ANNUAL REPORT (2011-12)
AICRP ON SUGARCANE (ENTOMOLOGY),
Zonal Agricultural Research Station, Powarkheda (M.P.)

Technical Programme 2011-12:

S. No.	Experiments Allotted	C/NC*
1.	E. 4.1: Evaluation of zonal varieties/genotypes for their reaction against major insect pests.	C
2.	E. 28: Survey and surveillance of sugarcane insect pests.	C
3.	E. 30: Monitoring of Insect Pests and their Bio-agents in Sugarcane Agro-ecosystem.	C
4.	E.32: Population dynamics of sugarcane borers (early shoot borer, top borer, internode borer and stalk borer) through pheromone traps.	C

***C/NC – Conducted/ Not Conducted**

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

Objective….: To screen the entries of the zonal varietal trails for their behaviour towards damage caused by key pests in the area

Year of Start: 1985-86 (Continuing)

Experimental details: Seventeen entries with three checks of early, and thirty five entries with two checks of mid-late group were screened for their reaction against infestation of key pests of the area. The infestation of insect pests recorded and the reactions are given in Table -1 & 2.

Results:

A. Early group:

Early Shoot Borer (ESB %):

The ESB infestation ranged between 2.84 to 16.77 per cent among various entries screened. Check varieties i.e., Co JN 86-141, Co 94008 and Co C 671 received 7.57, 11.42 and 17.90 per cent ESB infestation, respectively. Co 06022, Co 07012, PI 06132 and Co M 06082 received minimum ESB (less than 5%). The Co 08131 and Co 08131 registered highest ESB infestation (16.77 and 14.00%, respectively)

Table-1: Reaction of different entries (Early group) against early shoot borer, white fly, mealy bug and scale insect, Powarkheda, Madhya Pradesh (2011-12)

S.No.	Trial	Genotype/ Variety	ESB (%)	White Fly (/sq cm)	Mealy bug (% infested cane)	Scale (% infested cane)
1.	**AVT II (E) 11-12**	**Co 06001**	12.15	3.12	26.67	17.78
2.	**AVT II (E) 11-12**	**Co 06002**	7.37	3.05	42.22	22.22
3.	**AVT II (E) 11-12**	**Co 06022**	2.84	1.20	46.67	31.11
4.	**AVT II (E) 11-12**	**Co M 06082**	4.96	1.98	28.89	17.78
5.	**AVT II (E) 11-12**	**PI 06132**	4.18	5.52	24.45	15.55
6.	**AVT I (E) 11-12**	**Co 07012**	3.58	2.50	24.45	13.33
7.	**AVT I (E) 11-12**	**Co 07015**	8.31	2.32	11.11	13.33
8.	**AVT I (E) 11-12**	**Co N 07071**	5.48	5.28	35.56	20.00
9.	**AVT I (E) 11-12**	**PI 07131**	5.32	2.55	4.45	6.67
10.	**IVT (E) 11-12**	**Co 08001**	14.00	3.40	37.78	28.89
11.	**IVT (E) 11-12**	**Co 08006**	6.81	3.07	28.89	13.33
12.	**IVT (E) 11-12**	**Co 08071**	5.76	1.27	51.11	24.44
13.	**IVT (E) 11-12**	**Co 08131**	16.77	4.97	28.89	4.44
14.	**IVT (E) 11-12**	**VSI 08121**	5.59	1.98	24.45	11.11
15.	**Check**	**Co 94008**	**11.42**	**1.60**	**33.33**	**14.82**
16.	**Check**	**Co C 671**	**17.90**	**2.51**	**23.89**	**8.34**
17.	**Check**	**Co JN 86-141**	**7.57**	**1.30**	**20.00**	**4.44**

Whitefly (per square cm leaf area):

Whitefly population ranged from 1.20 to 5.52 per square cm leaf area in various early genotypes/ varieties screened. The checks i.e., Co JN 86-141, Co 94008 and Co C 671 received 1.30, 1.60 and 2.51 white fly per square cm leaf area, respectively. Among the various genotypes screened, Co 06022 exhibited the least whitefly infestation, followed by Co 08071 (1.27/sq cm leaf area). The PI 06132 and Co N 07071 recorded maximum white fly (more than 5/sq cm leaf area).

Mealy Bug (per cent infested canes):

Mealy bug ranged from 4.45 to 51.11 per cent infested canes in genotypes/ varieties evaluated. Check varieties, i.e, Co JN 86-141, Co C 671 and Co 94008 received 20.00, 23.89 and 33.33 per cent mealy bug infested canes. Among genotypes lowest infestation was registered in PI 07131 (4.45 % canes infested), followed by Co 07015 (11.11 % canes infested). Co 08071 (51.11 % canes infested) received the maximum mealy bug infestation.

Scale (per cent infested canes):

Scale infested canes (%) varied from 4.44 to 31.11 per cent in different genotypes/ varieties screened. Least infestation was observed in Co JN 86-141 (check) and Co 08131 (Both, 4.44 % infested canes). Maximum scale infested cane observed in Co 06022 (31.11%), followed by Co 08001 (28.89%) and Co 08071 (24.44%).

B. Mid late group:

Early Shoot Borer (ESB %):

Early shoot borer infestation (% dead heart) ranged from 3.01 to 16.15 per cent in various entries screened. The check varieties i.e., Co 99004 and Co 86032 received 9.90 and 13.78 per cent ESB infestation. The Co Vc 08063, Co 07006 and Co 06082 registered lowest less than 5 per cent ESB infestation. Among the entries, maximum ESB infestation recorded in Co Snk 07103, Co 06014 and Co 07008 (16.15, 12.99 and 12.91 %, respectively).

Table-2: Reaction of different entries (Midlate group) against early shoot borer, white fly, mealy bug and scale insect, Powarkheda, Madhya Pradesh (2011-12)

S. No.	Trial	Genotype/ Variety	ESB (%)	White Fly (/sq cm)	Mealy bug (% infested cane)	Scale (% infested cane)
1.	**AVT II (ML) 11-12**	**Co 06007**	6.56	1.42	44.45	2.22
2.	**AVT II (ML) 11-12**	**Co 06010**	9.41	3.87	13.33	4.44
3.	**AVT II (ML) 11-12**	**Co 06012**	5.33	3.32	31.11	11.11
4.	**AVT II (ML) 11-12**	**Co 06013**	8.43	2.50	24.45	4.44
5.	**AVT II (ML) 11-12**	**Co 06014**	12.99	5.87	37.78	11.11
6.	**AVT II (ML) 11-12**	**Co 06015**	12.14	4.02	26.67	2.22
7.	**AVT II (ML) 11-12**	**Co 06020**	9.91	5.60	37.78	22.22
8.	**AVT II (ML) 11-12**	**Co 06027**	10.48	5.77	26.67	11.11
9.	**AVT II (ML) 11-12**	**Co M 06082**	4.61	4.87	35.56	17.78
10.	**AVT II (ML) 11-12**	**Co M 06084**	6.58	2.52	22.22	2.22
11.	**AVT II (ML) 11-12**	**Co Snk 03632**	8.37	2.37	24.45	11.11
12.	**AVT I (ML) 11-12**	**Co 07006**	4.46	1.32	11.11	2.22
13.	**AVT I (ML) 11-12**	**Co 07007**	5.00	1.37	15.55	26.66
14.	**AVT I (ML) 11-12**	**Co 07008**	12.91	3.67	20.00	6.67
15.	**AVT I (ML) 11-12**	**Co 07009**	6.23	2.32	11.11	17.78
16.	**AVT I (ML) 11-12**	**Co 07010**	10.00	5.20	6.67	6.67
17.	**AVT I (ML) 11-12**	**Co Snk 07103**	16.15	3.55	15.56	24.44
18.	**IVT (ML) 11-12**	**Co 08007**	5.50	0.87	17.78	8.89
						Continue…….

S. No.	Trial	Genotype/ Variety	ESB (%)	White Fly (/sq cm)	Mealy bug (% infested cane)	Scale (% infested cane)
19.	**IVT (ML) 11-12**	**Co 08008**	5.77	5.18	24.45	22.22
20.	**IVT (ML) 11-12**	**Co 08009**	7.46	1.32	15.56	11.11
21.	**IVT (ML) 11-12**	**Co 08016**	5.82	3.10	24.45	17.78
22.	**IVT (ML) 11-12**	**Co 08018**	6.92	3.77	17.78	20.00
23.	**IVT (ML) 11-12**	**Co 08019**	7.43	1.32	15.56	20.00
24.	**IVT (ML) 11-12**	**Co 08020**	5.84	3.37	31.11	11.11
25.	**IVT (ML) 11-12**	**Co JN 08091**	6.80	2.95	17.78	4.44
26.	**IVT (ML) 11-12**	**Co M 08081**	6.06	3.97	8.89	20.00
27.	**IVT (ML) 11-12**	**Co N 08072**	8.23	1.93	22.22	4.45
28.	**IVT (ML) 11-12**	**Co R 08141**	9.13	5.10	24.45	4.44
29.	**IVT (ML) 11-12**	**Co Snk 08101**	11.79	4.45	24.45	22.22
30.	**IVT (ML) 11-12**	**Co Vc 08061**	5.12	1.55	11.11	22.22
31.	**IVT (ML) 11-12**	**Co Vc 08062**	5.84	1.83	35.56	6.67
32.	**IVT (ML) 11-12**	**Co Vc 08063**	3.01	2.00	24.45	15.56
33.	**IVT (ML) 11-12**	**Co Vc 08064**	7.94	1.52	28.89	22.22
34.	**IVT (ML) 11-12**	**Co VSI 08122**	7.59	2.88	26.67	22.22
35.	**IVT (ML) 11-12**	**Co VSI 08123**	8.45	3.98	24.45	13.33
36.	**Check**	**Co 86032**	**13.78**	**2.64**	**16.11**	**8.89**
37.	**Check**	**Co 99004**	**9.90**	**1.88**	**5.18**	**5.93**

Whitefly (per square cm leaf area):

Screened midlate genotypes received whitefly population from 0.87 to 5.87 per square cm leaf area. The checks i.e., Co 99004 and Co 86032 registered 1.88 and 2.64 individuals per square cm leaf area. Among the genotypes, the Co 08007 (0.87 individuals per square cm leaf area) received the lowest whitefly population, followed by Co 07006, Co 08019 and Co 08009 (all 1.32 individuals per square cm leaf area). The Co 06014 received maximum whitefly population, followed by Co 06027 and Co 06020 (5.87, 5.77 and 5.60 individuals/sq cm leaf area, respectively).

Mealy Bug (per cent canes infested):

In midlate genotypes/ varieties screened, the mealy bug infested canes ranged between 6.67 to 44.45 per cent. The check, Co 99004 (5.18 % canes infested) received the minimum mealy bug infestation, followed by Co 07010, Co M 08081 and Co 07006 (6.67, 8.89 and 11.11 % canes infested, respectively). The Co 06007 (44.45 % canes infested) received the maximum infestation, followed by the Co 06014 and Co 06020 (both 37.78 % canes infested)

Scale (per cent infested canes):

Scale infestation ranged from 2.22 to 26.66 per cent cane infested in different entries screened. The Co 07006, Co 06015 and Co 06007 exhibited least scale infestation (all exhibited 2.22% scale infested canes). The check varieties i.e., Co 99004 and Co 86032 had 5.93 and 8.89 per cent scale infested canes. Maximum scale infestation observed in Co 07007 (26.66 %) and Co Snk 07103 (24.44%).

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

Objectives: To identify key insect pests of sugarcane in the area.

Duration : Long term. **Year of Start: 2003-04**

Experimental Details:

The Hoshangabad, Bhaktara. Bankhedi, Narsinghpur and Betul sugarcane growing area was surveyed for the purpose of recording the sugarcane insect pests and their natural enemies

Results:

Different area surveyed along with insect pests observed with variety, infestation level recorded and any other important information (remark) are given in Table no. 3. From the survey made, the following important observations emerged –

1. The Co J 64 is the ruling variety, except Betul where Co 62175 is the ruling one. Other varieties contributed 20-30% area.

2. In area, early shoot borer and pyrilla is major while scale, whitefly and mealy bug are the minor insect pests infesting sugarcane.
3. At Baktara, early shoot borer infestation is more (17-29%). The late sowing at spring may be the major reason for more ESB.
4. No bio agent activity observed against early shoot borer, except Narsinghpur, where Sturmiopsis recorded.
5. *Nymphal cum adult parasitoid, Epiricania melanoleuca* and egg parasite, *Tetrastichus pyrillae* effectively working against pyrilla in all areas.
6. The sugarcane wooly aphid at Betul, while root borer at Bunkhedi are at alarming position.
7. At Betul, wooly aphid caused up to 30%, reduction in yield, while 15 to 35 % in Gur.
8. At Bankhedi, up to 70 per cent wilt is observed in some of the field. Although the seed source and variety is unknown, but presence of root borer in this area and continuance of its infestation in initial rainy season seems to be main reason for wilt severity.

Table: 3. Occurrence of naturally occurring insect pests on sugarcane

S. No.	Area	Insect pest	Variety	Infestation level	Remark
1.	**Hoshangabad**	ESB	Co 86032 Co JN 86-600 Co 99004 Co JN 86 141 Co C 671 Co J 64	12 9 10 8 15 18	No activity of any bio agent observed
		Range		8-18%	
		Pyrilla	Co 86032 Co JN 86-600 Co 99004 Co JN 86 141 Co C 671 Co J 64	Remained less than 5 individuals per leaf probably because of scattered fields and very hot and dry summer this year	Tetrastichus & Epiricania working effectively
		Whitefly	Traces		
		Scale	Remained less than 10%		
		Root Borer	Traces		

Continue……..

S. No.	Area	Insect pest	Variety	Infestation level	Remark
2.	**Bakhtara**	ESB (%)	Co J 64 Co S 88230 Co 94012 Co C 671	20 29 18 18	No activity of any bio agent observed
		Range		17-29	
		Pyrilla & Scale	5 to 12 /leaf Traces		*Tetrastichus* & *Epiricania* working effectively
3.	**Bankhedi**	ESB	Co J 64 Co 94008 Co S 88230 Co 86032 Co 92005	5-7 12 11 15 17	No activity of any bio agent observed
		Range		5 to 17	
		Pyrilla	Co J 64 Co 94008 Co S 88230 Co 86032 Co 92005	15 12 18 17 12	*Tetrastichus* & *Epiricania* working effectively
		Range		12 to 18	
		Root borer	Co J 64 Co 94008 Co 88230 Co 86032 Co 92005	Borer infestation varies from 5 to 19 %	In some fields of Co 92005 (nearby Bankhedi Sugar factory) about 70 % wilt observed
3.	**Narsinghpur (Kareli)**	Pyrilla	Co J 64 Co S 88230 Co J 68 Co 7219	17 21 19 9	
		Range		9 to 21	
		ESB (%)	Co J 64 Co 88230 Co J 68 Co 7219	9 6 12 11	Only at one *Sturmiopsis* pupa found
		Range		9 to 12	
		Scale	Traces to severe (in a few fields)	In some of the fields variety and seed source unknown	

Continue……..

S. No.	Area	Insect pest	Variety	Infestation level	Remark
1.	Betul	ESB (%)	Co 86032 Co 62175 Co 7318 Co 678 Co C 671 Belapuri (Local)	11 12 17 15 5 4	No activity of any bio agent observed
		Over all		4-17	
		Pyrilla (per leaf)	Co 86032 Co 62175 Co 7318 Co 678 Co C 671 Belapuri (Local)	15 12 8 18 8 3	*Tetrastichus* & *Epiricania* working effectively
		Range		3-18	
		Scale insect (% cane infested)	Co 86032 Co 62175 Co 7318 Co 619 Co C 671 Belapuri (Local)	8 4 6 12 3 4	Observed in some fields especially in ratoon crop
		Range		3-12	
		Wooly aphid (% leaf area Covered)	Co 86032 Co 62175 Co 7318 Co 678 Co C 671 Belapuri (Local)	11 16 35 46 18 25	
		Range		11-46%	
		Whitefly & Top shoot borer	In traces; comparatively more in area of rain water stagnation		

E. 30: Monitoring of Insect Pests and their Bio-agents in Sugarcane Agro-ecosystem.

Objectives: To monitor the key insect pests and their natural enemies of sugarcane in the area.

Year of start: 2006-07 Variety: Co 86032 Area: 0.2 ha

Experimental Details:

Sugarcane variety, Co 86032 was planted in 0.2 ha area for the study and all recommended package of practices were followed except application of insecticides.

RESULT:

At each Standard meteorological week (SMW) the observations on infestation of both key pests i.e., early shoot borer and pyrilla and their natural enemies were recorded. Data regarding meteorological parameters were obtained from Agro-Meteorological Project, ZARS, Powarkheda (Table-4, 5 & 6).

Early shoot borer infestation started in 10th SMW (1st week of March), reached to peak (2.4 %/week) in 20th SMW (3rd week of May) and continued up to 28th SMW (3rd week of July). In season, the cumulative infestation was observed to be 20.40 per cent. No bio agent activity was observed against ESB in the season, except negligible activity of *Sturmiopsis inferens* i.e., only a few puparia recovered from the ESB larvae in lab in the season.

Table 4: Activity of Early Shoot Borer and meteorological data, 2011, ZARS, Powarkheda (M.P.)

SMW	Date (2011)	Max. Temp. (^{O}C)	Min. Temp (^{O}C)	RH%	Rainfall (mm)	ESB infestation (%)	
						Weekly	Cumulative
9	**26/2 to 4/3**	32	12	93	0.00	0.00	0.0
10	**5 to 11/3**	33	12	100	0.00	0.20	0.2
11	**12 to 18/3**	34	11	93	0.00	0.20	0.4
12	**19 to 25/3**	37	15	79	0.00	0.40	0.8
13	**26/3 to 1/4**	38	11	100	0.00	0.60	1.4
14	**2 to 8/4**	36	18	85	3.40	1.00	2.4
15	**9 to 15/4**	39	18	88	0.00	1.60	4.0
16	**16 to 22/4**	42	20	64	0.00	1.80	5.8
17	**23 to 29/4**	42	22	68	0.00	2.20	8.0
18	**30/4 to 6/5**	44	25	62	0.00	2.00	10.0
19	**7 to 13/5**	42	25	60	0.00	2.00	12.0
20	**14 to 20/5**	45	26	48	0.00	2.40	14.4
21	**21 to 27/5**	41	25	44	0.00	1.80	16.2
22	**28/5 to 3/6**	42	27	55	2.60	1.40	17.6
23	**4 to 10/6**	42	26	77	0.00	1.00	18.6
24	**11 to 17/6**	44	24	88	30.40	0.60	19.2
25	**18 to 24/6**	38	24	100	95.90	0.40	19.6
26	**25/6 to 1/7**	31	24	96	42.00	0.40	20.0
27	**2 to 8/7**	34	24	92	71.00	0.20	20.2
28	**9 to 15/7**	33	24	95	32.60	0.20	20.4
29	**16 to 22/7**	32	24	100	149.50	0.00	20.4

It is observed that maximum temperature above 32^{O}C, minimum temperature above 12^{O}C and relative humidity of about 93 per cent is suitable for initiation of early shoot borer activity. Whereas, maximum temperature from 41 to 45^{O}C, minimum temperature from 20 to 25^{O}C and relative humidity 44 to 68 per cent is favorable for peak activity of pyrilla.

Pyrilla:

The pyrilla infestation observed in two distinct phases, first at initial growth phase (or in 1st half of summer) and second in rainy season (July to October-November). In 1st phase normally pyrilla population naturally remains low because of adverse climatic conditions (dry and high temperature). But, in 2nd phase the pyrilla population normally crosses 15 individuals per leaf. This year, even in 2nd phase, the pyrilla population remained less than 2 individuals per leaf. This may be because of very hot and dry summer with only one rainy day (3.4 mm rain) in 14 SMW.

First phase (summer) of pyrilla activity begins from 11th SMW week (2nd week of March) and continues up to 19th SMW week (2st week of May). The peak population of 0.80 to 1.07 individual per leaf was observed in 13th and 15th SMW week (1st fortnight of April). However, the activity of pyrilla and its natural enemies remains at low level.

Table 5: Seasonal incidence of pyrilla and its bio-agents and meteorological data (Summer-2011), ZARS, Powarkheda (M.P.).

Standard WEEK	Date (2011)	Max. Temp. (^{O}C)	Min. Temp (^{O}C)	RH%	Rainfall (mm)	Pyrilla/leaf	*Tetrastichus* (%)	Epiricania /leaf
10	**5 to 11/3**	33	12	100	0.00	0.00	0.00	0.00
11	**12 to 18/3**	34	11	93	0.00	0.33	2.64	0.00
12	**19 to 25/3**	37	15	79	0.00	0.40	5.64	0.00
13	**26/3 to 1/4**	38	11	100	0.00	1.40	7.24	0.13
14	**2 to 8/4**	36	18	85	3.40	0.80	7.12	0.27
15	**9 to 15/4**	39	18	88	0.00	1.07	8.68	0.40
16	**16 to 22/4**	42	20	64	0.00	0.60	2.52	0.27
17	**23 to 29/4**	42	22	68	0.00	0.40	1.40	0.07
18	**30/4 to 6/5**	44	25	62	0.00	0.13	0.32	0.00
19	**7 to 13/5**	42	25	60	0.00	0.07	0.00	0.00

Second phase of pyrilla and egg parasite, *Tetrastichus pyrillae* observed from 30th SMW week (last week of July), while after one week (31st SMW) the nymphal cum adult parasitoid, *Epiricania malanoleuca* appeared. Peak activity of Pyrilla (2.13 individuals/ leaf) and *Tetrastichus* (13.92 %) recorded at 33rd SMW. while after a week *E. malanoleuca* also observed peak activity (0.87 live cocoons/ leaf). There after, the activity of pyrilla and both its parasites declined and continued up to 37th SMW (3th week of September).

It is observed that, maximum temperature above 32 ^{O}C, minimum temperature above 24^{O}C and relative high humid conditions are favorable for initiation of pyrilla activity in sugarcane during rainy season. While maximum temperature of 32 ± 1^{O}C, minimum temperature of 24± 1^{O}C and 95 to 100 per cent RH seems to be favourable for peak activity of pyrilla.

Table 6: Activity of pyrilla and its bio agents in rainy season with meteorological data, 2011 at ZARS, Powarkheda (M.P.).

Standard WEEK	Date (2011)	Max. Temp. (^{O}C)	Min. Temp (^{O}C)	RH%	Rainfall (mm)	Pyrilla/ leaf	*Tetrastichus* (%)	*Epiricania*/ leaf
29	**16 to 22/7**	32	24	100	149.50	0.00	0.00	0.00
30	**23 to 29/7**	**33**	**23**	**100**	**25.20**	**0.27**	**2.48**	**0.00**
31	**30/7 to 5/8**	31	25	97	59.80	1.13	9.12	0.20
32	**6 to 12/8**	29	23	100	175.60	1.40	13.20	0.40
33	**13 to 19/8**	**29**	**24**	**95**	**17.60**	**2.13**	**13.92**	**0.60**
34	**20 to 26/8**	32	24	95	30.40	1.47	7.56	0.87
35	**27/8 to 2/9**	30	24	100	129.50	0.93	6.12	0.27
36	**3 to 9/9**	30	24	100	35.40	0.80	6.80	0.00
37	**10 to 16/9**	**32**	**24**	**95**	**59.60**	**0.33**	**3.68**	**0.00**
38	**17 to 23/9**	32	23	94	10.60	0.00	0.00	0.00
39	**24 to 30/9**	32	22	100	1.40	0.00	0.00	0.00

Fig.1: Seasonal Incidence of Early Shoot Borer & Meteorological Data (2011), ZARS, Powarkheda (M.P.)

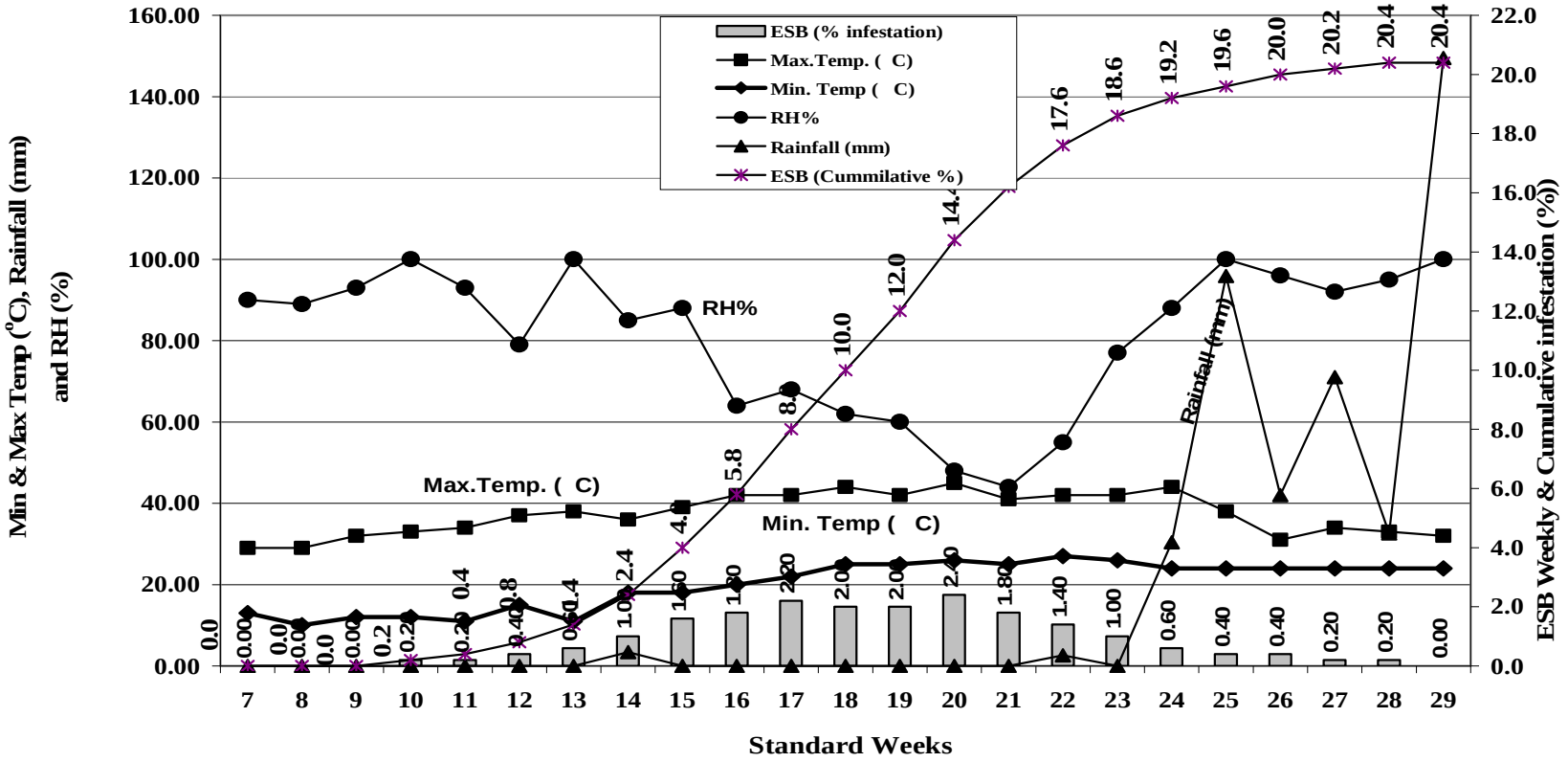


Fig. 2: Seasonal incidence of Pyrilla & Its natural enemies with Meteorological data(2011), ZARS, Powarkheda (M.P.)

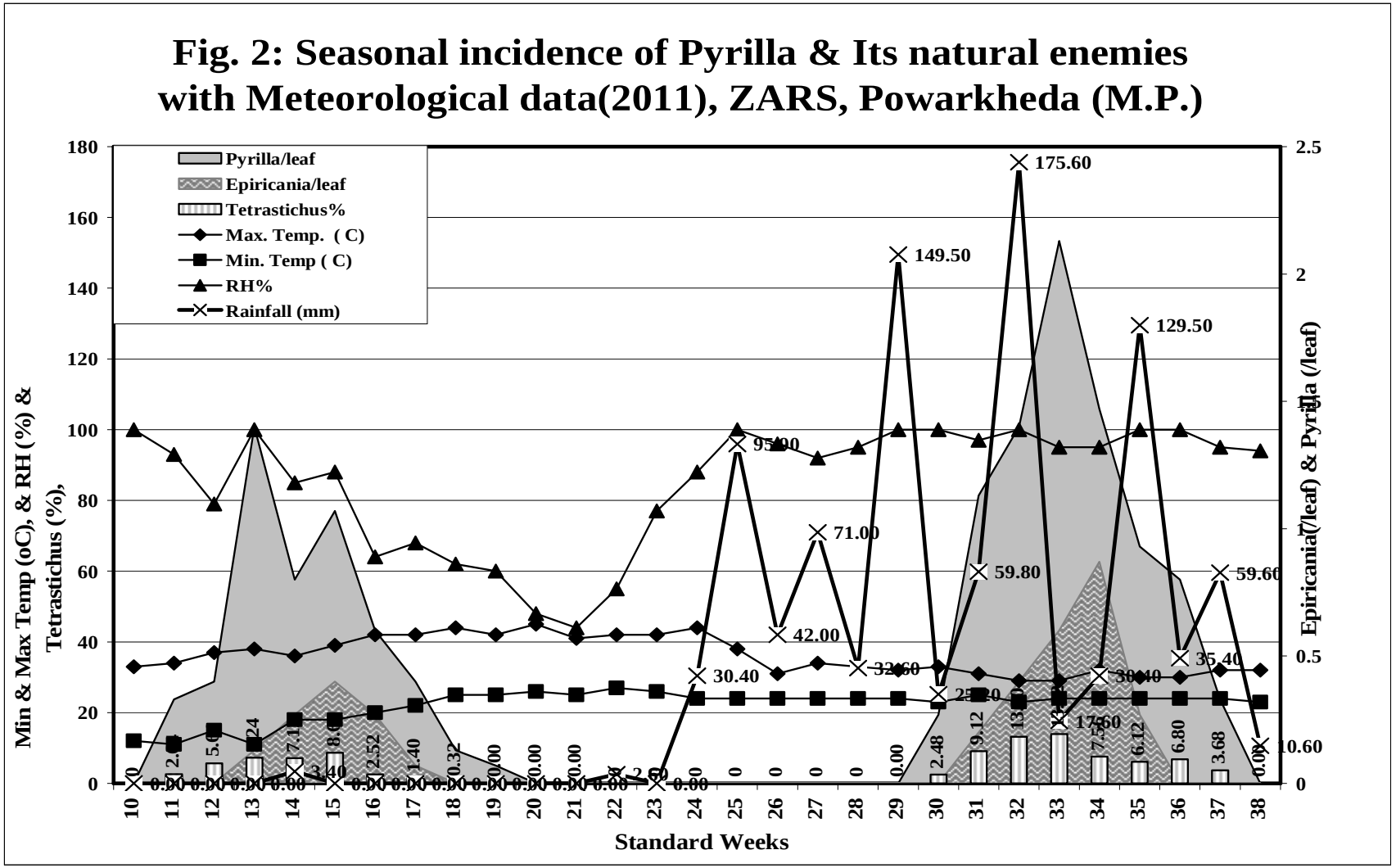
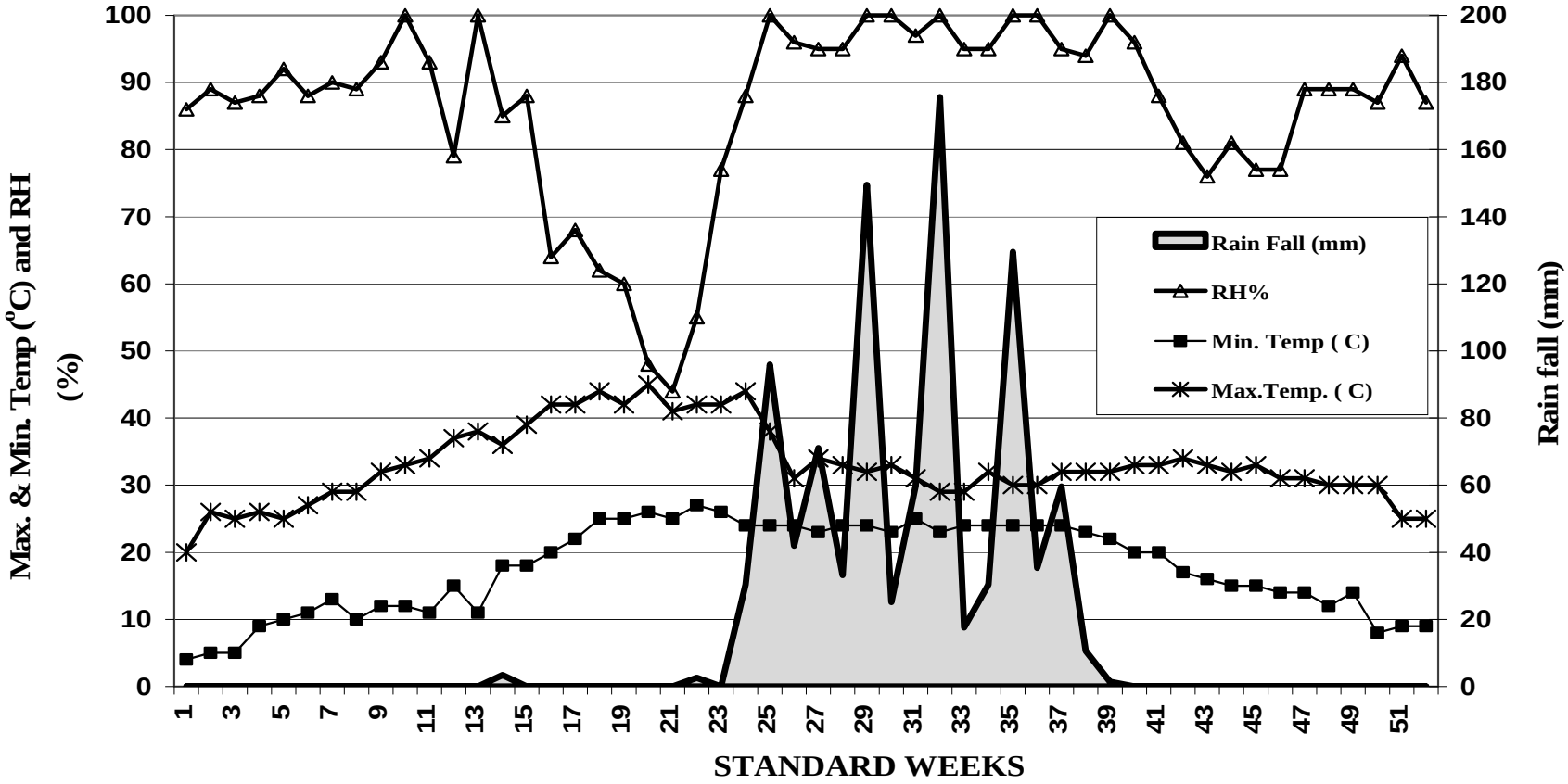


Fig. 3: METEOREOLOGICAL SITUATIONS DURING 2011, ZARS, POWARKHEDA (M. P.)



E.32: Population dynamics of sugarcane borers (early shoot borer, top borer, internode borer and stalk borer) through pheromone traps.

Objectives: To study the population dynamics of sugarcane borers (early shoot borer, top shoot borer, internode borer and stalk borer) through pheromone traps.

Year of start: 2008-09

Treatments: Pheromone lures of early shoot borer, top shoot borer, internode borer and stalk borer

Plot size: One acre

Methodology:

Three pheromone traps each for early shoot borer, internode borer and top shoot borer installed and daily observations for moth captured were recorded.

Results:

Early shoot borer:

The moth capturing started in pheromone traps from 9th SMW (1rd week of March). Maximum ESB moths captured from 17th to 23rd SMW i.e., from 4th week of April to 2nd week of June (0.38 to 0.52 moth/ day/trap). The peak moth capturing recorded at 21st SMW, afterward, the number of moths captured declined and ends at 28th SMW (3rd week of July).

In Sugarcane, the ESB dead hearts observed from 10th SMW, maximum numbers (1.8 to 2.2 % / week) from 16 to 21 SMW i.e., 4th week of April to 4th week of May. After this, ESB observed decline trend and continued up to 28th SMW.

Internode Borer and Top shoot borer:

During the season internode borer or top shoot borer moths didn't appeared.

Table 7: Activity of Early shoot borer and moths captured (/day/pheromone trap), 2011 at ZARS, Powarkheda (M. P.).

2011	STD weeks	ESB (% infestation)	ESB (Cumulative %)	ESB Per day per trap
12 to 18/2	**7**	0.0	0.0	0.00
19 to 25/2	**8**	0.0	0.0	0.00
26/2 to 4/3	**9**	0.0	0.0	0.05
5 to 11/3	**10**	0.2	0.2	0.00
12 to 18/3	**11**	0.2	0.4	0.05
19 to 25/3	**12**	0.4	0.8	0.05
26/3 to 1/4	**13**	0.6	1.4	0.10
2 to 8/4	**14**	1.0	2.4	0.14
9 to 15/4	**15**	1.6	4.0	0.24
16 to 22/4	**16**	1.8	5.8	0.29
23 to 29/4	**17**	2.2	8.0	0.38
30/4 to 6/5	**18**	2.0	10.0	0.33
7 to 13/5	**19**	**2.0**	12.0	0.43
14 to 20/5	**20**	2.4	14.4	0.43
21 to 27/5	**21**	1.8	16.2	0.52
28/5 to 3/6	**22**	1.4	17.6	0.38
4 to 10/6	**23**	1.0	18.6	0.38
11 to 17/6	**24**	0.6	19.2	0.29
18 to 24/6	**25**	0.4	19.6	0.14
25/6 to 1/7	**26**	0.4	20.0	0.05
2 to 8/7	**27**	0.2	20.2	0.00
9 to 15/7	**28**	0.2	20.4	0.05
16 to 22/7	**29**	0.0	20.4	0.00