Azadi Ka Amrit Mahotsav

ALL INDIA COORDINATED RESEARCH PROJECT ON SUGARCANE

TECHNICAL REPORT
2020-21

ENTOMOLOGY

Compiled by

Dr S.N. Sushil

Principal Scientist (Agril. Entomology)
PC Unit, AICRP on Sugarcane
&
Principal Investigator

भाकृअनुप-भारतीय गन्ना अनुसंधान संस्थान, लखनऊ-226 002

ICAR-INDIAN INSTITUTE OF SUGARCANE RESEARCH, LUCKNOW – 226 002

ISO 9001 : 2015

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Introduction

Sugarcane crop cultivation has been challenged by a large number of insect pests causing an average yield loss of 20-30 percent. About two dozen insect pests cause severe damage to the crop and thereby invite attention of the researchers for their management. Owing to various ill effects of chemical pesticides, due emphasis is desired on managing the menace of insect pests through non-chemical methods. In varietal development programme, screening of different genotypes of sugarcane against insect pests for their tolerance/ resistance in different zones of India under AICRP (Sugarcane) is one of the strongest tools to manage these pests without reliance on pesticides. Major research focus is inclined towards non-pesticide tools including utilization of bio-agents and IPM. In order to ensure availability of cost effective, potential bioagents in different zones of the country, attempt has been made by various participating organizations to develop simple and cheaper mass production techniques of the parasitoids, predators and entomopathogenic microbials. Such refined technologies would of immense support to the biological control units being operated by the state governments, universities and private players. Survey, surveillance and monitoring of insect pests and their bio-agents are the major thrust area under AICRP (Sugarcane) for better understanding on changing population dynamics of insect pests and their bioagent and subsequent formulation of management strategies against major insect pests at national level. Mitigation measures for region specific insect pest problem is being addressed under the umbrella of AICRP (Sugarcane). This programme has also been helping in getting information on entry, establishment and spread of invasive insect pests in sugarcane agro-ecosystem.

During the year 2020-2021, following programmes were assigned at different centres in Entomology discipline.

E.4.1: Evaluation of zonal varieties/genotypes for their reaction against major insect-pests

E. 28: Survey and surveillance of sugarcane insect-pests

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

E.34: Standardization of simple and cost-effective techniques for mass multiplication of sugarcane bio-agents

E. 40: Integrated approach to manage white grubs in sugarcane

E. 41: Assessment of yield losses caused by borer pests of sugarcane under changing climate scenario

Technical Programme-2020-21

1. Project E. 4.1	**:**	**Evaluation of zonal varieties/genotypes for their reaction against major insect-pests**
Objective	**:**	To grade the entries in the zonal varietal trials for their reaction against major insect pests
Year of Start	**:**	1985-86 (continuing)
Locations	**:**	Karnal (SBI), Lucknow, Shahjahanpur, Pusa, Seorahi, Coimbatore, Padegaon, Pune, Mandya, Tharsa, and Anakapalle
No. of replications	**:**	Three
Plot size	**:**	A minimum of 3 six meter rows per variety per replication
Methodology	**:**	The experiment should be conducted separately without insecticidal application. The seed material is to be obtained from the breeders of the respective centres and evaluation of only zonal entries be done. The susceptible check variety for each major insect-pest is to be included.
Observations to be recorded:	**:**	Please follow 'Research Methodology' (Soft copy attached)

2. Project E. 28	**:**	**Survey and surveillance of sugarcane insect-pests**
Objective	**:**	To identify key insect-pests of sugarcane in the area
Year of Start	**:**	2003-2004
Duration	**:**	Long term
Locations	**:**	Karnal (SBI), Lucknow, Shahjahanpur, Pusa, Seorahi, Coimbatore, Padegaon, Pune, Mandya, Tharsa, and Anakapalle
Methodology& Observations	**:**	Observations on insect pest incidence should be recorded three times preferably at an interval of three months after germination (shoot stage, cane formation stage, maturity stage) from command areas of at least 5 sugar mills.

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

Objective : To monitor the key insect pests and natural enemies in a fixed plot/area and to study the influence of weather parameters on pests and natural enemies.

Locations : Karnal (SBI), Lucknow, Shahjahanpur, Pusa, Seorahi, Coimbatore, Padegaon, Pune, Mandya, Tharsa, and Anakapalle

Year of start : 2006-2007

Duration : Long term

Methodology & Observations : Please follow 'Research Methodology' (Soft copy attached)

4. Project E. 34 : Standardization of simple and cost effective techniques for mass multiplication of sugarcane bio-agents

Objective : To develop simple and cost effective mass-multiplication techniques of promising bio-agents of the area.

Duration : Three years

Year of start : 2017-18

Location and bio-agents to be multiplied:

Sr. No.	Locations	Target bio agents
1.	Anakapalle	*Cladosporium cladosporoides*
2.	Lucknow	*Eumicrosoma sp. and Chrysoperla carnea*
3.	Padegaon	*Trichogramma chilonis*
4.	Coimbatore	*Beauveria brongniartii, Metarhizium anisopliae*
5.	Pune	*Beauveria bassiana*
6.	Mandya	*Chrysoperla carnea* and *Epiricanea melanoleuca*

Methodology : Use simple and cost effective host insect/ media for multiplication of parasitoids/predators and insect pathogens.

Note : For mass multiplication of entomopathogenic fungi, plant pathologistat the centre may be requested to jointly work.

5. Project E. 40: Integrated approach to manage white grubs in sugarcane

Objective : To develop suitable integrated pest management approach for the management of white grubs in sugarcane.

Year of start : 2021-22

Locations : Pune and Padegaon,

Treatments:

1. **IPM Module:**

- Spraying of host trees nearby sugarcane fields with insecticides (Profenophos 40% + Cypermethrin 4% EC @ 1 ml/ liter water or Chlorpyriphos 50% + Cypermethrin 5% EC @ 1 ml/ liter water at first shower of the monsoon season).
- Installation of IISR Combo Insect Trap or any other locally available light trap @ 1 Trap/ ha near host trees or about 20 feet away from the sugarcane field (April-September).
- Soil application of recommended dose of *Beauveria bassiana* or *B. brongniartii* or *Metarhizium anisopliae* or any other effective local bioagent just after pre-monsoon showers.
- Soil application of combination product Fipronil 40.0%+Imidacloprid 40.0% WG @ 450gm formulation/ha within 10 days of mass emergence of white grub beetles

2. **Organic Module:**

- Jarring & shaking of host trees in night hours, collection of beetles and killing in water with kerosene oil.
- Installation of IISR Combo Insect Trap or any other locally available light trap @ 1 Trap/ ha near host trees or about 20 feet away from the sugarcane field (April-September).
- Soil application of recommended dose of *Beauveria bassiana* or *B. brongniartii* or *Metarhizium anisopliae* or any other effective local bioagent just after pre-monsoon showers.

3. **Untreated Control (UTC):**

- No application of any of the above treatment in the field.

Note: All the three set of treatments (IPM, Organic and UTC) should be about 200 meters away from each other. Experimental area should be at least 1 acre.

Observations to be recorded

- Species diversity of white grubs in sugarcane
- Number of beetle catches per trap during the season
- Average number of grubs/clump out of 5 clumps in each month (May-August)
- Relative percent reduction/increase in grub population in different modules
- NMC and Cane Yield

6. Project E.41 : Assessment of yield losses caused by borer pests of sugarcane under changing climate scenario

Objective : To assess actual yield loss due to different species of borer pests of sugarcane in changing climatic scenario.

Year of start : 2019-20

Locations : Karnal (SBI), Lucknow, Shahjahanpur, Pusa, Seorahi, Coimbatore, Padegaon, Pune, Mandya, Tharsa, and Anakapalle

A. Chemical protection of the crop

Parameters	**Treated with recommended effective chemical insecticide**	**Untreated open for natural normal infestation of borers**
Area	0.1 ha	0.1 ha
Infestation (%) (for each borer)	Almost nil infestation	Value to be recorded
Yield	t/ha	t/ha

The correlation between the crop yield and degree of infestation is to be worked out.

B. Comparison of average yield of individual plants free from pest incidence with that of infested ones

- Individual plants from the same field is examined and the pest incidence and their yield are determined individually.
- The loss in yield (quantitative & qualitative) is estimated by comparing the average yield of healthy plants with that of plants showing different degrees of infestation.
- The same data can also be used for working out a regression equation between yield and infestation/ intensity of different species of borers.

Observations to be recorded

- Generation wise recording of different borer pest incidence and intensity.
- Intensity of insect damage by splitting the canes (counting of damaged internodes)
- Weight of infested and healthy canes for comparison (sample size as per availability of infested and healthy canes).
- Analysis of cane juice quality of infested cane with different intensity separately and healthy canes.

Project- E. 4.1: Evaluation of zonal varieties/genotypes for their reaction against major insect pests

Data on percent natural incidence of different insect pests was recorded on different varieties/ genotypes. In few cases, data on percent intensity and infestation index, number of insects/ leaf, number of insects/ sq cm of leaf etc. is calculated and grading is done accordingly. Details of grading for major insect pests is mentioned in table 1.

Table 1. Grading of insect pest reaction against sugarcane varieties/ genotypes

Sl. No.	Pest	Grades		
		Less Susceptible (LS)	Moderately Susceptible (MS)	Highly Susceptible (HS)
1.	Early shoot borer (% incidence)	Below 15.0	15.1-30.0	Above 30.0
2.	Root borer (% incidence)	Below 15.0	15.1-30.0	Above 30.0
3.	Stalk borer (Infestation index)	Below 2.0	2.1-5.0	Above 5.0
4.	Internode borer (% incidence)	Below 20.0	20.1-40.0	Above 40.0
5.	Top borer (% incidence)	Below 10.0	10.1-20.0	Above 20.0
6.	Termite (% incidence)	Below 10.0	10.1-35.0	Above 35.0
7.	Pyrilla (Nymph+Adult / leaf)	Below 5.0	5.1-20.0	Above 20.0
8.	Mealy bug (% incidence)	Below 5.0	5.1-30.0	Above 30.0
9.	Scale insect (% incidence)	Below 10.0	10.1-35.0	Above 35.0
10.	White fly (Nymph + Puparia / sq. inch)	Below 2.0	2.1-5.0	Above 5.0
11.	Sugarcane Woolly Aphid (% leaf area covered by aphid colony)	Below 25.0	25.1-50.0	Above 50.0

North West Zone

AVT (EARLY) I PLANT

Karnal

Five genotypes viz., Co 15025, Co 16029, CoLk 16201, CoLk 16202, CoPb 16181 alongwith one standard (check) Co 0238 were evaluated against major insect pests of the area. All the genotypes were less susceptible (LS) against early shoot borer (ESB), top borer and stalk borer except two genotypes CoLk 16201 and CoPb 16181, which were moderately susceptible (MS) to Stalk borer. All the genotypes were MS against root borer. (Table 2 & 8).

Lucknow

Altogether nine sugarcane genotypes viz; CoLk 14201, Co 15025, Co 16029, CoLk 16201, CoLk 16202, CoPb 16181 including three standards viz; CoJ 64, Co 0238, Co 05009 were evaluated against major insect pests. All the genotypes were MS against top borer

except CoJ 64 and Co 0238, which were highly susceptible (HS). All the genotypes were HS against stalk borer except CoLk 14201, which was MS. It is noteworthy that all the genotypes were less susceptible against root borer. Out of 9 genotypes, 4 each were LS and MS and only one genotype (Co 16029) was HS against internode borer. All the genotypes were LS against pink borer except Co 15025, which was MS. Genotypes CoLk 16202, CoPb 16181and CoJ 64 were LS against termites and rest other genotypes were MS (Table 2 and 11a &b).

Shahjahanpur

Altogether nine sugarcane genotypes viz; CoLk 14201, Co 15025, Co 16029, CoLk 16201, CoLk 16202, CoPb 16181 including three standards viz; CoJ 64, Co 0238, Co 05009 were evaluated against major insect pests. All the genotypes showed LS reaction to ESB, stalk borer and top borer except CoPb 16181 and Co 05009, which were MS to top borer. (Table 2 and 15 a&b).

AVT (EARLY) II PLANT

Karnal

Seven genotypes viz., Co 15023, Co 15024, Co 15027, CoLk 15201, CoLk 15205, CoPb 15212 and one standard check Co 0238 were evaluated against major insect pests. All the genotypes were LS against ESB, top borer and stalk borer except CoLk 15201, which was MS to stalk borer. Against root borer, CoLk 15201, CoLk 15205, CoPb 15212 were LS and rest other genotypes were MS (Table 3 and 9).

Lucknow

Altogether seven genotypes viz; Co 15027, CoLk 15201, CoLk 15205, CoPb 15212 including three standards viz; CoJ 64, Co 0238, Co 05009 were evaluated against major insect pests. All the genotypes were MS against top borer except CoJ 64 and Co 0238, which were HS. All the genotypes were HS against stalk borer. All the genotypes were MS against internode borer except CoLk 15205, CoPb 15212 and CoJ 64, which were LS. It is notewotthy that all the genotypes were LS against root borer except Co 15027, which was MS. All the genotypes were LS against pink borer. Only one genotype CoJ 64 was LS against termites and rest other genotypes were MS (Table 3 and 11 a&b).

Shahjahanpur

Altogether nine genotypes viz; Co 15023, Co 15024, Co 15027, CoLk 15201, CoLk 15205, CoPb 15212 including three standards viz; CoJ 64, Co 0238, Co 05009 were evaluated against major insect pests. All the genotypes along with standards showed LS reaction to ESB and stalk borer. All the genotypes showed LS reaction against top borer except Co 15023, CoLk 15205 and Co 0238, which were MS. (Table 3 and 16 a&b).

AVT (MIDLATE) I PLANT

Karnal

Five genotypes viz., Co 16030, CoLk 16203, CoLk 16204, Cos 16232, CoS 16233 alongwith standard check Co 05011 were evaluated against major insect pests. All the

genotypes evaluated were LS against ESB, top borer and stalk borer except one genotype, CoS 16232 which was MS against stalk borer. Against root borer, all the genotypes were MS except one genotypes, CoLk 16203 which was LS. (Table 4 and 8).

Lucknow

Altogether 8 genotypes viz; Co 16030, CoLk 16203, CoLk 16204, Cos 16232, CoS 16233 including standard checks CoS 767, CoPant 97222 and Co 05011 were evaluated against major insect pests. Allthe genotypes were HS against stalk borer and all the genotypes showed MS reaction against top borer except one genotype, Co 16030, which was HS. All the genotypes were LS against root borer, pink borer and internode borer except two genotypes, CoLk 16203, CoLk 16204, which were MS against internode borer. All the genotypes showed MS reaction against termites except CoLk 16204 and CoS 767 showed LS reaction. (Table 4 and 12 a&b)

Shahjahanpur

Altogether 8 genotypes viz; Co 16030, CoLk 16203, CoLk 16204, Cos 16232, CoS 16233 including standard checks CoS 767, CoPant 97222 and Co 05011 were evaluated against major insect pests. All the genotypes showed LS reaction against ESB, stalk borer and top borer. (Table 4 and 17 a&b).

AVT (MIDLATE) II PLANT

Karnal

Altogether eight genotypes viz. Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233 and standard check Co 05011 were evaluated against major insect pests. All the genotypes evaluated were LS against ESB, top borer and stalk borer except 2 genotypes, CoLk 15209 and Co 05011 which were MS against stalk borer. Against root borer, all the genotypes were LS except three genotypes, CoLk 15206, CoS 15233 and Co 05011, which showed MS reaction (Table 5 and 9).

Lucknow

Altogether nine genotypes viz. CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233 including standard checks CoS 767, CoPant 97222 and Co 05011 were evaluated against major insect pests. All the genotypes showed HS reaction against stalk borer, MS reaction against top borer and LS reaction against internode borer, root borer and pink borer. Against termites, CoLk 15206, CoLk 15207, CoLk 15209 and CoS 767, showed LS reaction and rest other genotypes showed MS reaction (Table 5 and 12a&b).

Shahjahanpur

In mid-late maturing group, 10 sugarcane genotypes viz; Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233 including standard checks CoS 767, CoPant 97222 and Co 05011 were evaluated against major insect pests. All the genotypes showed LS reaction against ESB and stalk borer except one genotype CoS 15232, which showed MS reaction against stalk borer. Three genotypes viz., CoLk 15206, CoS 15232 and Co 05011 were LS against top borer and rest other genotypes showed MS reaction (Table 5 and 18 a&b).

AVT (EARLY) RATOON

Karnal

Seven genotypes viz., Co 15023, Co 15024, Co 15027, CoLk 15201, CoLk 15205, CoPb 15212 and one standard check Co 0238 were evaluated against major insect pests. All the genotypes showed LS reaction against ESB, stalk borer, top borer and black bug and all the genotypes showed MS reaction against root borer (Table 6 and 10).

Lucknow

Altogether six genotypes viz; CoLk 15201, CoLk 15205, CoPb 15212 including three standards viz; CoJ 64, Co 0238, Co 05009 were screened against major insect pests. All the genotypes were MS against top borer except CoPb 15212, which was LS. All the genotypes were HS against stalk borer except Co 0238, which showed MS reaction. It is noteworthy that all the genotypes showed LS reaction against black bug and internode borer (Table 6 and 13 a&b).

Shahjahanpur

Altogether nine genotypes viz., Co 15023, Co 15024, Co 15027, CoLk 15201, CoLk 15205, CoPb 15212 including three standards were screened against major insect pests. All the genotypes showed LS reaction against ESB, stalk borer and top borer except one genotype, Co 05009, having MS reaction against top borer (Table 6 and 19 a&b)).

AVT (MIDLATE) RATOON

Karnal

Altogether eight genotypes viz. Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233 and standard check Co 05011 were evaluated against major insect pests. All the genotypes showed LS reaction against ESB, stalk borer, top borer and black bug. Against root borer, all the genotypes were MS except two genotypes, CoS 15232 and CoS 15233, which showed HS reaction (Table 7 and 10).

Lucknow

Altogether nine genotypes viz. CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233 including standard checks CoS 767, CoPant 97222 and Co 05011 were evaluated against major insect pests. All the genotypes showed HS reaction against stalk borer. Against top borer only two genotypes, CoLk 15206 and CoS 15232 showed LS reaction and rest other were MS (5 nos.) and HS ((2 nos.). All the genotypes showed LS reaction against root borer and internode borer except two genotypes, CoPb 15213 and CoS 15233, which showed MS reaction against internode borer (Table 7 and 14).

Shahjahanpur

In mid-late maturing group (ratoon), 10 sugarcane genotypes viz; Co 15026, CoLk 15206, CoLk 15207, CoLk 15209, CoPb 15213, CoS 15232, CoS 15233 including standard checks CoS 767, CoPant 97222 and Co 05011 were evaluated against major insect pests. All the genotypes showed LS reaction against ESB and stalk borer. All the genotypes showed LS reaction except Co 15026, CoS 767 and CoPant 97222 showed MS reaction and CoPb 15213 showed HS reaction against top borer (Table 7 and 20 a&b).

Table 2. AVT (Early) I Plant (NW Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Stalk Borer			Top Borer			Internode Borer	Root Borer		Pink Borer	Termite
		Karnal	Shahjahanpur	Karnal	Lucknow	Shahjahanpur	Karnal	Lucknow*	Shahjahanpur	Lucknow	Karnal	Lucknow	Lucknow	Lucknow
1.	CoLk 14201	-	LS	-	MS	LS	LS	MS	LS	LS	-	LS	LS	MS
2.	Co 15025	LS	LS	LS	HS	LS	LS	MS	LS	LS	MS	LS	MS	MS
3.	Co 16029	LS	LS	LS	HS	LS	LS	MS	LS	HS	MS	LS	LS	MS
4.	CoLk 16201	LS	LS	MS	HS	LS	LS	MS	LS	MS	MS	LS	LS	MS
5.	CoLk 16202	LS	LS	LS	HS	LS	LS	MS	LS	LS	MS	LS	LS	LS
6.	CoPb 16181	LS	LS	MS	HS	LS	LS	MS	MS	MS	MS	LS	LS	LS
7.	CoJ 64	-	LS	-	HS	LS	-	HS	LS	LS	-	LS	LS	LS
8.	Co 0238	LS	LS	LS	HS	LS	LS	HS	LS	MS	MS	LS	LS	MS
9.	Co 05009	-	LS	-	HS	LS	-	MS	MS	MS	-	LS	LS	MS

* Highest grade is taken out of 3rd and 4th brood.

Table 3. AVT (Early) II Plant (NW Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Stalk Borer			Top Borer			Internode Borer	Root Borer		Pink Borer	Termite
		Karnal	Shahjahanpur	Karnal	Lucknow	Shahjahanpur	Karnal	Lucknow*	Shahjahanpur	Lucknow	Karnal	Lucknow	Lucknow	Lucknow
1.	Co 15023	LS	LS	LS	-	LS	LS	-	MS	-	MS	-	-	-
2.	Co 15024	LS	LS	LS	-	LS	LS	-	LS	-	MS	-	-	-
3.	Co 15027	LS	LS	LS	HS	LS	LS	MS	LS	MS	MS	MS	LS	MS
4.	CoLk 15201	LS	LS	MS	HS	LS	LS	MS	LS	MS	LS	LS	LS	MS
5.	CoLk 15205	LS	LS	LS	HS	LS	LS	MS	MS	LS	LS	LS	LS	MS
6.	CoPb 15212	LS	LS	LS	HS	LS	LS	MS	LS	LS	LS	LS	LS	MS
7.	CoJ 64	-	LS	-	HS	LS	-	HS	LS	LS	-	LS	LS	LS
8.	Co 0238	LS	LS	LS	HS	LS	LS	HS	MS	MS	MS	LS	LS	MS
9.	Co 05009	-	LS	-	HS	LS	-	MS	LS	MS	-	LS	LS	MS

* Highest grade is taken out of 3rd and 4th brood.

Table 4. AVT (Midlate) I Plant (NW Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Stalk Borer			Top Borer			Internode Borer	Root Borer		Pink Borer	Termite
		Karnal	Shahjahanpur	Karnal	Lucknow	Shahjahanpur	Karnal	Lucknow*	Shahjahanpur	Lucknow	Karnal	Lucknow	Lucknow	Lucknow
1.	Co 16030	LS	LS	LS	HS	LS	LS	HS	LS	LS	MS	LS	LS	MS
2.	CoLk 16203	LS	LS	LS	HS	LS	LS	MS	LS	MS	LS	LS	LS	MS
3.	CoLk 16204	LS	LS	LS	HS	LS	LS	MS	LS	MS	MS	LS	LS	LS
4.	CoS 16232	LS	LS	MS	HS	LS	LS	MS	LS	LS	MS	LS	LS	MS
5.	CoS 16233	LS	LS	LS	HS	LS	LS	MS	LS	LS	MS	LS	LS	MS
6.	CoS 767	-	LS	-	HS	LS	-	MS	LS	LS	-	LS	LS	LS
7.	CoPant 97222	-	LS	-	HS	LS	-	MS	LS	LS	-	LS	LS	MS
8.	Co 05011	LS	LS	LS	HS	LS	LS	MS	LS	LS	MS	LS	LS	MS

*** Highest grade is taken out of 3rd and 4th brood.**

Table 5. AVT (Midlate) II Plant (NW Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Stalk Borer			Top Borer			Internode Borer	Root Borer		Pink Borer	Termite
		Karnal	Shahjahanpur	Karnal	Lucknow	Shahjahanpur	Karnal	Lucknow*	Shahjahanpur	Lucknow	Karnal	Lucknow	Lucknow	Lucknow
1.	Co 15026	LS	LS	LS	-	LS	LS	-	MS	-	LS	-	-	-
2.	CoLk 15206	LS	LS	LS	HS	LS	LS	MS	LS	LS	MS	LS	LS	LS
3.	CoLk 15207	LS	LS	LS	HS	LS	LS	MS	MS	LS	LS	LS	LS	LS
4.	CoLk 15209	LS	LS	MS	HS	LS	LS	MS	MS	LS	LS	LS	LS	LS
5.	CoPb 15213	LS	LS	LS	HS	LS	LS	MS	MS	LS	LS	LS	LS	MS
6.	CoS 15232	LS	LS	LS	HS	MS	LS	MS	LS	LS	LS	LS	LS	MS
7.	CoS 15233	LS	LS	LS	HS	LS	LS	MS	MS	LS	MS	LS	LS	MS
8.	CoS 767	-	LS	-	HS	LS	-	MS	MS	LS	-	LS	LS	LS
9.	CoPant 97222	-	LS	-	HS	LS	-	MS	MS	LS	-	LS	LS	MS
10.	Co 05011	LS	LS	MS	HS	LS	LS	MS	LS	LS	MS	LS	LS	MS

* Highest grade is taken out of 3rd and 4th brood.

Table 6. AVT (Early) Ratoon (NW Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Stalk Borer			Top Borer			Root Borer		Black bug	Internode Borer
		Karnal	Shahjahanpur	Karnal	Lucknow	Shahjahanpur	Karnal	Lucknow	Shahjahanpur	Karnal	Lucknow	Karnal	Lucknow
1.	Co 15023	LS	LS	LS	-	LS	LS	-	LS	MS	-	LS	-
2.	Co 15024	LS	LS	LS	-	LS	LS	-	LS	MS	-	LS	-
3.	Co 15027	LS	LS	LS	-	LS	LS	-	LS	MS	-	LS	-
4.	CoLk 15201	LS	LS	LS	HS	LS	LS	MS	LS	MS	LS	LS	LS
5.	CoLk 15205	LS	LS	LS	HS	LS	LS	MS	LS	MS	LS	LS	LS
6.	CoPb 15212	LS	LS	LS	HS	LS	LS	LS	LS	MS	LS	LS	LS
7.	CoJ 64	-	LS	-	HS	LS	-	MS	LS	-	LS	-	LS
8.	Co 0238	LS	LS	LS	MS	LS	LS	MS	LS	MS	LS	LS	LS
9.	Co 05009	-	LS	-	HS	LS	-	MS	MS	-	LS	-	LS

Table 7. AVT (Midlate) Ratoon (NW Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Stalk Borer			Top Borer			Root Borer		Black bug	Internode Borer
		Karnal	Shahjahanpur	Karnal	Lucknow	Shahjahanpur	Karnal	Lucknow	Shahjahanpur	Karnal	Lucknow	Karnal	Lucknow
1.	Co 15026	LS	LS	LS	-	LS	LS	-	MS	MS	-	LS	-
2.	CoLk 15206	LS	LS	LS	HS	LS	LS	LS	LS	MS	LS	LS	LS
3.	CoLk 15207	LS	LS	LS	HS	LS	LS	MS	LS	MS	LS	LS	LS
4.	CoLk 15209	LS	LS	LS	HS	LS	LS	MS	LS	MS	LS	LS	LS
5.	CoPb 15213	LS	LS	LS	HS	LS	LS	HS	HS	MS	LS	LS	MS
6.	CoS 15232	LS	LS	LS	HS	LS	LS	LS	LS	HS	LS	LS	LS
7.	CoS 15233	LS	LS	LS	HS	LS	LS	HS	LS	HS	LS	LS	MS
8.	CoS 767	-	LS	-	HS	LS	-	MS	MS	-	LS	-	LS
9.	CoPant 97222	-	LS	-	HS	LS	-	MS	MS	-	LS	-	LS
10.	Co 05011	LS	LS	LS	HS	LS	LS	MS	LS	MS	LS	LS	LS

Table 8. Reaction of sugarcane genotypes against major insect pests in AVT 1st plant at Karnal

Sl. No.	Variety/ Genotypes	Incidence (%)			Stalk borer		
		ESB	Top borer	Root borer	Incidence (%)	Intensity (%)	Infestation Index
1	Co 15025	1.3	1.9	24.6	16.3	10.9	1.8
2	Co 16029	0.0	0.3	28.7	8.8	14.5	1.3
3	CoLk 16201	0.7	0.7	19.7	36.1	13.2	4.8
4	CoLk 16202	0.9	1.1	16.0	19.0	7.5	1.4
5	CoPb 16181	1.2	1.1	19.1	18.9	13.4	2.5
6	Co 05011	1.0	0.4	26.7	7.5	4.9	0.4
7	CoLk 16203	1.2	1.9	10.7	14.3	5.2	0.7
8	CoLk 16204	1.5	0.4	15.3	14.8	7.5	1.1
9	CoS 16232	0.9	2.7	16.5	22.9	16.3	3.7
10	CoS 16233	0.6	1.1	19.1	10.1	14.2	1.4
11	Co 16030	0.7	2.0	27.4	11.0	10.9	1.2
12	Co 0238	1.1	1.7	26.6	10.8	7.7	0.8

Table 9. Reaction of sugarcane genotypes against major insect pests in AVT 2nd Plant at Karnal

Sl. No.	Variety/ Genotypes	Incidence (%)			Stalk borer		
		ESB	Top borer	Root borer	% Incidence	Intensity (%)	Infestation Index
1	CoS 15233	1.5	0.6	22.2	16.2	7.8	1.3
2	CoS 15232	1.3	1.0	7.7	12.5	11.2	1.4
3	CoPb 15213	1.0	0.7	13.9	16.6	8.8	1.5
4	Co 05011	1.9	0.2	18.1	22.2	11.7	2.6
5	CoLk 15209	0.4	0.7	6.9	27.3	9.4	2.6
6	CoLk 15207	0.5	1.2	10.3	6.2	11.0	0.7
7	CoLk 15206	0.0	0.6	20.1	14.0	12.6	1.8
8	Co 15026	0.8	0.8	13.2	23.8	8.3	1.7
9	Co 0238	1.7	1.8	20.6	8.3	9.4	0.8
10	CoPb 15212	0.3	1.0	14.9	15.7	9.0	1.4
11	CoLk 15205	0.7	0.8	12.8	14.8	12.7	1.9
12	CoLk 15201	0.6	0.7	13.6	18.9	15.0	2.8
13	Co 15027	0.0	1.2	23.7	19.7	9.8	1.9
14	Co 15024	0.0	0.9	15.6	16.8	10.1	1.7
15	Co 15023	1.1	1.1	22.6	12.9	9.7	1.3

Table 10. Reaction of sugarcane genotypes against major insect pests in ratoon at Karnal

Sl. No.	Variety/ Genotypes	Popn./ 20 leaves	% Incidence			Stalk borer		
		Black Bug	ESB	Top borer	Root borer	Incidence (%)	Intensity (%)	Infestation Index
1	Co 15023	1.6	0.7	1.2	26.2	16.0	11.0	1.7
2	Co 15024	1.1	0.0	0.5	22.1	2.1	7.4	0.5
3	Co 15027	2.0	0.8	0.7	25.3	6.6	6.7	0.7
4	CoLk 15201	1.5	0.3	0.4	29.6	6.1	8.1	0.5
5	CoLk 15205	1.5	0.4	0.6	16.1	3.7	9.0	0.4
6	CoPb 15212	1.5	0.4	0.6	27.1	10.0	7.2	1.1
7	Co 0238	1.4	0.3	2.6	28.7	8.1	13.0	1.2
8	Co 15026	1.9	0.0	1.5	28.2	8.2	10.6	0.8
9	CoLk 15206	1.4	0.5	0.6	27.9	2.2	2.9	0.2
10	CoLk 15207	1.1	0.5	0.9	20.3	2.0	14.3	0.5
11	CoLk 15209	1.4	0.8	0.4	19.7	8.0	12.6	1.1
12	Co 05011	1.9	0.8	1.3	27.0	3.8	8.9	0.5
13	CoPb 15213	1.5	2.0	1.6	27.3	2.7	4.6	0.2
14	CoS 15232	2.4	0.5	0.3	34.0	4.7	6.8	0.6
15	CoS 15233	1.6	0.6	0.5	30.2	7.0	8.7	0.6

Table-11a: Reaction of sugarcane genotypes against major insect pests in AVT Early Plant I & II at Lucknow

Sl.No.	Varieties	Stalk Borer		Internode Borer		Pink Borer	Top Borer							
							Brood							
							II		III		IV		V	
		Incidence	Reaction	Incidence (%)	Reaction	Incidence	Incidence	Reaction	Incidence	Reaction	Incidence	Reaction	Incidence	Reaction
II Plant														
1	CoLk -14201	4.03 (11.36)	MS	11.94 (20.17)	LS	2.99 (9.93)	7.30 (15.62)	LS	9.10 (17.51)	LS	10.90 (19.22)	MS	10.83 (19.18)	MS
2	CoLk -16201	9.33 (17.76)	HS	25.33 (30.16)	MS	2.00 (8.13)	7.53 (15.90)	LS	16.12 (23.66)	MS	10.00 (18.37)	LS	9.33 (17.70)	LS
3	CoLk -16202	7.33 (15.59)	HS	16.00 (23.49)	LS	2.17 (8.45)	8.10 (16.49)	LS	11.88 (2014)	MS	23.17 (28.71)	HS	12.00 (20.22)	MS
4	CoLk-15201	9.40 (17.82)	HS	26.88 (31.16)	MS	2.68 (9.28)	9.46 (17.87)	LS	14.14 (22.07)	MS	12.75 (20.89)	MS	7.40 (15.65)	LS
5	CoPb-16181	12.00 (20.22)	HS	25.33 (30.18)	MS	2.00 (8.13)	12.64 (20.81)	MS	10.01 (18.41)	MS	12.00 (20.26)	MS	10.67 (19.04)	MS
6	CoPb-15212	13.33 (21.39)	HS	14.00 (21.87)	LS	2.00 (8.13)	6.40 (14.61)	LS	11.28 (19.57)	MS	6.67 (14.92)	LS	18.00 (25.09)	MS
7	CoLk-15205	4.89 (12.67)	HS	9.70 (18.10)	LS	2.81 (9.47)	5.27 (13.24)	LS	8.28 (16.71)	LS	15.11 (22.82)	MS	7.19 (14.29)	LS
I Plant														
8	Co-15027	10.71 (19.05)	HS	20.93 (27.19)	MS	3.23 (10.24)	4.96 (12.85)	LS	4.35 (12.01)	LS	10.01 (18.33)	MS	10.80 (19.15)	MS
9	Co-15025	19.76 (26.25)	HS	19.76 (26.25)	LS	19.76 (26.25)	6.97 (15.29)	LS	3.49 (10.75)	LS	19.76 (26.25)	MS	24.52 (29.61)	HS
10	Co-15026	6.50 (14.74)	HS	16.00 (23.24)	MS	2.17 (8.45)	16.12 (23.60)	MS	6.85 (15.13))	LS	4.33 (11.99)	LS	5.17 (12.98)	LS
11	Co-16029	9.68 (18.10)	HS	22.39 (28.22)	HS	3.94 (11.36)	5.84 (13.95)	LS	5.12 (13.03)	LS	15.20 (22.86)	MS	13.61 (21.64)	MS
12	CoS-16232	7.48 (15.61)	HS	7.36 (15.69)	LS	3.12 (10.12)	13.75 (21.72)	MS	17.71 (24.87)	MS	13.31 (21.34)	MS	8.19 (16.54)	LS
13	Co-5009	12.67 (20.79)	HS	22.00 (27.95)	MS	2.67 (9.26)	5.75 (13.85)	LS	7.94 (16.35)	LS	11.33 (19.60)	MS	17.33 (24.56)	MS
14	Co-0238	12.05 (20.26)	HS	25.33 (30.19)	MS	2.88 (9.57)	13.03 (21.14)	MS	8.27 (16.67)	LS	23.25 (28.79)	HS	16.47 (23.90)	MS
15	CoJ-64	14.67 (22.36)	HS	16.67 (24.03)	LS	2.00 (8.13)	14.30 (22.21)	MS	4.39 (12.07)	LS	21.33 (27.49)	HS	12.00 (20.22)	MS

Figures in parentheses are angular transformed values

Table-11b: Reaction of sugarcane genotypes against major insect pests in AVT Early Plant I & II at Lucknow

Sl. No.	Varieties	Root Borer	Termite
II Plant			
1	CoLk 14201	8.36 (16.79)	12.37 (20.57)
2	CoLk -16201	10.47 (18.82)	12.13 (20.36)
3	CoLk -16202	9.69 (18.09)	9.75 (18.16)
4	CoLk-15201	11.39 (19.71)	15.09 (22.82)
5	CoPb-16181	9.97 (18.40)	9.93 (18.33)
6	CoPb-15212	11.25 (19.58)	15.52 (23.19)
7	CoLk-15205	11.25 (19.58)	17.95 (25.02)
I Plant			
7	Co-15027	16.55 (23.89)	19.54 (26.17)
8	Co-15025	13.95 (21.91)	17.95 (25.02)
9	Co-15026	7.43 (15.78)	25.03 (29.98)
10	Co-16029	10.24 (18.60)	25.47 (30.27)
11	CoS-16232	17.62) (24.80)	10.39 (18.77)
12	Co-5009	10.84 (19.18)	12.32 (20.54)
13	Co-0238	13.01 (21.09)	14.80 (22.60)
14	CoJ-64	13.91 (21.88)	9.31 (17.71)

Figures in parentheses are angular transformed values

Table-12a: Reaction of sugarcane genotypes against major insect pests in AVT Mid late Plant I & II at Lucknow

S.N.	Varieties	Stalk Borer		Internode Borer		Pink Borer	Top Borer							
							Brood							
							II		III		IV		V	
		Incidence (%)	Reaction	Incidence (%)	Reaction	Incidence (%)	Incidence (%)	Reaction	Incidence	Reaction	Incidence	Reaction	Incidence	Reaction
II Plant														
1	Co16030	18.22 (25.20)	HS	16.89 (24.25)	LS	2.26 (8.61)	8.43 (16.78)	LS	13.40 (21.40)	MS	21.41 (27.51)	HS	15.30 (23.00)	MS
2	CoLk16203	27.33 (31.44)	HS	22.67 (28.35)	MS	3.33 (10.14)	6.06 (14.15)	LS	9.94 (18.35)	LS	12.00 (20.22)	MS	4.67 (12.41)	LS
3	CoLk16204	21.33 (27.46)	HS	22.00 (27.90)	MS	3.33 (10.39)	6.49 (14.60)	LS	13.07 (21.10)	MS	8.00 (16.34)	LS	14.00 (21.93)	MS
4	Cos16233	16.00 (23.54)	HS	18.00 (25.07)	LS	2.67 (9.26)	7.77 (16.11)	LS	7.93 (16.31)	LS	18.00 (25.07)	MS	7.33 (15.67)	LS
5	CoLk15206	12.67 (20.83)	HS	16.67 (23.93)	LS	2.00 (8.13)	5.39 (13.37)	LS	3.74 (11.14)	LS	15.33 (23.03)	MS	7.33 (15.67)	LS
6	CoLk15207	12.67 (20.82)	HS	12.00 (20.22)	LS	2.00 (8.13)	10.04 (18.26)	LS	12.66 (20.77)	MS	18.00 (25.03)	MS	4.67 (12.41)	LS
7	CoLk15209	24.89 (29.91)	HS	17.04 (24.17)	LS	2.07 (8.27)	3.36 (7.99)	LS	10.87 (19.22)	LS	13.19 (21.25)	MS	6.22 (14.43)	LS
8	CoPb15213	22.48 (28.28)	HS	5.71 (13.73)	LS	2.13 (8.37)	7.15 (15.44)	LS	5.65 (13.74)	LS	11.97 (20.23)	MS	8.51 (16.85)	LS
9	CoS15233	15.01 (22.74)	HS	6.84 (15.13)	LS	2.06 (8.24)	10.31 (18.59)	LS	16.70 (24.08)	MS	8.96 (17.36)	LS	7.57 (15.91)	LS
I Plant														
10	CoS16232	6.82 (15.09)	HS	4.39 (11.99)	LS	4.39 (11.99)	5.02 (12.94)	LS	9.07 (17.51)	LS	15.26 (22.94)	MS	11.21 (19.52)	MS
11	CoS15232	21.05 (27.29)	HS	12.92 (21.05)	LS	2.04 (8.21)	9.74 (18.18)	LS	9.08 (17.51)	LS	11.55 (19.85)	MS	2.04 (8.21)	LS
12	Cos767	22.67 (28.35)	HS	9.33 (17.76)	LS	2.00 (8.13)	11.04 (18.92)	MS	7.68 (16.03)	LS	16.00 (23.54)	MS	13.33 (21.39)	MS
13	Co Pant97222	21.84 (27.82)	HS	15.83 (23.38)	LS	2.91 (9.70)	7.09 (15.37)	LS	10.12 (18.47)	LS	15.99 (23.54)	MS	8.86 (17.29)	LS
14	Co5011	20.67 (26.99)	HS	12.67 (20.83)	LS	2.00 (8.13)	8.98 (17.28)	LS	5.56 (13.62)	LS	8.00 (16.42)	MS	2.00 (8.13)	LS

Figures in parentheses are angular transformed values

Table-12b: Reaction of sugarcane genotypes against major insect pests in AVT Mid late Plant I & II at Lucknow

S.N	Varieties	Root Borer	Termite
II Plant			
1	Co16030	11.41 (19.64)	14.09 (22.03)
2	CoLk16203	11.05 (19.38)	11.76 (20.02)
3	CoLk16204	7.90 (16.28)	7.29 (15.64)
4	CoS16233	5.82 (13.84)	11.67 (19.93)
5	CoLk15206	8.58 (17.01)	7.45 (15.80)
6	CoLk15207	10.86 (19.19)	4.56 (12.19)
7	CoLk15209	7.29 (15.57)	5.17 (13.11)
8	CoPb15213	6.92 (15.17)	15.78 (23.38)
9	CoS15233	3.26 (10.37)	17.28 (24.54)
I Plant			
10	CoS16232	9.14 (17.57)	23.49 (28.94)
11	CoS15232	5.70 (13.79)	16.08 (23.63)
12	CoS767	10.32 (18.72)	8.92 (17.37)
13	Co Pant97222	12.85 (20.99)	11.47 (19.79)
14	Co5011	8.09 (16.49)	14.74 (22.56)

Figures in parentheses are angular transformed values

Table-13: Reaction of sugarcane genotypes against major insect pests in AVT Early ratoon at Lucknow

Sl. No.	Genotype	Stalk Borer		Internode Borer		Root Borer	Top Borer					
							III Brood		IV Brood		V Brood	
		Incidence (%)	Reaction	Incidence (%)	Reaction	Incidence (%)	Incidence (%)	Reaction	Incidence (%)	Reaction	Incidence (%)	Reaction
1	CoLk -16201	12.91 (20.96)	HS	12.30 (20.50)	LS	1.94 (8.00)	6.36 (14.42)	LS	4.55 (12.23)	LS	10.97 (19.32)	MS
2	CoPb-16181	11.35 (19.56)	HS	16.60 (24.02)	LS	1.92 (7.95)	7.59 (15.34)	LS	10.92 (19.20)	MS	9.35 (17.53)	LS
3	CoLk-16202	7.33 (15.67)	HS	13.33 (21.39)	LS	2.00 (8.13)	12.67 (20.78)	MS	13.33 (21.39)	MS	8.00 (16.34)	LS
4	CoPant-16221	8.36 (16.71)	HS	11.70 (19.85)	LS	1.94 (8.00)	11.70 (19.92)	MS	17.27 (24.46)	MS	8.48 (16.73)	LS
5	Co Pant-16222	21.74 (27.76)	HS	15.79 (23.38)	LS	4.59 (12.32)	6.59 (14.62)	LS	7.26 (15.49)	LS	5.87 (13.71)	LS
6	CoPb-14211	28.02 (31.77)	HS	7.38 (15.61)	LS	4.13 (11.57)	12.38 (20.35)	MS	5.79 (13.40)	LS	17.30 (24.43)	MS
7	CoLk-15201	27.33 (31.49)	HS	12.00 (19.98)	LS	8.67 (17.09)	8.67 (16.95)	LS	10.67 (18.94)	MS	8.67 (16.95)	LS
8	CoLk-15205	30.67 (33.57)	HS	14.00 (21.85)	LS	5.33 (13.16)	11.33 (19.47)	MS	14.00 (21.93)	MS	5.33 (13.29)	LS
9	CoPb-15212	7.00 (15.32)	HS	6.67 (14.75)	LS	4.67 (12.45)	7.00 (15.32)	LS	7.67 (16.07)	LS	5.33 (13.33)	LS
10	CoJ-064	8.33 (16.59)	HS	5.67 (13.75)	LS	1.89 (7.89)	17.22 (24.42)	MS	6.22 (14.44)	LS	17.44 (24.67)	MS
11	Co-0238	4.74 (12.47)	MS	12.22 (20.26)	LS	2.73 (9.32)	13.45 (21.38)	MS	11.55 (19.59)	MS	5.25 (13.12)	LS
12	Co-5009	11.58 (19.88)	HS	8.45 (13.88)	LS	2.18 (8.48)	2.18 (8.48)	LS	10.24 (18.60)	MS	2.85 (9.62)	LS

Figures in parentheses are angular transformed values

Table-14: Reaction of sugarcane genotypes against major insect pests in AVT Mid late ratoon at Lucknow

Sl. No.	Genotype	Stalk Borer		Internode Borer		Root borer	Top Borer					
							III Brood		IV Brood		V Brood	
		Incidence (%)	Reaction	Incidence (%)	Reaction	Incidence (%)	Incidence (%)	Reaction	Incidence (%)	Reaction	Incidence (%)	Reaction
1	CoLk 16203	17.92 (25.03)	HS	8.93 (17.29)	LS	2.74 (9.40)	6.21 (14.42)	LS	10.34 (18.69)	LS	10.39 (18.72)	MS
2	CoLk 16204	11.55 (19.85)	HS	14.26 (22.09)	LS	2.71 (9.35)	2.71 (9.35)	LS	12.30 (20.46)	MS	6.79 (15.07)	LS
3	CoPb-16212	19.13 (25.84)	HS	10.71 (18.99)	LS	4.11 (11.35)	7.08 (15.17)	LSs	16.16 (23.60)	MS	6.60 (14.87)	LS
4	CoS-16233	17.15 (24.45)	HS	11.03 (19.29)	LS	4.21 (11.51)	4.78 (12.57)	LS	18.51 (25.27)	MS	8.26 (16.59)	LS
5	Co-Pant 16223	17.56 (24.76)	HS	18.25 (25.26)	LS	3.39 (10.48)	2.03 (8.18)	LS	13.47 (21.39)	MS	9.44 (17.87)	LS
6	Co-16030	20.85 (26.39)	HS	16.69 (23.80)	LS	6.71 (14.27)	13.81 (21.62)	MS	9.18 (17.49)	LS	23.73 (28.29)	HS
7	CoH-14261	4.14 (11.74)	MS	11.01 (19.27)	LS	4.14 (11.74)	13.08 (21.01)	MS	19.29 (25.95)	MS	11.02 (19.37)	MS
8	CoLk-15206	18.00 (25.07)	HS	12.89 (20.93)	LS	5.33 (12.69)	6.89 (15.19)	LS	10.00 (18.19)	LS	8.00 (16.34)	LS
9	CoLk-15207	14.37 (22.17)	HS	18.52 (25.44)	LS	3.41 (10.54)	9.04 (17.44)	LS	19.41 (26.10)	MS	10.37 (18.72)	MS
10	CoLk-15209	16.36 (23.81)	HS	13.68 (21.42)	LS	4.08 (11.65)	5.44 (13.30)	LS	13.60 (21.62)	MS	13.62 (21.56)	MS
11	CoPb-15213	21.61 (27.31)	HS	26.91 (30.92)	MS	13.15 (20.89)	18.28 (25.10)	MS	21.61 (27.31)	HS	26.91 (30.92)	HS
12	CoPb-15232	6.84 (14.96)	HS	17.59 (24.47)	LS	2.93 (9.77)	6.22 (14.25)	LS	7.19 (15.51)	LS	7.14 (15.14)	LS
13	CoS-15233	11.57 (19.81)	HS	21.05 (27.09)	MS	2.72 (9.42)	12.90 (20.82)	MS	22.72 (28.24)	HS	7.46 (15.59)	LS
14	Co-15027	8.21 (16.63)	HS	19.81 (26.41)	LS	2.51 (9.09)	14.58 (22.15)	MS	19.13 (25.89)	MS	6.65 (14.86)	LS
15	CoS-767	10.43 (18.83)	HS	8.35 (16.48)	LS	3.48 (10.62)	3.54 (10.40)	LS	11.82 (20.08)	MS	8.31 (16.68)	LS
16	Co-5011	10.80 (19.09)	HS	11.67 (19.76)	LS	3.52 (10.73)	12.76 (20.69)	MS	17.37 (24.54)	MS	5.77 (13.81)	LS
17	CoPant-97222	6.17 (13.97)	HS	7.24 (15.55)	LS	5.78 (13.71)	15.24 (22.85)	MS	6.41 (14.56)	LS	6.29 (14.49)	LS

Figures in parentheses are angular transformed values

Table 15a. Reaction of sugarcane genotypes against major insect pests in AVT (Early) I Plant at Shahjahanpur.

Sl. No	Varieties/ Genotypes	Early shoot borer (% Incidence)						
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative incidence	Grade	No. of bored plants/ha.
1	Co 15025	3.09	1.58	1.38	1.14	3.06	LS	5092.56
2	Co 16029	2.90	3.14	1.17	1.04	3.07	LS	4861.08
3	CoLk 14201	4.07	2.27	1.86	0.89	2.76	LS	5092.56
4	CoLk 16201	2.61	4.12	0.59	1.43	3.76	LS	5555.52
5	CoLk 16202	3.27	2.70	1.55	1.09	2.92	LS	5092.56
6	CoPb 16181	5.21	2.75	2.39	0.87	3.52	LS	6712.92
Ck	CoJ 64	2.91	1.51	1.39	0.64	2.25	LS	4166.64
	Co 0238	4.53	1.96	2.20	0.69	3.64	LS	5092.56
	Co 05009	3.78	1.53	1.22	0.75	2.77	LS	3472.20
	SE	1.457	1.100	0.493	0.175	-	-	-
	CD	NS	NS	NS	NS	-	-	-

Table 15b. Reaction of sugarcane genotypes against major insect pests in AVT (Early) I Plant at Shahjahanpur.

Sl. No.	Varieties /Genotypes	Percent incidence of Top borer				Stalk borer			
		3rd brood	4th brood	At harvest	Grade	% incidence	% intensity	Infestation index	Grade
1	Co 15025	5.61	1.43	8.00	LS	26.67	1.92	0.68	LS
2	Co 16029	3.79	1.46	6.67	LS	21.33	1.47	0.31	LS
3	CoLk 14201	3.55	1.38	9.67	LS	38.67	2.99	1.27	LS
4	CoLk 16201	2.37	2.24	9.33	LS	26.67	2.66	0.71	LS
5	CoLk 16202	8.40	2.20	5.33	LS	26.67	2.26	0.65	LS
6	CoPb 16181	10.05	1.50	13.33	MS	32.00	1.37	0.44	LS
Ck	CoJ 64	2.21	1.36	6.67	LS	49.33	4.60	1.82	LS
	Co 0238	4.53	1.71	9.33	LS	26.67	1.91	0.53	LS
	Co 05009	15.57	3.57	6.67	MS	22.67	1.47	0.34	LS
	SE	2.453	0.373	2.981	-	6.192	0.536	0.371	-
	CD	7.417	1.128	NS	-	NS	1.622	NS	-

Table 16a. Reaction of sugarcane genotypes against major insect pests in AVT (Early) II Plant at Shahjahanpur.

Sl. No	Varieties/ Genotypes	Early shoot borer (% incidence)						
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative incidence	Grade	No. of bored plants/ha.
1	Co 15023	6.08	3.94	1.64	3.67	4.50	LS	6249.96
2	Co 15024	3.75	4.45	1.64	1.79	4.03	LS	5324.04
3	Co 15027	4.58	3.87	2.17	4.35	7.52	LS	7638.84
4	CoLk 15201	5.21	6.32	2.51	2.81	7.42	LS	7638.84
5	CoLk 15205	4.57	3.40	1.87	1.46	3.05	LS	3935.16
6	CoPb 15212	6.10	3.42	1.54	2.82	5.27	LS	7175.88
Ck	CoJ 64	3.12	7.14	4.95	2.16	4.43	LS	5324.04
	Co 0238	5.78	6.72	4.38	4.13	8.52	LS	9490.68
	Co 05009	4.42	3.70	7.18	2.33	5.76	LS	7407.36
	CoS767	5.56	5.82	1.12	3.96	6.13	LS	8796.24
	SE	1.718	1.408	1.328	0.580	-		-
	CD	N/S	N/S	N/S	1.735	-		-

Table 16b. Reaction of sugarcane genotypes against major insect pests in AVT (Early) II Plant at Shahjahanpur.

Sl. No.	Varieties /Genotypes	Percent incidence of Top borer				Stalk borer			
		3rd brood	4th brood	At harvest	Grade	% incidence	% intensity	Infestation index	Grade
1	Co 15023	0.96	0.83	10.67	MS	24.00	1.47	0.38	LS
2	Co 15024	0.34	0.56	5.33	LS	37.33	3.97	1.76	LS
3	Co 15027	0.90	0.55	5.33	LS	48.00	3.22	1.61	LS
4	CoLk 15201	1.94	0.82	5.33	LS	12.00	0.93	0.12	LS
5	CoLk 15205	0.34	0.45	14.67	MS	8.00	0.89	0.07	LS
6	CoPb 15212	0.32	0.50	9.33	LS	36.00	2.07	0.77	LS
Ck	CoJ 64	0.74	0.57	9.33	LS	21.33	1.86	0.51	LS
	Co 0238	0.37	0.61	16.00	MS	26.67	2.23	0.65	LS
	Co 05009	0.29	0.67	9.33	LS	33.33	1.60	0.52	LS
	CoS767	0.307	1.313	17.33	MS	28.00	1.02	0.32	LS
	SE	0.305	0.250	3.152	-	6.211	0.556	0.341	-
	CD	0.912	NS	NS	-	18.597	1.663	1.021	-

Table 17a. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) I Plant at Shahjahanpur.

Sl. No	Varieties/ Genotypes	Early shoot borer (% incidence)						
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative incidence	Grade	No. of bored plants/ha
1	Co 16030	4.77	1.74	2.33	0.95	2.88	LS	4166.64
2	CoLk 16203	7.60	1.54	1.34	0.49	2.46	LS	3472.20
3	CoLk 16204	6.91	1.64	1.03	0.77	2.61	LS	3935.16
4	CoS 16232	5.03	2.64	1.64	0.52	3.08	LS	3935.16
5	CoS 16233	3.31	2.73	0.73	0.73	2.73	LS	4398.12
Ck	CoS 767	4.81	2.97	1.68	1.25	3.65	LS	5092.56
	CoPant 97222	8.62	0.56	1.40	1.10	3.25	LS	4166.64
	Co 05011	3.40	2.76	0.81	0.99	2.97	LS	3703.68
	SE	1.94	0.604	0.626	0.298	-	-	-
	CD	NS	NS	NS	NS	-	-	-

Table 17b. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) I Plant at Shahjahanpur.

Sl. No.	Varieties /Genotypes	Percent incidence of Top borer				Stalk borer			
		3rd brood	4th brood	At harvest	Grade	% incidence	% intensity	Infestation index	Grade
1	Co 16030	2.18	1.60	5.33	LS	25.33	1.82	0.63	LS
2	CoLk 16203	1.31	1.03	6.67	LS	36.00	2.57	1.03	LS
3	CoLk 16204	2.78	1.42	4.00	LS	24.00	1.84	0.79	LS
4	CoS 16232	1.34	0.93	8.00	LS	29.33	1.82	0.55	LS
5	CoLk 16233	1.48	1.21	5.33	LS	16.00	1.00	0.17	LS
Ck	CoS 767	1.33	0.80	6.67	LS	28.00	1.84	0.57	LS
	CoPant 97222	5.99	2.04	9.33	LS	29.33	1.55	0.47	LS
	Co 05011	2.87	1.86	12.00	MS	38.67	1.73	0.67	LS
	SE	0.85	0.41	2.78	-	6.94	0.63	0.32	-
	CD	2.10	NS	NS	-	NS	NS	NS	-

Table 18a. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) II Plant at Shahjahanpur.

Sl. No	Varieties/ Genotypes	Early shoot borer (% incidence)						
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative incidence	Grade	No. of bored plants/ ha
1	Co 15026	3.19	3.47	4.00	3.32	7.49	LS	6018.48
2	CoS 15232	2.73	0.61	2.19	1.99	4.08	LS	5324.04
3	CoLk 15206	3.88	1.21	1.34	2.02	3.96	LS	5092.56
4	CoLk 15209	2.34	2.10	1.70	1.58	3.60	LS	4861.08
5	CoLk 15207	3.12	0.50	1.12	1.43	3.04	LS	3935.16
6	CoPb 15213	2.68	1.06	1.01	1.27	2.82	LS	4166.64
7	CoS 15233	2.14	1.88	3.13	3.17	6.58	LS	6994.40
Ck	CoS 767	2.39	0.17	1.78	2.35	4.20	LS	4629.60
	CoPant 97222	1.80	2.04	2.22	1.97	4.15	LS	6018.18
	Co 05011	2.25	1.71	2.52	2.07	4.99	LS	5781.25
	SE	0.87	0.607	0.477	0.228	-	-	-
	CD	N/S	1.817	1.427	0.681	-	-	-

Table 18b. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) II Plant at Shahjahanpur.

Sl No	Varieties /Genotypes	Percent incidence of Top borer				Stalk borer			
		3rd brood	4th brood	At harvest	Grade	% incidence	% intensity	Infestation index	Grade
1	Co 15026	2.20	0.85	14.67	MS	41.33	3.88	0.32	LS
2	CoLk15206	0.64	0.68	9.33	LS	25.33	2.26	2.01	MS
3	CoLk15207	0.94	0.70	6.67	LS	17.33	1.20	0.63	LS
4	CoLk 15209	1.43	0.54	12.00	MS	25.33	2.21	1.12	LS
5	CoPb15213	1.23	0.74	16.00	MS	14.67	1.62	0.31	LS
6	CoS 15232	0.49	0.56	10.66	MS	28	1.58	0.54	LS
7	CoS 15233	0.57	0.48	13.33	MS	37.33	2.88	0.64	LS
Ck	CoS 767	0.53	0.36	12.00	MS	13.33	0.72	0.11	LS
	CoPant 97222	0.84	0.67	12.00	MS	10.67	0.76	0.10	LS
	Co 05011	0	0.37	9.33	LS	28	2.49	0.68	LS
	SE	0.289	0.215	3.519	-	6.024	0.431	0.310	-
	CD	0.865	N/S	N/S	-	18.036	1.291	0.929	-

Table 19a. Reaction of sugarcane genotypes against major insect pests in AVT (Early) ratoon at Shahjahanpur.

Sl. No	Varieties/ Genotypes	Early shoot borer (% incidence)						
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative incidence	Infestation grade	No. of bored plants/ha
1	Co 15023	6.99	3.11	1.44	1.04	3.39	LS	4229.60
2	Co 15024	4.80	1.68	1.55	0.67	2.85	LS	3935.16
3	Co 15027	3.11	2.29	1.36	0.37	2.76	LS	3703.68
4	CoLk 15201	3.13	3.54	0.88	1.36	3.28	LS	4629.60
5	CoLk 15205	4.50	3.27	0.88	0.91	2.87	LS	3703.68
6	CoPb 15212	3.75	2.72	1.15	0.89	2.90	LS	3935.16
Ck	CoJ 64	6.56	3.29	0.89	0.52	2.88	LS	3935.16
	Co 0238	4.28	4.23	1.79	1.07	3.59	LS	4861.08
	Co 05009	3.72	3.44	0.90	0.98	2.86	LS	4166.64
	SE	1.686	1.254	0.345	0.463	-	-	-
	CD	NS	NS	NS	NS	-	-	-

Table 19b. Reaction of sugarcane genotypes against major insect pests in AVT (Early) ratoon at Shahjahanpur.

Sl. No.	Varieties /Genotypes	Percent incidence of Top borer				Stalk borer			
		3rd brood	4th brood	At harvest	Infestation grade	% incidence	% intensity	Infestation index	Infestation grade
1	Co 15023	2.99	1.31	6.67	LS	32.00	2.21	0.69	LS
2	Co 15024	3.36	1.77	4.00	LS	34.67	2.90	1.00	LS
3	Co 15027	2.94	1.43	8.00	LS	26.67	1.83	0.53	LS
4	CoLk 15201	2.13	3.24	9.33	LS	16.00	1.18	0.28	LS
5	CoLk 15205	1.58	1.89	6.67	LS	5.33	0.22	0.01	LS
6	CoPb 15212	2.55	1.92	8.00	LS	8.00	0.60	0.06	LS
Ck	CoJ 64	2.24	1.34	4.00	LS	8.00	0.28	0.03	LS
	Co 0238	4.62	1.98	5.33	LS	25.33	1.69	0.55	LS
	Co 05009	7.38	2.51	12.00	MS	12.00	1.18	0.13	LS
	SE	1.175	0.853	2.244	-	4.363	0.425	0.140	-
	CD	NS	NS	NS	-	13.193	1.285	0.425	-

Table 20a. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) ratoon at Shahjahanpur.

Sl. No.	Varieties/ Genotypes	Early shoot borer (% incidence)						
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative incidence	Infestation grade	No. of bored plants/ha
1	Co 15026	4.38	2.42	1.71	0.56	2.00	LS	3703.68
2	CoLk 15206	4.22	5.18	2.59	0.73	4.39	LS	7175.88
3	CoLk 15207	2.98	2.20	1.42	0.80	2.96	LS	4398.12
4	CoLk 15209	2.71	1.42	1.49	0.44	2.16	LS	3472.20
5	CoPb 15213	4.44	4.72	2.34	0.54	3.71	LS	6481.32
6	CoS 15232	3.37	4.58	1.64	0.53	3.40	LS	4629.60
7	CoS 15233	2.53	2.06	2.98	0.79	3.71	LS	5555.52
Ck	CoS 767	3.19	2.15	1.90	0.91	3.34	LS	4398.12
	CoPant 97222	2.02	1.38	0.82	0.42	1.79	LS	3009.24
	Co 05011	3.10	3.98	2.68	0.83	4.42	LS	6481.44
	SE	0.708	0.84	0.44	0.14	-	-	-
	CD	NS	2.51	NS	NS	-	-	-

Table 20b. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) ratoon at Shahjahanpur.

Sl. No.	Varieties /Genotypes	Percent incidence of Top borer				Stalk borer			
		3rd brood	4th brood	At harvest	Infestation grade	% incidence	% intensity	Infestation index	Infestation grade
1	Co 15026	1.84	1.70	12.00	MS	16.00	0.99	0.19	LS
2	CoLk 15206	1.84	0.62	6.67	LS	18.67	1.16	0.25	LS
3	CoLk 15207	3.45	1.53	5.33	LS	10.67	0.24	0.03	LS
4	CoLk 15209	12.68	3.06	6.67	LS	22.67	0.98	0.17	LS
5	CoPb 15213	0.98	0.57	21.33	HS	14.67	1.33	0.24	LS
6	CoS 15232	1.49	0.65	8.00	LS	10.67	0.46	0.05	LS
7	CoS 15233	2.83	1.51	5.33	LS	12.00	0.70	0.15	LS
Ck	CoS 767	1.38	1.48	10.67	MS	22.67	1.77	0.49	LS
	CoPant 97222	6.10	2.15	10.67	MS	18.6	1.36	0.25	LS
	Co 05011	1.38	0.82	5.33	LS	17.33	1.14	0.08	LS
	SE	0.98	0.25	1.816	-	5.931	0.404	0.134	-
	CD	2.93	0.74	5.44	-	NS	NS	NS	-

North Central & North East Zone

IVT (EARLY)

Pusa

In IVT (Early) altogether 11 entries including 3 standards were evaluated for their reaction against major insect pests, *viz.*, ESB, top borer, stalk borer and root borer. All the entries were LS against ESB, stalk borer and root borer. Against top borer, 6 entries showed LS and 5 entries showed MS reactions (Table 21 & 27).

AVT (EARLY) I PLANT

Pusa

In AVT (Early)-Ist Plant, 8 entries including 3 standards were evaluated for their reaction against major insect pests viz., ESB, top borer, stalk borer and root borer. All the entries were LS against ESB, stalk borer and root borer. Against top borer, three entries, CoP 16437, CoLk 16468 and CoSe 95422 were LS and rest other entries showed MS reaction (Table 22 & 28).

Seorahi

In AVT (Early)-Ist Plant, 8 entries including 3 standards were evaluated for their reaction against major insect pests viz., ESB, top borer, stalk borer and root borer. All the entries showed LS reaction against ESB, top borer, stalk borer and root borer (Table 22 and 33a,b &c).

AVT (EARLY) II PLANT

Pusa

In AVT (Early)-2nd Plant, 8 entries including 3 standards were evaluated for their reaction against major insect pests viz., ESB, top borer, stalk borer and root borer. All the entries were LS against ESB, stalk borer and root borer except CoSe 95422, which showed MS reaction against ESB. Against top borer, three entries, CoLk 15467, CoSe 15452 and CoSe 01421 were LS and rest other entries showed MS reaction (Table 23 & 29).

Seorahi

In AVT (Early)-2nd Plant, 8 entries including 3 standards were evaluated for their reaction against major insect pests viz., ESB, top borer, stalk borer and root borer. All the entries showed LS reaction against ESB, top borer, stalk borer and root borer (Table 23 and 34 a,b &c)).

IVT (MIDLATE)

Pusa

In IVT (Mid late) altogether 9 entries including 3 standards were evaluated for their reaction against major insect pests viz., ESB, top borer, stalk borer and root borer. All the

entries were LS against ESB, stalk borer and root borer. Against top borer, 6 entries showed LS and 3 entries showed MS reactions (Table 24 & 30).

AVT (MIDLATE) I PLANT

Pusa

In AVT (Midlate)-Ist Plant, 7 entries including 3 standards were evaluated for their reaction against major insect pests viz., ESB, top borer, stalk borer and root borer. All the entries were LS against ESB, stalk borer and root borer except CoBln 16502 and BO 91, which showed MS reaction against ESB. Against top borer, three entries, CoP 16439, CoBln 16502 and CoP 06436 were LS and rest other entries showed MS reaction (Table 25 & 31).

Seorahi

In AVT (Midlate)-Ist Plant, 7 entries including 3 standards were evaluated for their reaction against major insect pests viz., ESB, top borer, stalk borer and root borer. All the entries showed LS reaction against ESB, top borer, stalk borer and root borer (Table 25 & 35 a,b&c).

AVT (MIDLATE) II PLANT

Pusa

In AVT (Midlate)-2nd Plant, 10 entries including 3 standards were evaluated for their reaction against major insect pests viz., ESB, top borer, stalk borer and root borer. All the entries were LS against ESB and root borer. Against top borer, 4 entries, CoP 15438, CoSe 15453, CoP 0643 and CoP 9301 were LS and rest other entries showed MS reaction. All entries showed LS reaction against stalk borer except CoP 15440, BO 91 and CoP 06436, which showed MS reaction. (Table 26 & 32).

Seorahi

In AVT (Midlate)-2nd Plant, 10 entries including 3 standards were evaluated for their reaction against major insect pests viz., ESB, top borer, stalk borer and root borer. All the entries showed LS reaction against ESB, top borer, stalk borer and root borer (Table 26 & 36 a,b&c).

Table 21. IVT-(Early) (NC & NE Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer	Top Borer	Stalk Borer	Root Borer
		Pusa	Pusa	Pusa	Pusa
1.	CoSe 16454	LS	LS	LS	LS
2.	CoP 17436	LS	MS	LS	LS
3.	CoP 17437	LS	LS	LS	LS
4.	CoP 17438	LS	MS	LS	LS
5.	CoP 17440	LS	LS	LS	LS
6.	CoP 17441	LS	LS	LS	LS
7.	CoSe 17451	LS	MS	LS	LS
8.	CoBln 17501	LS	MS	LS	LS
9.	CoLk 94184(Std.)	LS	LS	LS	LS
10.	CoSe 95422 (Std.)	LS	MS	LS	LS
11.	CoSe 01421 (Std.)	LS	LS	LS	LS

Table 22. AVT-I Plant (Early) (NC & NE Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Top Borer		Stalk Borer		Root Borer	
		Pusa	Seorahi	Pusa	Seorahi	Pusa	Seorahi	Pusa	Seorahi
1.	CoP 16437	LS	LS	LS	LS	LS	LS	LS	LS
2.	CoP 16438	LS	LS	MS	LS	LS	LS	LS	LS
3.	CoLk 16466	LS	LS	MS	LS	LS	LS	LS	LS
4.	CoLk 16468	LS	LS	LS	LS	LS	LS	LS	LS
5.	CoSe 16451	LS	LS	MS	LS	LS	LS	LS	LS
6.	CoLk 94184(Std.)	LS	LS	MS	LS	LS	LS	LS	LS
7.	CoSe 95422 (Std.)	LS	LS	LS	LS	LS	LS	LS	LS
8.	CoSe 01421 (Std.)	LS	LS	MS	LS	LS	LS	LS	LS

Table 23. AVT-II Plant (Early) (NC & NE Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Top Borer		Stalk Borer		Root Borer	
		Pusa	Seorahi	Pusa	Seorahi	Pusa	Seorahi	Pusa	Seorahi
1.	CoLk 15466	LS	LS	MS	LS	LS	LS	LS	LS
2.	CoLk 15467	LS	LS	LS	LS	LS	LS	LS	LS
3.	CoP 15436	LS	LS	MS	LS	LS	LS	LS	LS
4.	CoSe 15452	LS	LS	LS	LS	LS	LS	LS	LS
5.	CoSe 15455	LS	LS	MS	LS	LS	LS	LS	LS
6.	CoLk 94184(Std.)	LS	LS	MS	LS	LS	LS	LS	LS
7.	CoSe 95422 (Std.)	MS	LS	MS	LS	LS	LS	LS	LS
8.	CoSe 01421 (Std.)	LS	LS	LS	LS	LS	LS	LS	LS

Table 24. IVT-(Mid late) (NC & NE Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer	Top Borer	Stalk Borer	Root Borer
		Pusa	Pusa	Pusa	Pusa
1.	CoSe 16455	LS	LS	LS	LS
2.	CoSe 16456	LS	MS	LS	LS
3.	CoP 17444	LS	LS	LS	LS
4.	CoP 17446	LS	LS	LS	LS
5.	CoSe 17452	LS	LS	LS	LS
6.	CoBln 17502	LS	MS	LS	LS
7.	BO 91(Std.)	LS	MS	LS	LS
8.	CoP 9301 (Std.)	LS	LS	LS	LS
9.	CoP 06436 (Std.)	LS	LS	LS	LS

Table 25. AVT-I Plant (Mid late) (NC & NE Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Top Borer		Stalk Borer		Root Borer	
		Pusa	Seorahi	Pusa	Seorahi	Pusa	Seorahi	Pusa	Seorahi
1.	CoP 16439	LS	LS	LS	LS	LS	LS	LS	LS
2.	CoLk 16470	LS	LS	MS	LS	LS	LS	LS	LS
3.	CoSe 16452	LS	LS	MS	LS	LS	LS	LS	LS
4.	CoBln 16502	MS	LS	LS	LS	LS	LS	LS	LS
5.	BO 91(Std.)	MS	LS	MS	LS	LS	LS	LS	LS
6.	CoP 06436(Std.)	LS	LS	LS	LS	LS	LS	LS	LS
7.	CoP 9301(Std.)	LS	LS	MS	LS	LS	LS	LS	LS

Table 26. AVT-II Plant (Mid late) (NC & NE Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Top Borer		Stalk Borer		Root Borer	
		Pusa	Seorahi	Pusa	Seorahi	Pusa	Seorahi	Pusa	Seorahi
1.	CoLk 15468	LS	LS	MS	LS	LS	LS	LS	LS
2.	CoLk 15469	LS	LS	MS	LS	LS	LS	LS	LS
3.	CoP 15438	LS	LS	LS	LS	LS	LS	LS	LS
4.	CoP 15439	LS	LS	MS	LS	LS	LS	LS	LS
5.	CoP 15440	LS	LS	MS	LS	MS	LS	LS	LS
6.	CoSe15453	LS	LS	LS	LS	LS	LS	LS	LS
7.	CoSe15454	LS	LS	MS	LS	LS	LS	LS	LS
8.	BO 91(Std.)	LS	LS	MS	LS	MS	LS	LS	LS
9.	CoP 06436(Std.)	LS	LS	LS	LS	MS	LS	LS	LS
10.	CoP 9301(Std.)	LS	LS	LS	LS	LS	LS	LS	LS

Table 27. Reaction of sugarcane genotypes against major insect pests in IVT (Early) at Pusa

Sl. No.	Varieties/ genotypes	Early shoot borer (% incidence)						Top borer (% incidence)			Stalk borer				Root borer (% incidence)	Reaction
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative	Reaction	III brood 5th month	IV Brood 7th month	*Reaction	% incidence	% intensity	Infestation index	Reaction		
IVT (Early) 8+3																
1	CoSe 16454	6.63	3.27	6.36	1.33	8.58	LS	7.67	9.36	LS	3.63	4.66	0.16	LS	4.67	LS
2	CoP 17436	0.00	4.78	5.11	1.21	6.76	LS	9.66	11.36	MS	2.72	2.33	0.06	LS	3.35	LS
3	CoP 17437	6.55	7.67	4.77	2.45	8.53	LS	6.36	8.78	LS	5.67	3.33	0.18	LS	6.75	LS
4	CoP 17438	7.62	9.36	5.39	2.33	9.63	LS	9.89	12.63	MS	2.15	1.66	0.03	LS	8.56	LS
5	CoP 17440	0.00	7.85	5.77	1.44	6.89	LS	5.56	8.79	LS	3.53	2.33	0.08	LS	9.63	LS
6	CoP 17441	3.33	7.69	4.89	1.76	7.53	LS	6.78	9.59	LS	3.95	1.33	0.05	LS	4.89	LS
7	CoSe 17451	7.22	7.85	5.27	2.55	7.22	LS	8.87	11.55	MS	7.57	5.33	0.39	LS	8.29	LS
8	CoBln 17501	9.26	6.38	4.67	2.87	9.59	LS	10.28	15.76	MS	8.63	7.66	0.65	LS	9.33	LS
9	CoLk 94184(Std.)	5.56	8.45	5.36	1.56	8.12	LS	7.12	9.12	LS	4.33	3.33	0.14	LS	7.28	LS
10	CoSe 95422 (Std.)	8.69	9.88	7.63	2.63	9.76	LS	9.36	12.25	MS	5.47	2.33	0.12	LS	8.35	LS
11	CoSe 01421 (Std.)	0.00	6.36	7.22	3.47	7.68	LS	6.73	9.63	LS	4.76	1.66	0.07	LS	6.53	LS

*Reaction based on 4th brood percent incidence

Table 28. Reaction of sugarcane genotypes against major insect pests in AVT (Early) I Plant at Pusa

S.N.	Varieties /genotypes	Early shoot borer (% incidence)						Top borer (% incidence)			Stalk borer				Root borer % incidenc	Reaction
		30 DAP	60 DAP	90 DAP	120 DAP	Cum.	Reaction	III brood 5th month	IV Brood 7th month	*Reaction	% incidence	% intensity	Infestation index	Reaction		
AVT (Early) 1st plant 5+3																
1	CoP 16437	0.0	5.12	2.33	1.23	5.36	LS	6.56	9.88	LS	4.55	3.63	0.16	LS	4.76	LS
2	CoP 16438	5.46	7.36	4.53	3.36	9.36	LS	7.36	10.35	MS	6.36	4.66	0.29	LS	5.36	LS
3	CoLk 16466	7.69	8.33	6.68	2.23	10.78	LS	8.37	12.55	MS	4.12	2.66	0.10	LS	6.99	LS
4	CoLk 16468	0.00	5.46	3.37	1.63	4.36	LS	7.12	9.47	LS	6.36	3.33	0.21	LS	8.36	LS
5	CoSe 16451	0.00	6.76	5.37	3.78	6.88	LS	9.63	13.51	MS	5.22	5.33	0.27	LS	5.66	LS
6	CoLk 94184(Std.)	6.36	9.63	7.11	3.43	10.33	LS	8.87	11.54	MS	7.36	2.63	0.19	LS	7.36	LS
7	CoSe 95422 (Std.)	7.55	6.35	5.33	2.56	9.76	LS	6.52	8.84	LS	6.25	4.36	0.27	LS	5.47	LS
8	CoSe 01421(Std.)	4.37	7.39	5.26	3.88	11.25	LS	8.96	11.55	MS	4.88	2.25	0.10	LS	7.33	LS

*Reaction based on 4th brood percent incidence

Table 29. Reaction of sugarcane genotypes against major insect pests in AVT (Early) II Plant at Pusa

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 index	Reaction		
AVT (Early) IInd plant 5+3																
1	CoLk 15466	5.63	7.40	3.22	1.33	8.43	LS	8.73	11.46	MS	6.73	1.44	0.09	LS	8.56	LS
2	CoLk 15467	0.00	5.86	7.63	3.47	6.51	LS	7.63	9.55	LS	4.56	1.33	0.06	LS	9.22	LS
3	CoP 15436	0.00	6.36	7.11	1.55	7.36	LS	6.69	9.76	MS	7.83	5.66	0.44	LS	7.89	LS
4	CoSe 15452,	8.55	5.27	3.25	1.26	8.39	LS	7.11	9.22	LS	5.36	6.36	0.34	LS	8.12	LS
5	CoSe 15455	5.36	7.14	4.63	2.41	9.11	LS	8.77	11.65	MS	7.45	5.33	0.39	LS	10.36	LS
6	ColK 84184 (Std.)	6.52	8.22	5.13	3.64	10.55	LS	9.33	13.65	MS	8.45	6.66	0.50	LS	8.76	LS
7	CoSe 95422(Std.)	5.33	7.67	4.75	2.11	8.67	MS	7.36	10.47	MS	6.44	4.35	0.28	LS	10.78	LS
8	CoSe 01421(Std.)	4.26	7.87	5.47	2.64	10.36	LS	6.33	9.12	LS	4.37	2.33	0.10	LS	9.55	LS

*Reaction based on 4th brood percent incidence

Table 30. Reaction of sugarcane genotypes against major insect pests in IVT (Mid late) at Pusa

Sl No	Varieties/ genotypes	Early shoot borer (% incidence)						Top borer (% incidence)			Stalk borer				Root borer % incidence	Reaction
		30 DAP	60 DAP	90 DAP	120 DAP	Cum.	Reaction	III brood 5th month	IV Brood 7th month	*Reaction	% incidence	% intensity	Infestation index	Reaction		
IVT (Midlate) 6 + 3																
1	CoSe 16455	3.66	7.21	4.36	2.56	7.88	LS	7.76	9.66	LS	5.67	2.33	0.13	LS	7.66	LS
2	CoSe 16456	5.78	9.53	7.33	4.55	12.59	LS	8.56	11.44	MS	7.87	4.56	0.35	LS	8.59	LS
3	CoP 17444	0.00	6.54	8-11	3.68	8.75	LS	6.23	9.16	LS	6.55	7.88	0.51	LS	57.35	LS
4	CoP 17446	4.76	7.31	4.88	2.13	7.47	LS	7.44	8.78	LS	8.12	6.55	0.53	LS	8.22	LS
5	CoSe 17452	0.00	4-57	6-78	4.22	7.58	LS	6.89	9.59	LS	9.35	10.33	0.95	LS	8.45	LS
6	CoBln 17502	6-36	9-38	6.27	3.73	12.83	LS	9.56	15.77	MS	8.76	5.66	0.49	LS	10.36	LS
7	BO 91(Std.)	5.11	8.65	5.39	3.14	11.37	LS	10.67	13.56	MS	7.56	4.36	0.32	LS	10.76	LS
8	CoP 9301	0.00	6.85	5.38	3.56	7.89	LS	7.53	9.76	LS	8.33	6.23	0.51	LS	8.89	LS
9	CoP 06436	3.59	6.33	4.67	2.26	8.76	LS	7.88	9.12	LS	7.22	5.36	0.38	LS	7.64	LS

*Reaction based on 4th brood percent incidence

Table 31. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) I Plant at Pusa

Sl No	Varieties/ genotypes	Early shoot borer (% incidence)						Top borer (% incidence)			Stalk borer				Root borer % incidence	Reaction
		30 DAP	60 DAP	90 DAP	120 DAP	Cum.	Reaction	III brood 5th month	IV Brood 7th month	*Reaction	% incidence	% intensity	Infestation index	Reaction		
AVT (Midlate) 1st Plant 4 + 3																
1	CoP 16439	4.24	6.88	5.11	2.56	8.76	LS	7.66	9.28	LS	4.56	2.36	0.10	LS	8.98	LS
2	CoLk 16470	9.36	7.56	6.78	3.87	12.37	LS	8.87	12.36	MS	8.76	6.66	0.58	LS	9.26	LS
3	CoSe 16452	6.46	7.12	8.25	4.77	14.36	LS	9.36	14.77	MS	7.22	5.78	0.41	LS	7.56	LS
4	CoBln 16502	8.79	5.87	6.54	3.56	11.56	MS	7.56	9.57	LS	8.63	5.36	0.54	LS	9.76	LS
5	BO 91(Std.)	6.76	7.63	8.73	4.22	13.56	MS	8.86	10.66	MS	6.88	3.56	0.24	LS	8.76	LS
6	CoP 06436(Std.)	8.36	4.56	7.88	3.56	11.33	LS	6.78	8.97	LS	5.34	2.36	0.12	LS	7.33	LS
7	CoP 9301(Std.)	6.53	4.86	5.39	2.21	8.56	LS	7.88	9.36	MS	4.76	1.36	0.06	LS	8.11	LS

*Reaction based on 4th brood percent incidence

Table 32. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) II Plant at Pusa

Sl No	Varieties /genotypes	Early shoot borer (% incidence)						Top borer (% incidence)			Stalk borer				Root borer % incidence	Reaction
		30 DAP	60 DAP	90 DAP	120 DAP	Cum.	Reaction	III brood 5th month	IV Brood 7th month	*Reaction	% incidence	% intensity	Infestation index	Reaction		
AVT (Midlate) 1Ind Plant + 3																
1	CoLk 15468	4.67	7.56	6.33	3.56	10..26	LS	9.76	13.56	MS	8.44	6.36	0.53	LS	7.87	LS
2	CoLk 15469	7.44	10.37	7.22	5.16	13.88	LS	8.57	10.66	MS	6.83	4.66	0.31	LS	8.57	LS
3	CoP 15438	6.26	7.87	5.77	2.82	9.67	LS	6.37	8.85	LS	5.88	3.33	0.17	LS	7.37	LS
4	CoP 15439	5.66	8.65	6.64	3.76	11.33	LS	8.46	10.76	MS	7.14	5.86	0.41	LS	9.12	LS
5	CoP 15440	4.37	7.56	6.77	4.55	10.87	LS	7.26	9.58	MS	6.33	3.56	0.22	MS	6.63	LS
6	CoSe 15453	7.66	8.36	7.56	4.67	13..56	LS	6.56	8.79	LS	7.89	6.66	0.52	LS	9.89	LS
7	CoSe 15454	0.00	7.33	8.75	5.44	9.55	LS	9.36	12.67	MS	5.10	3.33	0.16	LS	7.88	LS
8	BO 91 (Std.)	4.37	7.87	9.36	5.63	14.33	LS	8.86	11.36	MS	6.49	4.56	0.29	MS	9.63	LS
9	CoP06436(Std.)	0.00	6.76	8.96	5.36	9.39	LS	7.63	9.11	LS	4.86	2.15	0.10	MS	7.83	LS
10	CoP 9301 (Std.)	4.44	7.65	6.24	4.66	8.76	LS	6.78	8.75	LS	5.63	3.66	0.20	LS	6.57	LS

*Reaction based on 4th brood percent incidence

Table 33a. Reaction of sugarcane genotypes against major insect pests in AVT (Early) I Plant at Seorahi

Sl. No.	Genotype	% incidence of ESB					No. of bored plants/ha (on the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence	
1	CoP 16437	0.00	7.57	9.00	2.56	11.11	4691.35
2	CoP 16438	0.00	6.25	8.69	3.08	11.29	4938.27
3	CoLk 16466	0.00	7.69	7.58	3.20	12.71	5432.09
4	CoLk 16468	0.00	9.09	8.46	3.20	13.21	5679.01
5	CoSe 16451	0.00	4.08	7.81	3.18	11.11	4691.35
6	CoLk 94184	0.00	6.74	9.09	3.04	12.15	5432.09
7	CoSe 95422	0.00	4.12	5.88	1.65	7.29	3456.79
8	CoSe 01421	0.00	6.32	2.35	2.39	9.44	4197.53
	SE	-	1.22	1.38	0.52	-	-
	CD	-	3.70	4.21	1.58	-	-

Table 33b. Reaction of sugarcane genotypes against major insect pests in AVT (Early) I Plant at Seorahi

Sl. No.	Genotype	% incidence of top borer		
		III brood/5th month	IV brood/7th month	At harvest
1	CoP 16437	2.44	4.91	4.21
2	CoP 16438	2.68	5.28	5.35
3	CoLk 16466	1.64	3.37	6.10
4	CoLk 16468	3.01	5.09	5.80
5	CoSe 16451	1.86	4.30	3.63
6	CoLk 94184	2.09	3.87	6.04
7	CoSe 95422	2.87	4.33	5.36
8	CoSe 01421	2.38	5.55	4.44
	SE	0.22	0.57	0.41
	CD	0.68	1.73	1.23

Table 33c. Reaction of sugarcane genotypes against major insect pests in AVT (Early) I Plant at Seorahi

Sl. No.	Genotype	Stalk borer			Root borer
		% incidence	% intensity	Infestation index	% incidence
1	CoP 16437	12.00	1.32	0.15	4.36
2	CoP 16438	16.00	1.47	0.23	3.67
3	CoLk 16466	16.00	1.44	0.32	3.57
4	CoLk 16468	16.00	1.60	0.25	3.56
5	CoSe 16451	16.00	1.44	0.23	3.65
6	CoLk 94184	9.33	1.09	0.10	4.05
7	CoSe 95422	20.00	1.63	0.32	4.38
8	CoSe 01421	17.33	1.58	0.27	3.66
	SE	2.41	0.16	0.06	0.04
	CD	7.31	0.51	0.18	0.11

Table 34a. Reaction of sugarcane genotypes against major insect pests in AVT (Early) II Plant at Seorahi

Sl. No.	Genotype	% incidence of ESB					No. of bored plants/ha (on the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence	
1	CoP 15436	0.00	8.00	5.06	2.24	9.37	4444.44
2	CoLk 15466	0.00	8.33	7.56	3.04	9.14	4938.27
3	CoLk 15467	0.00	5.06	5.75	2.45	11.17	3950.61
4	CoSe 15452	0.00	4.87	4.54	2.58	9.03	3703.70
5	CoSe 15455	0.00	7.05	5.26	1.80	8.93	3950.62
6	CoLk 94184	0.00	7.04	3.16	1.12	6.38	2962.96
7	CoSe 95422	0.00	6.41	5.92	2.25	8.94	4197.53
8	CoSe 01421	0.00	6.25	6.10	2.51	9.88	4197.53
	SE	-	4.75	0.56	0.57	-	-
	CD	-	14.42	1.71	1.73	-	-

Table 34b. Reaction of sugarcane genotypes against major insect pests in AVT (Early) II Plant at Seorahi

Sl. No.	Genotype	% incidence of top borer		
		III brood/5th month	IV brood/7th month	At harvest
1	CoP 15436	2.18	3.62	5.85
2	CoLk 15466	2.53	4.64	6.41
3	CoLk 15467	2.00	3.30	5.72
4	CoSe 15452	1.76	5.14	4.10
5	CoSe 15455	1.48	3.80	5.42
6	CoLk 94184	1.82	3.46	6.07
7	CoSe 95422	2.90	4.38	5.31
8	CoSe 01421	2.25	4.61	4.91
	SE	0.28	0.48	0.50
	CD	0.85	1.46	1.52

Table 34c. Reaction of sugarcane genotypes against major insect pests in AVT (Early) II Plant at Seorahi

Sl. No.	Genotype	Stalk borer			Root borer
		% incidence	% intensity	Infestation index	% incidence
1	CoP 15436	16.00	1.35	0.22	4.46
2	CoLk 15466	17.33	1.42	0.27	3.37
3	CoLk 15467	10.66	0.89	0.09	3.17
4	CoSe 15452	16.00	1.42	0.22	3.67
5	CoSe 15455	18.66	1.54	0.28	3.75
6	CoLk 94184	12.00	1.13	0.16	4.25
7	CoSe 95422	18.66	1.44	0.26	4.36
8	CoSe 01421	20.00	1.72	0.34	3.77
	SE	2.16	0.14	0.14	0.03
	CD	6.57	0.43	0.44	0.11

Table 35a. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) I Plant at Seorahi

Sl. No.	Genotype	% incidence of ESB					No. of bored plants/ha (on the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence	
1	CoP 16439	0.00	6.97	9.24	3.06	12.34	5432.09
2	CoLk 16470	0.00	8.53	6.66	2.85	11.45	5432.09
3	CoBln16502	0.00	8.57	10.78	3.97	13.69	5679.01
4	CoSe 16452	0.00	5.33	5.88	2.40	8.47	3703.70
5	BO 91	0.00	4.87	6.19	8.33	8.33	3456.79
6	CoP 9301	0.00	5.33	8.87	2.42	10.55	4691.35
7	CoP 06436	0.00	11.39	7.74	2.19	12.31	6172.83
	SE	-	1.61	0.54	0.54	-	-
	CD	-	4.96	1.68	1.67	-	-

Table 35b. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) I Plant at Seorahi

Sl. No.	Genotype	% incidence of top borer		
		III brood/5th month	IV brood/7th month	At harvest
1	CoP 16439	2.15	3.65	3.89
2	CoLk 16470	2.91	3.10	4.97
3	CoBln16502	2.77	3.71	5.20
4	CoSe 16452	2.32	3.34	3.66
5	BO91	2.05	3.21	4.66
6	CoP 9301	1.39	3.52	4.78
7	CoP 06436	2.40	4.06	6.63
	SE	0.30	0.75	0.39
	CD	0.92	2.32	1.20

Table 35c. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) I Plant at Seorahi

Sl. No.	Genotype	Stalk borer			Root borer
		% incidence	% intensity	Infestation index	% incidence
1	CoP 16439	13.33	1.15	0.15	4.18
2	CoLk 16470	14.66	1.42	0.21	3.47
3	CoBln16502	13.35	1.26	0.17	3.33
4	CoSe 16452	13.33	1.14	0.15	3.27
5	BO91	10.66	1.15	0.12	3.75
6	CoP 9301	13.33	1.20	0.16	4.15
7	CoP 06436	13.33	1.15	0.15	4.16
	SE	139	0.11	0.03	0.05
	CD	4.29	0.34	0.09	0.15

Table 36a. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) II Plant at Seorahi

Sl. No.	Genotype	% incidence of ESB					No. of bored plants/ha (on the basis of Cumulative % incidence)
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative % incidence	
1	CoP 15438	0.00	8.33	10.31	3.04	13.58	6172.83
2	CoP 15439	0.00	8.86	8.80	3.03	12.56	5679.01
3	CoP 15440	0.00	7.14	9.09	3.65	13.18	5925.92
4	CoLk 15468	0.00	6.32	6.56	2.25	9.42	4444.44
5	CoLk 15469	0.00	7.79	8.59	2.51	11.93	5185.18
6	CoSe15453	0.00	3.48	5.00	2.51	5.95	2469.13
7	CoSe15454	0.00	3.79	3.24	1.66	5.85	2716.04
8	BO91	0.00	6.32	7.54	1.27	8.23	3456.79
9	CoP9301	0.00	6.84	8.87	2.32	1010	4691.35
10	CoP 06436	0.00	6.66	7.23	2.24	10.30	4938.27
	SE	-	1.18	0.90	0.44	-	-
	CD	-	3.52	2.69	1.32	-	-

Table 36b. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) II Plant at Seorahi

Sl. No.	Genotype	% incidence of top borer		
		III brood/5th month	IV brood/7th month	At harvest
1	CoP 15438	3.69	5.21	6.56
2	CoP 15439	2.97	4.91	5.94
3	CoP 15440	2.86	4.31	5.47
4	CoLk 15468	2.91	4.19	4.97
5	CoLk 15469	2.94	4.36	5.43
6	CoSe15453	2.09	3.86	3.70
7	CoSe15454	1.91	3.57	3.00
8	BO91	2.57	4.67	4.21
9	CoP9301	2.73	4.61	3.75
10	CoP 06436	2.70	4.44	5.19
	SE	0.35	0.39	0.35
	CD	1.04	1.16	1.05

Table 36c. Reaction of sugarcane genotypes against major insect pests in AVT (Mid late) II Plant at Seorahi

Sl. No.	Genotype	Stalk borer			Root borer
		% incidence	% intensity	Infestation index	% incidence
1	CoP 15438	18.66	1.56	0.29	3.39
2	CoP 15439	22.66	1.67	0.37	3.68
3	CoP 15440	14.66	1.30	0.19	3.58
4	CoLk 15468	16.00	1.06	0.17	3.67
5	CoLk 15469	16.00	1.37	0.21	3.69
6	CoSe15453	12.00	1.02	0.12	4.06
7	CoSe15454	12.00	1.12	0.13	4.26
8	BO91	12.00	1.18	0.15	3.35
9	CoP9301	20.00	1.69	0.33	3.47
10	CoP 06436	20.00	1.61	0.32	4.69
	SE	1.00	0.09	0.03	0.10
	CD	2.98	0.28	0.09	0.29

Peninsular Zone

IVT

Mandya

Twenty one genotypes with their zonal checks (Co 86032, CoC 671 and Co 09004) were screened for their reaction against major sugarcane pests. All the genotypes showed LS reaction against ESB, top borer and internode borer except three genotypes viz., Co 17013, Co 17014, CoVC 1706, which showed MS reaction against internode borer (Table 37 & 41).

Padegaon

Twenty one genotypes with their zonal checks (Co 86032, CoC 671 and Co 09004) were screened for their reaction against major sugarcane pests. All the genotypes showed LS reaction against ESB, top borer and scale insects. Against internode borer, only two genotypes Co 17003 and CoT 17366 showed LS reaction and rest other genotypes were either MS (14 nos.) or HS (5 nos.). All the genotypes were HS against mealy bug except one genotype, MS 17082, which showed MS reaction (Table 37 & 44 a,b &c)).

AVT - I PLANT

Coimbatore

Altogether 14 genotypes were screened against ESB and internode borer. Only two genotypes, viz., Co 14005 and Co 15017 showed LS reaction against ESB and rest other genotypes showed either MS reaction (6 nos.) or HS reaction (6 nos.). Against internode borer, only one genotype Co 15009, showed LS reaction and rest other genotypes either MS (12 nos.) or HS (1 no.) reactions (Table 38 and 48 a&b).

Mandya

Altogether 15 genotypes with their Zonal checks (Co 86032, CoC 671 and Co 09004) were screened for their reaction against major sugarcane insect pests. All the genotypes showed LS reaction against ESB, internode borer and top borer. (Table 38 & 42).

Padegaon

Fifteen genotypes were screened against ESB, internode borer, top borer, mealy bug and scale insect. On the basis of cumulative per cent incidence, all the entries were found LS to ESB and top borer. Only one genotype, CoSNK 15102 showed LS reaction against internode borer and rest other genotypes showed either MS (6 nos.) or HS (8 nos.) reaction. Against scale insect only one genotype, Co 09004 showed HS reaction and rest others were either MS (4 nos.) or LS (10 nos.). It is noteworthy that all the genotypes showed HS reaction against mealy bug (Table 38 and 45 a,b &c).

Pune

Altogether 15 genotypes with their Zonal checks (Co 86032, CoC 671 and Co 09004) were screened for their reaction against major insect pests. All the genotypes showed LS reaction against ESB and internode borer. Against mealy bug, all the genotypes showed LS reaction except three genotypes, Co 1500, Co 15021 and CoN 15071, which showed MS reaction (Table 38 & 51).

Tharsa

Altogether 13 genotypes with their Zonal checks (Co 86032 and CoC 671) were screened for their reaction against major insect pests. All the genotypes showed LS reaction against ESB and *Pyrilla* except Co 15009 and Co 15017, which showed MS reaction against ESB. Only one genotype, Co 15009, showed LS reaction against scale insect and rest other genotypes showed MS reaction (Table 38 & 54).

AVT - II PLANT

Coimbatore

Eighteen genotypes including three check varieties (Co 86032, CoC 671 and CoSnk 05103) were screened against major insect pests. Only 4 genotypes (Co 14027, MS 14081, MS 14082 and CoSnk 05103) showed LS reaction against ESB and rest other genotypes were either MS (12 nos.) or HS (2 nos.). Against internode borer, all the genotypes showed MS reaction except three genotypes, Co 14032, Co86032 and CoSnk 05103, which showed HS reaction (Table 39 and 49 a&b).

Mandya

In this experiment 18 genotypes including their zonal checks (Co 86032, CoC 671 and CoSnk 05103) were screened for their reaction against major sugarcane pests. All the genotypes showed LS reaction against ESB, internode borer and top borer (Table 39 & 43).

Padegaon

Eighteen genotypes with their zonal checks (Co 86032, CoC 671 and CoSnk 05103) were screened for their reaction against major sugarcane pests. All the entries showed LS reaction against ESB and top borer and HS reaction against mealy bug. Against internode borer, 11 entries showed MS and 7 entries showed HS reactions and none of the entries showed LS reaction. All the entries showed LS reaction against scale insect except Co 14032 and MS 14082, which showed MS reaction (Table 39 and 46 a,b &c).

Pune

Altogether eighteen genotypes including three check varieties (Co 86032, CoC 671 and CoSnk 05103) were screened against major insect pests. All the genotypes showed LS reaction against ESB, internode borer and mealy bug except two genotypes, Co 14030 and CoSnk 14102, which showed MS reaction against mealy bug. (Table 39 & 52).

AVT - RATOON

Coimbatore

Eighteen entries were screened against internode borer. All the entries showed HS reaction against internode borer except two entries, CoN 14073 and CoSnk 05103, which showed MS reaction. (Table 40 &50).

Padegaon

Altogether eighteen entries including three check varieties (Co 86032, CoC 671 and CoSnk 05103) were screened against major insect pests. All the entries showed LS reaction against ESB and top borer. Against internode borer, 5 entries showed HS reaction, 13 entries showed MS reaction and none of the entry showed LS reaction.All the entries showed HS reaction against mealy bug and scale insect except MS 14081, which showed MS reaction against scale insect. (Table 40 & 47 a,b &c).

Pune

Eighteen genotypes including three check varieties (Co 86032, CoC 671 and CoSnk 05103) were screened against major insect pests. All the genotypes showed LS reaction against ESB, internode borer. Against mealy bug, 11genotypes showed LS reaction and 7 genotypes showed MS reaction. None of the genotype showed HS reaction against mealy bug (Table 40 & 53)

Table 37. IVT (Peninsular Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Internode Borer		Top Borer		Mealy bug	Scale Insect
		Mandya	Padegaon	Mandya	Padegaon	Mandya	Padegaon	Padegaon	Padegaon
1.	Co 17001	LS	LS	LS	MS	LS	LS	HS	LS
2.	Co 17002	LS	LS	LS	HS	LS	LS	HS	LS
3.	Co 17003	LS	LS	LS	LS	LS	LS	HS	LS
4.	Co 17004	LS	LS	LS	MS	LS	LS	HS	LS
5.	Co 17005	LS	LS	LS	MS	LS	LS	HS	LS
6.	Co 17006	LS	LS	LS	MS	LS	LS	HS	LS
7.	Co 17008	LS	LS	LS	HS	LS	LS	HS	LS
8.	Co 17010	LS	LS	LS	MS	LS	LS	HS	LS
9.	Co 17012	LS	LS	LS	MS	LS	LS	HS	LS
10.	Co 17013	LS	LS	MS	MS	LS	LS	HS	LS
11.	Co 17014	LS	LS	MS	HS	LS	LS	HS	LS
12.	CoVC 17061	LS	LS	MS	MS	LS	LS	HS	LS
13.	CoN 17071	LS	LS	LS	MS	LS	LS	HS	LS
14.	CoN 17072	LS	LS	LS	MS	LS	LS	HS	LS
15.	MS 17081	LS	LS	LS	MS	LS	LS	HS	LS
16.	MS 17082	LS	LS	LS	MS	LS	LS	MS	LS
17.	CoVSI 17121	LS	LS	LS	HS	LS	LS	HS	LS
18.	CoT 17366	LS	LS	LS	LS	LS	LS	HS	LS
19.	Co 86032 (S)	LS	LS	LS	MS	LS	LS	HS	LS
20.	CoC 671 (S)	LS	LS	LS	HS	LS	LS	HS	LS
21.	Co 09004 (S)	LS	LS	LS	MS	LS	LS	HS	LS

Table 38. AVT - I Plant (Peninsular Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer					Internode Borer				Top Borer		Mealy bug		Scale Insect		Pyrilla
		Coim-batore	Mandya	Pade-gaon	Pune	Tharsa	Coim-batore	Mandya	Pade-gaon	Pune	Mandya	Pade-gaon	Pade-gaon	Pune	Pade-gaon	Tharsa	Tharsa
1.	Co 11015	MS	LS	LS	LS	-	MS	LS	MS	LS	LS	LS	HS	LS	LS	-	-
2.	Co 14005	LS	LS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	LS	LS	LS
3.	Co 15005	MS	LS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	LS	LS	LS	LS
4.	Co 15006	-	LS	LS	LS	LS	-	LS	HS	LS	LS	LS	HS	LS	LS	LS	LS
5.	Co 15007	HS	LS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	MS	MS	LS	LS
6.	Co 15009	HS	LS	LS	LS	MS	LS	LS	HS	LS	LS	LS	HS	LS	LS	MS	LS
7.	Co 15010	HS	LS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	MS	LS	LS
8.	Co 15017	LS	LS	LS	LS	MS	MS	LS	MS	LS	LS	LS	HS	LS	MS	LS	LS
9.	Co 15021	HS	LS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	MS	LS	LS	LS
10.	CoSnk 15102	HS	LS	LS	LS	LS	MS	LS	LS	LS	LS	LS	HS	LS	MS	LS	LS
11.	CoN 15071	HS	LS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	MS	LS	LS	LS
12.	PI 15131	MS	LS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	LS	LS	LS
13.	Co 86032 (S)	MS	LS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	LS	LS	LS	LS
14.	CoC 671 (S)	MS	LS	LS	LS	LS	HS	LS	MS	LS	LS	LS	HS	LS	LS	LS	LS
15.	Co 09004 (S)	MS	LS	LS	LS	-	MS	LS	HS	LS	LS	LS	HS	LS	HS	-	-

Table 39. AVT - II Plant (Peninsular Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer				Internode Borer				Top Borer		Mealy bug		Scale Insect
		Coim-batore	Mandya	Pade-gaon	Pune	Coim-batore	Mandya	Pade-gaon	Pune	Mandya	Pade-gaon	Pade-gaon	Pune	Pade-gaon
1.	Co 14002	MS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	LS	LS
2.	Co14004	MS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	LS	LS
3.	Co14012	MS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	LS	LS
4.	Co14016	MS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	LS
5.	Co 14027	LS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	LS	LS
6.	Co 14030	MS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	MS	LS
7.	Co 14032	MS	LS	LS	LS	HS	LS	MS	LS	LS	LS	HS	LS	MS
8.	CoN 14073	MS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	LS
9.	CoSnk 14102	MS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	MS	LS
10.	CoSnk 14103	HS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	LS	LS
11.	CoT 14367	HS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	LS
12.	CoTI 14111	MS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	LS
13.	CoVC 14062	MS	LS	LS	LS	MS	LS	HS	LS	LS	LS	HS	LS	LS
14.	MS 14081	LS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	LS
15.	MS 14082	LS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	MS
16.	Co 86032(S)	MS	LS	LS	LS	HS	LS	MS	LS	LS	LS	HS	LS	LS
17.	CoC 671(S)	MS	LS	LS	LS	MS	LS	MS	LS	LS	LS	HS	LS	LS
18.	CoSnk 05103 (S)	LS	LS	LS	LS	HS	LS	HS	LS	LS	LS	HS	LS	LS

Table 40. AVT - Ratoon (Peninsular Zone)

Sl. No.	Variety/ Genotypes	Early Shoot Borer		Internode Borer			Top Borer	Mealy bug		Scale Insect
		Padegaon	Pune	Coim-batore	Padegaon	Pune	Padegaon	Padegaon	Pune	Padegaon
1.	Co 14002	LS	LS	HS	HS	LS	LS	HS	LS	HS
2.	Co 14004	LS	LS	HS	HS	LS	LS	HS	MS	HS
3.	Co 14012	LS	LS	HS	HS	LS	LS	HS	LS	HS
4.	Co 14016	LS	LS	HS	MS	LS	LS	HS	MS	HS
5.	Co 14027	LS	LS	HS	HS	LS	LS	HS	MS	HS
6.	Co 14030	LS	LS	HS	MS	LS	LS	HS	MS	HS
7.	CoM 14032	LS	LS	HS	MS	LS	LS	HS	LS	HS
8.	CoN 14073	LS	LS	MS	MS	LS	LS	HS	LS	HS
9.	Co Snk 14102	LS	LS	HS	MS	LS	LS	HS	MS	HS
10.	CoSnk 14103	LS	LS	HS	MS	LS	LS	HS	LS	HS
11.	CoT 14367	LS	LS	HS	HS	LS	LS	HS	LS	HS
12.	CoTL 14111	LS	LS	HS	MS	LS	LS	HS	LS	HS
13.	CoVc 14062	LS	LS	HS	MS	LS	LS	HS	MS	HS
14.	MS 14081	LS	LS	HS	MS	LS	LS	HS	LS	MS
15.	MS 14082	LS	LS	HS	MS	LS	LS	HS	LS	HS
16.	Co 86032 (S)	LS	LS	HS	MS	LS	LS	HS	LS	HS
17.	CoC 671(S)	LS	LS	HS	MS	LS	LS	HS	MS	HS
18.	Cosnk 05103 (S)	LS	LS	MS	MS	LS	LS	HS	LS	HS

Table 41. Reaction of sugarcane genotypes against major insect pests in IVT at Mandya

Sl. No.	Varieties/genotypes	Cumulative incidence of sugarcane borers (%)		
		ESB	Top borer	Internode borer
1	Co 17001	1.85	2.77	6.67
2	Co 17002	2.48	3.32	11.33
3	Co 17003	1.80	2.99	12.67
4	Co 17004	2.41	3.07	10.67
5	Co 17005	1.69	3.76	13.33
6	Co 17006	4.19	4.14	12.00
7	Co 17008	1.59	5.39	17.67
8	Co 17010	3.39	2.65	14.67
9	Co 17012	2.54	3.09	5.33
10	Co 17013	1.99	4.06	21.33
11	Co 17014	4.28	2.59	20.67
12	CoVC 17061	2.82	2.71	25.33
13	CoN 17071	4.79	3.12	10.67
14	CoN 17072	2.92	3.35	12.33
15	MS 17081	1.35	2.61	9.67
16	MS 17082	2.86	1.48	13.33
17	CoVSI 17121	2.51	3.14	14.67
18	CoT 17366	1.81	2.62	12.00
19	Co 86032 (C)	1.60	1.60	21.33
20	CoC 671 (C)	1.55	4.71	18.33
21	Co 09004 (C)	1.37	3.49	16.00

Table 42. Reaction of sugarcane genotypes against major insect pests in AVT I Plant at Mandya

Sl. No.	Varieties/genotypes	Cumulative incidence of sugarcane borers (%)		
		ESB	Top borer	Internode borer
1	Co 11015	1.67	3.86	1.67
2	Co 14005	1.87	1.87	1.87
3	Co 15005	6.23	3.31	6.23
4	Co 15006	3.10	1.72	3.10
5	Co 15007	4.12	2.94	4.12
6	Co 15009	6.47	5.58	6.47
7	Co 15010	2.86	3.76	2.86
8	Co 15017	1.52	2.73	1.52
9	Co 15021	2.80	2.85	2.80
10	CoSnk 15102	2.58	5.24	2.58
11	CoN 15071	1.34	4.02	1.34
12	PI 15131	2.68	2.23	2.68
13	Co 86032 (C)	2.74	1.75	2.74
14	CoC 671 (C)	1.11	5.49	1.11
15	Co 09004 (C)	2.61	2.37	2.61

Table 43. Reaction of sugarcane genotypes against major insect pests in AVT II Plant at Mandya

Sl.No	Varieties/genotypes	Cumulative incidence of sugarcane borers (%)		
		ESB	Top borer	Internode borer
1	Co 14002	1.86	2.42	7.33
2	Co14004	2.05	1.99	12.00
3	Co14012	2.90	1.51	8.00
4	Co14016	1.50	1.43	8.00
5	Co 14027	1.88	3.07	12.00
6	Co 14030	2.94	4.30	4.00
7	Co 14032	1.59	1.40	6.67
8	CoN 14073	1.41	2.85	10.67
9	CoSnk 14102	1.10	1.16	8.00
10	CoSnk 14103	1.41	1.99	5.33
11	CoT 14367	1.27	3.60	12.00
12	CoTI 14111	1.75	1.80	16.00
13	CoVC 14062	1.50	1.75	2.67
14	MS 14081	1.75	2.03	17.33
15	MS 14082	1.44	1.50	7.33
16	Co 86032(C)	1.40	2.71	7.33
17	CoC 671(C)	1.77	2.97	4.00
18	CoSnk 05103 (C)	2.26	2.07	8.00

Table 44a. Reaction of sugarcane genotypes against major insect pests in IVT at Padegaon

Sr. No.	Genotypes	Per cent incidence of ESB days after planting					Reaction	No. of bored plants/ha
		30	60	90	120	Cumulative % incidence		(On the basis of Cumulative % incidence)
1	Co 17001	0.00	9.12	8.68	13.46	7.81	LS	7814
		0.00	**16.32**	**15.96**	**20.61**			
2	Co 17002	0.00	3.97	3.61	5.94	3.38	LS	3379
		0.00	**8.95**	**10.45**	**13.59**			
3	Co 17003	0.00	2.25	2.11	11.40	3.94	LS	3939
		0.00	**7.05**	**6.78**	**20.09**			
4	Co 17004	0.00	4.92	3.92	4.94	3.45	LS	3445
		0.00	**10.50**	**10.91**	**12.76**			
5	Co 17005	0.00	0.00	0.48	7.32	1.95	LS	2052
		0.00	**0.00**	**2.31**	**13.51**			
6	Co 17006	0.00	0.00	1.11	5.75	1.71	LS	1714
		0.00	**0.00**	**3.50**	**13.50**			
7	Co 17008	0.00	0.88	0.00	11.37	3.06	LS	3062
		0.00	**3.11**	**0.00**	**20.20**			
8	Co 17010	0.00	1.99	0.53	6.36	2.22	LS	2218
		0.00	**6.54**	**2.41**	**13.52**			
9	Co 17012	0.00	1.36	2.80	2.69	1.71	LS	1713
		0.00	**3.88**	**9.31**	**7.21**			
10	Co 17013	0.00	3.53	1.48	3.27	2.07	LS	2068
		0.00	**8.65**	**5.70**	**8.46**			
11	Co 17014	0.00	6.28	3.86	3.31	3.36	LS	3363
		0.00	**14.44**	**9.13**	**10.38**			
12	Co Vc 17061	0.00	0.00	1.35	5.20	1.64	LS	1635
		0.00	**0.00**	**3.87**	**12.16**			
13	CoN 17071	0.00	3.10	7.23	4.66	3.75	LS	3748
		0.00	**9.70**	**13.69**	**12.38**			
14	CoN 17072	0.00	5.24	2.62	10.02	4.47	LS	4468
		0.00	**10.58**	**7.26**	**18.40**			
15	MS 17081	0.00	3.33	1.20	3.93	2.11	LS	2113
		0.00	**6.14**	**5.04**	**11.14**			
16	MS 17082	1.45	2.60	2.79	6.80	3.41	LS	3411
		4.01	**7.43**	**9.35**	**12.31**			
17	CoVSI 17121	0.00	1.52	2.05	7.28	2.71	LS	2714
		0.00	**5.62**	**6.55**	**15.50**			
18	CoT 17366	2.21	0.00	2.64	2.65	1.88	LS	1876
		6.99	**0.00**	**8.94**	**7.60**			
20	Co 86032	0.00	7.18	0.97	6.16	3.58	LS	3577
		0.00	**12.58**	**4.52**	**14.22**			
20	CoC 671	0.00	3.50	5.92	2.05	2.87	LS	2869
		0.00	**8.75**	**14.06**	**8.23**			
21	Co 09004	0.83	12.40	4.09	7.31	6.16	LS	6158
		3.03	**20.98**	**9.56**	**14.75**			
S. E. ±		**1.33**	**2.93**	**1.63**	**0.33**	--	--	--
C.D. at 5 %		**3.79**	**8.37**	**4.65**	**0.94**	--	--	--
Less Susc. **(LS)**							0-15	
Moderate Susc **(MS)**							15.1-30	
Highly Susc. **(HS)**							above 30	

Bold figures are Arc sin transformed values

Table 44b. Reaction of sugarcane genotypes against major insect pests in IVT at Padegaon

Sl. No.	Genotypes/ Varieties	Internode Borer				Top Shoot Borer		
		% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction
1	Co 17001	30.00	2.07	0.62	MS	0.00	0.00	LS
		33.00				**0.00**		
2	Co 17002	50.00	3.64	1.82	HS	0.00	0.00	LS
		45.00				**0.00**		
3	Co 17003	20.00	1.15	0.23	LS	0.00	0.00	LS
		26.07				**0.00**		
4	Co 17004	40.00	2.16	0.86	MS	0.00	0.00	LS
		38.86				**0.00**		
5	Co 17005	30.00	1.37	0.41	MS	0.00	0.00	LS
		33.00				**0.00**		
6	Co 17006	30.00	1.84	0.55	MS	0.00	0.00	LS
		33.00				**0.00**		
7	Co 17008	53.33	3.34	1.78	HS	0.00	0.00	LS
		47.01				**0.00**		
8	Co 17010	26.67	1.52	0.40	MS	0.00	0.00	LS
		30.79				**0.00**		
9	Co 17012	40.00	2.18	0.87	MS	0.00	0.00	LS
		39.15				**0.00**		
10	Co 17013	40.00	2.29	0.91	MS	0.00	0.00	LS
		39.15				**0.00**		
11	Co 17014	43.33	2.43	1.05	HS	0.00	0.00	LS
		41.07				**0.00**		
12	Co Vc17061	30.00	2.07	0.62	MS	0.00	0.00	LS
		33.00				**0.00**		
13	CoN 17071	30.00	1.53	0.46	MS	0.00	0.00	LS
		33.21				**0.00**		
14	CoN 17072	33.33	2.49	0.83	MS	0.00	0.00	LS
		35.22				**0.00**		
15	MS 17081	40.00	1.91	0.76	MS	0.00	0.00	LS
		39.15				**0.00**		
16	MS 17082	33.33	2.04	0.68	MS	0.00	0.00	LS
		35.01				**0.00**		
17	CoVSI 17121	43.33	2.10	0.91	HS	0.00	0.00	LS
		41.07				**0.00**		
18	CoT 17366	20.00	1.44	0.29	LS	0.00	0.00	LS
		26.07				**0.00**		
20	Co 86032	23.33	1.12	0.26	MS	0.00	0.00	LS
		28.78				**0.00**		
20	CoC 671	56.67	3.20	1.81	HS	0.00	0.00	LS
		49.22				**0.00**		
21	Co 09004	40.00	2.27	0.91	MS	0.00	0.00	LS
		39.15				**0.00**		
S. E. ±		**4.01**						
C.D. at 5 %		**11.47**						
Less Susceptible **(LS)**		0 – 20				0 – 10		
Moderate Susc. **(MS)**		20.1 – 40				10.1 – 20		
Highly Susc. **(HS)**		Above 40				Above 20		

Bold Figures are Arc sin transformed values

Table 44c. Reaction of sugarcane genotypes against major insect pests in IVT at Padegaon

Sr. No	Genotypes/ Varieties	Mealy Bug			Scale Insect		
		% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
1	Co 17001	83.33 **66.15**	9.13	HS	0.00 **0.00**	0.00	LS
2	Co 17002	73.33 **63.93**	10.48	HS	0.00 **0.00**	0.00	LS
3	Co 17003	86.67 **72.78**	9.35	HS	0.00 **0.00**	0.00	LS
4	Co 17004	80.00 **63.93**	10.33	HS	10.00 **11.07**	1.03	LS
5	Co 17005	83.33 **70.07**	11.12	HS	0.00 **0.00**	0.00	LS
6	Co 17006	96.67 **83.86**	23.40	HS	0.00 **0.00**	0.00	LS
7	Co 17008	83.33 **75.00**	18.40	HS	0.00 **0.00**	0.00	LS
8	Co 17010	83.33 **70.78**	13.78	HS	0.00 **0.00**	0.00	LS
9	Co 17012	50.00 **45.00**	4.75	HS	10.00 **11.07**	0.95	LS
10	Co 17013	80.00 **63.93**	8.42	HS	0.00 **0.00**	0.00	LS
11	Co 17014	76.67 **61.92**	10.59	HS	0.00 **0.00**	0.00	LS
12	Co Vc 17061	86.67 **72.78**	9.67	HS	0.00 **0.00**	0.00	LS
13	CoN 17071	83.33 **66.15**	13.31	HS	0.00 **0.00**	0.00	LS
14	CoN 17072	90.00 **75.00**	14.75	HS	0.00 **0.00**	0.00	LS
15	MS 17081	66.67 **55.07**	6.75	HS	0.00 **0.00**	0.00	LS
16	MS 17082	26.67 **31.00**	2.53	MS	0.00 **0.00**	0.00	LS
17	CoVSI 17121	70.00 **57.00**	6.09	HS	0.00 **0.00**	0.00	LS
18	CoT 17366	73.33 **64.93**	10.79	HS	0.00 **0.00**	0.00	LS
20	Co 86032	70.00 **57.78**	8.62	HS	0.00 **0.00**	0.00	LS
20	CoC 671	60.00 **51.15**	6.45	HS	0.00 **0.00**	0.00	LS
21	Co 09004	73.33 **59.71**	11.17	HS	0.00 **0.00**	0.00	LS
S. E. ±		**8.56**			**3.46**		
C.D. at 5 %		**NS**			**NS**		
Less Susceptible **(LS)**		0 – 5			0 – 10		
Moderate Susc. **(MS)**		5.1 – 30			10.1 – 35		
Highly Susc. **(HS)**		Above 30			Above 35		

Bold Figures are Arc sin transformed values

Table 45a. Reaction of sugarcane genotypes against major insect pests in AVT I plant at Padegaon

Sl. No.	Genotypes	Per cent incidence of ESB days after planting					Reaction	No. of bored plants/ha
		30	60	90	120	Cumulative % incidence		(On the basis of Cumulative % incidence)
1	Co 11015	0.00	5.04	2.61	3.30	2.74	LS	2737
		0.00	**9.56**	**7.20**	**10.15**			
2	Co 14005	0.79	3.28	4.92	5.63	3.66	LS	3655
		2.96	**10.31**	**12.61**	**13.32**			
3	Co 15005	0.79	2.63	4.74	4.39	3.14	LS	3138
		2.96	**8.93**	**12.46**	**11.76**			
4	Co 15006	0.65	2.35	3.49	7.52	3.50	LS	3502
		2.68	**5.13**	**8.39**	**12.62**			
5	Co 15007	0.00	1.04	2.96	6.52	2.63	LS	2630
		0.00	**3.39**	**9.67**	**14.52**			
6	Co 15009	0.00	0.56	2.81	8.04	2.85	LS	2853
		0.00	**2.49**	**7.85**	**15.97**			
7	Co 15010	0.00	3.51	3.20	3.65	2.59	LS	2589
		0.00	**6.31**	**10.20**	**8.94**			
8	Co 15017	0.00	1.06	1.81	5.62	2.12	LS	2123
		0.00	**4.81**	**6.32**	**13.22**			
9	Co 15021	0.00	1.55	5.51	7.95	3.75	LS	3753
		0.00	**4.15**	**11.10**	**15.91**			
10	CoSNK 15102	0.00	0.64	0.57	2.07	0.82	LS	820
		0.00	**2.65**	**2.51**	**6.76**			
11	CoN 15071	0.00	3.59	3.74	8.42	3.94	LS	3935
		0.00	**8.93**	**10.64**	**16.16**			
12	PI 15131	0.65	5.65	3.51	7.24	4.26	LS	4263
		2.68	**13.50**	**8.07**	**15.59**			
13	Co 86032	0.00	9.20	5.68	10.39	6.32	LS	6320
		0.00	**14.47**	**13.59**	**17.49**			
14	CoC 671	0.00	6.77	5.12	2.67	3.64	LS	3640
		0.00	**12.36**	**10.41**	**7.69**			
15	Co 09004	0.00	5.90	7.96	7.52	5.35	LS	5347
		0.00	**11.02**	**15.67**	**15.40**			
S. E. ±		**1.49**	**3.83**	**3.17**	**2.50**	--	--	--
C.D. at 5 %		**NS**	**NS**	**NS**	**NS**	--	--	--
Less Susc. **(LS)**							0-15	
Moderate Susc **(MS)**							15.1-30	
Highly Susc. **(HS)**							above 30	

Bold figures are Arc sin transformed values

Table 45b. Reaction of sugarcane genotypes against major insect pests in AVT I plant at Padegaon

Sl. No	Genotypes/ Varieties	Internode Borer				Top Shoot Borer		
		% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction
1	Co 11015	26.67	1.35	0.36	MS	0.00	0.00	LS
		30.29				**0.00**		
2	Co 14005	33.33	2.20	0.73	MS	0.00	0.00	LS
		34.93				**0.00**		
3	Co 15005	43.33	2.50	1.08	HS	0.00	0.00	LS
		41.07				**0.00**		
4	Co 15006	43.33	2.36	1.02	HS	0.00	0.00	LS
		41.15				**0.00**		
5	Co 15007	46.67	3.42	1.60	HS	0.00	0.00	LS
		43.08				**0.00**		
6	Co 15009	43.33	3.35	1.45	HS	0.00	0.00	LS
		41.07				**0.00**		
7	Co 15010	36.67	1.99	0.73	MS	0.00	0.00	LS
		37.22				**0.00**		
8	Co 15017	33.33	3.16	1.05	MS	0.00	0.00	LS
		30.00				**0.00**		
9	Co 15021	50.00	3.98	1.99	HS	0.00	0.00	LS
		45.00				**0.00**		
10	CoSNK 15102	16.67	0.96	0.16	LS	0.00	0.00	LS
		20.93				**0.00**		
11	CoN 15071	56.67	4.51	2.55	HS	0.00	0.00	LS
		49.93				**0.00**		
12	PI 15131	33.33	2.08	0.69	MS	0.00	0.00	LS
		35.22				**0.00**		
13	Co 86032	43.33	2.72	1.18	HS	0.00	0.00	LS
		41.15				**0.00**		
14	CoC 671	40.00	2.37	0.95	MS	0.00	0.00	LS
		39.06				**0.00**		
15	Co 09004	63.33	4.41	2.79	HS	0.00	0.00	LS
		53.86				**0.00**		
S. E. ±		**4.74**						
C.D. at 5 %		**13.72**						
Less Susceptible **(LS)**		0 – 20				0 – 10		
Moderate Susc. **(MS)**		20.1 – 40				10.1 – 20		
Highly Susc. **(HS)**		Above 40				Above 20		

Bold Figures are Arc sin transformed values

Table 45c. Reaction of sugarcane genotypes against major insect pests in AVT I plant at Padegaon

Sl. No.	Genotypes/ Varieties	Mealy Bug			Scale Insect		
		% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
1	Co 11015	73.33	7.24	HS	0.00	0.00	LS
		63.85			**0.00**		
2	Co 14005	70.00	5.22	HS	0.00	0.00	LS
		57.78			**0.00**		
3	Co 15005	70.00	5.49	HS	6.67	0.97	LS
		57.70			**8.86**		
4	Co 15006	40.00	4.09	HS	10.00	1.71	LS
		39.15			**11.07**		
5	Co 15007	73.33	9.15	HS	16.67	2.01	MS
		64.22			**20.93**		
6	Co 15009	90.00	9.41	HS	0.00	0.00	LS
		75.00			**0.00**		
7	Co 15010	83.33	9.78	HS	20.00	1.95	MS
		70.78			**21.93**		
8	Co 15017	66.67	4.93	HS	16.67	1.75	MS
		55.78			**15.00**		
9	Co 15021	63.33	4.88	HS	0.00	0.00	LS
		53.86			**0.00**		
10	CoSNK 15102	63.33	5.37	HS	16.67	1.46	MS
		52.78			**15.00**		
11	CoN 15071	76.67	9.93	HS	0.00	0.00	LS
		66.93			**0.00**		
12	PI 15131	73.33	8.50	HS	0.00	0.00	LS
		63.93			**0.00**		
13	Co 86032	70.00	7.92	HS	0.00	0.00	LS
		61.92			**0.00**		
14	CoC 671	83.33	8.43	HS	0.00	0.00	LS
		70.78			**0.00**		
15	Co 09004	93.33	13.12	HS	43.33	4.09	HS
		81.15			**41.15**		
S. E. ±		**10.06**			**7.23**		
C.D. at 5 %		**NS**			**20.94**		
Less Susceptible **(LS)**		0 – 5			0 – 10		
Moderate Susc. **(MS)**		5.1 – 30			10.1 – 35		
Highly Susc. **(HS)**		Above 30			Above 35		

Bold Figures are Arc sin transformed values

Table 46a. Reaction of sugarcane genotypes against major insect pests in AVT II plant at Padegaon

Sl. No.	Genotypes	Per cent incidence of ESB days after planting					Reaction	No. of bored plants/ha
		30	60	90	120	Cumulative % incidence		(On the basis of Cumulative % incidence)
1	Co 14002	0.00	1.57	1.61	3.51	1.67	LS	1673
		0.00	**5.88**	**5.96**	**10.77**			
2	Co 14004	0.00	6.07	2.96	7.02	4.01	LS	4011
		0.00	**14.24**	**9.77**	**14.73**			
3	Co 14012	1.63	9.22	7.00	11.06	7.23	LS	7225
		4.25	**17.22**	**14.00**	**18.89**			
4	Co 14016	0.00	10.62	5.65	5.72	5.50	LS	5498
		0.00	**18.90**	**13.33**	**13.80**			
5	Co 14027	0.00	6.57	1.84	4.45	3.22	LS	3216
		0.00	**14.60**	**6.38**	**11.93**			
6	Co 14030	0.00	7.06	8.08	9.93	6.27	LS	6268
		0.00	**15.24**	**16.16**	**17.85**			
7	Co 14032	0.00	4.73	1.49	7.79	3.51	LS	3505
		0.00	**12.00**	**4.07**	**15.71**			
8	CoN 14073	0.00	5.28	2.87	4.55	3.18	LS	3176
		0.00	**12.43**	**7.97**	**11.88**			
9	CoSNK 14102	0.00	2.99	1.37	2.81	1.79	LS	1794
		0.00	**5.81**	**5.49**	**7.79**			
10	Co SNK 14103	1.68	4.73	0.50	9.11	4.00	LS	4004
		6.09	**10.01**	**2.34**	**17.14**			
11	CoT 14367	0.00	3.90	3.79	5.34	3.26	LS	3255
		0.00	**9.21**	**9.20**	**13.24**			
12	CoTI 14111	0.00	2.17	4.79	6.96	3.48	LS	3480
		0.00	**6.93**	**12.44**	**14.62**			
13	CoVC 14062	0.00	5.45	2.36	4.70	3.13	LS	3127
		0.00	**12.89**	**8.73**	**12.37**			
14	MS 14081	0.00	5.16	3.72	7.20	4.02	LS	4018
		0.00	**13.08**	**11.06**	**14.84**			
15	MS 14082	0.00	0.45	2.37	4.80	1.90	LS	2004
		0.00	**2.22**	**8.83**	**12.21**			
16	Co 86032	0.00	1.79	3.07	3.87	2.18	LS	2181
		0.00	**6.17**	**9.77**	**9.28**			
17	CoC 671	0.00	1.28	1.50	5.32	2.03	LS	2027
		0.00	**3.77**	**5.66**	**10.84**			
18	Co SNK 05103	0.00	0.40	4.11	4.63	2.28	LS	2283
		0.00	**2.09**	**11.50**	**9.29**			
S. E. ±		**1.22**	**3.07**	**2.47**	**2.82**	--	--	--
C.D. at 5 %		**3.49**	**8.83**	**8.10**	**8.65**	--	--	--
Less Susc. **(LS)**							0-15	
Moderate Susc **(MS)**							15.1-30	
Highly Susc. **(HS)**							above 30	

Bold figures are Arc sin transformed values

Table 46b. Reaction of sugarcane genotypes against major insect pests in AVT II plant at Padegaon

Sl. No	Genotypes/ Varieties	Internode Borer				Top Shoot Borer		
		% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction
1	Co 14002	43.33	3.15	1.36	HS	0.00	0.00	LS
		41.07				**0.00**		
2	Co 14004	53.33	3.50	1.86	HS	0.00	0.00	LS
		46.92				**0.00**		
3	Co 14012	43.33	2.45	1.06	HS	0.00	0.00	LS
		41.07				**0.00**		
4	Co 14016	36.67	2.51	0.92	MS	0.00	0.00	LS
		37.14				**0.00**		
5	Co 14027	56.67	3.66	2.07	HS	0.00	0.00	LS
		48.85				**0.00**		
6	Co 14030	33.33	1.81	0.60	MS	0.00	0.00	LS
		35.01				**0.00**		
7	Co 14032	30.00	1.93	0.58	MS	0.00	0.00	LS
		32.71				**0.00**		
8	CoN 14073	26.67	1.18	0.31	MS	0.00	0.00	LS
		31.00				**0.00**		
9	CoSNK 14102	30.00	1.28	0.38	MS	0.00	0.00	LS
		33.00				**0.00**		
10	Co SNK 14103	46.67	2.91	1.36	HS	0.00	0.00	LS
		42.99				**0.00**		
11	CoT 14367	40.00	2.09	0.84	MS	0.00	0.00	LS
		38.86				**0.00**		
12	CoTI 14111	23.33	1.36	0.32	MS	0.00	0.00	LS
		28.29				**0.00**		
13	CoVC 14062	43.33	3.06	1.33	HS	0.00	0.00	LS
		41.07				**0.00**		
14	MS 14081	30.00	1.76	0.53	MS	0.00	0.00	LS
		33.00				**0.00**		
15	MS 14082	30.00	2.05	0.61	MS	0.00	0.00	LS
		31.92				**0.00**		
16	Co 86032	33.33	1.83	0.61	MS	0.00	0.00	LS
		34.93				**0.00**		
17	CoC 671	40.00	2.03	0.81	MS	0.00	0.00	LS
		39.15				**0.00**		
18	Co SNK 05103	43.33	2.12	0.92	HS	0.00	0.00	LS
		40.86				**0.00**		
S. E. ±		**5.19**						
C.D. at 5 %		**NS**						
Less Susceptible **(LS)**		0 – 20				0 – 10		
Moderate Susc. **(MS)**		20.1 – 40				10.1 – 20		
Highly Susc. **(HS)**		Above 40				Above 20		

Bold Figures are Arc sin transformed values

Table 46c. Reaction of sugarcane genotypes against major insect pests in AVT II plant at Padegaon

Sr. No	Genotypes/ Varieties	Mealy Bug			Scale Insect		
		% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
1	Co 14002	46.67	3.64	HS	0.00	0.00	LS
		43.08			**0.00**		
2	Co 14004	43.33	4.03	HS	0.00	0.00	LS
		41.07			**0.00**		
3	Co 14012	43.33	4.34	HS	0.00	0.00	LS
		41.15			**0.00**		
4	Co 14016	96.67	14.44	HS	0.00	0.00	LS
		83.86			**0.00**		
5	Co 14027	53.33	4.94	HS	0.00	0.00	LS
		47.01			**0.00**		
6	Co 14030	96.67	18.74	HS	0.00	0.00	LS
		83.86			**0.00**		
7	Co 14032	76.67	10.79	HS	13.33	1.63	MS
		66.15			**13.08**		
8	CoN 14073	83.33	9.24	HS	0.00	0.00	LS
		70.07			**0.00**		
9	CoSNK 14102	70.00	5.85	HS	0.00	0.00	LS
		57.78			**0.00**		
10	Co SNK 14103	60.00	6.24	HS	0.00	0.00	LS
		50.85			**0.00**		
11	CoT 14367	43.33	5.25	HS	0.00	0.00	LS
		40.78			**0.00**		
12	CoTI 14111	43.33	7.23	HS	0.00	0.00	LS
		41.07			**0.00**		
13	CoVC 14062	83.33	11.08	HS	0.00	0.00	LS
		70.78			**0.00**		
14	MS 14081	46.67	4.21	HS	0.00	0.00	LS
		43.08			**0.00**		
15	MS 14082	70.00	7.97	HS	13.33	1.48	MS
		57.00			**13.08**		
16	Co 86032	63.33	6.58	HS	0.00	0.00	LS
		53.07			**0.00**		
17	CoC 671	70.00	6.26	HS	0.00	0.00	LS
		56.79			**0.00**		
18	Co SNK 05103	70.00	6.04	HS	0.00	0.00	LS
		57.00			**0.00**		
S. E. ±		**6.20**			**4.42**		
C.D. at 5 %		**17.83**			**NS**		
Less Susceptible **(LS)**		0 – 5			0 – 10		
Moderate Susc. **(MS)**		5.1 – 30			10.1 – 35		
Highly Susc. **(HS)**		Above 30			Above 35		

Bold Figures are Arc sin transformed values

Table 47a. Reaction of sugarcane genotypes against major insect pests in AVT II plant ratoon at Padegaon

Sl. No.	Genotypes	Per cent incidence of ESB days after planting					Reaction	No. of bored plants/ha
		30	60	90	120	Cumulative % incidence		(On the basis of Cumulative % incidence)
1	Co 14002	0.00	1.67	2.20	3.93	1.95	LS	2048
		0.00	**6.05**	**8.51**	**11.07**			
2	Co 14004	1.68	1.42	1.92	5.13	2.54	LS	2538
		4.32	**6.57**	**7.78**	**12.95**			
3	Co 14012	1.15	5.53	3.28	5.93	3.97	LS	3973
		5.01	**12.65**	**9.93**	**13.71**			
4	Co 14016	0.45	1.28	2.24	4.44	2.10	LS	2103
		2.23	**6.46**	**8.48**	**11.48**			
5	Co 14027	0.50	3.03	2.94	5.45	2.98	LS	2979
		2.34	**9.59**	**9.38**	**12.38**			
6	Co 14030	0.39	2.06	3.26	3.36	2.27	LS	2268
		2.06	**6.65**	**10.23**	**8.59**			
7	Co 14032	1.27	3.11	1.42	3.16	2.24	LS	2239
		5.23	**10.00**	**6.59**	**9.96**			
8	CoN 14073	0.00	2.14	2.75	3.38	2.07	LS	2066
		0.00	**8.23**	**9.52**	**10.12**			
9	CoSNK 14102	0.66	2.30	2.77	4.02	2.44	LS	2438
		2.70	**8.67**	**9.35**	**8.98**			
10	Co SNK 14103	2.13	2.42	3.74	12.55	5.21	LS	5211
		4.88	**8.70**	**10.62**	**20.18**			
11	CoT 14367	1.22	2.26	3.71	6.78	3.50	LS	3496
		3.68	**8.27**	**11.05**	**15.01**			
12	CoTI 14111	1.75	2.73	1.83	4.12	2.61	LS	2608
		7.25	**9.32**	**7.76**	**11.24**			
13	CoVC 14062	0.00	1.03	1.97	3.69	1.67	LS	1672
		0.00	**4.63**	**7.79**	**10.72**			
14	MS 14081	0.00	3.25	2.54	5.73	2.88	LS	2879
		0.00	**10.37**	**9.14**	**13.62**			
15	MS 14082	2.20	2.62	1.67	3.67	2.54	LS	2538
		6.84	**9.11**	**7.34**	**10.71**			
16	Co 86032	2.57	2.49	2.30	2.88	2.56	LS	2558
		8.89	**8.60**	**8.52**	**9.71**			
17	CoC 671	0.46	0.85	3.50	4.33	2.29	LS	2285
		2.24	**3.07**	**10.02**	**11.82**			
18	Co SNK 05103	1.35	3.17	2.11	4.45	2.77	LS	2770
		5.41	**10.12**	**8.33**	**12.00**			
S. E. ±		**2.65**	**1.64**	**0.17**	**1.82**	--	--	--
C.D. at 5 %		**NS**	**NS**	**0.49**	**5.24**	--	--	--
Less Susc. **(LS)**							0-15	
Moderate Susc **(MS)**							15.1-30	
Highly Susc. **(HS)**							above 30	

Bold figures are Arc sin transformed values

Table 47b. Reaction of sugarcane genotypes against major insect pests in AVT II plant ratoon at Padegaon

Sl. No	Genotypes/ Varieties	Internode Borer				Top Shoot Borer		
		% Incidence	% Intensity	% Infestation index	Reaction	% Incidence	% Intensity	Reaction
1	Co 14002	43.33	2.13	0.92	HS	0.00	0.00	LS
		41.07				**0.00**		
2	Co 14004	46.67	3.57	1.67	HS	0.00	0.00	LS
		43.08				**0.00**		
3	Co 14012	50.00	3.04	1.52	HS	0.00	0.00	LS
		45.08				**0.00**		
4	Co 14016	40.00	2.48	0.99	MS	0.00	0.00	LS
		39.15				**0.00**		
5	Co 14027	46.67	3.90	1.82	HS	0.00	0.00	LS
		42.78				**0.00**		
6	Co 14030	40.00	1.97	0.79	MS	0.00	0.00	LS
		39.15				**0.00**		
7	Co 14032	30.00	1.47	0.44	MS	0.00	0.00	LS
		32.71				**0.00**		
8	CoN 14073	33.33	1.57	0.52	MS	0.00	0.00	LS
		34.63				**0.00**		
9	CoSNK 14102	26.67	1.22	0.32	MS	0.00	0.00	LS
		30.29				**0.00**		
10	Co SNK 14103	26.67	1.34	0.36	MS	0.00	0.00	LS
		31.00				**0.00**		
11	CoT 14367	50.00	3.78	1.89	HS	0.00	0.00	LS
		45.08				**0.00**		
12	CoTI 14111	36.67	1.87	0.68	MS	0.00	0.00	LS
		37.14				**0.00**		
13	CoVC 14062	36.67	1.93	0.71	MS	0.00	0.00	LS
		37.22				**0.00**		
14	MS 14081	28.33	1.80	0.78	MS	0.00	0.00	LS
		31.93				**0.00**		
15	MS 14082	30.00	2.20	0.95	MS	0.00	0.00	LS
		33.00				**0.00**		
16	Co 86032	40.00	1.97	0.79	MS	0.00	0.00	LS
		38.86				**0.00**		
17	CoC 671	40.00	2.12	0.85	MS	0.00	0.00	LS
		39.15				**0.00**		
18	Co SNK 05103	33.33	1.90	0.63	MS	0.00	0.00	LS
		34.93				**0.00**		
S. E. ±		**5.92**						
C.D. at 5 %		**NS**						
Less Susceptible **(LS)**		0 – 20				0 – 10		
Moderate Susc. **(MS)**		20.1 – 40				10.1 – 20		
Highly Susc. **(HS)**		Above 40				Above 20		

Bold Figures are Arc sin transformed values

Table 47c. Reaction of sugarcane genotypes against major insect pests in AVT II plant ratoon at Padegaon

Sl. No	Genotypes/ Varieties	Mealy Bug			Scale Insect		
		% Incidence	% Intensity	Reaction	% Incidence	% Intensity	Reaction
1	Co 14002	70.00	5.20	HS	53.33	7.18	HS
		62.22			**46.92**		
2	Co 14004	76.67	5.32	HS	76.67	14.63	HS
		61.22			**65.85**		
3	Co 14012	66.67	5.46	HS	36.67	5.21	HS
		55.78			**31.92**		
4	Co 14016	86.67	9.82	HS	36.67	4.91	HS
		68.86			**37.22**		
5	Co 14027	86.67	9.43	HS	66.67	8.40	HS
		68.86			**54.99**		
6	Co 14030	93.33	13.57	HS	60.00	10.92	HS
		77.71			**50.85**		
7	Co 14032	76.67	7.80	HS	53.33	8.25	HS
		62.71			**46.92**		
8	CoN 14073	90.00	8.87	HS	60.00	5.64	HS
		71.57			**51.15**		
9	CoSNK 14102	76.67	7.68	HS	66.67	7.58	HS
		66.15			**54.99**		
10	Co SNK 14103	80.00	12.43	HS	63.33	9.69	HS
		68.07			**52.78**		
11	CoT 14367	76.67	7.84	HS	63.33	6.48	HS
		62.71			**52.78**		
12	CoTI 14111	76.67	7.44	HS	36.67	3.39	HS
		62.71			**37.22**		
13	CoVC 14062	80.00	8.73	HS	73.33	10.32	HS
		63.93			**64.22**		
14	MS 14081	76.67	7.71	HS	33.33	3.32	MS
		61.71			**34.63**		
15	MS 14082	80.00	7.69	HS	50.00	4.11	HS
		68.86			**45.00**		
16	Co 86032	90.00	9.20	HS	60.00	6.50	HS
		75.00			**50.85**		
17	CoC 671	73.33	7.61	HS	63.33	7.81	HS
		59.71			**53.15**		
18	Co SNK 05103	76.67	8.58	HS	46.67	8.25	HS
		65.85			**43.78**		
S. E. ±		**8.52**			**8.09**		
C.D. at 5 %		**NS**			**NS**		
Less Susceptible **(LS)**		0 – 5			0 – 10		
Moderate Susc. **(MS)**		5.1 – 30			10.1 – 35		
Highly Susc. **(HS)**		Above 30			Above 35		

Bold Figures are Arc sin transformed values

Table 48a. Reaction of sugarcane genotypes against major insect pest in AVT I plant at Coimbatore

Sl. No.	Entry	Early shoot borer				Bored plants/ha	Rating
		Mean % incidence			Cumulative % DH		
		30 DAP	60 DAP	90 DAP			
1	Co 11015	8.31	6.78	8.37	18.35	6173	MT
2	Co14005	7.15	5.19	3.29	11.32	7562	T
3	Co 15005	13.16	6.29	1.56	23.57	9568	MT
4	Co15007	11.35	9.92	1.04	34.78	4938	S
5	Co 15009	16.89	13.30	2.38	58.21	6019	S
6	Co15010	12.18	12.25	4.21	41.14	10031	S
7	Co15017	8.40	5.19	2.27	14.15	4475	T
8	Co15021	10.08	13.00	11.40	54.02	7253	S
9	CoN15071	12.72	12.91	3.81	51.72	9259	S
10	CoSnk15102	15.37	15.25	11.65	57.89	13580	S
11	PI 15131	7.00	7.28	1.72	17.67	6327	MT
12	Co 09004	5.10	9.90	2.25	16.40	6327	MT
13	CoC 671	5.41	10.35	0.45	17.18	6019	MT
14	Co 86032	8.60	9.88	2.35	22.17	7870	MT

Table 48b. Reaction of sugarcane genotypes against major insect pest in AVT I plant at Coimbatore

S.No	Entry	Internode borer		Infestation Index	Rating
		Incidence (%)	Intensity (%)		
1	Co 11015	36.78	2.77	1.01	MT
2	Co 14005	33.60	2.05	0.69	MT
3	Co 15005	22.18	1.77	0.39	MT
4	Co 15007	30.52	2.10	0.64	MT
5	Co 15009	18.59	1.33	0.25	T
6	Co 15010	29.13	2.42	0.70	MT
7	Co 15017	21.83	2.12	0.46	MT
8	Co 15021	24.69	1.81	0.45	MT
9	CoN 15071	20.23	1.62	0.33	MT
10	CoSnk 15102	28.65	2.42	0.69	MT
11	PI 15131	20.95	1.72	0.36	MT
12	Co 09004	24.32	1.71	0.42	MT
13	Co 86032	28.88	1.60	0.46	MT
14	CoC 671	41.11	2.79	1.15	S

Table 49a. Reaction of sugarcane genotypes against major insect pest in AVT II plant at Coimbatore

Sl. No.	Entry	Early shoot borer				Bored plants/ha	Rating
		Mean % incidence			Cumulative % DH		
		30 DAP	60 DAP	90 DAP			
1	Co 14002	5.24	7.40	2.16	16.42	6790	MT
2	Co 14004	4.38	3.92	3.29	18.06	4012	MT
3	Co 14012	1.70	1.94	2.87	21.55	3858	MT
4	Co 14016	9.15	9.34	2.65	25.33	8796	MT
5	Co 14027	4.28	4.12	1.66	10.10	4784	T
6	Co 14030	6.96	14.43	0.00	20.90	2160	MT
7	Co 14032	3.91	5.55	0.00	16.51	2778	MT
8	CoN 14073	5.15	11.06	1.85	16.67	2315	MT
9	CoSnk 05103	1.16	6.41	0.60	7.28	2315	T
10	CoSnk 14102	6.47	5.35	0.00	16.16	4938	MT
11	CoSnk 14103	8.44	5.57	5.40	30.72	7870	S
12	CoT 14111	5.48	8.09	0.68	17.67	6327	MT
13	CoT 14367	13.73	2.94	2.22	44.93	4784	S
14	CoVC14062	5.35	9.97	0.81	22.92	5093	MT
15	MS14082	2.07	6.22	0.71	12.29	7870	T
16	MS14081	5.93	3.29	1.12	13.90	5556	T
17	Co 86032	6.71	9.66	4.33	23.76	11111	MT
18	CoC 671	5.93	8.19	1.07	19.67	5556	MT

Table 49b. Reaction of sugarcane genotypes against major insect pest in AVT II plant at Coimbatore

Sl. No.	Entry	Internode borer		Infestation Index	Rating
		Incidence (%)	Intensity(%)		
1	Co 14002	36.67	2.63	0.96	MT
2	Co 14004	36.67	2.55	0.94	MT
3	Co 14012	33.33	2.23	0.74	MT
4	Co 14016	40.00	3.56	1.42	MT
5	Co 14027	30.00	2.43	0.73	MT
6	Co 14030	30.00	2.09	0.63	MT
7	Co 14032	46.67	2.93	1.37	S
8	CoN 14073	33.33	2.66	0.89	MT
9	CoSnk 14102	40.00	2.75	1.10	MT
10	CoSnk 14103	26.67	3.18	0.85	MT
11	CoSnk 05103	66.67	6.43	4.29	S
12	CoVC 14062	40.00	4.37	1.75	MT
13	CoT 14111	20.00	1.66	0.33	MT
14	CoT 14367	25.00	2.20	0.55	MT
15	MS 14081	33.33	3.30	1.10	MT
16	MS 14082	53.33	3.19	1.70	MT
17	Co 86032	43.33	3.29	1.42	S
18	CoC 671	26.67	1.91	0.51	MT

Table 50. Reaction of sugarcane genotypes against major insect pest in AVT ratoon at Coimbatore

Sl. No	Entry	Internode borer		Infestation Index	Rating
		Incidence (%)	Intensity (%)		
1	Co 14002	53.21	2.50	1.33	S
2	Co 14004	62.48	2.89	1.81	S
3	Co 14012	49.08	2.17	1.07	S
4	Co 14016	44.92	2.08	0.93	S
5	Co 14027	42.79	1.65	0.71	S
6	Co 14030	43.91	2.04	0.90	S
7	Co 14032	69.33	3.32	2.30	S
8	CoN 14073	38.81	1.60	0.62	MT
9	CoSnk 14102	53.24	2.19	1.17	S
10	CoSnk 14103	56.22	2.35	1.32	S
11	CoSnk 05103	33.31	1.48	0.49	MT
12	CoTi 14111	63.00	2.64	1.66	S
13	COT 14367	50.79	2.29	1.16	S
14	CoVc 14062	68.00	3.51	2.39	S
15	MS 14081	42.00	1.71	0.72	S
16	MS 14082	57.03	2.40	1.37	S
17	CoC 671	63.15	3.05	1.93	S
18	Co 86032	50.07	2.29	1.15	S

Table 51. Reaction of sugarcane genotypes against major insect pests in AVT I Plant at Pune

Sl No	Variety/ genotype	Early shoot borer (% incidence)					Internode Borer				Mealy Bug		
		30 DAP	120 DAP	Cum.	No. of bored plants/ ha	Grade	% incidence	% intensity	index	Grade	% incidence	% intensity	Grade
1	Co 11015	5.00	0.00	1.61 (1.32)	1190	LS	16.00 (3.93)	1.43	0.28	LS	0.00 (0.71)	0.00	LS
2	Co 14005	0.00	0.00	0.00 (0.71)	0	LS	4.00 (2.12)	0.24	0.01	LS	2.00 (1.41)	0.12	LS
3	Co 15005	0.00	0.00	0.00 (0.71)	0	LS	4.00 (1.81)	0.00	0.03	LS	2.00 (1.41)	0.00	LS
4	Co 15006	0.00	0.00	0.00 (0.71)	0	LS	10.00 (3.23)	1.51	0.17	LS	0.00 (0.71)	0.00	LS
5	Co 15007	0.00	2.63	3.13 (1.65)	1190	LS	16.00 (4.06)	1.10	0.18	LS	6.00 (2.52)	1.22	MS
6	Co 15009	0.00	1.67	1.22 (1.21)	1190	LS	6.00 (2.52)	0.48	0.03	LS	2.00 (1.41)	0.36	LS
7	Co 15010	0.00	1.85	2.38 (1.50)	1190	LS	8.00 (2.38)	0.65	0.10	LS	2.00 (1.41)	0.14	LS
8	Co 15017	0.00	0.00	0.00 (0.71)	0	LS	4.00 (2.12)	0.25	0.01	LS	0.00 (0.71)	0.00	LS
9	Co 15021	0.00	0.00	0.00 (0.71)	0	LS	10.00 (3.23)	0.61	0.06	LS	6.00 (2.12)	0.64	MS
10	CoSnk 15102	0.00	0.00	0.00 (0.71)	0	LS	8.00 (2.83)	0.61	0.10	LS	4.00 (1.81)	0.64	LS
11	CoN 15071	0.00	0.00	0.00 (0.71)	0	LS	8.00 (2.91)	0.67	0.05	LS	8.00 (2.92)	0.67	MS
12	PI 15131	0.00	0.00	0.00 (0.71)	0	LS	8.00 (2.91)	1.17	0.09	LS	0.00 (0.71)	0.00	LS
13	Co 86032 (Std)	0.00	7.14	5.71 (2.08)	4762	LS	8.00 (2.83)	0.65	0.07	LS	4.00 (1.81)	0.65	LS
14	CoC 671 (Std)	0.00	0.00	0.00 (0.71)	0	LS	12.00 (3.54)	0.86	0.10	LS	0.00 (0.71)	0.00	LS
15	Co 09004 (Std)	0.00	0.00	0.00 (0.71)	0	LS	12.00 (3.54)	0.87	0.10	LS	2.00 (1.41)	0.25	LS
	S.E ±												
	CD 5%			NS			NS				NS		
	CV												

(Figures in parenthesis are transformed values, while those outside are original values.)

Table 52. Reaction of sugarcane genotypes against major insect pests in AVT II Plant at Pune

Sl. No.	Variety/ genotype	Early shoot borer (% incidence)					Internode borer				Mealy bug		
		30 DAP	120 DAP	Cum.	No. of bored plants/ha	Grade	% incidence	% intensity	index	Grade	% incidence	% intensity	Grade
1	Co 14002	0.00	6.33	6.27 (2.60)	5952	LS	8.00 (2.91)	0.46	0.04	LS	0.00 (0.71)	0.00	LS
2	Co 14004	5.00	5.81	6.52 (2.19)	7143	LS	6.00 (2.52)	0.35	0.02	LS	0.00 (0.71)	0.00	LS
3	Co 14012	0.00	11.36	12.21 (3.45)	11905	LS	4.00 (1.81)	0.00	0.02	LS	0.00 (0.71)	0.00	LS
4	Co 14016	0.00	0.00	0.00 (0.71)	0	LS	6.00 (2.52)	0.46	0.03	LS	4.00 (1.81)	0.49	LS
5	Co 14027	0.00	2.94	2.94 (1.85)	2381	LS	4.00 (1.81)	0.25	0.02	LS	0.00 (0.71)	0.00	LS
6	Co 14030	0.00	1.14	1.28 (1.23)	1190	LS	0.00 (0.71)	0.00	0.00	LS	6.00 (2.12)	0.82	MS
7	CoM 14032	0.00	5.56	4.44 (1.89)	4762	LS	4.00 (2.12)	0.24	0.01	LS	2.00 (1.41)	0.12	LS
8	CoN 14073	0.00	2.82	2.38 (1.50)	2381	LS	2.00 (1.41)	0.10	0.00	LS	0.00 (0.71)	0.00	LS
9	Co Snk 14102	0.00	6.52	6.06 (2.46)	7143	LS	4.00 (1.81)	0.24	0.02	LS	6.00 (2.12)	0.92	MS
10	CoSnk 14103	0.00	0.00	0.00 (0.71)	0	LS	8.00 (2.91)	0.24	0.05	LS	0.00 (0.71)	0.92	LS
11	CoT 14367	0.00	1.45	1.92 (1.40)	1190	LS	2.00 (1.41)	0.12	0.00	LS	0.00 (0.71)	0.00	LS
12	CoTL 14111	0.00	0.00	0.00 (0.71)	0	LS	4.00 (2.12)	0.25	0.01	LS	4.00 (1.81)	0.23	LS
13	CoVc 14062	0.00	2.04	1.79 (1.36)	1190	LS	2.00 (1.41)	0.12	0.00	LS	2.00 (1.41)	0.47	LS
14	MS 14081	0.00	6.35	5.41 (2.03)	4762	LS	4.00 (2.12)	0.22	0.01	LS	2.00 (1.41)	0.19	LS
15	MS 14082	0.00	0.00	0.00 (0.71)	0	LS	0.00 (0.71)	0.00	0.00	LS	0.00 (0.71)	0.00	LS
16	Co 86032 (Std)	0.00	0.00	0.00 (0.71)	0	LS	0.00 (0.71)	0.00	0.00	LS	0.00 (0.71)	0.00	LS
17	CoC 671 (Std)	0.00	8.77	13.16 (2.94)	5952	LS	16.00(4.06)	1.06	0.17	LS	2.00 (1.41)	0.15	LS
18	CoSnk 05103 (Std)	0.00	0.00	0.00 (0.71)	0	LS	4.00 (2.12)	0.23	0.01	LS	0.00 (0.71)	0.00	LS
	S.E ±												
	CD 5%			NS			1.68				NS		
	CV						40.72						

(Figures in parenthesis are transformed values, while those outside are original values.)

Table 53. Reaction of sugarcane genotypes against major insect pests in AVT ratoon at Pune

Sl. No.	Variety/ genotype	Early shoot borer (% incidence)						Internode borer				Mealy bug		
		30 DAP	60 DAP	90 DAP	Cum.	No. of bored plants/ha	Grade	% incidence	% intensity	index	Grade	% incidence	% intensity	Grade
1	Co 14002	0.86	7.06	2.25	8.11 (2.84)	50000	LS	0.00 (0.71)	0.00	0.00	LS	0.00 (0.71)	0.00	LS
2	Co 14004	0.00	1.55	0.71	1.75 (1.50)	13889	LS	4.00 (2.12)	0.19	0.01	LS	12.00 (3.54)	0.97	MS
3	Co 14012	0.00	7.50	3.45	8.64 (2.94)	55556	LS	4.00 (1.81)	0.00	0.02	LS	0.00 (0.71)	0.00	LS
4	Co 14016	0.00	0.55	0.41	0.87 (1.10)	5556	LS	2.00 (1.41)	0.21	0.01	LS	6.00 (2.12)	0.42	MS
5	Co 14027	0.00	1.25	3.61	5.57 (2.42)	11111	LS	4.00 (2.12)	0.21	0.01	LS	8.00 (2.38)	0.43	MS
6	Co 14030	1.28	4.79	1.32	4.68 (2.28)	30556	LS	6.00 (2.52)	0.40	0.03	LS	8.00 (2.91)	0.42	MS
7	CoM 14032	0.00	6.25	5.41	11.04 (3.28)	25000	LS	12.00 (3.54)	0.60	0.07	LS	0.00 (0.71)	0.00	LS
8	CoN 14073	0.00	0.54	0.76	1.05 (1.16)	8333	LS	2.00 (1.41)	0.09	0.00	LS	0.00 (0.71)	0.00	LS
9	Co Snk 14102	1.28	0.63	2.62	3.61 (2.02)	19444	LS	2.00 (1.41)	0.10	0.00	LS	6.00 (2.52)	0.30	MS
10	CoSnk 14103	0.00	1.56	1.28	2.22 (1.46)	5556	LS	0.00 (0.71)	0.10	0.00	LS	0.00 (0.71)	0.30	LS
11	CoT 14367	0.00	1.00	0.93	1.67 (1.33)	5556	LS	0.00 (0.71)	0.00	0.00	LS	0.00 (0.71)	0.00	LS
12	CoTL 14111	0.00	0.48	1.00	1.12 (1.18)	11111	LS	2.00 (1.41)	0.09	0.00	LS	4.00 (1.81)	0.19	LS
13	CoVc 14062	0.00	0.00	4.69	4.69 (2.28)	16667	LS	0.00 (0.71)	0.00	0.00	LS	12.00 (3.54)	0.77	MS
14	MS1 4081	0.00	0.00	2.84	2.93 (1.76)	16667	LS	6.00 (2.52)	0.30	0.02	LS	0.00 (0.71)	0.00	LS
15	MS 14082	0.00	0.64	0.44	0.95 (1.20)	5556	LS	0.00 (0.71)	0.00	0.00	LS	0.00 (0.71)	0.00	LS
16	Co 86032 (std)	0.00	2.97	4.83	7.11 (2.72)	27778	LS	6.00 (2.52)	0.34	0.02	LS	2.00 (1.41)	0.23	LS
17	CoC 671(std)	0.00	0.00	0.00	0.00 (0.71)	0	LS	0.00 (0.71)	0.00	0.00	LS	12.00 (2.83)	0.88	MS
18	Cosnk 05103 (std)	0.00	3.85	1.44	4.41 (2.01)	33333	LS	6.00 (2.52)	0.31	0.02	LS	0.00 (0.71)	0.00	LS
	S.E $\pm$													
	CD 5%				NS			1.30				NS		
	CV							37.59						

(Figures in parenthesis are transformed values, while those outside are original values.)

Table 54. Reaction of sugarcane genotypes against major insect pests in AVT at Tharsa

Sl. No.	Genotypes	Early shoot borer infestation (%)					Reaction	Number of bored plants/ha (On the basis of Cumulative % incidence)	Scales		
		30 DAP	60 DAP	90 DAP	120 DAP	Cumulative			% incidence	% intensity	Reaction
1	Co 14005	4.76 (7.40)	0.00 (0.00)	2.78 (5.59)	0.00 (0.00)	5.56 (8.03)	LS	5557	14.67	25.62	MS
2	Co 15005	5.56 (8.03)	5.56 (8.03)	3.33 (6.14)	3.70 (6.49)	12.79 (20.74)	LS	12793	10.67	23.86	MS
3	Co 15006	3.70 (6.49)	4.17 (6.90)	6.36 (11.99)	3.70 (6.49)	14.81 (22.07)	LS	14813	12.00	12.12	MS
4	Co 15007	6.67 (8.85)	5.56 (8.03)	2.56 (5.36)	6.27 (11.85)	13.33 (17.70)	LS	13333	22.67	17.65	MS
5	Co 15009	9.72 (14.93)	9.52 (10.77)	14.17 (21.89)	3.33 (6.14)	22.22 (28.02)	MS	22223	21.33	8.52	LS
6	Co 15010	3.70 (6.49)	3.70 (6.49)	3.03 (5.85)	6.36 (11.99)	13.26 (21.16)	LS	13257	28.00	17.32	MS
7	Co 15017	5.56 (8.03)	17.73 (24.80)	13.43 (21.42)	9.76 (14.90)	29.33 (32.71)	MS	29327	25.33	17.22	MS
8	Co 15021	4.76 (7.40)	4.76 (7.40)	2.78 (5.59)	6.11 (11.73)	14.14 (21.43)	LS	14140	18.67	20.78	MS
9	CoSnk 15102	3.70 (6.49)	4.76 (7.40)	4.76 (7.40)	2.78 (5.59)	12.16 (20.32)	LS	12163	29.33	16.94	MS
10	CoN 15071	5.56 (8.03)	6.67 (8.85)	3.33 (6.14)	3.70 (6.49)	13.03 (20.84)	LS	13030	21.33	15.91	MS
11	PI 15131	4.76 (7.40)	5.56 (8.03)	3.70 (6.49)	3.33 (6.14)	12.78 (20.58)	LS	12777	9.33	27.27	MS
12	Co 86032	4.17 (6.90)	5.56 (8.03)	4.17 (6.90)	3.70 (6.49)	13.89 (21.75)	LS	13887	25.33	14.83	MS
13	CoC 671	5.56 (8.03)	6.67 (8.85)	2.56 (5.36)	3.33 (6.14)	12.73 (17.26)	LS	12727	22.67	18.72	MS
	SE (±)	7.10	7.76	5.31	3.49	4.82		-	-	-	-
	C.D. (0.05)	NS	NS	11.75	NS	NS		-	-	-	-

East Coast Zone

Anakapalle

In AVT (early)-I Plant, 6 entries were evaluated including 3 zonal checks against major insect pests of the area. All entries were MS against ESB and HS against internode borer. All entries showed HS reaction against scale insect except CoC 01061, which showed LS reaction (Table 55).

In AVT (early)-II Plant, 6 genotypes including 3 zonal checks were screened against major insect pests. All entries were MS against ESB. Against internode borer, only one entry, CoC 16336 was MS and rest all entries were HS. Overall 2 entries showed LS reaction against scale insect and rest others showed MS (1 no.) and HS (3 nos.) reactions (Table 55).

In AVT (mid-late)-I Plant, 9 genotypes including 4 zonal checks were screened against ESB, internode borer and scale insect. All genotypes showed MS reaction against ESB except CoOr 15346 and CoA 99082, which have HS reaction. Against internode borer, only CoC 16338 showed LS reaction and rest all entries have MS (1 no.) and HS (7 nos.) reactions. Only one entry, CoOr 15346 has LS reaction against scale insect and rest other entries have MS (6 nos.) and HS (2 nos.) (Table 56).

Table 55. AVT (Early)-I Plant & II Plant (East Coast Zone)- Location: Anakapalle

Sl. No	Variety/ Genotypes	AVT (Early)- I Plant			AVT (Early)- II Plant			
		ESB	Internode borer	Scale Insect	Variety/ Genotypes	ESB	Internode borer	Scale Insect
1.	CoA 17321	MS	HS	HS	CoA 16321	MS	HS	LS
2.	CoA 17323	MS	HS	HS	CoC 16336	MS	MS	MS
3.	CoC 17 336	MS	HS	HS	CoC 16337	MS	HS	HS
4.	CoA 92081 (S)	MS	HS	HS	CoA 92081 (S)	MS	HS	HS
5.	CoC 01061 (S)	MS	HS	LS	CoC 01061 (S)	MS	HS	LS
6.	Co 3151 (S)	MS	HS	HS	Co 3151 (S)	MS	HS	HS

Table 56. AVT (Midlate)-I Plant (East Coast Zone)- Location: Anakapalle

Sl. No.	Variety/ Genotypes	AVT (Midlate)- I Plant		
		ESB	Internode borer	Scale Insect
1.	CoC 15339	MS	HS	MS
2.	CoOr 15346	HS	HS	LS
3.	CoC16338	MS	LS	MS
4.	CoC 16339	MS	HS	HS
5.	CoV 16357	MS	HS	MS
6.	CoV 92102 (S)	MS	MS	MS
7.	Co 86249 (S)	MS	HS	HS
8.	Co 6030 (S)	MS	HS	MS
9.	CoA 99082 (Sc)	HS	HS	MS

Project No. E. 28. Survey and surveillance of sugarcane insect-pests

North West Zone

Karnal

The virtual survey carried out, due to Covid19 pandemic. Top borer and pink borer incidences ranged from traces to 70.0 and traces to 17.5 per cent respectively. Black bug incidence varied from traces to 7.00 and traces to 24.00 black bug/leaf in plant and ratoon crop respectively. Grasshopper and pyrilla incidences were recorded in traces. Blister mite incidence varied from traces to 80.0 per cent in leaf sheaths. The incidence of web mite was in some of the field up to 60.0 per cent. (Table 57).

Lucknow

The command areas of DSCL Sugar Mills, Loni, Chilbaria Sugar Mill, Nanpara Sugar Mill, Bahraich and Hata Sugar Mill, Deoria, Hata Sugar Mill, Hata, Bahraich and Hata Sugar Mill, Deoria, four units of DSCL, Group (Rupapur, Haryawan, Loni, Ajbapur), three units of Balrampur Group, Sekseria Sugar Mill, Biswan, Sitapur, Rosa Sugar Works Rosa, K. M. Sugar Mill Masodha, Oudh Sugar Mill, Hargaon, Dalmia Chini Mill, Ramgarh, IPL Chini Mill were surveyed during 2020. In few fields, ESB was recorded to the tune of 5.0-10.0%. Occurrence of top borer, stalk borer, internode borer, pyrilla was in traces. The sporadic incidence of army worm (*Spodoptera* sp.) was observed in Bahraich. In ratoon crop, top borer was the major problem and affecting 10-15% of the shoot. In Chilbaria Sugar Mill, and Nanpara Sugar Mill area, incidence of black beetle (*Heteronychus* sp.) was also observed that gnawing the basal portion of young shoots and causing dead hearts. It's incidence was of wide spread but restricted to around 5-10%. The incidence of root borer (27.0%), cumulative incidence of top borer (16.67%) was observed. Termite incidence was low.

Incidence of a black Delphacid Plant Hopper, *Eoeurysa flavocapitata* again reported from District, Muzaffarnagar of western Uttar Pradesh and UCSR, Shahjahanpur. The general appearance of adults is blackish and of newly emerged nymphs is pale green with red eyes and advanced stage nymphs are smoky. Both stages (adult and nymphs) are remaining concealed in leaf funnel/whorl of sugarcane and suck the plant sap. Some sort of sticky honey dew was observed on under surface of newly opened leaves that invited black sooty mould. Under surface of most of the leaves were covered with black sooty mould. In spite of yield loss to the crop it made the green cane tops unfit for cattle feed. Sporadic incidence of leaf mealy bugs was observed during field visits in the area (Table 57).

Shahjahanpur

Survey was conducted during pre-monsoon and post-monsoon in different sugar factory zones of six districts viz; Shahjahanpur, (Rosa, Maqsoodapur, Nigohi, Powayan sugar mill), Pilibhit (Pilibhit, Bisalpur, Barkhera sugar mill area), Hardoi (Loni, Hariyawan, Rupapur sugar mill), Sitapur (Biswan, Hargoan sugar mill area), Lakhimpur Kheri (Ajabapur, Kumbhi, Gola, Palia, Gularia, Aira, Khambharkheda sugar mill area) and Bareilly (Faridpur

and Nababganj) to assess the major insect pest of the area. During summer weather the incidence of ESB ranged from 0.35% (Ajabapur, Kumbhi, Gola, Palia, Gularia, Aira, Khambharkheda sugar mill area) to 1.25% (Rosa, Maksudapur, Powayan Nigohi sugar mill) on varieties Co 0238. The incidence of top borer was recorded ranged from 0.21% (Ajabapur, Kumbhi, Gola, Palia, Gularia, Aira, Khambharkheda sugar mill area) to 0.75% (Rosa, Maqsoodapur, Nigohi, Powayan, Biswan, Hargoan, Faridpur and Nababganj sugar mill area) on varieties Co 0238, CoS 08272, Co 0118. The incidence of root borer was recorded ranged from 0.5% (Loni, Hariyawan, Rupapur sugar mill area) to 0.75% (Rosa, Maksudapur, Nigohi, Powayan sugar mill area) on Co 0238. The incidence of Termite was recorded ranged from 0.5% (Loni, Hariyawan, Rupapur sugar mill area) to 1.5% (Faridpur and Nababganj sugar mill area) on varieties Co 0238 and Co 0118. The incidence of Thrips was recorded ranged from 0.83% (Pilibhit, Bisalpur, Barkhera sugar mill area) to 3.5% (Rosa, Maksudapur, Nigohi, Powayan sugar mill area) on Co 0238. The defoliator, grass hopper were recorded in stray in all factory zones while army worm was found in stray in almost all factory zones. Sucking pest mealy bug was recorded in stray in all sugar zones except Loni, Hariyawan, Rupapur, Biswan, Hargaon, Faridpur and Nababganj sugar mill area. Gurdaspur borer was recorded in stray in Loni, Hariyawan, Rupapur, Ajabapur, Kumbhi, Gola, Palia, Gularia sugar mill area. White grub incidence was found in stray at Ajabapur, Kumbhi, Gola, Faridpur and Nababganj sugar mill area (Table 57).

North Central Zone

Pusa

Survey was conducted for the insect pests of sugarcane at Pusa Farm during cropping season of 2020-21. Among borers pest, incidence of ESB (4.3 to 12.9%), root borer (3.7 to 9.6 %), top borer (2.5 to 16.7 %), stalk borer below (3.4 to 8.3 %) and Plassey borer (5.6 to 17.2 %) were recorded during reported period. While in case of sucking pests, the incidence of black bug (2.6 to 6.8%), pyrilla (5.4 to 13.9%), scale insect (1.6 to 7.4%), mealy bug (2.4 to 8.6%),white fly (5.3 to 18.9%) and derbid plant hopper (4.1 to 10.5%) were observed as the key pests. The incidence of other pests like grasshopper (6.8 to 11.5%), mites 7.8 to 22.6%) and termite (5 to 12%) were also recorded (Table 57).

Seorahi

Survey was conducted in Twenty one different sugar factory zones viz., Seorahi, Ramkola, Dhadha, Pratappur, Khadda, Siswabajar, Sathiyav, Goshi, Captangaj, Pipraech, Munderwa, Babhanan, Manakapur, Balrampur, Tulshipur, Utrola, Rudhawali, Kunuderkhi, Akberpur, Mausudha and Rauzagaw for key insect–pests of sugarcane. During hot weather, the incidence of top borer 2nd brood was low and ranged from 2.00% in Munderwa factory zone to 4.00% in Ghosi factory zone. Regarding the sucking pest i.e. thrips population / leaf was low. It was ranged from 4.50% (in Pipraich factory zones) to 9.50% (in Pratappur factory zone). Low incidence of mealy bug was observed with a range of 3.00% (in Ramkola ,Sathiyav, Munderwa and Siswabajar factory zone) to 5.55 % in Seorahi Factory Zone. The incidence of top borer at harvest was recorded low in all surveyed factory zones. The

minimum (2.50%) incidence of top borer was recorded around Ramkola factory zone while maximum (8.00%) around Sathiyav factory zone. The infestation of Stalk borer on cane basis was observed low in all surveyed factory zone. It ranged from 4.00% (around Ramkola) to 10.50% (around Pratappur and Pipraech factory zone). The incidence of White fly (Nymph & puperia) 2.5 sq. cm was observed low and ranged from 3.00% (in Mankapur factory zone) to 5.00% (in Masaudha factory zone) (Table 57).

Peninsular Zone

Coimbatore

Overall incidence of borer pests, viz. shoot borer (SB) and internode borer (INB) and the subterranean white grub in Tamil Nadu indicated medium incidence of SB (2.3 - 32.2%) and INB (4.5 - 20.1%); white grub incidence in endemic areas varied from 8 to 11 grubs/m2. Whitefly incidence was 24-104/leaf in Mundyampakkam area alone. Other pests like mealybug and white woolly aphid were low in individual farmers' fields which were kept under check by periodical detrashing and natural enemies respectively (Table 57).

Mandya

During 2020-21 survey was conducted at monthly interval in three sugar factory areas of Mandya district. During the survey seven pests and per cent of incidence was recorded viz., early shoot borer, top shoot borer, inter node borer, root grub, woolly aphids, mealy bugs and termites. The natural enemies of wolly aphids *Encarsia flavoscutellum* and *Dipha aphidivora* kept the pest under check. Termite appeared in few places but did not cause economic loss to the crop (Table 57).

Padegaon

Survey of sugarcane was carried out in the sugarcane fields of areas of Pune, Satara, and Ahmednagar districts. In most of the fields, CoM 0265 and Co 86032 varieties were planted. The new varieties *viz.,* MS 10001 was also planted in few fields. In Pune district, survey was undertaken in villages *viz.,* Nira, Gulanche, Nimbut. Someshwar, Wanewadi. During the period of survey per cent incidence of ESB, TB and IB ranged from 5.10 to 22.50, 0.00 to 1.80 and 12.60 to 25.00, respectively. Whereas, sucking pests *viz.,* pyrilla, woolly aphids, scale insect, mealy bug and white fly showed their population in the range of 1.50 to 4.50, 5.50 to 32.80, 0.00, 8.00 to 25.30, and 2.55 to 10.56, respectively on above mentioned sugarcane varieties. The infestation of white grub was observed in the range of 1.67 to 3.45 during the crop period. At Pune Dist. borer incidence was found low to moderate level. Sucking pests was found low to moderate level whereas, white grub population was found to be low level. In Satara district, survey was undertaken in villages *viz.,* Balu Patilachi wadi, Pimpare BK, Maryaachi wadi, Padegaon Farm, Taradgaon. During the survey range of per cent incidence of ESB, TB and IB was 3.50 to 15.25, 0.00 and 8.40- to 18.80, respectively. However, sucking pests *viz,* pyrilla, woolly aphids, scale insect, mealy bug and white fly showed their population in the range of 2.22 to 4.58, 6.25 to 20.50, 0.00, 10.25 to 25.40 and 2.65 to 5.55, respectively on above mentioned sugarcane varieties. The infestation of white grub was observed 1.80 to 2.45% throughout the crop period. In Ahmednagar district, survey

was undertaken in villages *viz.*, Loni BK, Gogalgaon, Satral, Kolhar BK, Babhaleshwar, Bagwatipura. During the survey range of per cent incidence of ESB TSB and IB was 10.60 to 40.50, 0.00 and 6.20 to 12.50, respectively. However, sucking pests *viz*, pyrilla, woolly aphids, scale insect, mealy bug and white fly showed their population in the range of 1.90 to 5.18, 8.00 to 40.00, 6.20 to 20.60 and 8.65 to 40.55, respectively on above mentioned sugarcane varieties. The infestation of white grub was observed in the range of 2.55 to 5.40 throughout the crop period. Overall survey indicated that, borer and sucking pest incidence was low to moderate. White grub was observed low level during middle of June to August 2020 (Table 57).

Pune

Survey conducted revealed that incidence (%) of ESB was in the range of 0.00 to 5.26%, while it was maximum 5.26% in December 2020 ratoon crop of Co 86032. The per cent incidence of internode borer was in the range 10.00 to 40.00%, while it was maximum 40.00 % in Co 86032 planted in the month on July 2020. The incidence of mealy bug was found maximum 40.00 in CoM 0265 planted in the month of July 2020 (Table 57).

Tharsa

Roving roving survey was conducted in Nagpur, Wardha, Gondia and Bhandara districts during first fortnight of December. Maximum mean incidence (9.13%) of internode borer (*C. sacchariphagus indicus***)** was observed on variety Co-9805 at Shivani Bandh village of Sakoli Tahsil in Bhandara district. Maximum mean incidence of pyrilla (*Pyrilla perpusilla*) (4.75 per leaf) was observed on variety MS-10001 at Bhivkhidki of Arjuni Mor Tahsil in Gondia district (Table 57).

Thiruvala

A survey of sugarcane arthropod insect pests was made in cane fields surrounding ARS, Thiruvalla. An abnormal yellowing of cane leaves was observed in all varieties grown in the field resembling potash deficiency. The plant sucking bug, *Phaenacantha bicolor* (Dist.) (Hemiptera: Colobathristidae) was identified as the causal agent of leaf yellow spotting. In order to estimate the degree of infestation, field counts of insects were taken. Four to 20 adults were observed on each plant. A yellow discolouration was observed at the feeding points on the leaves. At high infestation levels, there is an appreciable reduction in photosynthetic activity of leaves, due to the yellowing which could ultimately lead to yield loss. *Phaenacantha bicolor* (Dist.) (Hemiptera: Colobathristidae) is reported from the Indian Subcontinent for the first time. This is the first report of the bug as a pest of sugarcane in India (Table 57).

East Coast Zone

Anakapalle

Surveys conducted in Visakhapatnam district revealed incidence of ESB, (5-40%DH) during February- July months with peak incidence during April month; incidence of fall army worm (2-5%) during March-May with peak incidence during May month; incidence of sugarcane mite, *O.indicus* (3-15%) during May-June with peak incidence during May month

and incidence of termite during March-June with peak incidence during March month during formative stage. Incidence of pink mealybug, *S. sacchari* (10-40%) was observed in June- September with peak incidence during August month and yellow mealybug, *K.sacchari* (20-50%) observed during April –July with peak incidence during July month. Incidence of sugarcane aphid, *M.sacchari* (50-150aphids/leaf) was noticed during March to January with peak incidence during November month. Incidence of internode borer (10-60%) was noticed during July-October with peak incidence during September month.

A new invasive pest, Rugose Spiralling Whitefly (RSW), *Aleurodicus rugioperculatus* (Hemiptera: Aleyrodidae), which had invaded India in 2016, has been recorded on sugarcane for the first time at RARS, Anakapalle. Its incidence is recorded to the tune of 5-20% in close proximity to coconut plantation during Oct–Jan with peak incidence during December in Research farm, Anakapalle. Along with RSW, natural enemies *viz.*, lady bird beetles, *Cryptolaemus montrouzieri*, *Chilocorus nigrita*, *Scymnus nubilus* and the parasitoid wasp, *Encarsia guadelopae* were recorded in sugarcane ecosystem. The per cent parasitisation of *E.guadelopae* was high (60-70%) on RSW feeding on sugarcane leaves during January. A sooty mould scavenging beetle, *Leiochrinus nilgirianus* Kaszab (Coleoptera: Tenebrionidae) was also noticed on sugarcane leaves infected with sooty mould. (Table 57, Fig 1).

Fig 1: Rugose Spiralling Whitefly infestation on sugarcane & record of its parasitoids & predators

Parasitisation of *Encarsia guadeloupae on RSW*

Cryptolemus montrouzieri

Black ant feeding on adult of RSW

Sooty mould scavenging beetle, *Leiochrinus nilgirianus* Kaszab (Coleoptera: Tenebrionidae)

Table 57. Status of insect pests of sugarcane in different states of India based on survey and surveillance report.

Location	Insect pest	Incidence (%)	Varieties	Period	Any other information
Andhra Pradesh					
Research farm, RARS, Anakapalle, Ravikamatham mandal Vishakhapatnam District	Early shoot borer	5.0-20.0	87 A 298 (Ratoon), 2009 A 107, 93 A 145	March, 2020	Due to high temperatures low to moderate incidence of early shoot borer was observed on all commercial varieties
	Fall army worm	2.0-3.0			
	Internode borer	3.0-9.0			
	Scale insect	30.0-80.0			
Research farm, RARS, Anakapalle,	Early shoot borer	24.0-40.0	2009 A 107, 87 A 298, 93 A 145	April, 2020	-
	Fall army worm	3.0-5.0			-
Research farm, RARS, Anakapalle,	Early shoot borer	5.0-15.0	93 A 145	May, 2020	-
	Fall army worm	2.0-5.0			-
	Sugarcane mite	5.0-15.0			-
Research farm, RARS, Anakapalle,	Early shoot borer	2.0-8.0	93 A 145	June, 2020	-
	Sugarcane mite	3.0-10.0			-
Lakkavaram(v) ,Gavaravaram (v), in Chodavaram (M), Boilakinthada (v) in Devarapalli (M) Vishakhapatnam	Early shoot borer	2.0-6.0	2009 A 107 (ratoon) Co 7805 87 A 298 CoA 7706	July, 2020	Along with insect pests, moderate to severe incidence (20-30%) mosaic, smut (15-20%), YLD (5%) and grassy shoot (5%) were observed on 2099 A 107, 87 A 298 & Co A 7706, CoA 7805 varieties.
	Yellow mealybug	15.0-50.0			
	Internode borer	4.0-20.0			
	Web mite	2.0-5.0			
Lakshmipuram (V) Gowripatnam (v) in Chodavaram (M), Vishakhapatnam	Early shoot borer	1.0-5.0	2009A 107, Co 7805, 87A 298, CoA 7706	August, 2020	
	Internode borer	10.0-20.0			
	Web mite	2.0-5.0			
	Sugarcane aphids /leaf	20-45			
	Rusty plum aphids/leaf	5.0-15			
Kotavuratla Vishakhapatnam	Internode borer	5.0-25.0	2009 A 107, 87A 298, Co 7805 and Co7706	September, 2020	
	Sugarcane aphid	30-60			
	Mealybug	5.0-10.0			
	Sugarcane aphids/leaf	25-45			
Chodavaram mandal, Bucchayya peta and Kotvuratla mandalsand RARS, Anakapalle, Visakhapatnam	Internode borer	8.0-10.0	2009 A 107 (ratoon) Co 7805 87 A 298, Co 7805 and Co7706	October, 2020	
	Sugarcane aphid/leaf	30.0-60.0			
	Rugose spiraling white fly	2.0-10.0			
Atchuthapuram, Yellamanchili and Payakarao peta , Kotauratla and Makavara palem mandals and RARS, Anakapalle, Visakhapatnam	Internode borer	4.0-6.0	2009 A 107, 87A 298, Co 62175 and 2003 V 46 COA16321, Co A 16323	November, 2020	-
	Sugarcane aphid /leaf	60.0-150.0			-
	White woolly aphid	5.0-10.0			-
	Rugose spiraling white fly	2.0-13.0			-
Rajam , Garividi	Early shoot borer	5.0-10.0	2009 A	December,	-

mandals in operational area of EID Parrys' India Pvt., Ltd., Sankili in Srikakulam district and RARS, Anakapalle, Visakhapatnam	Internode borer	5.0-10.0	107, 87A 298, Co86032 and 2003 V 46 Co A 16321, CoA 16323	2020	-
	Sugarcane aphid /Leaf	30.0-40.0			-
	Rugose spiralling white fly	2.0-20.0			-
	Web mite	20.0-40.0			-
RARS, Anakapalle, Visakhapatnam	Rugose spiralling white fly (% incidence)	5.0-10.0	Co A 16321, CoA 16323	January, 2021	60-70% parasitization by *Encarsia gudeloupae*
Bihar					
Pusa Farm	Root borer	3.7-9.6	CoP 2061, CoP 9301, Rajendra Ganna-1, CoP 112, BO 154, BO 153	-	-
	Shoot borer	4.3-12.9		-	-
	Top borer	2.5-16.7		-	-
	Stalk borer	3.4-8.3		-	-
	Plassey borer	5.6-17.2		-	-
	Grasshopper	6.8-11.5		-	-
	Black bug	2.6-6.8		-	-
	Pyrilla	5.4-13.9		-	-
	Scale insect	1.6-7.4		-	-
	Mealy bug	2.4-8.6		-	-
	White fly	5.3-18.9		-	-
	Derbid plant hopper	4.1-10.5		-	-
	Mites	7.8-22.6		-	-
	Termites	5.0-12.0		-	-
Maharashtra					
Pune (Nira, Gulanche, Nimbut, Someshwar, Waniwadi.)	Early shoot borer	5.1-22.50	Co 86032 CoM 0265 MS 10001	-	-
	Top shoot borer	0.0-1.80		-	-
	Internode borer	12.60-25.00		-	-
	Pyrilla/ leaf	4.50		-	1.0-2.45 nos.of *Epiricania melanoleuca*/plant
	Woolly aphid	5.50-32.80		-	-
	Mealy bug	8.0-25.30		-	-
	White fly	2.55-10.56		-	-
	White grub	1.67-3.45		-	-
Satara (Balu patilachi wadi, Pimpare BK, Maryaachi wadi , Padegaon Farm, Taradgaon)	Early shoot borer	3.50-15.25	Co 86032 CoM 0265 MS 10001	-	-
	Internode borer	8.40-18.80		-	-
	Pyrilla/ leaf	2.22-4.58		-	0.8-1.8 nos.of *E.melanoleuca*/plant
	Woolly aphid	6.25-20.50		-	-
	Mealy bug	10.25-25.40		-	-
	White fly	2.65-5.55		-	-
	White grub	1.80-2.45		-	-
Ahmednagar (Loni BK Gogalgaon Satral Kolhar BK Babhaleshwar Bagwatipura)	Early shoot borer	10.60-40.50	Co 86032 CoM 0265	-	-
	Internode borer	6.20-12.50		-	-
	Pyrilla/ leaf	1.90-5.18		-	1.7-2.50 nos.of *E.melanoleuca*/plant
	Woolly aphid	8.00-40.00		-	-
	Mealy bug	6.20-20.60		-	-

	White fly	8.65-40.55		-	-
	White grub	2.55-5.40		-	-
Pune and nearby areas	Early shoot borer	1.20-5.26	Co 86032 CoM 0265		
	Internode borer	10-40		-	Max. in July planted Co 86032
	Mealy bug	10-40		-	Max. in July planted Co 0265
Nagpur, Wardha, Gondia,Bhandara	Internode borer	1.25-16.70	CoM 0265 Co 8005 Co 9805 Co 10001 Co 92005	1st fortnight, Dec, 2020	-
	Pyrilla	1.6-6.8			-
Karnataka					
Three sugar mill area of Mandya District	Early shoot borer	7.5-28.0	-	-	-
	Top shoot borer	6.0-18.5	-	-	-
	Internode borer	12.5-29.5	-	-	-
	Mealy bug	12.0	-		At maturity
	Woolly aphid	40 – 65	-	-	*Encarsia* and *Dipha* found active
	Root grub	3 – 4 grubs / clump	-	-	-
	Termites	-	-	-	Damage in patches
Kerala					
Thiruvalla	*Phaenacantha bicolor*	4 to 20 adults/plant	-	-	First report from Indian sub-continent
Tamil Nadu					
Coimbatore, Mundyampakkam areas	Shoot borer	2.3-32.2	-	-	-
	Internode borer	4.5-20.1	-	-	-
	White grub	8-11 grubs/m^2	-	-	-
	Whitefly	24-104 nos./leaf	-	-	-
Haryana					
Karnal,	Top borer	0.0 to 70.0	-	-	-
	Pink borer	0.0 to 17.5	-	-	-
	Black bug	0.0 to 07.00 black bug/leaf in plant 0.0 to 24.00 black bug/leaf in ratoon crop	-	-	-
	Grasshopper	Traces	-	-	-
	Pyrilla	Traces	-	-	-
	Blister mite	0.0 to 85.0% in leaf sheaths	-	-	-
	Web mite	60.0%	-	-	-
Uttar Pradesh					
Rosa, Maksudapur,	ESB	1-5	Co 0238	-	-

Powayan, Nigohi sugar mill area (Shahjahanpur district)	Top borer	0-3		-	-
	Root borer	1-5		-	-
	Army worm	1-3		-	-
	Termite	0-3		-	-
	Thrips	1-2		-	-
	Mealy bug	0-1		-	-
	Grass hopper	0-3		-	-
Pilibhit, Bisalpur and Barkhera sugar mill area (Pilibhit district)	Termite	0-2	Co 0238	-	-
	Root borer	0-2		-	-
	Thrips	0-3		-	-
Loni, Hariyawan, Rupapur Sugar mill area (Hardoi district)	Termite	0-2	Co 0238 CoS 08272 Co 118	-	-
	Top borer	1-3		-	-
	Thrips	0-8		-	-
	Root borer	1-2		-	-
	Gurdaspur Borer	0-2		-	-
	Grass hopper	0-2			
Biswan, Hargaon Sugar mill area (Sitapur district)	Thrips	0-5	Co 0238	-	-
	Top borer	0-2		-	-
				-	-
Ajbapur, Kumbhi, Gola, Pallia, Gularia, Aira, Khambharkhera sugar mill area (Lakhimpur Kheri)	ESB	0-5	Co 0238 Co 0118	-	-
	Top borer	0-3		-	-
	Root borer	0-2		-	-
	Gurdaspur Borer	0-2		-	-
	Termite	0-5		-	-
	Grass hopper	0-3		-	-
	Thrips	0-7		-	-
	Mealy bug	0-2		-	-
	White grub	0-2		-	-
Faridpur and Nababganj sugar mill area (Bariely District)	ESB	0-3	Co 0238 Co 0118	-	-
	Top borer	0-3		-	-
	Termite	0-5		-	-
	Grass hopper	0-3		-	-
	White grub	0-1		-	-
Rupapur, Haryawan, Loni, Ajbapur, Hata, Biswan sugar mills area	Early shoot borer	5-10	-	-	-
	Top borer, stalk borer, internode borer, Pyrilla	Traces	-	-	-
Nanpara and Chilberia Sugar Mills area, Bahraich	Black beetle (*Heteronychus*sp.)	5-10	-	-	-
	Root borer	27.0	-	-	-
	Top borer	16.67	-	-	-
Seorahi, Ramkola, Dhadha, Pratappur, Khadda, Siswabajar, Sathiyav, Goshi, Captangaj, Pipraech, Munderwa, Babhanan, Manakapur, Balrampur, Tulshipur, Utrola, Rudhawali, Kunuderkhi, Akberpur, Mausudha and Rauzagaw sugar mills area	Top Borer 2nd brood	1-6	Co 0238 Co 0118 Co 98014 CoS 08272 CoLk 94184 CoP 9301 CoS 08279	-	-
	Trips/Leaf	5-13		-	-
	Mealy bugs/plant	1-8		-	-
	Top Borer at harvest	1-12		-	-
	Stalk Borer at harvest	2-16		-	-
	White fly (nymph&puperia) 2.5 sq. cm	2-7			

Project No. E. 30: Monitoring of insect-pests and bio-agents

North West Zone

Karnal

A non-replicated experiment with sugarcane variety, Co 15023 was carried out and monitored the incidence of major insect pests and their bio agents of sugarcane at regular interval. The cumulative incidence of early shoot borer and top borer varied from 2.3 to 4.3 and 5.7 to 7.9 per cent respectively. Pink borer incidence was 7.3 per cent. Incidence of root borer and stalk borer was 28.3 and 24.6 per cent respectively. Termite and pyrilla incidence was in traces. The mean black bug population was 2.0 bug/leaf. Parasitization of top borer larvae by *Isotima javensis* and *Stenobracon deesae* was 3.2 and 2. 9 per cent respectively. *Cotesia flavipes*, a larval cum pre pupal parasitoid of stalk borer, was found to parasitize up to 3.1 % stalk borer larvae (Table 58).

Table 58. Monitoring of insect-pests and their bio-agents in sugarcane at Karnal

Sl	Insect-pests	Incidence / Population	Bio- agents	Parasitization (%)
1	Pink borer	7.3%	-	-
2	Early shoot borer	2.3 to 4.3 %	-	-
3	Top borer	5.7 to 7.9 %	*Isotima javensis*	3.2 (Larvae)
			Stenobracon deesae	2.9 (Larvae)
4	Root borer	28.3%	-	-
5	Termite	traces	-	-
6	Black bug	2.0.0/leaf	-	-
7	Stalk borer	Incidence - 24.6 % intensity - 7.6 % Infestation index - 1.9	*Cotesia flavipes*	3.1 (Larvae)
8	Pyrilla	Nil	Nil	Nil

Lucknow

Experiment on monitoring of insect pests of sugarcane was carried out with Co 0238. Planting was done in autumn season of 2019. Recommended agronomic practices were followed to raise a good crop. Average germination was recorded >33.00 percent. Periodic observations on incidence of insect pests and parasitoids of pests were recorded. Incidence of termite in standing crop was 4.55 per cent. Incidence of top borer II, III, IV and V brood was 10.15, 17.88, 26.31 and 16.00 percent, respectively. Incidence of root borer was 13.21 per cent. Incidence of internode borer was 23.68 per cent, while the incidence of stalk borer was 24.81 percent. The incidence of *Pyrilla perpusilla* was in traces and its adult and nymph parasitoid, *Fulgoraesia* (*Epiricania) melanoleuca* was also noticed in traces. Incidence of mealy bug was 42.46 percent. Black bugs were present in every clump. Parasites like *Telenomus beneficiens* (14.33 to 30.00 % on egg mass basis). Total parasitisation of top borer was 33.33 % due to *Stenobracon* sp. (3.51 to 5.88 %), *Rhaconotus* sp. (7.02 to 11.76%) and *Isotima javensis* (10.53 to 17.65 %) and predatory fauna comprising of Coccinellids, spiders and ants were noticed active in the field at different stages of the crop (Table 59 a,b,c & d)

Table 59 a . Monitoring of insect-pests and their bio-agents in sugarcane at Lucknow

a. Top borer

Period of Observation	**Incidence of top borer (%)**	**% parasitisation (Top borer)**								
		T. japonicum	*T. chilonis*	*T. beneficiens*	*I. javensis*	*Cotesia flavipes*	*Rhaconotus scirpophagae*	*Elasmuszehntneri*	*S. deesae*	***B. bassiana***
1	2	3	4	5	6	7	8	9	10	11
II brood 04-03-2020 (7th week)	10.15	-	-	-	10.53	-	7.02	-	3.51	-
III brood 10-05-2020(19th week)	17.88	-	-	25.0 on egg mass basis	15.00	-	10.00	-	0.0	-
IV brood 10-06-2020 (23rd week)	26.31	-	-	30.00 on egg mass basis	17.65	-	11.76	-	5.88	-
V brood 17-09-2020.(38th week)	16.00	-	-	14.33 on egg mass basis	-	-	0.00	-	5.00	-

Table 59 b . Monitoring of insect-pests and their bio-agents in sugarcane at Lucknow

b. Internode and Root borer

Period of Observation	**Incidence of internode borer**	**% parasitisation**				**Period of Observation**	**Incidence of Root borer**	**% parasitisation**		
		T. chilonis	***T. japonicum***	***Cotesia flavipes***	***B. bassiana***			***T. chilonis***	***Cotesia flavipes***	***B. bassiana***
1	2	3	4	5	6	1	2	3	4	5
19-09-2020(35th week)	23.68	-	-	Traces	-	7-7-2020	13.21	-	-	-

Table 59 c . Monitoring of insect-pests and their bio-agents in sugarcane at Lucknow

c. Stalk borer and Mealy bug

Period of Observation	**Incidence of stalk borer**	**% parasitisation**				**Period of Observation**	**Incidence of Mealy bug**	**% parasitisation**		
		T. chilonis	***T. japonicum***	***Cotesia flavipes***	***B. bassiana***			***T. chilonis***	***Cotesia flavipes***	***B. bassiana***
1	2	3	4	5	6	1	2	3	4	5
20-08-2020(33rd week)	24.81	-	-	-	-	11-10-2020	47.46	-	-	-

Table 59 d . Monitoring of insect-pests and their bio-agents in sugarcane at Lucknow

d. ***Pyrilla perpusilla***

Period of Observation	Incidence of *P. perpusilla*			% Parsitisation				
	No. of adults/leaf	No. of nymphs/leaf	No. of egg mass/leaf	*Epiricania melanoleuca*			*Tetrastichus pyrillae*	*Lestrodryinus pyrillae*
				Cocoon	Egg mass	Adults	% parasitisation On egg mass basis	% parasitisation On egg mass basis
1	2	3	4	5	6	7	-	-
20-07-2020. (29th Week	-	-	-	-	-	-	-	-
22-08-2020. (34th Week)	traces	traces	traces	traces	traces	-	-	-
10-10-2020. (41Week)	traces	traces	-	traces	-	-	-	-

Shahjahanpur

Experiment was conducted with planting of variety UP 05125 in 0.2 ha area at Shahjahanpur (UP) to monitor the key insect pest and their bio-agent. The incidence of early shoot borer was recorded maximum by 3.19%, 2.37% and 2.4% during 24th, 29th and 16th standard meteorological week (SMW), respectively. The incidence of top borer was recorded maximum 4.30% during 35th SMW followed by 2.20%, 1.80% and 1.50% during 31st, 26th and 22nd SMW, respectively. The per cent incidence of stalk borer (on cane basis) was recorded maximum 21.33% during 47rd SMW followed by 20.00% during 38th SMW, respectively. The bio-agent viz; *elenomus sp.(Within parasitized egg mass)*, *Isotima javensis*, *Rhaconotus scirpophagae* and *Stenobracon deesae* were recorded as major parasitoids of top borer. *Cotesia flavipes*, a larval parasitoid of stalk borer was also recorded from fields. The peak activity of egg-prasitoid *T. beneficiens* was observed to be 8.00% during 31st SMW and declined up to 1.30% during 35th SMW. A parasitisation of larvae by *I. javensis* was observed from 26th SMW (1.20%) and increase up to 3.30% during 31st SMW thereafter decreases up to 2.10% during 35th SMW. The parasitisation of top borer by *R. scirpophagae* was recorded minimum (1.20%) during 31th SMW which increase up to 2.80% during 35th SMW, thereafter decrease up to 1.40% during 38th SMW. The parasitisation of *S. deesae* ranged from 2.01% during 31st SMW to 2.30% during 38th SMW. The parasitisation of stalk borer larvae by *C. flavipes* was recorded maximum 6.2% during 34th SMW (Table 60 a&b).

Table 60 a. Monitoring of insect-pests and their bio-agents in sugarcane at Shahjahanpur

Period of observation Dates + SMW	% incidence ESB	% Parasitisation (ESB)		Stalk borer			% Parasitisation (Stalk borer)
		T.chilonis	*E.annulipes*	% incidence	% intensity	Infestation index	*Cotesia flavipes*
1	2	3	4	5	6	7	8
16-04-19, 16th SMW	2.40	-	-	-	-	-	-
18-05-19, 20th SMW	1.68	-	-	-	-	-	-
17-06-19, 24th SMW	3.19	-	-	-	-	-	-
20-07-19, 29th SMW	2.37	-	-	-	-	-	-
20-08-19, 34th SMW	-	-	-	17.33	2.04	0.37	6.2
22-09-19, 38th SMW	-	-	-	20.00	1.80	0.36	5.2
25-10-19, 43th SMW	-	-	-	16.00	1.70	0.24	3.9
19-11-19, 47th SMW	-	-	-	21.33	1.86	0.39	4.2

Table 60 b. Monitoring of insect-pests and their bio-agents in sugarcane at Shahjahanpur

Period of observation Dates + SMW	% incidence top shoot borer	% Parasitisation (Top shoot borer)						
		T. beneficiens	*I. javensis*	*A. flavipes*	*Rhaconotus Scripophagae*	*Elasmus zehntneri*	*S. deesae*	*B. bassiana*
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
16-04-19, 16th SMW	-	-	-	-	-	-	-	-
30-05-19, 22nd SMW	1.50	1.15	-	-	-	-	-	-
28-06-19, 26th SMW	1.80	2.50	1.20	-	1.30	-	-	-
30-07-19, 31st SMW	2.20	8.00	3.30	-	1.20	-	2.01	-
28-08-19, 35th SMW	4.30	1.30	2.10	-	2.80	-	2.20	-
20-09-19, 38th SMW	-	-	-	-	1.40	-	2.30	-
25-10-19, 43rd SMW	-	-	-	-	-	-	-	-

North Central Zone

Pusa

Experiment was conducted with planting of sugarcane variety CoP 2061 in 0.2 hectare area at Pusa Farm. The population of root borer, shoot borer, top borer, stalk borer, plassey borer, pyrilla and their natural enemies were recorded at monthly interval during cropping season of 2020-21. The data on monitoring of insect pests and their bio-agents

revealed that the mean per cent incidence of root borer, shoot borer, top borer, stalk borer and plassey borer varied from 1.6 to 9.8%, 2.9 to 11.7%, 1.70 to 15.7% , 1.6 to 8.3 % and 3.7 to 16.4%, respectively. Whereas, the incidence of sugarcane Pyrilla was recorded from 1.5 to 12.0 per leaf. The bio-agents of root and early shoot borer were not observed during cropping season of 200-21. While, parasitization of bio-agents such as *Cotesia flavipes*, against top borer, stalk borer and plassey borer were recorded and % parasitization varied from 2.3 to 9.5%, 1.7 to 10.7 and 2.5 to 16.1 respectively. Whereas peak of parasitization was observed in the month of August and stalk/ plassey borer in the month of October. The parasitization by *T. pyrillae* and *E. melanoleuca* were recorded from August to December and July to December, respectively. Their peaks were noticed in the month of October (11.2 %) and (12.3%), respectively (Table 61 a&b).

Table 61 a. Monitoring of insect-pests and their bio-agents in sugarcane at Pusa

Period of observation	% incidence top borer	% incidence of Shoot borer	% incidence of root borer	% incidence of stalk borer	% incidence of plassey borer	*Pyrilla*/leaf
March, 20	2.8	3.5	2.3	0.0	0.0	0.0
April, 20	5.6	7.9	5.7	0.0	0.0	0.0
May, 20	8.9	11.7	9.8	0.0	0.0	1.4
June, 20	15.7	6.4	4.9	0.0	4.6	3.7
July, 20	12.4	2.9	1.6	3.9	7.2	5.1
August, 20	7.6	0.0	0.0	5.6	10.8	7.6
September, 20	5.3	0.0	0.0	8.3	16.4	8.5
October, 20	3.8	0.0	0.0	6.5	10.1	6.6
November, 20	1.7	0.0	0.0	3.5	5.9	3.5
December, 20	0.0	0.0	0.0	1.6	3.7	1.3
January,21	0.0	0.0	0.0	0.0	0.0	0.0
Febrauary,21	0.0	0.0	0.0	0.0	0.0	0.0

Table 61 b. Monitoring of insect-pests and their bio-agents in sugarcane at Pusa

Period of observation	% parasitization of *C. flavipes*			% parasitization (*Pyrilla*)		% Parasitization (root and shoot borer) if any
	Top borer	Stalk borer	Plassey borer	*T. pyrillae*	*E. melanoleuca*	
March, 20	0.0	0.0	0.0	0.0	0.0	-
April, 20	0.0	0.0	0.0	0.0	0.0	-
May, 20	2.3	0.0	0.0	0.0	0.0	-
June, 20	4.1	1.7	2.5	0.0	2.3	Not observed
July, 20	6.8	2.6	7.6	0.0	4.6	-
August, 20	9.5	5.9	11.8	5.3	7.5	-
September, 20	7.5	8.6	12.3	7.4	10.8	-
October, 20	6.5	10.7	16.1	11.2	12.3	-
November, 20	3.1	7.4	8.7	9.5	9.5	-
December, 20	0.0	3.5	4.6	6.8	5.7	-
January,21	0.0	0	0.0	0.0	0.0	-
Febrauary,21	0.0	0	0.0	0.0	0.0	-

Seorahi

The Experiment was conducted in 0.2 ha area with CoS 08272 variety at Seorahi for monitoring the key insect-pests and their natural enemies. The incidence of Shoot borer was recorded maximum (7.89%) during 24th SMW followed by 4.98%, 3.66% and 2.13% during 20th, 16th and 29th SMW respectively. The incidence of top borer was recorded maximum (6.67%) during 35st SMW followed by 4.06%, 3.57%, 2.02% and 1.50% during 31th, 26th, 22nd and 38th SMW, respectively. The percent incidence of stalk borer (on cane basis) was observed to be maximum 10.05% during 43rd SMW followed by 7.20% during 38th SMW, respectively. The bio-agents viz. *Isotima javensis*, *Stenobracon sp.*, *Elasmus zehnteri* and *Rhaconotus scirpophagae* were recorded as major parasitoids of Top borer and *Cotesia flavipes* , a larval parasitoid of stalk borer was also recorded from the field. Parasitisation of top borer larvae by *I. javensis* was recorded minimum 2.00% during 22th SMW and increased up to 20.20% during 35th SMW there after decreased up to 3.63% during 38th SMW. The parasitisation top borer larvae by *Stenobracon sp* was observed with minimum 5.00% during 22nd SMW and increased up to 17.64 % during 35th SMW there after decreased up to 6.25% during 38th SMW. The parasitisation of top borer larvae by *E. zehnteri* was observed with 4.00% during 26th SMW and increases up to 11.42% during 35th SMW there after decreases up to 4.16% during 38th SMW. On top borer larvae, *R.scirpophagae* was observed minimum 5.00% during 26th SMW and increased up to 9.37% during 35th SMW there after decreased up to 6.00% during 38th SMW. *C. flavipes* was recorded to parasitize up to 11.11% stalk borer larvae during 43th SMW followed by 9.37% during 38th SMW (Table 62).

Table 62 . Monitoring of insect-pests and their bio-agents in sugarcane at Seorahi

(1) Early shoot borer							
Period of observation Dates + SMW	**% incidence**	**% Parasitisation(ESB), if any**					
		T. chilonis		***E. annulipes***		***S. inferens***	
16-04-2020 (16th SMW)	3.66	-		-		-	
18-05-2020 (20th SMW)	4.98	-		-		-	
17-06-2020 (24th SMW)	7.89	-		-		-	
20-07-2020 (29th SMW)	2.13	-		-		-	
(2)Top borer							
Period of observation Dates + SMW	**% incidence**	**% Parasitisation (Top shoot borer)**					
		Stenobracon sp.	***I. javensis***	***Elasmuszehntneri***	***Rhaconotusscripophagae***	***T. Japonicum***	***T. chilonis***
31-05-2020 (22nd SMW)	2.02	6.25	2.00	-	-	-	-
30-06-2020 (26th SMW)	3.57	10.52	3.12	4.00	5.00	-	-
29-07-2020 (31th SMW)	4.06	13.63	16.66	10.71	8.00	-	-
29-08-2020 (35th SMW)	6.67	17.64	20.00	11.42	9.37	-	-
22-09-2020 (38th SMW)	1.50	5.00	3.63	4.16	6.00	-	-
25-10-2020 (43rd SMW)	-	-	-	-	-	-	-
(3)Stalk borer							
Period of observation Dates + SMW	**% incidence**	**% Parasitisation (Stalk borer)**					
		Cotesia flavipes	***Apanteles flavipes***	***Apanteles pyralophagus***	***S. inference***	***Nosema sp.***	***B. bassiana***
18-04-2020 (16th SMW)	-	-	-	-	-	-	-
20-05-2020 (20th SMW)	-	-	-	-	-	-	-
16-06-2020 (24th SMW)	-	-	-	-	-	-	-
22-07-2020 (29th SMW)	-	-	-	-	-	-	-
21-08-2020 (34th SMW)	-	-	-	-	-	-	-
23-09-2020 (38th SMW)	7.20	9.37	-	-	-	-	-
26-10-2020 (43rd SMW)	10.05	11.11	-	-	-	-	-

Peninsular Zone

Coimbatore

In monitoring plot, planted in March 2020, pest incidence was assessed at monthly intervals in five random spots. Shoot borer and internode borer were the borer pests but both occurred at low intensity. Shoot borer dead hearts ranged 1.23-6.9% during March-July. Internode borer incidence ranged 0.9-4.9% during September-January, but it was slightly higher (18.8%) at harvest. Whitefly, mealybug and yellow mite were observed at low levels. Parasitoid activity was also observed. Parasitization by *Sturmiopsis inferens* on shoot borer was 12.3 and 10.7% in June and July, respectively (Table 63).

Table 63 . Monitoring of insect-pests and their bio-agents in sugarcane at Coimbatore

Sl. No	Insect pest	Prevalence period	Max. incidence /population	Natural enemy	Prevalencee period	Max. parasitization/ population
1	Shoot borer	March 2020	1.23%	-	-	-
		April	6.85%	-	-	-
		May	4.69%	-	-	-
		June	4.11%	*Sturmiopsis inferens*	-	12.31
		July	2.35%	"		10.71
2	Internode borer	August	0.00	*Cotesia flavipes*		1.51
		September	0.90			
		October	4.90			
		November	0.00			
		December	0.00			
3				*Telenomus* sp.	Through-out the year	100.0% within parasitized egg masses
4	Pyrilla	June	Traces	-	-	-
5	Sheath mite	June	Traces	-	-	-
6	Sheath mite	July	Traces	-	-	-
7	Mealy bug	June	Traces	-	-	-
8	Mealy bug	July	Traces			
9	Woolly aphid	December	Mean rating 2.84	*Encarsia* (6.4%)	-	-

Mandya

Cumulative incidence of ESB in CoVC 18061 sugarcane variety was 4.25 % in 120 days after planting. Incidence of top borer was 14.25% at 210 days afterplanting. Incidence of internode borer was 26.25%. Aphid, whitefly and pyrilla appeared in very small numbers but failed to establish and spread. Woolly aphid incidence was observed at 150 and 180 days after sowing and it was restricted to few clumps. *Dipha* (2larva/pupa/clump), *Micromus* (2 larva/leaf), kept the woolly aphid under control (Table 64).

Table 64 . Monitoring of insect-pests and their bio-agents in sugarcane at Mandya

Time of observation	Percent Incidence			Woolly aphid	Natural enemies
	ESB	TSB	INB	Leaf area covered	
30DAP	0.00	---	---	---	
60DAP	1.25	---	---	---	---
90DAP	3.00	---	---	---	---
120DAP	0.00	---	---	---	---
150DAP	---	2..50	--	15%	*Dipha 2 larva/ 1 pupa /leaf*
180DAP	---	---	---	10 %	*Micromus larva 2 /leaf*
210DAP	---	14.25	---	---	---
At harvest	---	---	26.25	---	---

Padegaon

The data of ESB, Pyrilla, mealy bug, woolly aphid and white flies and their natural enemies was recorded. During the year 2020-21, the incidence of early shoot borer was found in the range of 2.15 to 16.80 per cent. Initial incidence was recorded during 11th SMW week (2.15%). Thereafter the incidence showed increasing trend and recorded peak incidence on 17th SMW with 16.80 per cent. Thereafter, the incidence showed decreasing trend. The parasitism due to *T. chilonis* was observed from 14th SMW to 23rd MW in the range of 0.10 to 3.20 per cent. The infestation of pyrilla was noticed from 32th MW to 41th SMW in the range of 1.00 to 4.20 per leaf. The infestation was very low on sugarcane. However, *E. melanoleuca* was seen during the 34th to 41 SMW with 2.00 to 25.20 per cent parasitism and 1.00 to 2.60 egg mass & cocoon. Mealy bug population was noticed from 36th SMW to end of observations i.e. 52nd SMW in the range of 2.00 to 50.00 per 10 plants. Trend of population was found increasing up to end of observations. The predatory coccinellids seen during 40th SMW (0.60) and steadily increased up to 52nd SMW (4.00). The initial population of woolly aphid was observed during 32 SMW (0.50 / 150 leaves). Thereafter population was steadily increased and showed its peak population (30.68 /150 leaves) during 45th SMW. Then after the population showed decreasing trend up to end of the observation (52nd SMW). Predatory *D. aphidivora* observed during 39th SMW with 1.00 larvae. The peak population noticed on 46 SMW (30.00 larvae) then after population showed decreasing up to last observation. Similar trend was also noticed in respect of *Micromus*. The population of *Micromus* observed in the range of 1.00 to 30.00 grubs/150 leaves from 38th SMW to 52nd SMW. The peak population noticed during 47th SMW (30.00 grubs /150 leaves). After that the decreasing trend of population was found. White fly population was noticed from 27th SMW to 42th SMW in the range of 1.56 to 29.66 per leaf. Thereafter population steadily increased and showed its peak population (29.66%) in 34th SMW. Then after population showed in decreasing trend. The population of *Encarsia spp.* was seen in the range of 0.80 to 5.10 per cent parasitism from 28th to 41th SMW (Table 65 a&b).

Table 65 a . Monitoring of insect-pests and their bio-agents in sugarcane at Padegaon.

Date & (SMW)	Early Shoot Borer		Pyrilla/leaf			Mealy bug/ 10 plant		Woolly aphids/ 150 leaf			White flies	
	% incidence	% Parasitism	Av. No.	*E. melanoleuca*		% incidence	Coccinellids	Av. No.	*D. aphidivora*	*Microm us*	% incidence	% Parasitism
				% Parasitism	*Egg mass & Cocoon*							
06.3.20 (10)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14.3.20 (11)	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23.3.20 (12)	2.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31.3.20 (13)	4.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.4.20 (14)	6.60	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.4.20 (15)	7.25	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22.4.20 (16)	10.52	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29.4.20 (17)	16.80	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.5.20 (18)	10.30	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.5.20 (20)	8.16	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.5.20 (20)	12.40	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26.5.20 (21)	6.50	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02.6.20 (22)	5.65	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
09.6.20 (23)	2.56	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.6.20 (24)	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23.6.20 (25)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.7.20 (26)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.7.20 (27)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.56	0.00
15.7.20 (28)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	0.80
22.7.20 (29)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.76	1.90
29.7.20 (30)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.56	2.40
5.8.20 (31)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.97	3.80
12.8.20 (32)	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	22.78	4.00

Table 65 b . Monitoring of insect-pests and their bio-agents in sugarcane at Padegaon.

Date & (SMW)	Early Shoot Borer		Pyrilla/leaf			Mealy bug/ 10 plant		Woolly aphids/ 150 leaf			White flies/leaf	
	% incidence	% Parasitism	Av. No.	*E. melanoleuca*		% incidence	% Parasitism	Av. No.	*D. aphidivora*	*Microm us*	% incidence	% Parasitism
				% Parasitism	*Egg mass & Cocoon*							
20.8.20 (33)	0.00	0.00	2.00	0.00	0	0.00	0.00	1.06	0.00	0.00	25.67	4.20
26.8.20 (34)	0.00	0.00	2.20	2.00	0	0.00	0.00	1.20	0.00	0.00	29.66	5.10
02.9.20 (35)	0.00	0.00	3.00	4.00	0	0.00	0.00	1.67	0.00	0.00	22.56	4.80
09.9.20 (36)	0.00	0.00	3.40	12.00	1.00	2.00	0.00	1.80	0.00	0.00	20.12	3.50
16.9.20 (37)	0.00	0.00	4.00	20.00	1.30	8.00	0.00	2.80	0.00	0.00	12.86	2.45
23.9.20 (38)	0.00	0.00	4.20	25.20	2.60	10.00	0.00	5.45	0.00	1.00	10.45	2.20
30.9.20 (39)	0.00	0.00	2.00	10.40	2.00	17.18	0.00	8.50	1.00	5.00	6.87	1.80
07.10.20 (40)	0.00	0.00	1.00	5.30	1.60	18.00	0.60	10.80	2.00	7.00	5.25	0.90
14.10.20 (41)	0.00	0.00	1.00	3.20	1.20	20.00	0.80	15.65	2.00	10.00	4.22	0.20
21.10.20 (42)	0.00	0.00	0.00	0.00	1.00	21.60	1.20	18.50	3.00	12.00	1.87	0.00
28.10.20 (43)	0.00	0.00	0.00	0.00	0.00	22.40	1.40	20.80	10.00	15.00	0.00	0.00
04.11.20 (44)	0.00	0.00	0.00	0.00	0.00	25.20	2.00	25.59	15.00	20.00	0.00	0.00
11.11.20 (45)	0.00	0.00	0.00	0.00	0.00	28.00	2.30	30.68	25.00	25.00	0.00	0.00
18.11.20 (46)	0.00	0.00	0.00	0.00	0.00	30.00	3.00	24.52	30.00	28.00	0.00	0.00
25.11.20 (47)	0.00	0.00	0.00	0.00	0.00	35.40	3.00	16.45	25.00	30.00	0.00	0.00
02.12.20 (48)	0.00	0.00	0.00	0.00	0.00	40.00	3.60	16.80	20.00	18.00	0.00	0.00
09.12.20 (49)	0.00	0.00	0.00	0.00	0.00	45.60	4.00	12.51	15.00	13.00	0.00	0.00
16.12.20 (50)	0.00	0.00	0.00	0.00	0.00	46.30	3.00	10.43	10.00	10.00	0.00	0.00
23.12.20 (51)	0.00	0.00	0.00	0.00	0.00	48.80	3.20	8.45	8.00	5.00	0.00	0.00
31.12.20 (52)	0.00	0.00	0.00	0.00	0.00	50.00	4.00	5.00	2.0	2.00	0.00	0.00

Pune

The per cent incidence of early shoot borer was maximum 0.64% in 11th SMW (12.03.2020), while plot was free from it in 3rd, 5th and 7th SMW. The per cent incidence of internode borer was maximum 27%, in 31st SMW (30.07.2020), while it was free from it in 19th SMW and 21st SMW. The per cent intensity and infestation index of internode borer was maximum 5.21% and 1.15 respectively in 23rd SMW (10.06.2020).

Tharsa

The insect pests were recorded on sugarcane var. Co-86032 during 2020-21 were early shoot borer, scales and Pyrilla. The seasonal incidence data (Table:1) revealed that infestation of early shoot borer infestation was started in 15th SMW with its initial infestation of 4.25%, reached its peak (10.22 %) in 17th SMW and continued upto 32nd SMW. It had significant positive correlation with Maximum Temperature, Bright Sunshine, Wind Speed and Evaporation and significant negative correlation with Morning and Evening relative humidity, rainfall and rainy days. However, recorded non-significant correlation with Minimum Temperature.

The incidence of scales insect initiated during 36th SMW (8.00 % incidence and 2.00 % intensity) and it continued. Peak % incidence (36.00 %) and % intensity (10.8 %) was recorded in 41st SMW. It had highly significant positive correlation with wind speed. However, recorded non-significant correlation with other weather parameters.

The incidence of Pyrilla was initiated during 12th SMW (0.03 per leaf) and it was continued up to 41st SMW. The peak Pyrilla incidence per leaf was recorded in 25th SMW (4.25 per leaf). It had significant positive correlation with Minimum Temperatures, Evening relative humidity, Rainfall and Rainy days. However, recorded non-significant correlation with Maximum Temperatures, Morning relative humidity, bright sunshine, wind speed and evaporation

Lady bird beetle and spiders were the major generalist predators of the sugarcane insect pests. Their incidence was recorded in 11th and 10th SMW (LBB- 1.1 and Spiders-0.1 per plant), respectively. Lady bird beetle population reached its peak (4.6 per plant) in 19th SMW and spiders (8.2 per plant) in 24th SMW (Table-1.1). Their incidence continued upto 52nd SMW. Incidence of the natural enemies basically correlated with the population of the host insects as they are generalist predator. However, their population recorded non-significant correlation with all major weather parameters (Table 66 & 67).

Table 66 . Monitoring of insect-pests and their bio-agents in sugarcane at Tharsa.

Sl. No.	SMW	Early shoot borer (% infestation)	Scales		Pyrilla (Nymph & Adults) (No./ leaf)	Natural Enemies (No./Plant)	
			% incidence	% intensity		LBB	Spiders
1	9	--	--	--	--	--	--
2	10	--	--	--	--	--	0.1
3	11	--	--	--	--	1.1	0.5
4	12	--	--	--	0.03	1.4	1.2
5	13	--	--	--	0.09	2.2	2.7
6	14	--	--	--	0.12	2.8	3.3
7	15	4.25	--	--	0.28	3.6	3.6
8	16	8.65	--	--	0.45	3.9	4.2
9	17	**10.22**	--	--	1.03	3.1	4.5
10	18	9.35	--	--	2.45	3.7	4.9
11	19	8.55	--	--	2.85	**4.6**	5.2
12	20	7.24	--	--	3.06	3.8	6.9
13	21	6.22	--	--	3.16	3.6	7.2
14	22	7.06	--	--	3.60	2.7	6.8
15	23	5.10	--	--	3.10	2.2	5.8
16	24	4.60	--	--	3.95	2.4	**8.2**
17	25	4.25	--	--	4.25	3.1	4.5
18	26	4.10	--	--	3.80	2.4	5.3
19	27	3.70	--	--	4.60	2.2	5.6
20	28	3.34	--	--	3.90	2.1	5.4
21	29	3.22	--	--	3.65	2.4	4.4
22	30	2.80	--	--	2.80	3.1	4.2
23	31	1.45	--	--	3.00	2.4	3.9
24	32	0.95	--	--	3.10	2.2	5.4
25	33	--	--	--	3.20	4.4	5.6
26	34	--	--	--	2.95	3.1	5.0
27	35	--	--	--	2.05	2.4	4.5
28	36	--	8.00	2.00	1.95	2.2	4.3
29	37	--	12.00	1.20	1.35	3.4	6.2
30	38	--	16.00	2.91	0.80	4.1	7.4
31	39	--	24.00	7.20	0.60	3.3	6.1
32	40	--	24.00	6.00	0.35	2.9	6.9
33	41	--	**36.00**	**10.80**	0.20	3.4	7.5
34	42	--	24.00	4.00	--	3.7	8.1
35	43	--	16.00	6.40	--	2.9	7.9
36	44	--	28.00	6.00	--	3.4	6.4
37	45	--	24.00	4.80	--	3.6	7.6
38	46	--	20.00	4.00	--	4.1	6.4
39	47	--	24.00	4.00	--	3.3	7.5
40	48	--	24.00	3.69	--	2.9	6.7
41	49	--	16.00	3.43	--	3.4	6.4
42	50	--	20.00	4.29	--	3.7	6.3
43	51	--	16.00	5.33	--	2.9	4.4
44	52	--	20.00	4.00	--	1.9	3.5

SMW : Standard Meteorological Week; LBB: Lady Bird Beetle

Table 67: Correlation coefficient between weather parameters and population dynamics of major sugarcane insect pests and their natural enemies (Co-86032)

Weather parameters	Correlation coefficient ('r' value)				
	Incidence of sugarcane pests			Natural Enemies (No./plant)	
	Early Shoot Borer	Scale	Pyrilla	Lady bird beetle	Spiders
Temperature (^{0}C) Max	0.807**	-0.020^{NS}	-0.011^{NS}	0.235^{NS}	-0.002^{NS}
Temperature (^{0}C) Min	0.429^{NS}	0.011^{NS}	0.487**	0.137^{NS}	0.186^{NS}
Humidity (%) Morning	-0.770**	0.251^{NS}	0.290^{NS}	-0.219^{NS}	0.217^{NS}
Humidity (%) Evening	-0.814**	0.447^{NS}	0.366*	-0.089^{NS}	0.388**
Rainfall (mm)	-0.663**	0.303^{NS}	0.389*	-0.268^{NS}	-0.018^{NS}
Rainy Days (No.)	-0.622**	-0.174^{NS}	0.549**	-0.311*	-0.049^{NS}
Bright sunshine (hrs.)	0.574*	0.049^{NS}	-0.347^{NS}	0.180^{NS}	-0.161^{NS}
Wind Speed (Km/hr)	0.545*	0.567*	0.224^{NS}	0.110^{NS}	0.090^{NS}
Evaporation (mm)	0.768**	0.407^{NS}	-0.107^{NS}	0.151^{NS}	-0.063^{NS}
No. of observations	18	17	30	42	43

Significant P = (0.05%)* & (0.01%)**

East Coast Zone

Anakapalle

In experiment of monitoring of insect pests in sugarcane ecosystem, peak incidences of early shoot borer (14.0 DH%) , sugarcane mite (20.0%) and fall army worm (7.0%) were recorded during 2nd FN of May. Peak incidence of internode borer was observed during 1st FN of October (30.0%); sugarcane aphid (110aphids/ leaf) during 2nd FN of November; web mite (26.0%) during 1st FN of December and scale insect (20.0%) during 2nd FN of December. The per cent parasitisation of *T. chilonis* (2.60%) is high during 2nd FN of September. The predatory population (*Stethorus punctillum)* of spider mites and the per cent parasitisation of *Aphelinus* sp on sugarcane aphid *M.sacchari* were high during 1st fortnight of December. Association between weather parameters and incidence of major insect pests of sugarcane revealed that incidence of early shoot borer has showed significant positive correlation with maximum (r= 0.76) and minimum (r= 0.72) temperatures and negative correlation with morning relative humidity (R= -0.73). Incidence of internode borer showed significant positive correlation with rainfall (r=0.50); incidence of sugarcane mite showed significant positive correlation with maximum & minimum temperatures (r=0.91, 0.73) and negative correlation with rainfall (r= -0.52), relative humidity (r= -0.58) whereas web mite showed negative correlation with maximum and minimum temperatures (r= -0.70; -0.74). Sugarcane aphid showed negative correlation with maximum temperature (r= -0.35) and positive correlation with relative humidity (r= 0.39) (Table 68, 69, 70 & 71).

Table 68. Peak incidence of major pests and their bioagents in association with weather parameters at Anakapalle

Month	Insect Pest	Max Field Incidence or Damage	Rainfall (mm)	Min. & Max Temps during the FN of the month	RH Min. & RH Max during the FN of the month
2nd FN of May, 20	1.Early shoot borer (*Chilo infuscatellus)*	13.74 %	0	26.0 & 34.6	56.4 & 81.2
	2.Sugarcane mite (*Oligonychus indicus*)	20.0%			
	3. FAW, S.*frugiperda*	7.00			
1st FN of Oct, 20	4. Internode borer (*C. sacchariphagus indicus*)	30.0%	348.0	24.0 & 30.8	74.8 & 88.6
	Parasitisation of T.chilonis	2.60%	79.1	31.9 & 24.6	85.9 &64.9
2nd FN Nov, 20	5. Sugarcane aphid (*M.sacchari*)	110 aphids/leaf	98.5	20.5 & 30.5	57.2 & 82.9
1st FN of Dec,20	*6. Web mite (S. krungthepensis)*	26.0 %	0	16.0 & 29.6	52.5 & 85.7
2nd Fn of Dec, 20	*Stethorus punctillum*	8-10/leaf	0	15.7 & 28.5	49.3 & 86.6
	Parasitisation of *Aphilinus* sp on aphids (Mummified aphids)	12-14 /leaf	0	15.7 & 28.5	49.3 & 86.6
2nd FN of Dec, 20	8. Scale insect (*M. glomerata*)	20.0%	0	15.7 & 28.5	49.3 & 86.6

Table 69. Incidence of early shoot borer, termite, internode borer, leaf mealybug and egg parasitoid *T.chilonis* and sugarcane borer moths captured in Delta traps at Anakapalle

Period of observation	ESB(%DH)	ESB moths /pheromone trap	FAW (%)	Internode borer (%)	INB moths /pheromone trap	*Trichogramma chilonis (%)*	Earwigs/ clump	Coccinellids/ clump	Rainfall	Temperature (^{0} C)		Relative humidity (%)	
									(mm)	Max.	Min.	FN	AN
1st FN of May,20	1.00	6	3.00	-	-	0.20	2-3	4-5	60.3	33.59	24.31	81.50	59.25
2nd FN of May,20	**13.74**	**10**	**7.00**	-	-	1.20	3-5	3-6	0.0	34.6	26.0	81.2	56.4
1st FN of June,20	2.85	8	3.60	-	-	0.80	3-5	3-4	97.5	32.8	25.2	80.6	65.0
2nd FN of June,20	1.00	5	2.00	-	-	0.30	4-6	2-3	85.5	33.2	25.4	80.4	59.3
1st FN of July,20	1.00	2	3.00	-	-	0.40	2-3	-1-2	226.8	32.1	24.7	84.2	63.7
2nd FN of July, 20	0.14	0	-	-	-	0.40	3-5	1-2	13.9	32.3	24.9	85.9	60.9
1st FN of Aug,20	0.29	0	-	0	1	0.80	2-3	2-3	113.6	31.2	24.5	85.8	70.3
2nd FN of Aug, 20	0.04	0	-	5.0	3	1.20	2-3	2-4	15.9	31.7	24.9	85.6	61.9
1st FN of Sep, 20	-	0	-	5.0	2	2.00	1-2	1-2	73.1	33.0	24.6	85.5	64.8
2nd FN of Sep, 20	-	0	-	15.0	2	**2.60**	1-2	2-4	79.1	31.9	24.6	85.9	64.9
1st FN of Oct, 20	-		-	**30.0**	8	1.00	2-4	1-2	348.0	30.8	24.0	88.6	74.8
2nd FN of Oct, 20	-		-	20.0	**10**	1.60	2-4	2-3	98.2	31.3	22.9	85.9	55.8
1st FN of Nov, 20	-		-	10.0	8	1.00	4-5	1-2	34.4	30.5	20.5	81.1	53.6
2nd FN of Nov, 20	-		-	5.0	6		3-5	-	98.5	28.9	18.9	82.9	57.2
1st FN of Dec, 20	-		-	1.0	*2*		4-5	-	0.0	29.6	16.0	85.7	52.5
2nd FN of Dec, 20	-		-	1.0	0	2.00	2-3	-	0.0	28.5	15.7	86.6	49.3

Table 70. Incidence of sucking pests and their bioagents in sugarcane in association with weather parameter at Anakapalle

Period of observation	Sugarcane mite, *O. indicus (%)*	Web mite, *S. krugthepensis (%)*	Predator, *Stethorus* sp	Sugarcane aphid / leaf (*M. sacchari)*	Parasitised aphids by *Aphilinus* sp.	Rusty plum aphid/leaf (*H. setariae)*	Scale insect (%)	Rainfall	Temperature (^{0} C)	Relative humidity (%)	Rainfall
								(mm)	Max.	Min.	(mm)
1st FN of May, 20	7.00		2-3	-	-	-		60.3	33.6	24.3	60.3
2nd FN of May, 20	**20.00**		4-6	-	-	-		0.0	34.6	26.0	0.0
1st FN of June, 20	4.00		2-4	-	-	-		97.5	32.8	25.2	97.5
2nd FN of June, 20	2.00		1-2	7.0	-	-		85.5	33.2	25.4	85.5
1st FN of July,20	0.00	10.0	2-3	21.0	3-5	-		226.8	32.1	24.7	226.8
2nd FN of July, 20	-	13.0	2.4	48.0	3-5	15.0		13.9	32.3	24.9	13.9
1st FN of Aug,20	-	18.0	5-7	98.0	10-11	**26.0**		113.6	31.2	24.5	113.6
2nd FN of Aug, 20	-	16.0	4-5	36.0	2-5	8.0		15.9	31.7	24.9	15.9
1st FN of Sep, 20	-	8.0	-2-4	84.0	6-8	13.0		73.1	33.0	24.6	73.1
2nd FN of Sep, 20	-	11.0	4-6	66.0	6-10	8.0		79.1	31.9	24.6	79.1
1st FN of Oct, 20	-	19.0	5-8	68.5	8-12	8.0		348.0	30.8	24.0	348.0
2nd FN of Oct, 20	-	21.0	5-9	82.0	8-10	14.0		98.2	31.3	22.9	98.2
1st FN of Nov, 20	-	26.0	3-4	110.0	5-10	-		34.4	30.5	20.5	34.4
2nd FN of Nov, 20	-	20.0	3-6	66.0	10-12	-	10.0	98.5	28.9	18.9	98.5
1st FN of Dec, 20	-	**36.0**	**8-10**	48.0	**12-14**	-	15.0	0.0	29.6	16.0	0.0
2nd FN of Dec, 20	-	20.0	3-6	2.0	6-8	5.0	**20.0**	0.0	28.5	15.7	0.0

Table 71. Correlation (r) between weather parameters and incidence of major insect pests in sugarcane agro ecosystem at Anakapalle

Insect pest	Rainfall (mm)	Temp ^{0}C (Max.)	Temp ^{0}C (Min)	RH % (FN)	RH% (AN)
ESB	-0.12	0.76*	0.72*	-0.73*	-0.37
Internode borer	0.50*	0.31	0.38	0.22	0.18
Sugarcane mite	-0.52*	0.91*	0.73*	-0.58*	-0.58*
Web mite	-0.26	-0.70*	-0.74*	-0.16	-0.52
Sugarcane aphid	0.18	-0.35*	-0.11	0.39*	0.23

*Significant at 5% level

E.34: Standardization of simple and cost effective techniques for mass multiplication of sugarcane bio-agents

North West Zone

Lucknow

Eumicrosoma spp. (Hymenoptera : Scelionidae) is a potential egg parasitoid of black bugs of sugarcane, *Cavelerious sweeti* Myamoto and *Dimorphopterus gibbus* and other chinch bugs of loan grass. *Eumicrosoma* spp. is mass multiplied in the laboratory on laboratory reared eggs of black bugs of sugarcane. Black bugs are mass multiplied on natural host plant in the laboratory. The culture of parasitoid was maintained throughout the year from April, 2020 onwards.

Rearing of black bug, Dimorphopterus gibbus (Fabricius) and Cavelerius sweeti Myamoto

There are two major steps in rearing of black bug in the laboratory.

Muslin bag for oviposition: A muslin bag measuring 20.0 x 8.0 cm was developed. Three to four cut tops of sugarcane with 5 cm leaf portion were kept in a muslin bag and field collected male & female (1:1) were released into the bag. In one bag 50 pairs of insect can be accommodated. After release of insects, open end of bag is closed with rubber bands and kept in tray for egg laying. Eggs are glued to the bottom of tray which are collected daily and stored in homoeopathic vials at ambient room temperature for further development. Fresh eggs are rice shaped and creamy white in colour. At maturity eggs become dark orange in colour.

Paper cone for nymph development: Paper cone was developed from a sterilized paper of 25 cm^2 size and cut cane (8-10) with leaf sheath. One such cut piece of sugarcane stalk was placed at the

lower left corner of the paper and rolled in a manner that it takes the shape of cone without touching the upper end of cut stalk. Narrow end of the paper cone was tightened with the help of rubber bands. Mature egg (orange in colour) or freshly hatched nymphs were released to the paper cone and its upper broader end was closed by folding twice and inserting the rear corner of the second fold into the first one. Dried out setts and leaf tops are being changed at the interval of 4-5 days in summer and 5-6 days interval in winter and rainy seasons. During change of insects from old cone to new ones, due precaution of mechanical damage is of paramount importance. Incubation, nymphal and total period of lifecycle of *D. gibbus* varied from 6.0 to 11, 23 to 47, 31 to 57 days, respectively.

Mass multiplication of Eumicrosoma sp (Hymenoptera: Sceilionidae) an egg parasitoid of Lygaeid bugs of sugarcane

Eumicrosoma sp. is a potential egg parasitoid of black bug of sugarcane. Rearing technique of *Eumicrosoma* sp. was developed at IISR, Lucknow. *Eumicrosoma* sp. is a black shiny Sceilionid wasp. Eggs of black bug *D. gibbus* were used as laboratory host. Fresh eggs (fresh or 24 hour old) are offered to the gravid female in homoeopathic vials for parasitization. Parasitized eggs turn blackish from one end and in few days turned completely black to shiny black just before hatching. No super parasitism was observed. Parasitization ranged from 30.00 to 90.00 percent. Single gravid female could parasitize on an average of 16 eggs with a range of 6-22 eggs. Development period of parasitoid varied from 7-11 days. Parasitization and longevity of adults varied from 79.00 to 92.00 per cent and 1-3 days, respectively.

Peninsular Zone

Coimbatore

For economizing mass production of entomopathogenic fungi (EPF), cotton seed cake was found best for *Metarhizium anisopliae*, sesame seed cake extract for *Beauveria bassiana* and wheat bran and rice bran extracts for *B. brongniartii* based on spore production. Multiplication of the *M. anisopliae* strain (SBIMA-16) was done through liquid fermentation. An improved medium with increased concentrations (10 and 15%; named SBI I & II respectively) of jaggery and amended with supplements was assessed for culturing the EPF and compared with jaggery media without supplements. Efficacy data showed that highest mortality was seen with SBI-I (94.44%) comparable with jaggery 15% and SBI-II (91.67%) but higher than that obtained with YPSS (83.33%). Corresponding colony growth and spore viability of several EPF on solid media revealed superiority of SBI-I medium. In pot culture experiments with various combinations of *B. brongniartii, B. bassiana, M.anisopliae, Heterorhabditis indica, Steinermea glaseri* and six selected insecticides at field recommended dose, EPFs showed high mortality rates of white grub.

Pune

During 2020-21-20, produced 1787.9 cc *Corcyra* eggs, 1201 *Trichogramma chilonis* cards and 248 *T. pretiosum* cards. Supplied 914 Tc and 61 Tp cards for the control of borers in 65 ha area and 91 cc *Corcyra* eggs were supplied to Govt. Bio-control lab in Maharashtra state as nucleus culture.

East Coast Zone

Anakapalle

Standardization of simple, cost effective techniques for mass multiplication of bioagent (*Cladosporium cladosporioides)*, effective against sugarcane woolly aphid, *Ceratovacuna lanigera* was attempted. Crushed grains of sorghum, bajra, maize, rice, ragi and wheat with one per cent yeast extract be assayed for the sustainability for mass production of the fungus, *Cladosporium cladosporioides*. Thirty grams each of these substrates are taken in separate 250 ml conical flasks containing 30 ml of distilled water. After thorough mixing they are plugged with cotton and autoclaved at 15 psi pressure at 121^0C for 30 minutes. Circular agar disks of 5 mm diameter are cut from the ten day old fungal culture grown in PDA plates. One disk is transferred to each flask and shaken well to disperse the inoculums. The flasks are incubated in BOD incubator at 25±1 ^{0}C. Spores are harvested from eighth day onwards by adding 100 ml of 0.02% Tween-80 in to the flasks followed by filtration through muslin after shaking. Spore concentration in the suspension is estimated microscopically with a Neubaurer improved double ruling haemocytometer. Spore counts are taken daily for each substrates from 8^{th} to 10^{th} day after inoculation. Virulence of the pathogen is assayed against white woolly aphid, *Ceratovacuna. lanigera*. Among the solid media, par boiled rice produced highest spore count of 16.4 X 10^5 per 100 gm followed by rice (15.60 X 10^5) and were found as the suitable medium for mass culturing of *C. cladosporioides* under laboratory conditions. Based on cost incurred for the production of spores, among *in vitro* produced cereal media for the production of spores, parboiled rice (Rs. 0.38), rice (Rs. 0.39) are the best low cost substrates for 1 X 10^5 spore production compared to other cereal grains (Table 72).

Table 72. Spore count of *C. cladosporoides* when cultured on different solid grains at Anakapalle.

Media	Spore count (X 10^5 per 1ml)	Biomass (g) per 100 gm	Cost of production of 1 X 10^5 spores (Rs)
Parboiled rice	16.40	0.68	0.38
Rice	15.60	0.40	0.39
Sorghum	11.08	0.70	0.63
Pearl millet	13.90	0.80	0.89
Ragi	13.70	1.00	0.56
Maize	13.96	0.43	0.53
Wheat	3.42	0.42	7.92
CD(p=0.05)	**0.52**	**0.07**	
CV%	**1.38**	**2.60**	

E. 40: Integrated approach to manage white grubs in sugarcane

Two centres (Padegaon and Pune) in white grub prone area were allotted the trial. The experiment could not be conducted at Padegaon due to Covid-19 pandemic and the trial was vitiated because white grub infestation was very low.

E. 41: Assessment of yield losses caused by borer pests of sugarcane under changing climate scenario

Peninsular Zone

Coimbatore

Yield loss due to internode borer (INB) attack was assessed at harvest in an experimental plot with the popular variety Co 86032. Infested canes were segregated based on the position of INB bore holes in the canes, *viz*. top, middle, bottom, top-middle, middle-bottom, top-bottom and top-middle- bottom, representing attack in different broods. Measurements of cane girth, internode number, cane length and cane weight were taken for sample canes (5-40) in different categories and control. The category 'bottom', though collected, was excluded from analysis since it had only one cane. Data were analysed for variance using the categories as treatments (Table 7). The percent of canes with bore holes in top was the highest (37.4) followed by top-middle (26.2) and top-bottom and middle categories (12.1 each). TMB (6.5) and MB (4.7) had lower percent of canes. Cane girth, internode number and cane length did not differ among the different categories. However, cane weight differed significantly with TMB and TM damage reducing it marginally over control. Overall, the results indicated that repeated attacks of internode borer in different broods did not result in significant loss in cane yield parameters (Table 73).

Mandya

The treated plot with recommended chemical insecticide, Chlorantroniliprole 0.4 G at 2.25 kg for 0.1 ha. recorded the yield of 94 t/ha whereas the untreated recorded 87 t/ha yield. The yield in untreated plot was comparatively less when compared to treated due to the higher incidence of borers in untreated field.

Padegaon

In protected plot per cent incidence of ESB was 0.00, 0.00, 0.11 and 0.08 at 30, 60, 90 and 120 DAP, respectively due to application of recommended effective chemical insecticides. However, in untreated plot per cent incidence was 0.2, 3.64, 6.17 and 6.09, at 30, 60, 90 and 120 DAP, respectively. The per cent incidence of internode borer in treated plot and untreated plot showed 1.20 and 4.60, respectively. Top borer was not observed throughout the crop period in both plots. Among different treatments, plot treated with recommended effective chemical insecticide recorded highest germination percent (56.50 %), No. of milliable cane (72.58

thousands ha^{-1}), average cane weight (2.39 kg) and Yield (170.47 t/ha) as against untreated plot. The quality parameters viz., Brix, purity sucrose and CSS% are influenced by plot treated with recommended effective chemical insecticide. The brix(%), purity (%), sucrose (%) and CCS% in treated plots were 20.85, 96.75, 19.09 and 14.25, respectively, while in untreated plots were 19.84, 96.21, 18.91 and 14.10, respectively (Table 74).

Table 73. Yield parameters in sugarcane with varying levels of internode borer infestation at Coimbatore

Borer damage category[@]	**No. of canes**	**% infestation**	**% intensity**	**Cane girth (cm)**	**Internode number**	**Cane length (cm)**	**Cane weight (kg)**
TM	28	26.2	17.0 (4.1)[#] c[$]	25.59 a	23.0 a	200.32 a	1.006 a
MB	5	4.7	10.8 (3.3) abc	27.14 a	28.2 a	222.40 a	1.285 ab
TB	13	12.1	10.9 (3.3) b	26.84 a	25.2 a	215.15 a	1.212 ab
TMB	7	6.5	18.8 (4.4) c	26.60 a	22.6 a	206.43 a	1.112 ab
T	40	37.4	8.8 (2.9) ab	26.51 a	24.0 a	219.08 a	1.227 ab
B[!]	1	0.9	-	-	-	-	-
M	13	12.1	4.6 (2.2) a	44.45 a	27.1 a	204.92 a	1.395 b
C			0.0 (0.7) d	25.89 a	24.9 a	220.32 a	1.252 ab
F value			70.96 ***	1.94 ns	3.32 **	1.32 ns	2.68 *
r^1				-0.086 ns	-0.382 ns	-0.206 ns	-0.305 ns
r^2				-0.362 ns	-0.508 ns	-0.511 ns	-0.749 ns
r^3		0.255 ns					

[@] T: top; M: middle; B: bottom; TM: top and middle; TB: top and middle; MB: middle and bottom;
TMB: top, middle and bottom

[#] Figures in parentheses are $(x+0.5)^{0.5}$ values

[$] Means followed by the same letter in a column are not significantly different (P>0.05) by Tukey HSDfor unequal replications

[!] Excluded from analysis since only one cane was obtained in this category during sampling

[1] Correlation between % incidence and cane parameters; [2] Correlation between % intensity and caneparameters; [3] Correlation between % incidence and % intensity

*** P<0.01; ** P<0.01; * P<0.05; ns P>0.05

Table 74. Effect of borer pests' incidence on growth, yield and quality parameters of sugarcane at Padegaon.

Parameters	Treated with recommended effective chemical insecticide				Untreated open for natural normal infestation of borer			
Area	0.1 ha				0.1 ha			
Borer Incidence								
Early Shoot Borer (% incidence)	30 DAP	60 DAP	90 DAP	120 DAP	30 DAP	60 DAP	90 DAP	120 DAP
	0.00	0.00	0.11	0.08	0.20	3.64	6.17	6.09
Cumulative incidence of ESB	0.045				4.025			
No. of bored plants/ha.	45				4025			
Internode Borer (% Incidence)	1.20				4.60			
Top Shoot Borer (% Incidence)	0.00				0.00			
Growth and Yield Parameter								
Germination %	56.50				49.25			
NMC (thousands ha-^{1})	72.58				71.84			
Average Cane Weight (kg)	2.39				2.15			
Yield (t/ha)	170.47				152.46			
Quality Parameter								
Brix	20.85				19.84			
Purity	96.75				96.21			
Sucrose	19.09				18.91			
CCS%	14.25				14.10			

Pune

The cumulative % incidence of early shoot borer was 1.77% in IPM block, while 1.32% in control block. Plant population per ha was numerically high 52857 in IPM Block and it was 50714 in control block. Sugarcane yield per ha was numerically high 104.02 t/ha in IPM block and it was 96.70 in control block (Table 75).

Table 75. Effect of borer pests' incidence on growth, yield and quality parameters of sugarcane at Pune.

Sl. No.	Parameters	T_1 (IPM block)	T_2 (Control plot)	Cal. t
1	Per cent incidence of ESB at 30 DAP	1.00	0.00	NS
2	Per cent Germination at 45 DAP	52.40	41.00	3.02
3	Per cent incidence of ESB at 45 DAP	0.74	0.00	NS
4	Per cent incidence of ESB at 60 DAP	1.01	0.26	NS
5	Per cent incidence of ESB at 90 DAP	0.77	1.07	NS
6	Per cent incidence of ESB at 120 DAP	0.23	0.31	NS
7	Cumulative incidence of ESB	1.77	1.32	
8	Tillering ratio at 120 DAP	4.20	3.94	NS
9	No. of bored plants/ha.	1714	929	
10	Per cent incidence of INB at 150 DAP	4	2	NS
11	Per cent intensity of INB at 150 DAP	0.97	0.64	NS
12	Infestation index of INB at 150 DAP	0.04	0.03	NS
13	Per cent incidence of INB at 300 DAP	6.00	7.00	NS
14	Per cent intensity of INB at 300 DAP	0.37	0.41	NS
15	Infestation index of INB at 300 DAP	0.04	0.03	NS
16	Plant Population/ha	52857	50714	NS
17	Single cane wt kg	1.97	1.89	NS
18	Sugarcane yield t/ha	104.02	96.70	NS
19	Per cent reduction in sugarcane yield		7.04	
20	CCS t/ha	16.14	13.88	NS
21	Total cane height (cm)	316.78	262.11	NS
22	Milable cane height (cm)	276.89	215.44	NS
23	No. of internode	22	18	NS
24	Diameter (cm)	3.13	2.80	4.80
25	Brix %	23.09	21.55	NS
26	Sucrose %	21.42	19.92	NS
27	Purity %	93.07	92.73	NS
28	CCS%	15.36	14.32	NS
29	Unit loss in CCS %		6.77	
30	B:C Ratio	2.55	2.07	
31	ICBR	0.87		

East Coast Zone

Anakapalle

Cumulative incidence of early shoot borer was 14.42%; 10.96 % DH in unprotected plots of 93 A 145 and 87 A 298 varieties respectively, while it was 4.79%; 5.49% DH in protected plots of 93 A 145 and 87 A 298 varieties respectively. Relatively high incidence of internode borer *i.e.,* 60.0%; 62.0 % with intensity of 4.48%, 3.80% respectively, recorded in unprotected plots of 93 A 145 & 87A 298, while it was 48% and 40% with intensity of 2.6% and 1.6% respectively in protected plots of 93 A 145 & 87A 298. The borer attack resulted in 2.77% and 1.72 per cent reduction in cane yields of 93 A 145 (68.57T/ha) & 87 A 298 (68.40T/ha) varieties respectively in unprotected plots as against relatively more yields, 70.52T/ha and 69.60T/ha in protected plots. The juice quality (Sucrose %) was also better in protected plots over unprotected plots (Table 76 & 77).

Table 76. Incidence of early shoot borer (%DH) and total shoots/ ha at 120 DAP in protected and unprotected plots at Anakapalle

Treatment	Incidence of early shoot borer up to 120 DAP(%DH)										Total shoots at 120 DAP /ha	
	30 DAP		60 DAP		90 DAP		120 DAP		Cumulative up to 120 DAP			
	93A 145	87 A 298	93 A 145	87 A 298	93 A 145	87 A 298	93 A 145	87 A 298	93 A 145	87 A 298	93 A 145	87 A 298
Protected plot	1.75	0.81	2.89	4.17	0.03	0.06	0.03	0.0	4.79	5.49	1,21,010	1,20,897
Unprotected plot	7.62	6.74	8.24	5.42	1.24	0.15	0.84	0.36	14.42	10.96	1,16,320	1,10,061

Table 77. Effect of internode borer on growth parameters, per cent sucrose and yield of sugarcane at Anakapalle

Treatment	Incidence of internode borer (%)		Intensity of internode borer (%)		Cane height (m)		Cane weight (Kg)		Juice Sucrose (%)		Cane yield (t/ha)		Reduction in yield (%)	
Variety	93 A 145	87A 298	93 A 145	87A 298	93 A 145	87A 298	93 A 145	87A 298	93 A 145	87A 298	93 A 145	87A 298	93 A 145	87A 2 98
T_1-Protected plot	48.00	40.00	2.60	1.60	2.41	2.42	1.30	1.19	19.15	19.10	70.52	69.60	-	-
T_2-Unprotected plot	60.00	56.00	4.48	3.80	1.89	2.33	1.19	1.16	18.90	18.97	68.57	68.40	2.77	1.72

Summary

- During the year 2020-21, six projects were conducted in entomology discipline of AICRP (S) at 11 centres (regular and voluntary) under 4 different sugarcane producing zones of India.
- In North West Zone, under project on evaluation of zonal varieties/ genotypes against major insect pests, all the entries were highly susceptible (HS) for one or more than one insect pests except CoLk 14201, Co 15023, Co 15024 in early group and Co 15026 in mid late group which were either less susceptible (LS) or moderately susceptible (MS) against all the major insect pests.
- In North Central Zone, all the genotypes screened were either LS or MS against ESB, top borer, stalk borer and root borer. None of the genotype was HS against any pest.
- In Peninsular Zone, all the entries were HS for one or more than one insect pests except MS 17082 in IVT trial, which was either LS or MS against all the major insect pests at all the centres.
- In East Coast Zone, all the entries were HS for one or more than one insect pests except CoC 16337 in early group and CoC 16338 & CoV 92102 in mid late group which were either LS or MS against all the major insect pests.
- Under project on survey and surveillance of sugarcane insect pests, severe to low incidence of sugarcane insect pests viz., ESB, root borer, internode borer, stalk borer, top borer, plassey borer, fall army worm, white grub, termites, scale insect, white fly, mealy bug, web mite, sugarcane woolly aphid, rusty plum aphid, thrips, black bug were reported from different parts of the country. Some uncommon insect pests viz., plant hopper (*Eoeurysa flavocapitata*), blister mite were also reported. Invasive insect pest, Fall army worm (*Spodoptera frugiperda*) was reported this year also on sugarcane from Andhra Pradesh.
- A new invasive pest, Rugose Spiralling Whitefly (RSW), *Aleurodicus rugioperculatus* (Hemiptera: Aleyrodidae), which had invaded India in 2016, has been recorded on sugarcane for the first time at RARS, Anakapalle. Its incidence is recorded to the tune of 5-20 percent. Along with RSW, natural enemies *viz*., lady bird beetles, *Cryptolaemus montrouzieri, Chilocorus nigrita*, *Scymnus nubilus* and the parasitoid wasp, *Encarsia guadelopae* were recorded in sugarcane ecosystem. Besides, a plant sucking bug, *Phaenacantha bicolor* (Dist.) (Hemiptera: Colobathristidae) was recorded as pest of sugarcane at Thiruvala, Kerala. This is reported from the Indian Subcontinent for the first time.
- The bioagents, viz., *Isotima javensis, Cotesia flavipes, Rhaconotus scirpophagae, Encarsia flavoscutellum, E. guadelopae, Elasmus zehnteri, Sturmiopsis inferens, Aphelinus* sp., *Fulgoraesia* (*Epiricania) melanoleuca, Telenomus beneficiens, Telenomus* sp., *Stenobracon deesae, Stenobracon* sp. *Tetrasticus pyrillae, Encarsia flavoscutellum, Dipha aphidivora, Micromus igorotus, Trichogramma chilonis, Cryptolaemus montrouzieri, Chilocorus nigrita, Scymnus nubilus, Stethorus punctillum* were found active against different pests in sugarcane.
- Mass multiplication of sugarcane bio-agents using cost effective techniques was done for *Trichogramma chilonis, T. pretiosum, Eumicrosoma* sp., *Beauveria brongniartii, B. bassiana* and *Metarhizium anisopliae* and *Cladosporium cladosporioides* for use against various insect pests.
- Assessment of yield losses caused by borer pests revealed a significant yield loss of cane in unprotected crops over the protected crops. A loss of 50% yield was recorded, on attack of three generations of internode borer on sugarcane.