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ALL INDIA CO-ORDINATED RESEARCH PROJECT

ON

SUGARCANE

(INDIAN COUNCIL OF AGRICULTURE RESEARCH)

TECHNICAL REPORT

OF

SUGARCANE ENTOMOLOGY

(2016-17)

CENTRE: PUSA (BIHAR)

SUGARCANE RESEARCH INSTITUTE
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Annual Report of All India Co-ordinated Research Project on Entomology
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(2016-17)

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	:	2016-17
(iv)	Year of Start	:	1985-86
(v)	Location	:	Sugarcane Research Institute, Pusa, Bihar
(vi)	Technical Programme	:	2016-17
(vii)	Replication	:	03
(viii)	Plot Size	:	06 Meter long.
(ix)	Row to row	:	90 cm (Spacing)

Technical Summary

Thirty six varieties/genotypes compressing of 6 IVT, 5 AVT E 1P, 6 IVT M, 6 AVT M IP, 7 AVT M IIP and 6 AVT IIP including standard check were evaluated against root, shoot, top and stalk borer at SRI, Pusa (Table 1-1f).

The cumulative incidence of early shoot borer was recorded as lowest (6.75 %) in varietyCoLK12207 AVTE IP and highest (16.31%) in variety CoSe11454 (Std.) AVT M IIP. The genotype tested under different maturity groups are graded under less to moderately susceptible reaction against early shoot borer. While, incidence of root borer was found minimum (6.99%) in variety CoP13436 IVT E and maximum (10.25%) in variety CoSe11544 AVT M IIP graded as less susceptible reaction. The incidence of top borer was recorded as less to moderate being 7.90.36% in variety CoSe 13451 AVT E and 11.03% in variety CoSe 92423 AVT M IP 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 0.48 per cent and showed less susceptible reaction for all tested genotypes.

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 index	Reaction		
IVT (Early)4+2																
1	CoP 13436	0.00	12.6	9.32	4.60	11.71	LS	8.64	11.30	MS	0.00	0.00	0.00	LS	6.99	LS
2	CoP 13437	0.00	8.50	5.32	4.10	9.76	LS	9.02	9.73	LS	4.32	2.33	0.10	LS	7.35	LS
3	CoSe 13451	12.20	9.15	5.50	6.07	14.5	LS	8.32	7.90	LS	0.10	0.75	0.00	LS	6.89	LS
4	CoSe 13452	6.70	9.10	7.85	3.95	15.30	MS	8.15	9.30	LS	1.96	1.22	0.02	LS	8.60	LS
5	BO 130 (Std.)	6.20	7.30	4.90	4.20	14.36	LS	5.94	8.10	LS	0.05	0.55	0.03	LS	8.08	LS
6	CoSe 95422 (Std.)	6.35	7.50	7.20	6.35	15.72	MS	7.96	10.03	MS	0.10	0.85	0.00	LS	8.35	LS

*** Reaction based on 4th brood percent 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	% incid-ence	% intensity	Infestation index	Reaction		
AVT (Early)1st plant 3 +2																
1	CoLK 12207	0.00	6.78	6.50	2.00	6.75	LS	6.90	8.20	LS	0.00	0.00	0.00	LS	7.50	LS
2	CoP 12436	5.10	7.15	6.35	4.38	15.86	MS	7.36	10.10	MS	2.56	2.15	0.05	LS	8.35	LS
3	CoSe 12451	0.00	7.85	6.98	1.90	8.67	LS	7.30	9.40	LS	0.80	3.15	0.02	LS	8.20	LS
4	BO 130 (Std.)	0.00	9.20	8.32	3.10	14.36	LS	7.38	8.30	LS	0.15	4.25	0.00	LS	9.10	LS
5	CoSe 95422 (Std.)	12.10	13.30	6.98	2.90	15.72	MS	8.30	9.40	LS	4.98	7.75	0.09	LS	9.76	LS

***Reaction based on 4th brood percent 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	% incid-ence	% intensity	Infestation index	Reaction		
IVT (Midlate)4 + 2																
1	CoP 13438	11.00	9.10	7.95	2.50	13.45	LS	6.80	7.30	LS	0.80	1.25	0.01	LS	7.35	LS
2	CoP 13439	9.65	7.00	7.10	3.85	10.75	LS	8.30	10.10	MS	0.75	1.50	0.01	LS	8.20	LS
3	CoSe 13453	2.65	11.20	7.56	1.80	9.30	LS	8.75	9.85	LS	5.60	6.70	0.37	LS	7.56	LS
4	CoSe 13454	3.95	10.78	5.30	3.00	11.25	LS	8.35	9.50	LS	3.20	1.30	0.04	LS	7.98	LS
5	BO 191 (Std.)	1.08	9.30	7.35	2.89	12.65	LS	7.30	10.00	LS	1.95	2.53	0.05	LS	9.30	LS
6	CoP 9301 (Std.)	10.30	7.80	6.98	4.00	14.30	LS	7.50	10.05	MS	3.80	2.65	0.10	LS	9.50	LS

***Reaction based on 4th brood percent incidence**

Table 1d. 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 index	Reaction		
AVT (Midlate) 1st plant 4 + 2																
1	CoLK 09204	6.72	9.25	6.30	1.95	12.09	LS	7.35	9.00	LS	0.50	1.35	0.00	LS	7.35	
2	CoP 12438	8.30	7.53	6.30	1.98	11.10	LS	8.10	9.95	LS	1.32	1.75	0.02	LS	9.00	
3	CoLK 12209	8.50	5.30	7.00	3.20	10.24	LS	7.30	10.10	MS	0.80	2.01	0.02	LS	8.50	
4	Cose 12453	11.90	13.95	10.25	5.60	14.80	LS	8.75	10.25	MS	1.00	1.45	0.01	LS	9.35	
5	BO 91 (Std.)	1.08	9.30	7.35	2.85	12.65	LS	6.90	9.50	LS	0.30	1.50	0.00	LS	8.95	
6	CoP 9301 (Std.)	1030	7.80	6.98	4.00	14.30	LS	8.05	9.30	LS	3.80	1.02	0.04	LS	9.30	

***Reaction based on 4th brood percent incidence**

Table 1e. 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 index	Reaction		
AVT (Midlate)- II Plant 4 + 3																
1	BO 155	6.25	6.20	5.90	1.90	10.83	LS	7.30	9.85	LS	2.60	5.40	0.40	LS	9.80	LS
2	CoSe 11453	7.50	8.10	6.50	1.90	9.17	LS	8.30	10.90	MS	2.66	0.75	0.02	LS	10.10	LS
3	CoSe 11454	11.00	9.90	8.80	3.35	16.58	MS	8.75	9.25	LS	0.10	1.05	0.00	LS	10.25	LS
4	CoSe 11455	0.00	7.60	7.00	2.40	8.62	LS	8.90	10.30	MS	0.15	0.75	0.00	LS	9.98	LS
5	BO 91(Std.)	1.08	9.30	7.35	2.85	12.65	LS	7.35	9.20	LS	0.20	0.10	0.00	LS	9.70	LS
6	CoP 9301 (Std.)	10.30	7.80	6.98	4.00	14.30	LS	6.75	9.50	LS	3.00	4.00	0.12	LS	9.80	LS
7	CoSe 92423(std.)	13.60	14.90	8.10	4.10	16.31	MS	8.10	11.03	MS	5.30	9.10	0.48	LS	10.10	LS

***Reaction based on 4th brood percent incidence**

Table 1f. 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 index	Reaction		
AVT (Early)- II Plant - 4 + 2																
1	CoP 11436	1.05	8.70	6.70	5.45	10.05	LS	6.80	8.70	LS	0.10	1.05	0.00	LS	7.48	LS
2	CoP 11437	2.01	9.70	7.25	6.15	12.25	LS	7.70	8.20	LS	1.20	0.75	0.00	LS	8.35	LS
3	CoP 11438	3.35	8.70	8.00	7.50	14.08	LS	8.95	10.35	MS	0.00	0.50	0.00	LS	8.20	LS
4	CoP 11451	12.66	10.01	6.70	8.75	15.80	MS	8.30	9.25	LS	4.35	1.25	0.05	LS	9.05	LS
5	BO 130	6.20	7.30	4.90	4.20	14.36	LS	8.50	9.00	LS	3.20	4.25	0.14	LS	8.20	LS
6	CoSe 95422	6.35	7.50	7.20	6.35	15.72	MS	8.20	9.20	LS	2.80	1.75	0.05	LS	8.90	LS

***Reaction based on 4th brood percent 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	:	2016-17 :
(iv)	Year of start	:	2003-04
(v)	Location	:	Sugarcane Research Institute, DRPCAU, Pusa, Bihar
(vi)	Technical programme	:	2016-17

Technical Summary

A Survey was conducted on the insect pests of sugarcane under different village of reserved area ofHasanpur sugar factory during cropping season of 2016-17. The percent incidence of early shoot borer (5.5 to 11.5%), root borer (3 to 6%), top borer (10.5 to 17.5%), stalk borer below5%, army worm (6.5 to 15.5%) and pyrilla (6.5 to 19) per leaf were observed as the key pests of sugar factory reserved area of sugarcane .The incidence of other pests like Plassey borer, Mealy bug, Termite, Grass hopper, Scale insect, White fly, 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 and Stalk borer were varied from 2.0 to 9.0%, 2.0 to8.0% and 5.0 to 16.0%, and 1.0 to 7.0%, respectively. While, Pyrilla was observed 5-14 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.	BO 130, CoSe 95422, CoP 2061, Co 238	Kalyanpur	Root borer	02	04	3.0
			Pyrilla/leaves	05	20	12.50
			Shoot borer	08	15	11.50
			Top borer	10	35	17.50
2.	CoP 9301, Co 235, BO 153	Masina	Pyrilla	08	30	19.00
			Shoot borer	05	14	9.50
			Root borer	02	10	6.00
3.	Co 239, BO 91, CoP 12436	Chhatneshwar	Pyrilla	05	25	15.00
			Army warm	05	13	9.00
4.	BO 91, Co 238, CoVS 13102, BO 130, CoP 2061, CoP 9301	SRI, Museum	Pyrilla	03	10	6.50
			Top borer	10	20	15.00
			Army warm	05	08	6.50
			Shoot borer	05	10	7.50
			Stalk borer	01	04	2.50
			Root borer	02	05	3.50
5.	BO 91,BO 130, CoVS 13102, Co 235	Jatmalpur	Army warm	11	20	15.5
			Top borer	08	16	12.0
			Shoot borer	04	11	7.50
6.	CoP 2061	Pusa farm	Pyrilla	05	14	9.5
			Root borer	02	8	5.0
			Scale insect	01	03	2.0
			Shoot borer	02	9	5.5
			Top borer	05	16	10.5
			Stalk borer	01	7	4.0

Project No. E-30

1.	Project Title	:	Monitoring of insect pests and bio-agents in sugarcane agro-ecosystem.
2.	Objective	:	To monitor the key insect pests and natural enemies in the area.
3.	Period under report	:	2016-17
4.	Year of start	:	2007-08
5.	Location	:	Sugarcane Research Institute, DRPCAU, Pusa, Bihar
6.	Plot size	:	0.2 hectare
7.	Duration	:	Long term
8.	Variety	:	BO 153
9.	Metrological data	:	Recorded Monthly average

Technical Summary

Sugarcane variety BO 153 was planted in 0.2 hectare area at Pusa Farm, Sugarcane Research Institute, Pusa. The population of Root borer, Shoot borer, Top borer, Stalk borer, Pyrilla, and their natural enemies were recordedat monthly interval during cropping season of 2016-17. The data on monitoring of insect pests and their bio-agents revealed that the mean per cent incidence of Rootborer , Shoot borer ,Top borer and Stalk borer were varied from 1.8to 10.2%, 2.0 to 14.3%, 1.0 to 16.7% and 2.0 to 5.3% respectively.Whereas,the incidence of sugarcane Pyrilla was recorded which varied from 1.0 to 17.9/leaf .

The bio-agents of Root and Early shoot borer were not observed during cropping season of 2016-17. While, parasitization of bio-agents such as, *Apantelisflavipes* ,*Rhanconotus. scirpophagae and Stenobracondeesae*were recorded against top borer. The data presented in table 3 to 4 revealed that population of S. *deesae* varied from 5 to 11.5% during May to November. Where its peaks (11.5%) noticedin September. Population of *Apantelisflavipes* was ranged in between 2.5 to 12.7 % during May to November with its highest population (12.7%) was recorded in month of September. The activity of *R. scirpophagae*was recorded from July to November with its peak (8.2%) in month of September. The parasitization of *T. pyrillae* and *E. melanoleuca*were recorded from july to November and May to November, respectively. Their peaks were noticed in the month of November (70.2%) and September(29.2%), respectively. In case of Stalk borer, the parasitization of *Apantalisflavipes*was recorded from 5.8 to 15.3% during August to November.

Table: 3. E.30 Monitoring of insect pests and their natural enemies in Sugarcane (2016-17)

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	-	-	-	-	5.2	3.50	
April	7.5	-	-	-	11.6	6.20	
May	14.5	4.5	-	2.5	14.3	10.20	
June	16.7	8.9	-	6.5	6.7	5.40	
July	12.3	10.6	1.5	8.5	2.0	1.80	
August	8.7	10.5	4.0	10.2	-	-	
September	5.4	12.7	8.2	11.5	-	-	
October	1.2	5.6	3.5	7.8	-	-	
November	1.0	2.5	1.8	3.5	-	-	
December	Trace	-	--	-	-	-	

Table : 3a. E.30 Monitoring of insect pests and their natural enemies in Sugarcane (2016-17)

Period of observation	Pyrilla/leaf	% Parasitism (Pyrilla)		% incidence of stalk borer	% parasitism (stalk borer)
		T. pyrillae	*E. melanoleuca*		*A. flavipes*
January	-	-	-	-	-
February	-	-	-	-	-
March	2.5	-	-	-	-
April	5.7	-	-	-	-
May	15.2	-	4.2	-	-
June	17.9	-	10.6	-	-
July	14.3	12.2	18.5	2.5	-
August	10.5	20.5	29.2	4.5	11.2
September	5.5	30.2	25.2	5.3	15.3
October	1.5	50.6	15.1	3.7	14.1
November	1.0	70.2	3.2	2.0	5.8
December	-	-	-	-	-

Table: 4. Meteorological data during crop season,2016-17

Months/Year		Temperature (^{0}C)		Humidity (%)		Rainfall (mm)
		Maximum	Minimum	07 hrs	14 hrs	
March, 2016	I	29.1	16.9	85	47	2.0
	I I	33.7	17.1	80	34	3.6
April, 2016	I	37.2	21.2	69	30	3.2
	I I	39.3	22.2	73	28	0
May, 2016	I	35.2	23.4	83	50	65.2
	I I	33.8	22.7	83	56	67.6
June, 2016	I	36.2	26.2	80	55	28.4
	I I	34.2	26.2	87	67	76.7
July, 2016	I	32.9	26.4	89	73	100.6
	I I	30.9	23.9	92	84	203.5
August, 2016	I	33.4	26.3	87	68	107.4
	I I	34.0	24.2	85	65	3.4
September,2016	I	31.9	25.8	93	79	170.4
	I I	30.8	23.2	92	78	148.8
October, 2016	I	33.1	23.9	90	67	34.6
	I I	39.1	21.8	86	48	0
November,2016	I	30.9	18.2	85	39	0
	I I	27.2	13.6	87	49	0
December,2016	I	23.2	11.3	88	63	0
	I I	21.3	11.2	92	67	0
January,2017	I	20.8	8.2	93	60	0
	I I	24.1	9.1	93	65	0
February, 2017	I	23.8	10.2	92	61	0
	I I	27.9	11.5	87	55	0

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	:	2016-17
5.	Year of Start	:	2012-13
6.	Location	:	Sugarcane Research Institute, DRPCAU,Pusa, Bihar
7.	Plot size	:	01 acre
8.	Duration	:	Long term
9.	Variety	:	BO 153

Technical Summary

The experiment was conducted with variety BO 153 at Pusa Farm, Sugarcane Research Institute, DRPCAU, Pusa to study the management of borer complex of sugarcane (ESB, TB and SB) through lures. The data presented in table 5 to 5b revealed that the activity of ESB started from 2nd fortnight of March to 1st fortnight of July and its maximum(7.33) moths per trap were catch in 1st fortnight of May.The incidence of ESB in treated plot and untreated plots were 9.73 and 14.25 per cent, respectively.The activity of TB started from 2nd fortnight of March to 2nd fortnight of August with a maximum (7.33) moths/trap catch in 1st fortnight of June. However, their incidences in treated and untreated plot were14.20 and 17.30 per cent, respectively.The activity of stalk borer started from 2nd fortnight of July to 1st fortnight of November with a maximum (3.33) moths/trap catch in 2nd fortnight of August.The incidence of stalk borer in treated and untreated plots were3.85 and 5.95 per cent, respectively.

The data (Table 5a) revealed that the temperature played a positive role with the activities of early short borer, top borer and stalk borer in sugarcane. While other weather factors such as RH and rainfall played a negative role with the borer complex in sugarcane.

Table:5. Moth catch of borer complex of sugarcane through lures at Pusa (2016-17)

Months		Temperature (^{0}C)		Humidity (%)		Rainfall (mm)	No. of moth trapped		
		Maximum	Minimum	07 hrs	14 hrs		ESB	TB	SB
March, 2016	I	29.1	16.9	85	47	2.0	0.33	0.00	0.00
	I I	33.7	17.1	80	34	3.6	1.66	0.33	0.00
April, 2016	I	37.2	21.2	69	30	3.2	5.33	5.00	0.00
	I I	39.3	22.2	73	28	0.0	6.66	6.33	0.00
May, 2016	I	35.2	23.4	83	50	65.2	7.33	5.00	0.00
	I I	33.8	22.7	83	56	67.6	5.33	4.66	0.00
June, 2016	I	36.2	26.2	80	55	28.4	6.00	7.33	0.00
	I I	34.2	26.2	87	67	76.7	6.00	7.00	0.00
July, 2016	I	32.9	26.4	89	73	100.6	6.33	6.66	0.00
	I I	30.9	23.9	92	84	203.5	0.66	1.33	1.00
August, 2016	I	33.4	26.3	87	68	107.4	0.00	0.00	2.33
	I I	34.0	24.2	85	65	3.4	0.00	0.00	3.33
September, 2016	I	31.9	25.8	93	79	170.4	0.00	0.00	1.00
	I I	30.8	23.2	92	78	148.8	0.00	0.00	0.66
October, 2016	I	33.1	23.9	90	67	34.6	0.00	0.00	1.33
	I I	39.1	21.8	86	48	0.0	0.00	0.00	2.33
November, 2016	I	30.9	18.2	85	39	0.0	0.00	0.00	0.66
	I I	27.2	13.6	87	49	0.0	0.00	0.00	0.00
December, 2016	I	23.2	11.3	88	63	0.0	0.00	0.00	0.00
	I I	21.3	11.2	92	67	0.0	0.00	0.00	0.00
January, 2017	I	20.8	8.2	93	60	0.0	0.00	0.00	0.00
	I I	24.1	9.1	93	65	0.0	0.00	0.00	0.00
Febuary, 2017	I	23.8	10.2	92	61	0.0	0.00	0.00	0.00
	I I	27.9	11.5	87	55	0.0	0.00	0.00	0.00

Table 5a: Correlation analysis between moth catches and weather factors at Pusa (2016-17)

Borer complex	Temperature (^{0}C)		Relative humidity (%)		Rainfall (mm)
	Max.	Min.	07hrs.	14hrs.	
ESB	0.742**	0.642*	-0.329	-0.132	-0.165
TB	0.667*	0.815**	-0.210	0.070	-0.037
SB	0.668*	0.360	-0.414	-0.038	-0.248

Significant at 5% level (r± =0.4227)
Significant at 1% level (r± = 0.5368)

Table 5b: Impact of moth catches of borer complex of sugarcane through lures at Pusa (2016-17)

Treatment	% incidence of borer complex		
	Early shoot borer	Top borer	Stalk borer
With pheromone traps	9.73	14.20	3.25
Without pheromone traps	14.25	17.80	5.95

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	:	2016-17
5.	Year of Start	:	2013-14
6.	Location	:	Sugarcane Research Institute, DRPCAU,Pusa, Bihar
7.	Plot size	:	6 x 5.4 M^2
8.	Design	:	RBD
9.	Variety	:	CoP9301

Technical Summary

The data summarized in table 6, and reveals from the resultsthat Chlorantraniliprol 18.5 SC@375ml/ha was superior when it was sprayed at 30DAP and 60DAP as recorded maximum germination (34.0 %),least cumulative incidence of ESB (5.00%) and highest yield (86.20t/ha) followed by Chlorantraniliprol 0.4 G and Flubendiamide being32.8%, 5.95%, 85.00t/ha and 29.90%, 7.00% and 83.20t/ha,respectively.However,remaining treatments were significant over control.

Among the insecticides, the percent incidence, yield and quality parameterin order of performance were Chlorantraniliprole 18.5SC>Chlorantraniliprole 0.4G>Flubendiamide>Fipronil 0.3G>Carbofuran 3 G>Phorate 10 G>Spinosad 45SC during course of study.

Table 6.Bio-efficacy of new insecticides for the control of sugarcane early shoot borer at Pusa (2016-17)

Treat. No.	Treatment details	Germi-nation (%)	Cumulative % incidence of ESB	Brix (%)	Pol (%)	Purity (%)	CCS (%)	Yield (t/ha)
T_1	Fipronil 0.3G@ 25kg/ha	29.5	6.35	18.95	16.00	86.80	11.55	81.90
T_2	Chlorantraniliprole 0.4G @ 22.5 kg/ha	32.8	5.95	19.20	16.94	87.60	11.90	85.00
T_3	Chlorantraniliprole 18.5SC @ 375ml/ha	34.00	5.00	19.70	17.00	89.00	12.20	86.20
T_4	Spinosad 45SC@ 90ml/ha	28.4	9.00	17.85	15.95	85.90	11.00	77.50
T_5	Flubendiamide @250ml/ha	29.90	7.00	18.90	16.00	87.10	11.50	83.20
T_6	Phorate 10 G @15kg/ha	28.20	8.90	18.65	16.01	87.00	11.20	78.00
T_7	Carbofuran 3 G @ 33 kg/ha	29.20	7.23	19.00	16.15	87.90	11.40	80.10
T_8	Untreated Control	27.8	18.66	16.60	15.00	85.98	9.95	67.20
	SEm ±	1.01	0.523	0.59	0.52	2.59	0.33	3.36
	CD at 5%	3.07	1.59	NS	NS	NS	NS	10.21
	CV %	5.86	10.66	5.49	5.60	5.15	5.02	7.30