

**ALL INDIA CO-ORDINATED RESEARCH PROJECT  
ON  
SUGARCANE**



**ANNUAL REPORT  
SUGARCANE ENTOMOLOGY  
2012-13**

**SUGARCANE SECTION  
DEPARTMENT OF PLANT BREEDING AND GENETICS  
PAU, LUDHIANA**

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**1. Evaluation of varieties for their reaction against major insect pests.**

<b>Project No.</b>	<b>E. 4.1.</b>
Location	Sugarcane Research Farm Ladhawal, PAU Ludhiana.
Title	Evaluation of zonal varieties for their reaction against major insect pests.
Objectives	To grade the entries in the zonal varietal trials for their behavior towards damage by key pests in the area.
Year of start	1985-86
Technical program	Early and mid-late genotypes/varieties to be evaluated against major insect pests without any insecticidal application. Observations to be recorded on the incidence of shoot borer in June, top borer in July and September and stalk borer at harvest.
Technical program	To continue with the new entries.

**Technical Report:**

Genotypes	Zonal Varietal Trials, 48 entries
Design	RBD
Replications	Three
Plot size	27 sq. m.
Date of planting	20-3-2012

Forty eight genotypes comprising of twenty two early maturing (twelve under IVT E, three under AVT E I plant and five under AVT E II plant) and twenty six late maturing (eight under IVT ML, six under AVT ML I plant and nine under AVT ML II plant) with respective group standards were evaluated against early shoot borer, (*Chilo infuscatellas* Snellen), top borer (*Scirpophaga excerptalis* walker) and stalk borer (*Chilo auricilus* Dudgeon) of sugarcane at PAU, Ludhiana.

Early shoot borer incidence was found to be low in all the tested genotypes ranged from 0.00 to 5.00 (CoH 09261, CoPb 09211, Co 09022, CoH 08264, CoH 07263, CoLk 09201, CoLk 09203, CoPb 09212, CoPant 84211, CoPb 08211, CoPb 08212, CoS 08233, Co 07023, CoH 07261, CoLk 09204, CoPb 09214, CoS 09232, CoH 08262, CoH 08263, CoPb 08217, CoS 08235, Co 07028, CoLk 07202, CoPb 07213 and CoS 7234). The other genotypes showed early shoot borer incidence ranged from 5.26 to 7.61 (Co 09020, CoH 09262, CoH 09293, CoLk 09202, CoPb 09181, CoPb 09213, CoS 09246, CoJ 64, Co 06032, Co 07025 CoLk 07201, Co 09021, CoH 09264, CoS 09240, CoS 767, CoS 8436, CoPant 97222, CoS 08234, CoH 07264, CoLk 07203, CoPb 07212 and CoS 07232). Only one genotype viz. CoS 09231(IVT ML) showed early shoot borer incidence above ten percent (Table1). The cumulative incidence of top borer was recorded as low. However, it ranged from 3.26 per cent in CoLk 09202 (IVT E) to 11.36 per cent in CoH 08263 (AVT ML I) in all the genotypes evaluated which exhibited low to moderately susceptible reaction against top borer. The per cent incidence of stalk borer ranged from 1.33 per cent in CoH 09263 (IVT E) to 12.00 per cent in CoS 07234 (AVT MLII). However, the genotypes under six different group showed less susceptible reaction to stalk borer (0.05- 1.92 infestation index) (Table1).

**Summary:** Early shoot borer incidence was found to be low in all the tested genotypes under six different groups. The cumulative incidence of top borer was recorded as low to moderate ranging from 3.26 to 11.36 per cent. The genotypes tested also showed less than two per cent infestation index reaction to the stalk borer.

## 2. Survey and Surveillance of insect pests of Sugarcane

<b>Project No.</b>	<b>E. 28.</b>
Location	Sugarcane fields nearby sugar factories of Punjab
Title	Survey and surveillance of insect pests of Sugarcane
Objectives	To identify key insect pests of sugarcane in the area
Year of start	2003-04
Technical program	Roving survey of sugarcane fields at 5-8 Km distance be recorded
Technical program	To continue for the next year

Sugarcane fields nearby sugar factories of Punjab were surveyed for insect pests in the area. Incidence of termite ranged between 1-2 per cent in popular varieties of sugarcane *viz.*, CoJ 85, CoJ 88, Co 238 and CoS 8436 around sugar factories at Nawansahar, Gurdaspur, Budhewal and Morinda. The incidence of early shoot borer, top borer and stalk borer ranged between 3-7, 6-10 and 5-12 per cent, respectively, in different varieties of sugarcane *viz.*, CoJ 85, CoJ 83, CoJ 88, Co 238, CoH 119 and CoS 8436 in different cane growing areas of Punjab. The incidence of pyrilla was observed to be 10-14 per cent around Gurdaspur and Ajnala sugar factories on different varieties *viz.*, Co 238, CoS 8436 and CoJ 85 due to scanty rainfall and prolonged drought conditions in this region. The incidence of whitefly, black bug, mite and mealybug were found in traces (Table 2).

**Summary:** Most of the sugar mill areas surveyed exhibited low insect pest incidence. Early shoot borer, top borer, stalk borer, termite and pyrilla were recorded as major insects in sugarcane. The per cent incidence of early shoot borer, top borer, stalk borer, termite and pyrilla varied from low to moderate range. The incidence of whitefly, black bug, mite and mealybug was found in traces.

### 3. Monitoring of insect pests and bioagents in sugarcane agro-ecosystem

<b>Project No.</b>	<b>E. 30.</b>
Location	Sugarcane Research Farm Ladhawal, PAU Ludhiana.
Title	Monitoring of insect pests and bioagents in sugarcane agro-ecosystem
Objectives	To monitor key insect pests and natural enemies in the area
Year of start	2006-07
Technical program	1. Planting of sugarcane variety recommended for the region in 0.2 ha area. 2. All recommended practices to be followed except application of insecticide.
Technical program	To continue for the next year
<b>Technical Report:</b>	
Date of planting	4.04.12
Variety	CoJ 88
Area	0.2 ha

Sugarcane variety CoJ 88 was planted in 0.2 ha area and the incidence of insect pests and their natural enemies was recorded. The early shoot borer incidence started from 2<sup>nd</sup> week of April and reached its peak level of 8.8 per cent in 2<sup>nd</sup> week of May which thereafter, declined to 2.0 per cent in the 2<sup>nd</sup> week of July. No activity of bio-agent was observed against early shoot borer. The top borer incidence started from month of July and reached to its peak level of 10.2 per cent in 2<sup>nd</sup> week of August. Thereafter, top borer incidence decreased to 4.6 per cent in the 2<sup>nd</sup> fortnight of October. The bio-agent *viz.*, *Isotima javensis* and *Stenobracon* sp. was recorded as 1-2 per cent in the month of July and August. The stalk borer incidence started from last week of August and reached to its peak level of 7.5 per cent in the month of October and thereafter, stalk borer incidence declined. Parasitization by bio-agents *viz.*, *Sturmiopsis inference* and *Cotesia flavipes* were observed 1-2 percent in the month of September to November. The activity of *Pyrilla* on sugarcane initiated from first 1<sup>st</sup> week of August and continued up to last week of October. Activity of bio-agent *viz.*, *Epiricania melanoleuca* (1-2 per cent parasitization) was observed from the month of September to October (Table 3).

**Summary:** The incidence of early shoot borer ranged from 2.0 to 8.8 per cent from 2<sup>nd</sup> week of April to 2<sup>nd</sup> week of July. Top borer incidence was 4.6 and 10.2 per cent in the month of July to 2<sup>nd</sup> fortnight of October. Stalk borer incidence varied from 4.8 to 7.5 per cent from last week August to October. The bio-agent *Isotima javensis* and *Stenobracon* sp were recorded as major parasitoids of top borer with 1.0 and 2.0 per cent parasitization, *Sturmiopsis inference* and *Cotesia flavipes* with 1.0 to 2.0 per cent parasitization were recorded as major natural enemies of stalk borer. The activity of bio-agent *Epiricania melanoleuca* (1-2 per cent parasitization) was observed on pyrilla.

#### **4. Management of borer complex of sugarcane through lures**

<b>Project:</b>	<b>E.36.</b>
<b>Location:</b>	Sugarcane Research Farm Ladhawal, PAU, Ludhiana
<b>Title:</b>	Management of borer complex of sugarcane through lures.
<b>Objective:</b>	To manage sugarcane borers (early shoot borer, top borer and stalk borer) through pheromone traps
<b>Year of start:</b>	2008-09
<b>Variety:</b>	CoJ 88
<b>Date of planting:</b>	28.03.2012
<b>Area:</b>	1 acre

The management of borer complex (early shoot borer, top borer and stalk borer) of sugarcane through lures was conducted at Sugarcane Research Farm, Ladhawal, PAU, Ludhiana. For the purpose, three pheromone traps for each borer were installed during first week of April till the harvest of crop. Observation on number of moth catches was recorded at weekly intervals. The activity of early shoot borer started from 19<sup>th</sup> MW (Monthly Week) (first week of May) to 34<sup>th</sup> MW (Third week of August). Thereafter, it was found to be nil up to 7<sup>th</sup> MW (2<sup>nd</sup> week of February 2013). The highest number of early shoot borer catches (10 moths/trap) trapped in 23<sup>rd</sup> MW (first week of June) when maximum and minimum temperature was 38.6 and 25.1 °C. The early shoot borer moth catches were positively ( $r = 0.5479$  and  $0.5102$ ) correlated with maximum and minimum temperature, respectively, while it was negatively correlated

with morning relative humidity ( $r = -0.6333$ ), evening relative humidity ( $r = -0.3298$ ) and rainfall ( $r = -0.1395$ ).

Activity of top borer started from 23<sup>rd</sup> MW (first week of June) to 39<sup>th</sup> MW (last week of September) and thereafter, it was found to be nil up to the harvest of crop. The highest number of top borer catches (6 moths/trap) trapped during 27<sup>th</sup> MW (first week of July) when maximum and minimum temperature was 36.4 and 28.1 °C. The top borer moth catches were positively ( $r = 0.3260$  and  $0.5449$ ) correlated with maximum and minimum temperature, respectively, and also positively correlated with evening relative humidity ( $r = 0.2271$ ) and rainfall ( $r = 0.3415$ ), while it was negatively correlated with morning relative humidity ( $r = -0.1119$ ).

The activity of stalk borer started from 35<sup>th</sup> MW (last week of August) to 48<sup>th</sup> MW (last week of November), thereafter, it was found to be nil up to the harvest of crop. The highest number of early stalk borer catches (4 moths/trap) were trapped in 41<sup>st</sup> MW (second week of October) when maximum and minimum temperature were 33.4 and 17.6 °C. The stalk borer moth catches were positively correlated with ( $r = 0.0280$ ) with maximum temperature, morning relative humidity ( $r = 0.2778$ ) and rainfall ( $r = 0.1254$ ), while it was negatively correlated with ( $r = -0.0623$ ) with minimum temperature and evening relative humidity ( $r = -0.0560$ ) (Table 4, 5).

**Summary :** The activity of early shoot borer started from first week of May to third week of August. The highest number of early shoot borer were trapped in first week of June and the activity of top borer was started from first week of June to last week of September. The highest number of top borer were trapped in first week of July. The activity of stalk borer started from last week of August to last week of November. The highest number of early stalk were trapped in second week of October.

## HIGHLIGHTS

1. Early shoot borer incidence was found to be low in all the tested genotypes under six different groups. The cumulative incidence of top borer was recorded as low to moderate ranging from 3.26 to 11.36 per cent. The genotypes tested also showed less than two per cent infestation index reaction to the stalk borer.
2. Most of the sugar mill areas surveyed exhibited low insect pest incidence. Early shoot borer, top borer, stalk borer, termite and pyrilla were recorded as major insects in sugarcane. The per cent incidence of early shoot borer, top borer, stalk borer, termite and pyrilla varied from low to moderate range. The incidence of whitefly, black bug, mite and mealybug was found in traces.
3. The incidence of early shoot borer ranged from 2.0 to 8.8 per cent from 2<sup>nd</sup> week of April to 2<sup>nd</sup> week of July. Top borer incidence was 4.6 and 10.2 per cent in the month of July to 2<sup>nd</sup> fortnight of October. Stalk borer incidence varied from 4.8 to 7.5 per cent from last week August to October. The bio-agent *Isotima javensis* and *Stenobracon* sp were recorded as major parasitoids of top borer with 1.0 and 2.0 per cent parasitization, *Sturmiopsis inference* and *Cotesia flavipes* with 1.0 to 2.0 per cent parasitization were recorded as major natural enemies of stalk borer. The activity of bio-agent *Epiricania melanoleuca* (1-2 per cent parasitization) was observed on pyrilla.
4. The activity of early shoot borer started from first week of May to third week of August. The highest number of early shoot borer were trapped in first week of June and the activity of top borer was started from first week of June to last week of September. The highest number of top borer were trapped in first week of July. The activity of stalk borer started from last week of August to last week of November. The highest number of early stalk were trapped in second week of October.



**Table 1. Screening of varieties for resistance to insect pests**

Sr. No	Genotype	Shoot borer Incidence (%)	Top borer incidence (%)			Stalk borer		Infestation index
			III Brood	IV Brood	Cumulative	Incidence (%)	Intensity (%)	
<b>IVT Varietal Trial (Early)</b>								
1	Co 09020	5.68	4.44	0.00	4.44	5.33	8.00	0.43
2	CoH 09261	0.00	5.94	0.99	6.93	4.00	6.67	0.27
3	CoH 09262	5.43	3.26	2.17	5.43	2.67	8.00	0.21
4	CoH 09263	6.98	4.65	2.33	6.98	1.33	4.00	0.05
5	CoLk 09201	2.13	6.38	1.06	7.45	5.33	9.33	0.50
6	CoLk 09202	6.52	3.26	0.00	3.26	2.67	8.00	0.21
7	CoLk 09203	1.25	6.25	2.50	8.75	6.67	10.67	0.71
8	CoPb 09181	6.94	5.83	1.82	7.64	6.67	9.33	0.62
9	CoPb 09211	0.00	4.94	1.23	6.17	1.33	5.33	0.07
10	CoPb 09212	3.70	6.17	1.23	7.41	4.00	8.00	0.32
11	CoPb 09213	6.67	5.56	2.22	7.78	6.67	10.67	0.71
12	CoS 09246	6.33	5.06	2.53	7.59	5.33	8.00	0.43
<b>Standards</b>								
1	CoJ 64	7.06	7.06	1.18	8.24	6.67	12.00	0.80
2	CoPant 84211	4.82	4.82	2.41	7.23	5.33	11.25	0.60
<b>AVT Varietal Trial (Early I plant )</b>								
1	CoPb 08211	1.11	1.11	2.22	3.33	2.67	6.67	0.18
2	CoPb 08212	2.47	6.17	1.23	7.41	2.67	10.67	0.28
3	CoS 08233	3.49	4.65	2.33	6.98	4.00	5.33	0.21
<b>Standards</b>								
1	CoJ 64	7.61	6.52	1.09	7.61	6.67	8.00	0.53
2	CoPant 84211	5.32	5.32	2.13	7.45	5.33	10.67	0.57
<b>AVT Varietal Trial (Early II plant )</b>								
1	Co 06032	5.26	3.16	2.11	5.26	6.67	9.33	0.62
2	Co 07023	2.22	4.44	2.22	6.67	5.33	8.00	0.43
3	Co 07025	6.25	3.75	0.00	3.75	5.33	6.67	0.36
4	CoH 07261	1.18	5.88	1.18	7.06	2.67	8.00	0.21
5	CoLk 07201	6.82	4.55	1.14	5.68	4.00	5.00	0.20
<b>Standards</b>								
1	CoJ 64	7.32	6.10	1.25	7.35	5.33	9.33	0.50
2	CoPant 84211	3.75	6.25	2.88	9.13	5.33	10.67	0.57
<b>IVT Varietal Trail (Mid late)</b>								
1	Co 09021	5.43	5.43	1.09	6.52	4.00	8.00	0.32
2	Co 09022	0.00	4.88	1.22	6.10	5.33	10.67	0.57
3	CoH 09264	6.25	6.25	2.50	8.75	2.67	10.67	0.28
4	CoLk 09204	2.30	4.44	2.22	6.67	5.33	13.33	0.71
5	CoPb 09214	4.60	4.60	1.15	5.75	1.33	8.00	0.11

6	CoS 09231	10.39	5.95	1.19	7.14	5.33	10.67	0.57
7	CoS 09232	1.14	5.00	2.50	7.50	5.33	8.00	0.43
8	CoS 09240	5.75	5.75	2.30	8.05	6.67	12.00	0.80
<b>Standards</b>								
1	CoS 767	7.32	6.02	1.20	7.23	8.00	14.67	1.17
2	CoS 8436	6.33	7.59	1.27	8.86	4.00	8.00	0.32
3	CoPant 97222	7.06	4.71	2.35	7.06	4.00	12.00	0.48
<b>AVT Varietal Trial (Midlate I plant)</b>								
1	CoH 08262	4.88	4.88	2.44	7.32	8.00	12.00	0.96
2	CoH 08263	3.41	7.95	3.41	11.36	4.00	9.33	0.37
3	CoH 08264	0.00	5.56	1.11	6.67	5.33	9.33	0.50
4	CoPb 08217	3.61	7.23	1.20	8.43	6.67	10.67	0.71
5	CoS 08234	6.67	4.44	1.11	5.56	5.33	12.00	0.64
6	CoS 08235	5.00	6.25	1.25	7.50	8.00	13.33	1.07
<b>Standards</b>								
1	CoS 767	7.06	7.37	1.05	8.42	6.67	12.00	0.80
2	CoS 8436	6.82	5.68	2.27	7.95	8.00	10.67	0.85
3	CoPant 97222	6.17	6.17	1.23	7.41	6.67	12.00	0.80
<b>AVT Varietal Trial (Midlate II plant)</b>								
1	Co 07028	4.60	5.75	2.30	8.05	5.33	8.00	0.43
2	CoH 07263	0.00	5.56	1.11	6.67	8.00	10.67	0.85
3	CoH 07264	5.56	3.33	2.22	5.56	4.00	9.33	0.37
4	CoLk 07202	4.76	2.38	2.38	4.76	6.67	12.00	0.80
5	CoLk 07203	5.32	6.38	0.00	6.38	6.67	10.67	0.71
6	CoPb 07212	6.25	5.21	2.08	7.29	4.00	8.00	0.32
7	CoPb 07213	4.35	3.26	2.17	5.43	8.00	12.00	0.96
8	CoS 07232	5.43	4.35	2.17	6.52	5.33	9.33	0.50
9	CoS 07234	4.88	6.10	1.22	7.32	12.00	16.00	1.92
<b>Standards</b>								
1	CoS 767	7.14	7.45	1.06	8.51	5.33	13.33	0.71
2	CoS 8436	5.68	5.68	1.14	6.82	4.00	10.67	0.43
3	CoPant 97222	6.49	6.49	1.30	7.79	8.00	12.00	0.96

### Grade

Pest	LS	MS	HS
Early shoot borer (%)	Below 15.0	15.1-30.0	Above 30.0
Top borer (%)	Below 10.0	10.1-20.0	Above 20.0
Root borer	Below 15.0	15.1-30.0	Above 30.0
Stalk borer (infestation index)	Below 2.0	2.1-5.0	Above 5.0
Pyrilla (nymph + adult per leaf)	Below 5.0	5.1-20.0	Above 20.0
Whitefly (per square inch)	Below 2.0	2.1-5.0	Above 5.0

**Table 2. Survey and surveillance of insect pest of sugarcane in Punjab during 2012-13**

<b>S. No.</b>	<b>Factory Zone</b>	<b>Varieties</b>	<b>Name of Pest</b>	<b>Per cent incidence</b>
1.	Nawanshahar Gurdaspur Budhewal (Ludhiana) Morinda	CoJ 85 CoJ 88 Co 238 CoS 8436	Termite	1-2
2.	Nawanshahar Phagwara Ajnala Gurdaspur Mukerian Dhuri Budhewal (Ludhiana) Bhogpur (Jalandhar) Morinda	CoJ 85 CoJ 83 CoJ 88 Co 238 CoH 119 CoS 8436	Early shoot borer	3-7
3.	Budhewal (Ludhiana) Bhogpur (Jalandhar) Phagwara Ajnala Gurdaspur Mukerian Dhuri Morinda	Co 238	Top borer	10-15
	Budhewal (Ludhiana) Bhogpur (Jalandhar) Gurdaspur Phagwara Ajnala Gurdaspur Mukerian Dhuri Morinda	CoJ 85 CoJ 88 CoH 119 CoS 8436	Top borer	6-10
4.	Gurdaspur Ajnala	Co 238 CoS 8436 CoJ 85	Pyrilla	10-14

	Phagwara Ajnala Mukerian Dhuri Nawanshahar Budhewal (Ludhiana) Bhogpur (Jalandhar)	CoJ 85 CoJ 83 CoJ 88 Co 238 CoH 119 CoS 8436	Pyrilla	Traces
5.	Mukerian Dhuri Nawanshahar Budhewal (Ludhiana)	CoJ 85 CoJ 88 Co 238 CoS 8436	Whitefly	Traces
6.	Ajnala Abohar	CoJ 85 Co 238 Co 119	Mite	Traces
7.	Phagwara Gurdaspur Mukerian Bhogpur (Jalandhar)	Co 238 CoH 119 CoS 8436	Mealybug	Traces
8.	Gurdaspur Phagwara Gurdaspur Mukerian Bhogpur (Jalandhar)	CoJ 85 Co 238 CoH 119 CoS 8436	Blackbug	Traces
9.	Nawanshahar Phagwara Ajnala Gurdaspur Mukerian Budhewal (Ludhiana) Bhogpur (Jalandhar) Morinda	CoJ 85 CoJ 83 CoJ 88 Co 238 CoH 119 CoS 8436	Stalk borer	5-12



**Table 4. Number of Early shoot borer, Top borer and Stalk borer moth trapped at weekly interval with weather parameters (2012-13)**

Standard Week	Date	Early shoot borer	Top borer	Stalk borer	Average Temperature °C		Average Relative Humidity %		Total Rain fall (mm)
					Max	Min	Morning	Evening	
13	26.03.12	0.00	0.00	0.00	31.5	15.4	82.5	35.0	0.0
14	2.03.12	0.00	0.00	0.00	34.9	18.2	73.7	31.0	0.0
15	9.04.12	0.00	0.00	0.00	32.3	17.3	75.0	39.0	19.8
16	16.04.12	0.00	0.00	0.00	33.9	19.0	79.2	29.3	0.4
17	23.04.12	0.00	0.00	0.00	34.0	17.9	67.7	31.2	15.1
18	30.04.12	0.00	0.00	0.00	35.8	19.4	48.7	17.7	0.0
19	7.05.12	2.00	0.00	0.00	39.0	23.5	46.7	20.0	0.0
20	14.05.12	4.00	0.00	0.00	39.8	23.8	48.5	20.0	1.6
21	21.05.12	0.00	0.00	0.00	41.2	23.1	45.5	16.3	0.0
22	28.05.12	8.00	0.00	0.00	44.1	26.3	43.3	18.8	0.0
23	4.06.12	10.00	2.00	0.00	38.6	25.1	59.3	34.0	1.5
24	11.06.12	4.00	0.00	0.00	42.5	26.2	55.5	28.8	0.0
25	18.06.12	5.00	4.00	0.00	41.3	29.2	57.3	32.5	1.6
26	25.06.12	6.00	0.00	0.00	39.1	27.7	64.5	40.2	0.0
27	2.07.12	3.00	6.00	0.00	36.4	28.1	71.0	54.0	14.5
28	9.07.12	4.00	3.00	0.00	34.9	27.4	79.5	55.8	5.6
29	16.07.12	2.00	4.00	0.00	36.5	28.5	71.3	52.3	1.6
30	23.07.12	0.00	0.00	0.00	35.1	27.8	83.7	67.0	12.8
31	30.07.12	2.00	2.00	0.00	34.4	27.4	78.7	65.7	1.0
32	6.08.12	1.00	5.00	0.00	33.6	27.1	88.5	75.0	24.3
33	13.08.12	0.00	1.00	0.00	33.9	27.0	86.7	70.7	21.4
34	20.08.12	1.00	0.00	0.00	31.3	25.7	89.5	80.7	11.8
35	27.08.12	0.00	2.00	2.00	33.3	26.0	91.3	67.8	21.5
36	3.09.12	0.00	0.00	0.00	32.9	26.4	79.8	68.7	0.8
37	10.09.12	0.00	3.00	2.00	33.8	25.4	89.3	64.8	93.4
38	17.09.12	0.00	1.00	0.00	31.0	22.5	92.7	66.7	5.7
39	24.09.12	0.00	1.00	1.00	33.2	20.8	93.3	48.8	0.0
40	1.10.12	0.00	0.00	3.00	34.1	19.7	89.5	43.7	0.0
41	8.10.12	0.00	0.00	4.00	33.4	17.6	90.7	41.3	0.0
42	15.10.12	0.00	0.00	2.00	31.2	15.5	90.3	43.2	0.0
43	22.10.12	0.00	0.00	2.00	28.8	12.3	90.0	44.2	1.0
44	29.10.12	0.00	0.00	0.00	29.6	13.6	91.8	41.7	0.0
45	5.11.12	0.00	0.00	1.00	28.5	12.2	91.2	40.0	0.0
46	12.11.12	0.00	0.00	0.00	26.2	10.3	95.0	44.0	0.0
47	19.11.12	0.00	0.00	3.00	25.1	8.8	89.0	35.8	0.0
48	26.11.12	0.00	0.00	1.00	23.7	7.6	89.3	40.0	0.0
49	3.12.12	0.00	0.00	0.00	24.4	6.3	89.8	36.8	0.0
50	10.12.12	0.00	0.00	0.00	19.4	10.0	90.3	67.7	8.8
51	17.12.12	0.00	0.00	0.00	19.4	6.6	93.5	57.8	0.0
52	24.12.12	0.00	0.00	0.00	14.4	7.9	91.8	71.0	0.0
1	31.12.12	0.00	0.00	0.00	10.9	5.2	89.3	74.0	0.0
2	7.01.13	0.00	0.00	0.00	18.4	4.6	91.7	52.5	0.0
3	14.01.13	0.00	0.00	0.00	17.9	7.1	96.2	69.0	8.2
4	21.01.13	0.00	0.00	0.00	19.3	3.9	97.5	50.0	0.0
5	28.01.13	0.00	0.00	0.00	21.3	7.5	97.5	59.3	19.2
6	4.02.13	0.00	0.00	0.00	19.4	7.5	98.7	68.2	1.0
7	11.02.13	0.00	0.00	0.00	20.6	9.7	96.2	64.0	33.4

**Table 5. Correlation of weather parameters with moth catches (2012-13)**

<b>Correlation coefficient</b>	Early shoot borer	Top borer	Stalk borer
Maximum Temperature	0.5479	0.3260	0.0280
Minimum Temperature	0.5102	0.5449	-0.0623
Relative Humidity % (Morning)	-0.6333	-0.1119	0.2778
Relative Humidity % (Evening)	-0.3298	0.2271	-0.0560
Rain fall	-0.1395	0.3415	0.1254