



Observations on natural enemies of insect pests in sorghum field

D.R. PATEL* AND M.S. PUROHIT

Department of Entomology, College of Agriculture, Navsari Agricultural University, NAVSARI (GUJARAT) INDIA
(Email : patel.devendra2829@yahoo.com)

Abstract : Field trials were laid out in the Agricultural Research Station, Navsari Agricultural University, Tanchha, Dist-Bharuch under rain fed condition during *Rabi* 2006-07, 2007-08 and *Kharif* 2007-08, 2008-09 to study the population of predators and correlation with host. In *Rabi* season green lacewing reached peak level in 1st SMW (January, 1-7), lady bird beetle reached peak level at 3rd SMW (January, 15-21) while spider reached peak level in 49th SMW (December, 3-9). In *Kharif* season the coccinelid and spider reached its maximum intensity 38th SMW (September, 17-23), chrysopid reached its peak at 45th SMW (November, 5-11). The correlation co-efficient study revealed that the chrysoperla predator had significant positively correlated with aphids and plant hopper. Predatory beetle had significant positively correlated with aphids while significant negative correlation with plant hopper population in *Rabi* and positively correlated in *Kharif*. The spider population had negatively correlated with aphids population. While it had significant positive correlation with plant hopper ($r=0.152$).

Key Words : Sorghum, Aphid, Plant hopper, Lady bird beetle, Green lacewing, Spider, Correlation co-efficient

View Point Article : Patel, D.R. and Purohit, M.S. (2014). Observations on natural enemies of insect pests in sorghum field. *Internat. J. agric. Sci.*, 10 (2): 677-680.

Article History : Received : 28.11.2013; Revised : 20.04.2014; Accepted : 01.05.2014

INTRODUCTION

Under modern IPM practices insect pest suppression by need based application of insecticides together with the adoption of eco friendly cultural practices are very much convincing. Control of pest population by biological means is very encouraging. Among the various alternatives available, biological control is the most promising one; with hundreds of outstanding successes are reported all over the world (Sathe *et al.*, 2003). Spider, green lacewing and lady bird beetle are recognized as an insect predator in many crop ecosystems. Its predatory potential is well established for a variety of insect pests and considered an important component in the ecologically sound pest management packages of different

crops. Sathe and Bhosale (2001) reported that, predators are the organisms, which directly attack, kill and eat one of the other species (prey of host). Typically, insect predators are characterized by a set of attributes that distinguish them from parasitoids, They are large relative to their prey and require more than one prey individual to complete development; they have free-living predatory immature stages; and many species of insect predators are predacious as both immature and adults (Hagen *et al.*, 1976). According to Sahayaraj (2004), the arthropod predators of insects include beetles, true bugs, preying mantids, lacewings, flies, midges and wasp. The lady bird beetles, tiger beetles, stink bug bug, spiders; dragon flies, damsel flies, black ants, preying mantid, ground beetles are important predaceous insects. The population growth of any

* Author for correspondence (Present Address) :
College of Agriculture (N.A.U.), Muktampur, BHARUCH (GUJARAT) INDIA

pest species is effectively controlled by their natural enemies (Vorley, 1986). Lady bird beetle prey on a number of species of aphid on different host plants (Sakuratani, 1977; Winder *et al.*, 1994). The lady beetles are predacious both at larval and adult stages and feed on various crop pests such as aphids and other soft bodied insects like brown plant hopper, thrips etc (Rawat and Modi, 1969; Kring *et al.*, 1985 and Sumalde *et al.*, 1993). Considering the importance of predator and to generate information regarding seasonal abundance of predators on sorghum, the present investigation was undertaken.

MATERIAL AND METHODS

Field trials were laid out in the Agricultural Research Station, Navsari Agricultural University, Tanchha, Dis-Bharuch under rain fed condition during *Rabi* 2006-07 and was repeated in *Rabi* 2007-08. Same sets of experiments were also conducted in *Kharif* 2007-08 and 2008-09. The experiment was laid out in a Randomized Block Design and replicated four times. Six genotypes of sorghum *viz.*, GJ 36, GJ 38, GJ 40, GJ 41, CSH 16 and CSV 18 were sown in October (*Rabi*) and July (*Kharif*). All the post sowing recommended agronomical practices were followed. Experimental area was kept free from insecticidal spray throughout the season in order to record the incidence of insect pests and their predators. With a view to find out the seasonal fluctuations of predators in sorghum, the observation of different predators were recorded in six cultivars *viz.*, GJ 36, GJ 38, GJ 40, GJ 41, CSH 16 and CSV 18 during *Rabi* season of 2006-07, 2007-08 and *Kharif* season of 2007-08, 2008-09 at weekly interval starting second week after sowing till harvesting of the crop. The number of adults of green lacewing, lady bird beetle and spider were recorded from randomly selected five plants in each net plot of different

cultivars of sorghum. Mean population of green lacewing, lady bird beetle and spider per plant were calculated separately. Simple correlation between predatory insects *viz.*, green lacewing, lady bird beetle and spider with their host insects like aphids and plant hopper were worked out by using their periodical mean population.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Rabi :

The period mean indicated that the green lacewing population started 4 WAS (47th std week) and remained throughout the crop season with peak population (0.68 GLW/plant) in 1st std week (January, 1-7) in 2006-07, while it appeared in 9 WAS (52nd std week) in 2007-08 in lower form. Pooled data (Table 1) revealed that the green lacewing appeared from 5 WAS (48th std week) and reached peak level (0.34 GLW/plant) in 10 WAS (1st std week). The lady bird beetle appeared (Table 1) in 5 WAS (48th std week) and reached peak level (0.81 LBB/plant) in 10 WAS (1st std week) in 2006-07 and, while in 2007-08 it started from 6 WAS (49th std week) and reached peak at 13 WAS (1.75 LBB/plant). Pooled data revealed that predator appeared from 5 WAS (48th std week) and remained active throughout crop season with maximum population (1.04 LBB/plant) in 12 WAS (3rd std week). This predator appeared from 5 WAS (48th std week) in 2006-07 and 6 WAS (49th SMW) in 2007-08. The pooled data revealed that spider appeared in 5 WAS (48th std week) with maximum number of spider (0.06 spider/plant) in 6 WAS (49th std week). The three predators *viz.*, green lacewing, lady bird beetle and spider appeared

Table 1 : Population of natural enemies of sorghum during *Rabi* 2006-07 and 2007-08

Std. week	WAS	Date	Mean population of natural enemies per plant								
			Green lacewing			Lady bird beetle			Spider		
			2006-07	2007-08	Mean	2006-07	2007-08	Mean	2006-07	2007-08	Mean
45	2	5-11 Nov	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46	3	12-18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47	4	19-25	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	5	26-2	0.03	0.00	0.02	0.04	0.00	0.02	0.05	0.00	0.03
49	6	3-9 Dec	0.13	0.00	0.06	0.19	0.03	0.11	0.08	0.05	0.06
50	7	10-16	0.28	0.00	0.14	0.22	0.12	0.17	0.03	0.08	0.05
51	8	17-23	0.08	0.00	0.04	0.36	0.13	0.24	0.01	0.08	0.04
52	9	24-31	0.11	0.08	0.09	0.56	1.19	0.88	0.01	0.08	0.04
1	10	1-7 Jan	0.68	0.00	0.34	0.81	0.65	0.73	0.05	0.06	0.05
2	11	8-14	0.58	0.00	0.29	0.60	0.78	0.69	0.03	0.01	0.02
3	12	15-21	0.44	0.01	0.23	0.48	1.60	1.04	0.00	0.01	0.00
4	13	22-28	0.33	0.00	0.16	0.26	1.75	1.00	0.03	0.00	0.02
5	14	29-4	0.18	0.00	0.09	0.15	1.52	0.83	0.03	0.00	0.02
6	15	5-11 Feb	0.10	0.00	0.05	0.08	1.42	0.75	0.00	0.00	0.00

simultaneously with sucking pest incidence indicated to some natural check of sucking pests.

Kharif:

In *Kharif* 2007-08 green lacewing appeared in 14 WAS (43rd std week). While in 2008-09 it appeared earlier *i.e.*, 7 WAS (36th std week). Maximum population of green lacewing was found 0.07 per plant in 16 WAS (45th std week) during 2007-08 and 0.15 per plant during 12 WAS (41st std week) in 2008-09. The pooled data (Table 2) revealed that this predator appeared from 7 WAS (36th std week) and remained active throughout crop season. Maximum population (0.09 GLW /plant) was found during 16 WAS (45th std week). The coccinellid predator appeared from 7 WAS (36th std week) and remained throughout crop season in 2007-08 and appeared from 5 WAS (34th std week) in 2008-09 with maximum (1.03 LBB/plant) in 9 WAS (September, 17-23) in *Kharif* 2007-08 and 0.59 lady bird beetle per plant in 16 WAS (November, 5-11) in 2008-09. The pooled data (Table 2) indicated that lady bird beetle appeared from 5 WAS (34th std week) and continued from rest of crop period

with maximum population (0.74 /plant) in 9 WAS (38th std week). Spider population appeared from 7 WAS (36th SMW) in 2007-08 and 5 WAS (34th std week) in 2008-09 and thereafter remained throughout the crop period. The pooled data (Table 2) indicated that spider appeared between 5 WAS (34th std week) to 16 WAS (45th std week) with maximum population (0.47 / plant) in 9 WAS (38th std week). The activity of predators *viz.*, chrysopa, lady bird beetle and spider coincided with the incidence of sucking pest and exerting to some extent natural check on sucking pest.

Correlation between insect predators and their host insects:

In *Rabi* the correlation co-efficient (Table 3) revealed that the green lacewing had positively correlated with aphids and plant hopper ($r=0.240, 0.143$, respectively). It can be seen from the results that the predatory beetle had positive correlation with aphid ($r=0.614$) and the correlation co-efficient was significant, while significant negative correlation with plant hopper population ($r=-0.081$) indicated that the pest population might be suppressed by its predators. The spider

Table 2 : Population of natural enemies of sorghum during *Kharif* 2007-08 and 2008-09

Std. week	WAS	Date	Mean population per plant									
			Green lacewing			Lady bird beetle			Spider			
			2007-08	2008-09	Mean	2007-08	2008-09	Mean	2007-08	2008-09	Mean	
31	2	30-5 July	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	3	6-12 Aug	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33	4	13-19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34	5	20-26	0.00	0.00	0.00	0.00	0.57	0.28	0.00	0.46	0.23	0.23
35	6	27-2	0.00	0.00	0.00	0.00	0.36	0.18	0.00	0.55	0.28	0.28
36	7	3-9 Sep	0.00	0.06	0.03	0.06	0.36	0.21	0.04	0.38	0.21	0.21
37	8	10-16	0.00	0.09	0.05	0.10	0.52	0.31	0.08	0.31	0.20	0.20
38	9	17-23	0.00	0.10	0.05	1.03	0.45	0.74	0.59	0.35	0.47	0.47
39	10	24-30	0.00	0.08	0.04	0.73	0.18	0.45	0.45	0.28	0.36	0.36
40	11	1-7 Oct	0.00	0.03	0.02	0.38	0.27	0.32	0.42	0.31	0.36	0.36
41	12	8-14	0.00	0.15	0.08	0.38	0.27	0.33	0.39	0.49	0.44	0.44
42	13	15-21	0.00	0.14	0.07	0.81	0.30	0.55	0.48	0.37	0.42	0.42
43	14	22-28	0.05	0.06	0.05	0.67	0.38	0.52	0.12	0.15	0.13	0.13
44	15	29-4	0.03	0.08	0.06	0.58	0.28	0.43	0.07	0.26	0.16	0.16
45	16	5-11 Nov	0.07	0.12	0.09	0.53	0.59	0.56	0.05	0.12	0.08	0.08

Table 3 : Correlation between insect predator and their host insects of sorghum during *Rabi* (pooled)

Insect pest	Green lacewing	Lady bird beetle	Spider
Aphids	0.240*	0.614*	-0.005
Plant hopper	0.143*	-0.081*	0.152*

* indicate significance of values at P=0.05

Table 4 : Correlation between insect predator and their host insects of sorghum during *Kharif* (pooled)

Insect pest	Green lacewing	Lady bird beetle	Spider
Aphids	0.264*	0.157*	-0.027
Plant hopper	0.094*	0.443*	0.498*

* indicate significance of values at P=0.05

population had negative correlation with aphids population. While it had significant positive correlation with plant hopper ($r=0.152$). In *Kharif* (Table 4) the chrysoperla predator was positively correlated with aphids and plant hopper ($r=0.264$, 0.094 , respectively) and their correlation co-efficient was significant. Similarly the population of predatory beetle had significant positive correlation with aphids and plant hopper population ($r=0.157$, 0.443). While the spider was negatively correlated with aphid population, although their correlation co-efficient were non significant. While it had significant positive correlation with plant hopper ($r=0.498$). Thus three predators *viz.*, green lacewing, lady bird beetle and spider appeared simultaneously with sucking pest incidence indicated to some natural check of sucking pests Chandra and Kushwaha (1987) and Ghetiya (1992) also reported positive correlation of coccinellid with the aphid. Further, the positive correlation of jassid population with lady bird beetle was also reported by Kalariya (1983). Thus the present finding is in agreement to that of earlier results.

Summary :

In *Rabi* season green lacewing reached peak level in 1st std week (January, 1-7), lady bird beetle reached peak level at 3rd std week (January, 15-21) while spider reached peak level in 49th std week (December, 3-9). Results also revealed that chrysoperla was positively correlated with aphids and plant hopper ($r=0.240$, 0.143 , respectively), while lady bird beetle had positive correlation with aphids ($r=0.614$) and negative correlation with plant hopper population ($r=0.081$). Spider had significant positive correlation with plant hopper ($r=0.152$). In *Kharif* season the coccinellid and spider reached its maximum intensity 38th std week (September, 17-23) chrysopid reached its peak at 45th std week (November, 5-11) *i.e.*, at time of harvesting. Results revealed that green lacewing had positive and significant correlation with aphid and plant hopper ($r=0.264$, 0.094 , respectively) while lady bird beetle had positive and significant correlation with aphid in *Rabi* and *Kharif* season. While it was negatively correlated with plant hopper in *Rabi* season and positively correlated in *Kharif*. Spider had negative and non significant correlation with aphid, while positive and significant correlation with plant hopper. Thus,

results revealed that sucking pest was suppressed by these predators.

REFERENCES

- Chandra, S. and Kushwaha, K.S. (1987).** Impact of environmental resistance on aphid complex of cruciferous crops under the agro climatic conditions of Udaipur-II: Biotic components. *Indian J. Ent.*, **49**(1) : 86-113.
- Ghetiya, L.V. (1992).** Binomics, population dynamics and chemical control of aphid (*Aphis gossypii*) on coriander. M.Sc. (Ag.) Thesis, Gujarat Agricultural University, Junagadh, GUJARAT (INDIA).
- Hagen, K.S., Viktorov, G.A., Yasumatsu, K. and Schuster, M.F. (1976).** Range, forage and grain crops. pp. 397-442.
- Kalariya, G.B. (1993).** Insect pest sequence and varietal susceptibility in pigeon pea, (*Cajanas cajan*) under North Gujarat conditions. M.Sc. (Ag.) Thesis, Gujarat Agricultural University, Sardar Krushinagar, GUJARAT (INDIA).
- Rawat, R. and Modi, B.N. (1969).** Record of some predaceous coccinellid beetles on aphid and mite pert from Madhya Pradesh. *Indian J. Agric. Sci.*, **39**(1) : 1057.
- Sahayaraj, K. (2004).** *Indian Insect predators in Biological Control*. Daya publishing house, Delhi. pp. 4-5.
- Sakuratani, Y. (1977).** Spacial distribution pattern of the low density populations of aphids in the corn fields. *J. Appl. Ent. Zool.*, **21** : 66-73.
- Sathe, T.V. and Bhosale, Y.A. (2001).** *Insect pest predators*. Daya publishing house, Delhi. 124 p.
- Sathe, T.V., Inamdar, S.A. and Dawale, R.K. (2003).** *Indian pest parasitoids*. Daya publishing house, Delhi. pp.5-7.
- Sumalde, A.C., Calilung, V.J., Canlas, M.L.J. and Barile, G. (1993).** Studies in the management of Thrips palmi attacking potato in the low land. Inc. College, Laguna (Philippines). p-32.
- Vorley, W.T. (1986).** The activity of parasitoids (Hymenoptera: Braconidae) of cereal aphids (Hemiptera: Aphididae) in winter and spring in southern England. *Bull. Ent. Res.*, **76** : 491-504.
- Winder, L., Hirst, D.J., Carter, N., Wratten, S.D. and Sopp, P.I. (1994).** Estimating predation of the grain aphid *Sitobion avenae* by polyphagous predators. *J. Appl. Ecol.*, **31** : 1-12.

10th
Year
★★★★★ of Excellence ★★★★★