bug, Termite, Grass hopper, Scale insect, White fly, Army worm etc. were also recorded in traces. Besides, Sugar Mills reserved area, a roving survey was also conducted at sugarcane field in and around Pusa at monthly interval. The per cent incidence of early Shoot borer, Root borer, Top borer were varied from 2.23 to 9.33,1.27 to8.67 and 6.10 to 10.82,respectively.While, Pyrilla was observed 5-15 per leafat Pusa Farm.

Table 2. Survey and Surveillance of sugarcane insect pests at SRI, Pusa

Sl. No.	Variety	Location	Name of pest	% incidence		
				Min.	Max.	Average
1.	Cos 767 BO 147 CoSe 92423 CoP 9301	Harinagar	ESB	4	16	10
			Top borer	7	15	11
			Pyrilla / leaf	15	25	20
			Black bug,white fly & Stalk borer	Trace	Trace	Trace
2.	Bo-147 Cos-0238,BO 91	Narkatiyaganj	ESB	3	9	6
			Top borer	9	14	11.5
			Pyrilla / leaf	15	40	27.5
3.	Co 0235,239,118 ,BO 91,141,ColK 7701	Hasanpur	ESB	3	9	6
			Top borer	5	11	8
			Pyrilla / leaf	30	70	50
4.	BO 153 ,BO 141,BO 154,BO 139,CoP 2061	Pusa Farm	ESB	2.23	9.33	5.88
			Root borer	1.27	8.67	4.94
			Top borer	6.10	10.82	8.46
			Pyrilla / leaf	5	15	10
5.	BO 91,BO 141,CoSe 92423	Sidwalia	Top borer	6	13	9.5
			Stalk borer	2	5	3.5
			Pyrilla / leaf	20	25	22.5
			Scale insect	Trace	Trace	Trace
				Trace	Trace	Trace

Project No. E-30

1.	Project Title	:	Monitoring of insect pests and bio-agents in sugarcane agro-ecosystem.
2.	Objective	:	To grade entries in the zonal varietal trials for their behaviour towards damage by key pests in the area.
3.	Project No.	:	**E-30**
4.	Period under report	:	2014-15
5.	Year of Start	:	2007-08
6.	Location	:	Sugarcane Research Institute, Pusa, Bihar
7.	Plot size	:	0.2 hectare
8.	Duration	:	Long term
9.	Variety	:	BO 141
10	Metrological data	:	Yes (Monthly average)

Technical Summary:-

Sugarcane variety BO 141was planted in 0.2 hectare area. The population of Root borer, Shoot borer, Top borer, Stalk borer, Pyrilla, and their natural enemies were recordedat monthly interval during cropping season 2014-15 at Pusa Farm of Sugarcane Research Institute. The data on monitoring of insect pest and its bio-agent revealed that the mean per cent incidence of Root borer , Shoot borer ,Top borer and Stalk borer were varied from 1.3 to7.6% ,1.6% to 9.3%, traces to 11.3% and 1.3 to 5.2%,respectively.Whereas,the incidence of sugarcane Pyrilla was recorded which varied from traces to 3.7/leaf .

The bio-agents of Root and Early shoot borer were not appeared during cropping season 2014-15. While, parasitization of bio-agents such as, *Apantelisflavipes* , *Rhanconotus. scirpophagae and Stenobracondeesae*were recorded against top borer. The data presented in table 3a-b revealed that population of S. *deesae* varied from 0.55 to 7.3% during May to October. Whereits peaks (7.33%) noticed in September. Population of *Apantelisflavipes* was ranged between 0.43 to 8.3 % during May to November with its highest population (8.3%) was recorded in month of September. The activity of *R. scirpophagae*was recorded form August to October with its peak (4.3%) in month of September. The parasitization of *T. pyrillae* and *E. melanoleuca* was recorded from May to November and their highestparasitization per cent was recorded 29.00% and 22.6%, respectively in month of October. In case of Stalk borer, the parasitization of *Apantalisflavipes*was also recorded but noticed in traces.

Table : 3a. E.30 Monitoring of insect pest and natural enemies of Sugarcane (0.2 ha area)

Period of observation	% incidence top borer	% Parastitism (Top borer)			% incidence of shoot borer	% incidence of root borer	% Parssitism of (root and shoot borer) if any
		A. flavipes	*R. scripophagae*	*S. deesae*			
January	-	-	-	-	-	-	Not observed
February	-	-	-	-	-	-	
March	2.7	-	-	-	3.6	2.1	
April	6.7	-	-	-	5.6	3.9	
May	9.4	.43	-	0.55	9.3	7.6	
June	11.3	2.3	-	1.3	5.1	4.2	
July	10.6	4.9	0.9	3.6	1.6	1.3	
August	7.5	6.6	2.6	5.1	-	-	
September	5.9	8.3	4.3	7.3	-	-	
October	3.2	4.3	1.3	3.6	-	-	
November	Trace	1.3	-	-	-	-	
December	Trace	-	--	-	-	-	

Table : 3b. E.30 Monitoring of insect pest and natural enemies of Sugarcane (0.2 ha area)

Period of observation	Pyrilla/leaf	% Parasitism (Pyrilla)		% incidence of stalk borer	% parasitism (stalk borer)
		T. pyrillae	*E. melanoleuca*		*A. flavipes*
January	-	-	-	-	-
February	-	-	-	-	-
March	**1.3**	-	-	-	-
April	2.5	-	1.3	-	-
May	3.7	-	6.6	-	-
June	2.3	-	-	-	-
July	0.8	-	-	1.32	-
August	1.6	**24.00**	12.00	3.63	Trace
September	3.1	21.00	20.00	5.23	Trace
October	2.6	29.00	22.6	4.36	Trace
November	2.1	16.00	14.3	2.65	-
December	Trace	-	-		-

Table 4. Meteorological data during crop season 2013-14

Month	Temperature		Relative humidity (%)		Rainfall (mm)
	Max.	Min.	7 hrs.	14 hrs.	
March, 2014	29.80	15.20	83.6	40.80	5.30
April, 2014	37.05	19.50	68.6	28.30	0.00
May, 2014	37.60	24.10	72.10	49.70	32.00
June, 2014	36.20	26.35	82.95	58.75	46.60
July, 2014	32.55	26.50	88.85	73.10	169.4
August, 2014	32.70	26.20	90.80	76.80	175.85
September, 2014	32.50	25.75	90.70	71.80	64.7
October, 2014	31.45	21.40	90.90	58.25	40.8
November, 2014	28.60	13.90	87.10	40.85	0.00
December, 2014	19.85	10.05	92.10	70.85	0.00
January, 2015	19.35	11.00	9.35	10.70	105.10
February, 2015	24.65	12.30	89.95	58.50	0.60

Project No. E-36

1.	Project Title	:	Management of borer complex of sugarcane through lures.
2.	Objective	:	To manage sugarcane borer (early shoot borer, top borer and stalk borer) through pheromone traps.
3.	Period under report	:	2014-15
5.	Year of Start	:	2012-13
6.	Location	:	Sugarcane Research Institute, Pusa, Bihar
7.	Plot size	:	01 acre
8.	Duration	:	Long term
9.	Variety	:	CoP 2061

Technical Summary:-

The experiment was conducted with variety CoP 2061 at Pusa to study the management of borer complex of sugarcane (ESB, TB and SB) through lures. The data presented in table 4a revealed that the activity of ESB started from 1st fortnight of March to 1st fortnight of July, while the highest no of moths were trapped in 2nd fortnight of April (4.99/trap).The incidence of ESB in treated plot and untreated plots were 8.37 and 9.12 per cent, respectively.Whereas, the activity of TB started from 2nd fortnight of March to 1st fortnight with maximum moth trapped in 1st fortnight in June (4.83 moth/trap). However, the incidences of treated and untreated plot were 11.57 and 13.33 per cent, respectively.The activity of stalk borer started from 1st fortnight of July to 1st fortnight of October with maximum moth trapped in 2nd fortnight of September (1.33 moth/trap).The incidence of stalk borer in treated and untreated plot was 3.67 and 4.56 per cent, respectively.

Table 5a: Moth Catch of borer complex of sugarcane through lures at Pusa (2014-15)

Months/year	Fortnightly Interval	Temperature (^{0}C)		Relative humidity (%)		Rainfall (mm)	No of moth trapped		
		Maximum	Minimum	07 00 hrs.	14 00 hrs.		ESB	TB	SB
March, 2014	I	26.9	13.2	88.8	46.6	10.6	1.00	0.00	0.00
	II	32.7	17.2	77.8	35.1	0.0	1.99	0.00	0.00
April, 2014	I	35.7	18.0	71.6	31.6	0.0	3.33	0.99	0.00
	II	38.4	21.0	65.6	25.0	0.0	4.99	1.66	0.00
May, 2014	I	38.6	24.2	67.0	35.8	1.3	3.99	1.99	0.00
	II	36.6	24.0	77.2	40.5	62.7	3.66	2.33	0.00
June, 2014	I	36.5	26.6	82.5	53.8	24.6	1.33	4.83	0.00
	II	35.9	26.1	83.4	63.7	68.6	0.33	2.49	0.00
July, 2014	I	32.8	26.6	89.6	74.3	212.6	0.33	3.99	0.16
	II	32.3	26.4	88.1	71.9	127.2	0.00	2.83	0.89
August, 2014	I	32.9	26.5	90.5	78.2	270.2	0.00	1.99	0.99
	II	32.5	25.9	91.2	73.9	81.7	0.00	0.83	0.83
September, 2014	I	32.4	25.6	90.2	69.7	61.2	0.00	0.33	1.00
	II	32.5	25.9	91.2	73.9	68.2	0.00	0.33	1.33
October, 2014	I	32.7	23.6	91.4	63.9	81.6	0.00	0.16	0.50
	II	30.2	19.2	90.4	52.6	0.0	0.00	0.00	0.00
November, 2014	I	30.0	16.2	88.8	43.8	0.0	0.00	0.00	0.00
	II	27.2	11.6	85.4	37.9	0.0	0.00	0.00	0.00
December, 2014	I	21.3	12.6	92.9	71.7	0.0	0.00	0.00	0.00
	II	18.4	8.5	91.3	70.0	0.0	0.00	0.00	0.00
January, 2015	I	19.4	10.1	9.8	11.3	1074	0.00	0.00	0.00
	II	19.3	11.9	8.9	10.1	1028	0.00	0.00	0.00
February, 2015	I	23.1	9.3	88.6	50.5	0.0	0.00	0.00	0.00
	II	26.2	15.3	91.3	61.5	1.2	0.00	0.00	0.00

Table 5b: Correlation analysis between moth catches and weather parameters at Pusa (2014-15)

Borer complex	Temperature ^{0}C		Relative humidity %		Rainfall (mm)
	Max.	Min.	7hrs.	14hrs.	
ESB	0.5974**	0.1871	-0.1577	-0.4675*	0.2335
TB	0.6050**	0.6856**	0.115	0.2186	-0.0998
SB	0.224	0.577**	0.2939	0.5967**	-0.0276
Significant at 5% level (r± =0.4227) Significant at 1% level (r± = 0.5368)					

Table 5c: Impact of moth catches of borer complex of sugarcane through lures at pusa (2014-15)

Treatment	% incidence of borer complex		
	Early shoot borer	Top borer	Stalk borer
With pheromone traps	8.37	11.57	3.67
Without pheromone traps	9.12	13.33	4.56

Project No. E-37

1.	Project Title	:	Bio-efficacy of newer 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.	Period under report	:	2014-15
5.	Year of Start	:	2013-14
6.	Location	:	Sugarcane Research Institute, Pusa, Bihar
7.	Plot size	:	6 x 5.4 M2
8.	Design	:	RBD
9.	Variety	:	CoP 2061

Technical Summary:-

Data summarized in table 6, It reveals from the tablethat Chlorantraniliprol 18.5 SC@375ml/ha was superior when it was spray at 30DAP and 60DAP as recorded maximum germination (32.89 %),lest cumulative incidence of ESB (3.18%) and highest yield (90.33t/ha) followed by Chlorantraniliprol 0.4 G and Flubendiamide being32.52%, 3.72%,88.83t/ha and 29.93%, 4.11% and 88.16t/ha,respectively.However,remaining treatments were at significant over control.

The present study among the insecticides, the order of performance were Chlorantraniliprole 18.5SC>Chlorantraniliprole 0.4G>Flubendiamide>Fipronil 0.3G>Carbofuran 3 G>Phorate 10 G>Spinosad 45SC

Table6.Bioefficacy of new insecticides for the control of sugarcane early shoot borer at Pusa (2014-15)

Treat. No.	Treatment details	Germination (%)	Cumulative % incidence of ESB	Yield (t/ha)
T_1-	Fipronil 0.3G@ 25kg/ha	29.87	4.75	86.80
T_2-	Chlorantraniliprole 0.4G @ 22.5 kg/ha	32.52	3.72	88.83
T_3-	Chlorantraniliprole 18.5SC @ 375ml/ha	32.89	3.18	90.33
T_4-	Spinosad 45SC@ 90ml/ha	28.73	7.68	83.33
T_5-	Flubendiamide @250ml/ha	29.93	4.11	88.16
T_6-	Phorate 10 G @15kg/ha	29.14	6.80	84.23
T_7-	Carbofuran 3 G @ 33 kg/ha	29.25	5.30	84.56
T_8-	Untreated Control	28.21	12.55	71.30
	SEm±	1.82	0.40	3.24
	CD at 5%	5.54	1.23	9.84
	CV %	10.55	11.76	6.63