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Entomology

(All India Coordinated Research Project on Sugarcane)



Division of Crop Protection
Indian Institute of Sugarcane Research
Lucknow 226 002

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Project No. E 4.1: Evaluation of varieties/genotypes for their reaction against major insect pests.

In Advanced Varietal Trial (AVT):

In early maturing group 8 sugarcane genotypes viz., CoH 09262, CoH 09263, CoLk 09202, CoPb 09181, CoS 09246, CoPb 08211, CoPb 08212, CoS 08233 and in mid late maturing group 11 genotypes viz., Co 09022, CoH 09264, CoLk 09204, CoPb 09214, CoS 09232, CoH 08262, CoH 08263, CoH 08264, CoPb 08217, CoS 08234, CoS 08235 (Table 1) were planted in plots of 3.5 x 6m plot size in February, 2013 with 90 cm row to row distance and three replications. CoJ 64 was taken as standard for early group and CoPant 97222 for mid late group. Recommended agronomic practices were followed to raise a good crop. No insecticide was applied at any stage of the crop.

In early group, incidence of top borer III and IV brood was ranged 13.51 to 39.96 and 18.59 to 45.67 per cent, respectively. Incidence and intensity of internode borer ranged 14.00 to 38.67 and 1.01 to 3.02 percent, respectively. Infestation index was higher (1.09) in CoPb 09181. Incidence and intensity of stalk borer ranged 10.67 to 50.67 and 1.48 to 6.62 percent, respectively. Infestation index was higher (3.35) in CoH 09282 (Table 2).

No genotype showed LS reaction, five genotypes viz., CoLk 09202, CoPb 09181, CoPb 08211, CoPb 08212, CoS showed MS reaction and four genotypes including standard viz., CoH 09262, CoH 09263, CoS 09246, CoJ 64 showed HS reaction to top borer (III Brood) and all genotypes were HS to top borer (IV Brood). In case of internode borer, CoPb 08211, CoPb 08212, CoS 08233 showed LS reaction and rest of genotypes showed MS reaction. All genotypes showed HS Reaction to stalk borer (Table 3).

Corrected brix, sucrose percent and purity coefficient ranged 17.30 to 19.66, 14.91 to 17.89 and 83.27 to 90.96, respectively in the month of November. Cane yield was higher in CoLk 09202 (Table 4).

In mid late group, incidence of top borer III and IV brood was ranged 8.5 to 30.73 and 16.90 to 44.20 per cent, respectively. Incidence and intensity of internode borer ranged 8.00 to 34.67 percent and 0.48 to 12.13, respectively. Infestation index was higher (3.56) in Co 09022. Incidence and intensity of stalk borer ranged 5.33 to 29.33 and 0.80 to 3.54 percent, respectively. Infestation index was higher (1.04) in CoPb 09214 (Table 5).

In mid late group, only one genotype, CoH 08262 was LS, three genotypes viz., Co 09022, CoLk 09204, CoH 08263, CoH 08263 and standard were HS and rest of the genotypes MS to top borer (III Brood). Two genotypes viz., CoH 08262 and CoH 08264 were MS to top borer (IV brood) and rest of the genotypes were HS. In the case of internode borer, only two genotypes viz., CoS 09232 and CoH 08262 were LS and rest of the genotypes were MS. All genotypes were HS to stalk borer (Table 6).

Corrected brix, sucrose percent and purity coefficient ranged 17.30 to 19.66, 14.91 to 17.89 and 84.26 to 86.91, respectively in the month of December. Cane yield was higher in CoLk 09204, CoH 09264, and CoS 08235 (Table 7).

Incidence of *Pyrilla perpusilla* was very high in all the genotypes, it was chased by its parasitoid, *Epiricania melanoleuca* and lower surface of leaves was full of Epiricania cocoons. Incidence of mealy bug was cent per cent in all genotypes. No incidence of white fly white grubs was noticed in any of the genotypes. Termite incidence was also negligible

Table-1: List of varieties evaluated (AVT)

S.N.	Early maturing I Plant	Mid late maturing I Plant
1	CoH 09262	Co 09022
2	CoH 09263	CoH 09264
3	CoLk 09202	CoLk 09204
4	CoPb 09181	CoPb 09214
5	CoS 09246	CoS 09232
	Early maturing II Plant	Mid late maturing II Plant
6	CoPb 08211	CoH 08262
7	CoPb 08212	CoH 08263
8	CoS 08233	CoH 08264
9	CoJ 64	CoPb 08217
10		CoS 08234
11		CoS 08235
12		CoPant 97222

Table-2: Incidence of insect pests in early maturing genotypes (AVT)

S.N	Variety	Germination (%)	Incidence of top borer		Stalk borer			Internode Borer		
			III brood	IV brood	Incidence (%)	Intensity (%)	Infestation index	Incidence (%)	Intensity (%)	Infestation index
1	CoH 09262	28.27 (31.75)	30.49 (33.48)	45.67 (42.42)	50.67 (45.36)	6.62 (14.80)	3.35	30.67 (32.88)	2.90 (9.73)	0.89
2	CoH 092633	42.59 (40.72)	20.61 (26.89)	22.70 (28.25)	20.00 (26.48)	1.48 (6.94)	0.29	30.66 (33.57)	2.08 (9.64)	0.64
3	CoLk 09202	44.67 (41.90)	16.40 (23.66)	18.59 (25.39)	18.67 (25.38)	1.82 (7.62)	0.34	29.33 (32.57)	2.47 (8.89)	0.72
4	CoPb 09181	18.75 (25.62)	13.51 (21.16)	32.25 (34.28)	16.00 (23.46)	1.73 (7.43)	0.28	38.67 (38.26)	2.84 (9.49)	1.09
5	CoS 09246	38.43 (38.29)	39.96 (39.15)	29.90 (33.04)	20.00 (26.48)	2.95 (9.88)	0.59	29.33 (32.77)	3.02 (9.99)	0.88
6	CoPb 08211	27.78 (31.23)	16.78 (23.58)	34.39 (35.72)	22.67 (28.35)	2.36 (8.79)	0.53	14.67 (22.18)	1.59 (7.17)	0.23
7	CoPb 08212	26.15 (30.71)	16.46 (23.85)	32.03 (34.36)	20.00 (26.30)	2.00 (7.85)	0.40	20.00 (26.09)	1.75 (7.37)	0.35
8	CoS 08233	18.52 (25.32)	17.99 (25.04)	37.02 (37.25)	10.67 (18.98)	1.52 (6.99)	0.16	14.00 (20.38)	1.01 (5.52)	0.14
9	CoJ 64	29.63 (32.90)	31.21 (33.83)	42.16 (40.44)	32.00 (034.44)	2.91 (9.59)	0.93	34.67 (35.77)	3.02 (9.89)	1.05
S.Em±		3.737	3.559	3.480	2.977	1.479	-	5.774	1.504	-
CD at 5%		7.922	7.545	8.005	6.311	3.135		12.241	3.188	

Table:3. Reaction of sugarcane genotypes (Early) against top borer and internode borer (AVT)

Insect pests	Scale incidence (%)	Category	Genotype
Top borer III Brood	<10.0	LS	-
	10.1-20.0	MS	CoLk09202, CoPb 09181, CoPb 08211, CoPb 08212, CoS08233
	>20.0	HS	CoH 09262, CoH 09263, CoS09246, CoJ64
Top borer IV Brood	<10.0	LS	-
	10.1-20.0	MS	-
	>20.0	HS	CoLk09202, CoPb 09181, CoPb 08211, CoPb 08212, CoS08233, CoH 09262, CoH 09263, CoS09246, CoJ64
Internode borer	<20.0	LS	CoPb 08211, CoPb 08212, CoS 08233
	20.1-40.0	MS	CoH 09262, CoH 09263, CoLk 09202, CoPb 09181, CoS 09246, CoJ 64
	>40.0	HS	-
Stalk borer	<2.0	LS	-
	2.1-5.0	MS	-
	>5.0	HS	CoH 09262, CoH 092633, CoLk 09202, CoPb 09181, CoS 09246, CoPb 08211, CoPb 08212, CoS 08233

Table-4: Quality parameters and cane yield in early group

S.N	Variety	Quality parameters			Cane Yield (t/ha)
		Corrected Brix	Sucrose (%)	Purity Coefficient	
1	CoH 09262	18.85	16.88	89.47	40.49
2	CoH 092633	17.30	14.91	86.16	31.60
3	CoLk 09202	18.47	15.39	83.27	55.06
4	CoPb 09181	18.25	15.67	85.88	29.63
5	CoS 09246	18.49	15.72	84.79	15.80
6	CoPb 08211	19.10	17.06	89.27	15.31
7	CoPb 08212	19.66	17.89	90.96	32.09
8	CoS 08233	19.59	17.19	90.63	26.17
9	CoJ 64	19.15	16.58	86.61	23.21
S.Em±		NS	0.859	1.170	8.119
CD at 5%			1.812	3.359	17.336

Table-5: Incidence of insect pests in mid late maturing genotypes (AVT)

S.N	Variety	Germination (%)	Incidence of top borer		Stalk borer			Internode Borer		
			III brood	IV brood	Incidence (%)	Intensity (%)	Infestation index	Incidence (%)	Intensity (%)	Infestation index
1	Co 09022	39.35 (38.82)	30.73 (33.55)	44.16 (41.59)	25.33 (30.14)	2.50 (9.00)	0.63	29.33 (32.41)	12.13 (16.35)	3.56
2	CoH 09264	43.29 (41.01)	16.82 (24.20)	27.88 (31.85)	5.33 (13.16)	0.52 (3.83)	0.03	34.67 (35.97)	2.24 (8.59)	0.78
3	CoLk 09204	36.80 (37.26)	20.90 (26.71)	33.76 (35.45)	17.33 (24.38)	1.33 (6.49)	0.23	21.33 (27.17)	2.04 (8.082)	0.43
4	CoPb 09214	34.03 (35.64)	17.57 (24.54)	30.64 (33.50)	29.33 (32.70)	3.54 (10.52)	1.04	21.33 (27.35)	1.66 (7.32)	0.35
5	CoS 09232	50.66 (45.35)	12.62 (20.69)	21.86 (27.48)	8.00 (16.42)	0.80 (5.04)	0.06	16.00 (22.47)	2.72 (9.33)	0.43
6	CoH 08262	40.97 (39.75)	8.50 (16.85)	16.90 (24.13)	16.00 (23.46)	1.31 (6.44)	0.21	8.00 (16.42)	0.48 (3.96)	0.04
7	CoH 08263	33.79 (35.52)	21.91 (27.89)	32.51 (34.73)	21.33 (27.40)	2.87 (9.59)	0.61	28.67 (32.32)	2.48 (9.029)	0.71
8	CoH 08264	31.94 (34.38)	11.10 (19.44)	17.94 (25.03)	25.33 (30.19)	2.61 (9.20)	0.66	30.67 (32.88)	2.60 (9.07)	0.79
9	CoPb 08217	37.96 (38.01)	18.75 (25.29)	40.41 (39.33)	9.33 (17.70)	0.81 (5.11)	0.07	28.00 (31.83)	2.53 (9.035)	0.71
10	CoS 08234	42.82 (40.79)	16.47 (23.82)	24.37 (29.22)	12.00 (20.08)	0.88 (5.21)	0.10	22.67 (28.19)	1.66 (7.27)	0.49
11	CoS 08235	37.73 (37.85)	13.87 (21.26)	31.88 (34.10)	18.67 (25.25)	1.68 (7.06)	0.31	26.67 (30.52)	2.18 (8.34)	0.58
12	CoPant 97222	25.23 (29.69)	26.27 (30.53)	44.20 (41.62)	20.00 (26.36)	2.54 (9.08)	0.51	32.00 (33.17)	3.14 (9.77)	1.00
S.Em±		3.745	3.420	4.146	3.051	1.660	-	NS	NS	-
CD at 5%		7.667	7.000	8.488	6.246	3.398				

Table:6. Reaction of sugarcane genotypes (Mid-late) against top borer and internode borer (AVT)

Insect pests	Scale (%) incidence)	Category	Genotype
Top borer III Brood	<10.0%	LS	CoH 08262
	10.1-20.0	MS	CoH 09264, CoPb 09214, CoS 09232, CoH 08264, CoPb 08217, CoS08234, CoS 08235
	>20.0	HS	Co 09022, CoLk 09204, CoH 08263, CoPant 97222
Top borer IV Brood	<10.0%	LS	-
	10.1-20.0	MS	CoH 08262, CoH 08264
	>20.0	HS	CoH 09264, CoPb 09214, CoS 09232, CoPb 08217, CoS08234, CoS 08235, Co 09022, CoLk 09204, CoH 08263, CoPant 97222
Internode borer	<20.0	LS	CoS 09232, CoH 08262
	20.1-40.0	MS	Co 09022, CoH 09264, CoLk 09204, CoPb 09214, , CoH 08263, CoH 08264, CoPb 08217, CoS 08234, CoS 08235
	>40.0	HS	-
Stalk borer	<10.0%	LS	-
	10.1-20.0	MS	-
	>20.0	HS	Co 09022, CoH 09264, CoLk 09204, CoPb 09214, CoS 09232, CoH 08262, CoH 08263, CoH 08264, CoPb 08217, CoS 08234, CoS 08235

Table-7: Quality parameters and cane yield in mid late group

S.N	Variety	Quality parameters			Cane Yield (t/ha)
		Corrected Brix	Sucrose (%)	Purity Coefficient	
1	Co 09022	19.71	17.36	86.83	39.01
2	CoH 09264	19.49	16.64	85.36	57.28
3	CoLk 09204	19.51	16.82	86.34	68.15
4	CoPb 09214	19.89	17.28	86.87	48.89
5	CoS 09232	20.26	17.57	86.68	42.22
6	CoH 08262	20.39	17.71	86.91	36.54
7	CoH 08263	15.64	17.95	85.38	22.22
8	CoH 08264	20.56	17.81	86.66	50.37
9	CoPb 08217	19.58	16.49	84.26	47.41
10	CoS 08234	20.18	17.43	86.38	37.53
11	CoS 08235	19.61	16.89	86.15	57.28
12	CoPant 97222	20.14	17.37	86.28	31.11
S.Em± CD at 5%		NS	NS	NS	6.199 12.68

E.30: Monitoring of insect pests and bio-agents in sugarcane agro-ecosystem

Canes of CoLk 8102 were planted by cutter planter in February, 2013. Recommended agronomic practices were followed to raise a good crop. Periodic observations on incidence of insect pests and parasitoids of pests were recorded. Germination was 44.44 to 63.89 per cent. Incidence of termites on sett basis was 35.5 per cent, on shoot basis it was 1.56 per cent while after cane formation damage of termites was limited to only dry leaves only. Incidence of top borer II, III and IV brood was 26.67, 35.76 and 38.33 percent, respectively. Incidence of root borer at shoot stage was 7.14 per cent and in the month of September incidence it was 53.85 per cent. Incidence of internode borer was 36.92 per cent. The incidence of *Pyrilla perpusilla* was very high which was suppressed by its parasite, *Epiricania melanoleuca*. Incidence of mealy bug was 100 percent. White fly, black bug were in traces.

Parasites like *Telenomus beneficiens*, *Stenobracon* sp., *Rhaconotus* sp., *Isotima javensis*, *Epiricania melanoleuca* and predatory fauna comprising of Coccinellids, spiders and ants were noticed in the field at different stages of the crop.

Table 1: Incidence of different insect pests of sugarcane

Top borer

Period of Observation	Incidence of top borer	% parasitisation (Top borer)								
		<i>T. japonicum</i>	<i>T. chilonis</i>	<i>T. beneficiens</i>	<i>I. Javensis</i>	<i>Cotesia flavipes</i>	<i>Rhaconotus scirpophagae</i>	<i>Elasmus zehntneri</i>	<i>S. desae</i>	<i>B. bassiana</i>
1	2	3	4	5	6	7	8	9	10	11
II brood 03-06-13 (IV Week)	26.67	-	-	35% on egg mass basis	2.0	-	6.0	-	4.0	-
III brood 27-07-13 (IV Week)	35.76	-	-	-	2.0	-	2.0	-	4.0	-
IV brood 04-09-2013 (I Week)	38.33	-	-	-	2.0	-	8.0	-	4.0	-

Internode and root borer

Period of Observation	Incidence of internode borer	% parasitisation				Period of Observation	Incidence of Root borer	% parasitisation		
		<i>T. chilonis</i>	<i>T. japonicum</i>	<i>Cotesia flavipes</i>	<i>B. bassiana</i>			<i>T. chilonis</i>	<i>Cotesia flavipes</i>	<i>B. bassiana</i>
1	2	3	4	5	6	1	2	3	4	5
10-10-13 (II Week)	36.92	8.0 on egg mass basis	-	-	-	03-06-13 (I Week)	7.14	-	-	-
-	-	-	-	-	-	5-9-13 (I Week)	53.85	-	-	-

Stalk borer and Mealy bug

Period of Observation	Incidence of stalk borer	% parasitisation				Period of Observation	Incidence of Mealy bug	% parasitisation		
		<i>T. chilonis</i>	<i>T. japonicum</i>	<i>Cotesia flavipes</i>	<i>B. bassiana</i>			<i>T. chilonis</i>	<i>Cotesia flavipes</i>	<i>B. bassiana</i>
1	2	3	4	5	6	1	2	3	4	5
10-10-13 (II Week)	10.50	-	-	-	-	10-10-13 (II Week)	100.0 on cane basis	-	-	-

Pyrilla perpusilla

Period of Observation	Incidence of <i>P. perpusilla</i>			% Parasitisation				
	No. of adults/leaf	No. Of nymphs/leaf	No. of egg mass/leaf	<i>Epiricania melanoleuca</i>			<i>Tetrastichus pyrillae</i>	<i>Lestrodryinus pyrillae</i>
				Cocoon	Egg mass	Adults	% parasitisation On egg mass basis	% parasitisation On egg mass basis
1	2	3	4	5	6	7	8	9
27-07-13 (IV Week)	1-2	2-5	4-5	1-2	-	-	25.0	10.0
04-09-2013 (I Week)	3-5	80-120	1-2	8-10	1-2	1	50.0	-
10-10-13 (II Week)	1-2	12-180	-	80-100	3-5	1	-	-

Project No. E.32: Population dynamics of sugarcane borers (Early shoot borer, top borer, internode borer and stalk borer) through pheromone trap

In one acre of sugarcane field (CoLk 8102) 7 sex pheromone traps were installed and another one acre field was taken as check without traps. Pheromone traps were installed for the catch of male moths of top borer on 28-04-2012 and moths of top borer (II brood) were caught in traps from 29-04-2013 and continued up 31-05-2013. Total moths caught were 437. Lure Septa for top borer were changed brood wise. Against top borer (III brood) it was changed on 17-06-2013 but no catches were noticed due to early and continuous rains. Lure septa of stalk borer were placed in the trap on 10-07-2013. No catches of stalk borer were noticed. Incidence of top borer II , III, and IV brood was 16.47, 29.0 and 45.50 per cent, respectively in plot with traps as against 15.00, 33.33 and 49.67 per cent, respectively in plot without traps. No septa for internode borer were available.

Table 1. Number of moths trapped in the respective pheromone lures during 2012-13

No. of moths trapped		
Top borer		Stalk borer
II Brood (29-04-2013 to 25-05-2013)	III Brood (17-06-2013)	Overlapping Broods (12.07.12 to 12. 11.12)
437 (7 traps)	No catch	NIL(7 traps)

Table 2. Effect of pheromone lures on the incidence of top borer

Treatments	Brood-wise Incidence of top borer (%)	
	III	IV
With pheromone traps	29.0	45.50
Without pheromone traps	33.33	49.67