

Survey and surveillance of sunflower defoliator pests and their natural enemies in Northern dry zone of Karnataka

■ SYED MUZAMMIL* AND A.P. BIRADAR

Department of Agricultural Entomology, College of Agriculture (U.A.S.), VIJAYAPUR (KARNATAKA) INDIA

ARTICLE INFO

Received : 23.12.2016
Revised : 03.03.2017
Accepted : 10.03.2017

KEY WORDS :

Sunflower, Defoliator insect pests,
Foliage damage, Coccinellids, Spiders

ABSTRACT

Studies indicated the prevalence of high population of defoliator insect pests *viz.*, Tobacco cutworm, *Spodoptera litura* Fabricius, cabbage semilooper, *Thysanoplusia orichalcea* Fabricius, Bihar hairy caterpillar, *Spilarctia obliqua* Walker, on sunflower during 2014. The mean population of defoliators and per cent foliage damage was recorded maximum in Basavana Bagewadi and Hungund taluk while, it was minimum in Indi and Muddebihal generally, the population of defoliator insect pests occurrence on sunflower crop was very low during seedling stage and it was gradually increased during vegetative stage of the crop and reached a peak occurrence during reproductive stage. Maximum population of coccinellids and spiders were recorded in Basavana Bagewadi and Hungund taluk whereas, minimum Indi, Muddebihal and Sindagi taluk, respectively.

How to view point the article : Muzammil, Syed and Biradar, A.P. (2017). Survey and surveillance of sunflower defoliator pests and their natural enemies in Northern dry zone of Karnataka. *Internat. J. Plant Protec.*, **10**(1): 69-74, DOI : 10.15740/HAS/IJPP/10.1/69-74.

*Corresponding author:

Email : muzzujasu930@gmail.com

INTRODUCTION

Sunflower (*Helianthus annuus* L.) is one of the important oilseed crops in the world and ranks third in area after soybean and groundnut. Cultivated sunflower belongs to the family Asteraceae (Compositae) a native of Southern USA and Mexico. It is a rich source of edible oil (40-52%) having anti-cholesterol properties due to the presence of polyunsaturated fatty acids (55-65% linoleic acid and 20-30% oleic acid) (Joksimovic *et al.*, 2006).

Presently in India sunflower is cultivated over an area of 0.75 mha with a

production of 0.51mt and productivity (692 kg/ha⁻¹). The major sunflower growing states in the country are Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu. Among these, Karnataka is the leading state in the country, popularly known as "Sunflower state". Presently in Karnataka sunflower is cultivated over an area of 0.39 mha with the production of 0.19 mt and productivity of 503 kg/ha⁻¹ (Anonymous, 2013). In the recent past, the crop is also becoming popular in non-traditional states *viz.*, Punjab, Haryana and Uttar Pradesh.

Despite the rapid spread of other crop, disheartening trend to that, the productivity is going down in recent

years. The potential of the crop is, far from being exploited and the yield levels of the country are the lowest in the world due to several biotic and a biotic stresses. Among the several biotic stresses for successful sunflower production, susceptibility to insect pests and diseases is one of the major constraints. Sunflower serves as a host for a wide array of insect species. In India more than 50 insect species have been found to damage the crop at different stages of the crop growth. Among them, nine are major pests and remaining as miner ones. Insect pests of sunflower are broadly classified as seedling pests, sucking pests, soil insects, defoliators and inflorescence pests (Basappa and Santhalakshmi, 2005). The defoliating insects are definitely important pests of sunflower (Rogers, 1992). The loss in seed yield due to defoliators in a rain-fed *Kharif* crop was upto 58.06 per cent, per ha (Suhās *et al.*, 1996).

MATERIAL AND METHODS

Roving survey :

A roving survey was undertaken from seedling to harvesting stage of the crop in five taluks (Vijayapur, Basavana Bagewadi, Indi, Muddebihal and Sindagi) of Vijayapur district and one taluk (Hungund) of Bagalakote district during *Kharif/Rabi* 2014. From each taluk, five fields were selected and from each field ten plants were selected. Observations were recorded at different crop growth stages *viz.*, seedling (25 days after sowing), vegetative (25-45 days after sowing) and reproductive stage (45 days after sowing).

Fixed plot survey :

The fixed plot survey was carried out to know the incidence of defoliator pests infesting sunflower hybrid KBSH-53 was raised on the 4.2 x 4 m plot at Regional Agriculture Research Station (RARS) Vijayapur at weekly intervals starting from seedling stage to till harvest

of the crop. Observations on number of larvae per plant will be taken from 10 randomly selected plants in the field.

Observations on number of defoliator insect pests and number of natural enemies during seedling, vegetative and reproductive stage and percentage of leaf damage on 10 randomly selected plants were made. The incidence was estimated and the information was scored as follows:

- L = Low (<10% infestation)
- M = Medium (11-25% infestation)
- H = High (>25 % infestation)

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

Roving survey :

The data pertaining to defoliator insect pests, foliage damage and their natural enemy population is presented in Table 1, 2 and 3.

Among the different taluks surveyed during seedling stage of the crop, the maximum population density of *Spodoptera litura* was observed in Basavana Bagewadi (0.50 larvae/plant) followed by Hungund (0.48 larvae/plant) and Vijayapur (0.40 larvae/plant) taluks. The lowest population density 0.18 larvae/plant was recorded in Indi followed by Muddebihal (0.20 larvae/plant) and Sindagi taluk of 0.34 larvae/plant (Table 1).

The maximum population density of *Thysanoplusia orichalcea* was observed in Basavana Bagewadi (0.28 larvae/plant) followed by Hungund (0.26 larvae/plant) and Vijayapur (0.22 larvae/plant). The lowest population density 0.10 larvae/plant was recorded in Indi followed by Muddebihal (0.16 larvae/plant) and Sindagi 0.20 larvae/plant (Table 1). However, the population of *Spilarctia obliqua* was not observed in different taluks

Table 1 : Population density of sunflower defoliator pests and their natural enemies during seedling stage in different taluks

Sr. No.	Taluks	Population density of defoliator insect pests (larvae/plant)			% foliage damage due to defoliators	No. of natural enemies/plant	
		<i>S. litura</i>	<i>T. orichalcea</i>	<i>S. obliqua</i>		Coccinellids	Spiders
1.	Basavana Bagewadi	0.50	0.28	0.00	9.80	0.46	0.10
2.	Indi	0.18	0.10	0.00	4.30	0.16	0.02
3.	Muddebihal	0.20	0.16	0.00	5.20	0.20	0.04
4.	Sindagi	0.34	0.20	0.00	6.90	0.20	0.06
5.	Vijayapur	0.40	0.22	0.00	7.20	0.24	0.06
6.	Hungund	0.48	0.26	0.00	8.80	0.32	0.08

during seedling stage of sunflower crop (Table 1).

The maximum foliage damage was observed in Basavana Bagewadi (9.80%) followed by Hungund (8.80%) and Vijayapur (7.20%). The minimum foliage damage (4.30%) was recorded in Indi followed by Muddebihal (5.20%) and Sindagi 6.90 per cent (Table 1).

The maximum number of coccinellids were observed in Basavana Bagewadi (0.46adults/plant) followed by Hungund (0.32 adults/plant) and Vijayapur (0.24 adults/plant). The minimum numbers of coccinellids 0.16 adults/plant were recorded in Indi followed by Muddebihal and Sindagi 0.20 adults/plant (Table 1). The maximum number of spiders were observed in Basavana Bagewadi (0.10 adults/plant) and Hungund (0.08 adults/plant) and were followed by Vijayapur and Sindagi (0.06 adults/plant). The minimum number of spiders 0.02 adults/plant was recorded in Indi followed by Muddebihal taluk 0.04 adults/plant (Table 1).

Among the different taluks surveyed during vegetative stage of the crop, the maximum population density of *S. litura* was observed in Basavana Bagewadi (0.32 larvae/plant) followed by Hungund (0.30 larvae/plant) and Sindagi (0.26 larvae/plant). The lowest population density 0.18 larvae/plant was recorded in

Muddebihal followed by Vijayapur (0.20 larvae/plant) and Indi 0.24 larvae/plant (Table 2).

The maximum population density of *T. orichalcea* was observed in Basavana Bagewadi (1.54 larvae/plant) followed by Vijayapur and Hungund (1.46 larvae/plant). The lowest population density 1.02 larvae/plant was recorded in Indi followed by Muddebihal (1.26 larvae/plant) and Sindagi 1.28 larvae/plant (Table 2).

The maximum population density of *S. obliqua* was observed in Basavana Bagewadi (2.08 larvae/plant) followed by Hungund (2.06 larvae/plant) and Sindagi (1.92 larvae/plant). The lowest population density of 1.04 larvae/plant was recorded in Indi followed by Muddebihal (1.38 larvae/plant) and Vijayapur 1.64 larvae/plant (Table 2).

The maximum foliage damage were observed in Basavana Bagewadi (25.10%) followed by Hungund (24.00%) and Sindagi (21.20%). The minimum foliage damage of (11.40%) was recorded in Indi followed by Muddebihal (17.00%) and Vijayapur 20.90 per cent (Table 2).

The maximum number of coccinellids were observed in Basavana Bagewadi (0.90adults/plant) followed by Vijayapur (0.82 adults/plant) and Hungund (0.62 adults/plant). The minimum number of coccinellids 0.40 adults/

Table 2 : Population density of sunflower defoliator pests and their natural enemies during vegetative stage in different taluks

Sr. No.	Taluks	Population density of defoliator insect pests (larvae/plant)			% foliage damage due to defoliators	No. of natural enemies/plant	
		<i>S. litura</i>	<i>T. orichalcea</i>	<i>S. obliqua</i>		Coccinellids	Spiders
1.	Basavana Bagewadi	0.32	1.54	2.08	25.10	0.90	0.32
2.	Indi	0.24	1.02	1.04	11.40	0.40	0.16
3.	Muddebihal	0.18	1.26	1.38	17.00	0.48	0.22
4.	Sindagi	0.26	1.28	1.92	21.20	0.48	0.16
5.	Vijayapur	0.20	1.46	1.64	20.90	0.82	0.24
6.	Hungund	0.30	1.46	2.06	24.00	0.62	0.32

Table 3 : Population density of sunflower defoliator pests and their natural enemies during reproductive stage in different taluks

Sr. No.	Taluks	Population density of defoliator insect pests (larvae/plant)			% foliage damage due to defoliators	No. of natural enemies/plant	
		<i>S. litura</i>	<i>T. orichalcea</i>	<i>S. obliqua</i>		Coccinellids	Spiders
1.	Basavana Bagewadi	0.26	0.78	3.18	30.00	1.90	1.16
2.	Indi	0.18	0.42	1.70	17.80	1.48	0.62
3.	Muddebihal	0.28	0.44	2.28	22.40	0.98	0.28
4.	Sindagi	0.22	0.60	2.54	24.40	1.62	0.62
5.	Vijayapur	0.14	0.72	2.78	26.30	1.66	0.90
6.	Hungund	0.22	0.76	2.94	28.70	1.84	0.96

plant was recorded in Indi followed by Muddebihal and Sindagi of 0.48 adults/plant (Table 2). The maximum number of spiders was observed in Basavana Bagewadi and Hungund (0.32 adults/plant) followed by Vijayapur (0.24 adults/plant). The minimum number of spiders 0.16 adults/plant was recorded in Indi and Sindagi followed by Muddebihal 0.22 adults/plant (Table 2).

Among the different taluks surveyed during reproductive stage of the crop, the maximum population density of *S. litura* was observed in Muddebihal (0.28 larvae/plant) and Basavana Bagewadi (0.26 larvae/plant) followed by Hungund and Sindagi (0.22 larvae/plant). The lowest population density 0.14 larvae/plant was recorded in Vijayapur followed by Indi 0.18 larvae/plant (Table 3).

The maximum population density of *T. orichalcea* was observed in Basavana Bagewadi (0.78 larvae/plant) followed by Hungund (0.76 larvae/plant) and Vijayapur (0.72 larvae/plant). The lowest population density of 0.42 larvae/plant was recorded in Indi followed by Muddebihal (0.44 larvae/plant) and Sindagi 0.60 larvae/plant (Table 3).

The maximum population density of *S. obliqua* was observed in Basavana Bagewadi (3.18 larvae/plant) followed by Hungund (2.94 larvae/plant) and Vijayapur (2.78 larvae/plant). The lowest population density of 1.70 larvae/plant was recorded in Indi followed by Muddebihal (2.28 larvae/plant) and Sindagi 2.54 larvae/plant (Table

3).

The maximum incidence of foliage damage were observed in Basavana Bagewadi (30.00%) followed by Hungund (28.70%) and Vijayapur (26.30%). The minimum incidence of foliage damage of (17.80%) was recorded in Indi followed by Muddebihal (22.40%) and Sindagi 24.40 per cent (Table 3).

The maximum number of coccinellids was observed in Basavana Bagewadi (1.90 adults/plant) followed by Hungund (1.84 adults/plant) and Vijayapur (1.66 adults/plant). The minimum number of coccinellids (0.98 adults/plant) was recorded in Muddebihal followed by Indi (1.48 adults/plant) and Sindagi 1.62 adults/plant (Table 3). The maximum number of spiders was observed in Basavana Bagewadi (1.16 adults/plant) followed by Hungund (0.96 adults/plant) and Vijayapur (0.90 adults/plant). The minimum number of spiders 0.28 adults/plant was recorded in Muddebihal followed by Indi and Sindagi 0.62 adults/plant (Table 3).

Fixed plot survey :

The data pertaining to defoliator insect pests, foliage damage and their natural enemy population is presented in Table 4.

The population density of *S. litura* larvae ranged from 0.40 to 0.90 larvae/plant. The population increased gradually and reached peak during 38 DAS (0.90 larvae/

Table 4 : Studies on the population density of defoliator insect pests and natural enemies in sunflower under fixed plot

Date of survey	Standard meteorological weeks	Crop duration (days)	Population density of defoliator insect pests (larvae/plant)			% foliage damage due to defoliators	No. of natural enemies/plant	
			<i>S. litura</i>	<i>T. orichalcea</i>	<i>S. obliqua</i>		Coccinellids	Spiders
25-08-2014	34	10	0.00	0.00	0.00	0.00	0.00	0.00
02-09-2014	35	17	0.40	0.10	0.00	4.50	0.10	0.00
09-09-2014	36	24	0.50	0.20	0.00	7.50	0.10	0.10
16-09-2014	37	31	0.60	0.30	0.20	10.50	0.20	0.20
23-09-2014	38	38	0.90	0.40	1.00	13.50	0.40	0.30
30-09-2014	39	45	0.70	0.80	1.50	18.50	1.20	0.50
07-10-2014	40	52	0.70	2.00	1.60	25.00	1.60	0.70
14-10-2014	41	59	0.60	1.90	2.80	30.50	2.00	0.90
21-10-2014	42	66	0.40	1.60	3.20	36.50	2.20	1.10
28-10-2014	43	73	0.30	1.40	3.80	45.50	2.50	1.70
05-11-2014	45	80	0.20	1.00	2.00	52.50	2.00	1.60
12-11-2014	46	87	0.00	0.40	1.00	59.50	1.50	1.20
19-11-2014	47	94	0.00	0.00	0.20	-	1.00	1.00
26-11-2014	48	101	0.00	0.00	0.00	-	0.00	0.20
03-12-2014	49	108	0.00	0.00	0.00	-	0.00	0.00

plant) of the crop. There was decline in larval populations in later stages of the crop growth (Table 4).

The activity of defoliating insect pest population was low during seedling stage. The population increased gradually from vegetative to reproductive stage of the crop. The population density of *T. orichalcea* ranged from 0.10 to 2.00 larvae/plant, highest larval population was reached during 52 DAS (2.00 larvae/plant) of the crop. There was decline in larval populations in later stages of the crop growth (Table 4).

The population density of *S. obliqua* was observed during 31 DAS (days after sowing), in which the larval population of *S. obliqua* ranged from 0.20 to 3.80 larvae/plant, highest larval population was reached during 73 DAS (3.80 larvae/plant) of the crop. There was decline in larval populations in later stages of the crop growth (Table 4).

The population density of coccinellids and spiders per plant were observed during 17 days and 24 days, in which the population of coccinellids and spiders ranged from 0.10 to 2.50/plant and 0.10 to 1.70/plant, highest coccinellids and spiders population was reached during 73 days (2.50 larvae/plant) and 73 days (1.70 larvae/plant) of the crop (Table 4).

The foliage damage noticed on the crop at seedling stage was at lower level, the foliage damage gradually increased day by day, per cent foliage damage increased from 4.50 to 59.50 per cent. Highest per cent foliage damage was reached during 87 DAS (59.50%) of the crop (Table 4).

The present investigation are close conformity with the outcomes of Basappa (1995) who opined that, sunflower crop is damaged by different species of insect pests, of which the polyphagous pests like capitulum borer *Helicoverpa armigera* (Hubner.), green semilooper *T. orichalcea*, Bihar hairy caterpillar *S. obliqua*, tobacco caterpillar, *S. litura*, were of major economic importance. Bilapate and Jadhav (1995) who opined that, occurrence of pests depends upon on the crop age, opined that the defoliators like *S. litura*, *Trichoplusia ni* and *S. obliqua* active from 25-60 days and other pests like *Helicoverpa armigera*, *S. obliqua* were active 60-100 days old crop. The activity of lepidopteron defoliators like *S. litura*, *T. orichalcea* and *S. obliqua* were observed on soybean crop from 28 days after growth and caused severe defoliation (Kamala, 2000). Sunflower crop in Uttar Pradesh in winter, summer

and monsoon periods, out of 35 species observed, *Monolepta signata*, *Alticacyanea*, *A. crenulata*, *Nysius minor*, *Leptocentrus taurrus*, *S. obliqua*, *T. orichalcea* and *H. armigera* were important pests (Shyam *et al.*, 2000).

The present investigation are closely related with earlier workers Suhas *et al.* (1996) reported that sunflower cv. MORDEN was defoliated by 0, 25, 50, 75 or 100 per cent on 25, 50 and 75 days after sowing (DAS) to simulate attack by *Spilosoma obliqua* and *Thysanoplusia orichalcea*. The loss in seed yield per hectare due to defoliators in a rain-fed *Kharif* crop was upto 58.06 per cent. Bakhietia *et al.* (1997) also found that, *Amrasca biguttula biguttula*, *Bemisia tabaci*, *Helicoverpa armigera*, *S. litura*, *Trichoplusia ni* and *S. obliqua* were the important insect pests in Punjab and causes upto 35.7 to 51.3 per cent reduction in yield of sunflower.

The results were in agreement with the findings of Ambrose *et al.* (2000) who reported in pigeonpea maximum predation was noticed at the highest prey densities and searching time decreased as prey density increased. Borah and Dutta (2003) who reported that, predatory spiders of *H. armigera* in pigeonpea ecosystem was *Oxyopes ratnae*, *Oxyopes shewta*, *Neoscona* spp. and *Plexippus paykullii* appeared from flowering until maturity and at senescence. Manu (2012) studied seasonal population density of natural enemies in soybean during *Kharif* season and found the activity of coccinellids (2.54/mrl), chrysopids (0.94/mrl) and *N. rileyi* infected cadavers (9.50/mrl) during cropping period.

REFERENCES

- Ambrose, D.P., Claver, M.A. and Mariappan, P. (2000). Functional response of *Rhynocoris marginatus* (Heteroptera: Reduviidae) to two pests of pigeonpea (*Cajanus cajan*). *Indian J. Agric. Sci.*, **70** (9) : 630-632..
- Bakhietia, D.R. C., Kaur, Sukhwinder, Sandhu, I. S., Brar, D. S. and Kular, J.S. (1997). Monitoring of insect pests and quantification of yield losses in sunflower. *J. Insect Sci.*, **10** (2) : 140-142.
- Basappa, H. (1995). Insect pest management in sunflower – innovative approaches, In: *Subject matter workshop cum seminar on integrated pest management in oilseeds*, October 10-17, Directorate of Oilseeds Research, Hyderabad.
- Basappa, H. and Santhalakshmi Prasad, M. (2005). Insect pests and diseases of sunflower and their management (Ed.

Hegde, D.M., Directorate of Oilseeds Research, Hyderabad, 80pp.

Bilapate, G.G. and Jadhav, R.N. (1995). Key pests of sunflower and their parasites in Marathwada, *Proc. Indian natn. Sci. Acad.*, **61**(4): 275 - 280.

Borah, S.R. and Dutta, S.K. (2003). Predatory spiders of *Helicoverpa armigera* (Hubner) in pigeonpea. *Insect-Environment.*, **9** (1): 18-20.

Joksimovic, J., Atlagic, J., Marinkovic, R. and Jovanovi, D. (2006). Genetic control of oleic and linoleic acid contents in sunflower. *Helia*, **29** (44) : 33-40.

Kamala, N.V. (2000). Development of integrated pest management modules for soybean [*Glycine max* (L.)Merril.], M.Sc. (Ag.), Thesis, University of Agricultural Sciences, Bangalore, KARNATAKA (INDIA).

Manu, N. (2012). Crop loss estimation and management of

leaf eating caterpillars in soybean. M.Sc. (Ag.) Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA).

Rogers, C.E. (1992). Insect pests and strategies for their management in cultivated sunflower. *Field Crops Res.*, **30** (3-4): 301-332.

Shyam, L., Rajnish, K. and Ali, S. (2000). Studies on the insect pest succession of sunflower in eastern Uttar Pradesh. *Shashpa*, **7**(1) : 95-97.

Suhas, Y., Balikai, R.A., Shantappanavar, N.B., Naganagouda, A., Lingappa, S. and Gumaste, S.K. (1996). Studies on artificial defoliation in dry land sunflower, *Karnataka J. Agric. Sci.*, **9** (2) : 250-252.

■ WEBLIOGRAPHY

Anonymous (2013). *Indiastat.com*- India's comprehensive statistical analysis, data information and facts about India.

10th
Year
★★★★★ of Excellence ★★★★★