DOI: 10.15740/HAS/AU/12.TECHSEAR(1)2017/54-57
Agriculture Update
Volume **12** | TECHSEAR-1 | 2017 | 54-57
Visit us : *www.researchjournal.co.in*
e ISSN-0976-6847

RESEARCH ARTICLE :

Estimation of yield losses caused by defoliators in sunflower

NARESHKUMAR E. JAYEWAR, SADASHIV S. GOSALWAD AND MILIND M. SONKAMBLE

ARTICLE CHRONICLE :
Received :
05.07.2017;
Accepted :
22.07.2017

SUMMARY : A field experiment in paired plot design with two treatments and sixteen replications was laid out at experimental farm of Oilseeds Research Station, Latur, to assess the relative abundance and extent of damage caused by the various pests attacking sunflower in the Marathwada region of the Maharashtra state during the 2011 and 2013 in *Kharif* seasons. Selective applications of insecticides such as quinalphos , profenophos and Spinosad was deployed in field experiments to determine the extent of damage caused by the defoliators of the sunflower. For the management of other sucking pest and head borer selective insecticides treatment was given in both protected and unprotected plots of the experiment. Pooled results indicated that sunflower crop left unprotected recorded significant yield reduction to the extent of 20.29 per cent as compared to crop protected through chemicals.

How to cite this article : Jayewar, Nareshkumar E., Gosalwad, Sadashiv S. and Sonkamble, Milind M. (2017). Estimation of yield losses caused by defoliators in sunflower. *Agric. Update*, **12**(TECHSEAR-1) **: 54-57; DOI: 10.15740/HAS/AU/12.TECHSEAR(1)2017/54-57.**

KEY WORDS :
Sunflower, Defoliators, Yield losses

Author for correspondence :
NARESHKUMAR E. JAYEWAR
Department of Agricultural Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, PARBHANI (M.S.) INDIA
Email:nareshkumarjayewar@gmail.com

See end of the article for authors' affiliations

BACKGROUND AND OBJECTIVES

Sunflower popularly known as Surajmukhi, is a familiar plant in India. The plant was traditionally grown for its ornamental value. However, presently sunflower is mainly grown for its oil. The oil is used for culinary purposes, in the preparation of *Vanaspati* and in the manufacture of soaps and cosmetics. It is especially recommended for heart patients. Its cake is rich in protein and is used as a cattle and poultry feed. The major sunflower growing states are Karnataka, Andhra Pradesh, Maharashtra, Tamil Nadu and Haryana Sunflower is cultivated in an area of 0.90 million ha with a production of 0.62 million tones and productivity of 696 kg per ha in India (Deepa *et al.*, 2015).This productivity of sunflower in India is much lower than global average productivity, this is mainly attributed to occurrence of several pests and diseases on sunflower. The crop is suffering from many diseases like leaf spot, blight, downy mildew, powdery mildew, charcoal rot, sclerotium rot or wilt, rhizopus head rot, sunflower necrosis virus, cucumber mosaic virus and root knot nematode (Saharan *et al.*, 2005) and about 251 insect pests are reported to infest the sunflower and among these a major pests are leafhoppers, thrips, whiteflies, defoliators and head borers are key

pest of the crop.

Amoung these insects in the Indian subcontinent, though more than fifty insect species have been reported on sunflower, cutworms (*Agrotis* spp.), sucking pests, leaf and plant hoppers (*Amrasca biguttula biguttula* Ishida, *Empoasca* spp.), thrips (*Thrips palmi* Karny), whitefly (*Bemisia tabaci* Gennadius), defoliators (*Spilosomaobliqua* Walker, *Spodoptera litura* Fabricius, and *Plusia orichalcea* Fab.) and capitulum borer (*Helicoverpa armigera* Hubner) are major pests of economic concern (Basappa, 1998). In Marathwada region of the Maharashtra state of the country is continuously witnesses the heavy attack of defoliators, (Anonymous, 2013) but detailed and systematic studies on the levels of damage caused were lacking. Therefore the study was undertaken to assess the relative abundance and extent of damage caused by, the various pests attacking groundnut in the region.

RESOURCES AND METHODS

The experiments were conducted at field of Entomology section of Oilseeds Research Station, Latur during the year 2009-2010, 2010–2011 and 2011-2012 on Sunflower variety Morden. The experiment was laid out in paired plot design with two treatments, and sixteen replication. The crop was sown at the spacing of 60 cm x 30 cm having gross and net plot size was 4.2 x 4.5 m^2. and 3.6 x 4.2 m^2, respectively. All the agronomical practices were followed as per recommendations. In first treatment (T_1-protected), the spray application of quinalphos 0.03 per cent, profenophos 0.05 per cent, and Spinosad 0.006 per cent were given with help of manually operated knapsack sprayer after the appearance of the defoliating pests while other treatment plots and protected were sprayed with selective insecticides so as manage sucking pest and head borer in both protected and unprotected plots of the experiment, but sprays in unprotected plots were avoided in presence of defoliating pest and for management of other pest mechanical collection and other mechanical management means such as use of sticky traps for sucking pest was followed. The observation on the defoliators population were recorded before and after 5 days of application of insecticides in both the treatment on five plants which were selected randomly from each plot and at the end of the experiment mean population of the pest in both the treatment was worked out and original data was transformed using square root transformation and further statistical analysis was carried out.

Estimation of yield losses:

Seed yield received from protected and unprotected at harvest were recorded separately from each net plot and data so collected was subjected to analysis and result obtained was compaired using t test of significance. The increased yield over control and avoidable yield losses were computed using following formula (Pradhan,1969).

$$\text{Percentage yield increase over control} = 100 \times \left[\frac{T - C}{C}\right]$$

$$\text{Avoidable yield losses} = 100 \times \left[\frac{T - C}{T}\right]$$

where,

T = Yield from treated Plot (kg/ha)

C = Yield from control Plot (kg/ha)

Treatments details : Two

T_1 - Protected through chemical

T_2 -Unprotected

OBSERVATIONS AND ANALYSIS

From the Table 1 to 4, it can be concluded that, crop protected through chemicals was least infested by pest as compared to crop left unprotected, as mean population of defoliators in protected plot was 0.99 larvae/plant which was significantly less of that 1.90 larvae/plant in unprotected plot. As a result of which crop left unprotected recorded significantly less yield *i.e.* 1759 kg/ha as compared to crop protected through chemicals *i.e.* 2127 kg/ha wchich means unprotected plot recorded a yield loss of 368 kg/ha .Similarly significant yield reduction to the extent of 17.30 per cent was recorded in unprotected treatment. As result protected treatment recorded highest net return of Rs. 5718, and IBCR 1:1.83 over unprotected tretment .

The results of yield losses on sunflower are in conformity with those recorded by Basappa (1997) and he further explained that the sunflower crop is damaged at different phenological stages by several defoliators which include *Spilosoma obliqua* Walker, *Spodoptera litura* Fabricius, *Spodoptera exigua* Hub., *Estigmene lactinea* Fab., *Euproctis fraterna* Fab., *Euproctis virguncula* Wlk. *P.ricini* Fab., *Plusia signata* Fab. and *Plusia orichalcea* Fab. The loss in seed yield due to

Table 1 : Estimation of yield loss caused by defoliators

Treatments	Av. defoliators	Yield		Treatments	Av. defoliators	Yield	
Control (Unproected)	larvae / plant	kg / plot	kg / ha	Protected through chemicals	larvae / plant	kg/plot	kg/ha
1	2.20	2.32	1983	1	0.40	2.62	2239
2	1.80	2.38	2034	2	0.10	2.68	2291
3	1.20	1.90	1622	3	0.10	2.18	1863
4	1.80	1.82	1556	4	0.00	2.46	2103
5	2.40	1.92	1644	5	0.40	2.60	2219
6	2.60	2.29	1954	6	0.60	2.84	2429
7	1.20	2.40	2051	7	0.40	2.95	2517
8	1.80	2.18	1865	8	0.20	2.40	2047
9	2.20	2.00	1711	9	0.10	2.44	2088
10	2.40	2.18	1860	10	0.20	2.42	2068
11	2.60	2.12	1815	11	0.40	2.42	2071
12	2.00	1.99	1697	12	0.00	2.46	2103
13	2.40	1.42	1217	13	0.60	2.98	2546
14	2.00	1.90	1621	14	0.40	2.00	1709
15	2.60	1.93	1648	15	0.80	2.06	1761
16	1.80	2.19	1871	16	0.20	2.32	1983
Average	2.06	2.06	1759	Average	0.31	2.49	2127
t = 4.92	**significant(t =2.13 5%,2.94%)						

Table 2 : Percentage loss in yield

Sr. No.	Treatments	Yield (kg/ha)	Yield losses (kg/ha)	Percentage loss
1.	Protected (T_1)	2127		
2.	Unprotected (T_2)	1759	368	17 .30%
	'T' value	4.92**		

** indicate significance of values at P= 0.05

Table 3 : Economics of the protected over unprotected

Sr. No.	Treatments	Cost of cultivation	Cost of treatments (Rs.)	Gross returns (Rs.)	Net returns (Rs.)	I.R	ICBR
1.	Protected (T_1)	18000	4586	59556	36970	5718	1:1.83
2.	Unprotected (T_2)	18000	--	49252	31252		

*IR= Incremental return over control; Cost of groundnut pods is considered as Rs. 45/kg

defoliators in a rainfed *Kharif* crop was upto 268 kg/ha. If the defoliators attack is before sunflower initiation it would affect food partitioning between stem, leaves and roots and if it is later it would affect growth of both vegetative parts and inflorescence. *Spilosoma obliqua* is highly polyphagous and occurs all over India, and is often reported to cause colossal damage to sunflower. *Spodoptera* may also assume injurious levels similar to *S. obliqua.* Adults of *Zygogramma bicolorata* Pallister which were released as biocontrol agents for the control of *Parthenium* weed were observed feeding on sunflower plants in an isolated field. Beetles were also found in low numbers on other plant species like *Amaranthus* spp., cultivated sunflower *Helianthus annuus* and wild sunflower *H. tuberosus* L., but feeding was negligible though there was a high population and severe defoliation of *Parthenium* in the vicinity. Rajanna (1995) reported that the defoliators injuries to sunflower crop are economically important and their infestation ranged from seed germination to harvest of the crop . In groundnut similar result was reported by Singh and Sacchan (1992) that groundnut crop is damaged by thrips,cicadelid and *Spilosoma obligua* at vegetative and bloom stage resulted in 23.0 and 31.4 per cent yield loss.hence, the crop protection measures against the pest at the vegetative and bloom stage found most effective in minimising the yield loss.

Table 4 : Estimation of yield loss due to defoliators: Pooled results (2009-2011)

Sr. No. / Treatment no.	Av. defoliators larvae / plant								Yield/Pl							
	Unprotected				Protected				Unprotected				Protected			
	2009	2010	2011	Pooled mean	2009	2010	2011	Pooled mean	2009	2010	2011	Pooled mean	2009	2010	2011	Pooled Mean
1	5.30	3.70	2.20	3.73	0.20	0.60	0.40	0.40	1.168	0.883	2.32	1.46	1.619	1.13	2.62	1.79
2	6.20	2.30	1.80	3.43	0.80	0.20	0.10	0.37	1.021	1.165	2.38	1.52	1.422	1.2	2.68	1.77
3	5.00	2.55	1.20	2.92	0.60	0.30	0.10	0.33	0.969	1.298	1.90	1.39	1.582	1.52	2.18	1.76
4	5.50	3.25	1.80	3.52	0.40	0.40	0.00	0.27	0.936	1.117	1.82	1.29	1.307	1.28	2.46	1.68
5	7.00	1.50	2.40	3.63	0.60	0.15	0.40	0.38	1.044	0.919	1.92	1.30	1.415	1.79	2.60	1.93
6	6.70	1.45	2.60	3.58	0.30	0.05	0.60	0.32	0.936	1.053	2.29	1.43	1.568	1.31	2.84	1.91
7	7.20	2.50	1.20	3.63	0.40	0.10	0.40	0.30	0.965	1.263	2.40	1.54	1.472	1.34	2.95	1.92
8	5.90	2.40	1.80	3.37	0.50	0.15	0.20	0.28	1.041	1.507	2.18	1.58	1.519	1.56	2.40	1.82
9	6.80	3.45	2.20	4.15	0.80	0.25	0.10	0.38	0.968	1.373	2.00	1.45	1.482	1.53	2.44	1.82
10	6.30	1.25	2.40	3.32	0.70	0.35	0.20	0.42	0.948	1.263	2.18	1.46	1.475	1.36	2.42	1.75
11	5.80	2.40	2.60	3.60	0.60	0.15	0.40	0.38	0.998	1.116	2.12	1.41	1.24	1.39	2.42	1.68
12	6.70	1.40	2.00	3.37	0.20	0.30	0.00	0.17	1.101	1.311	1.99	1.47	1.405	1.45	2.46	1.77
13	5.70	1.75	2.40	3.28	0.40	0.15	0.60	0.38	0.989	1.127	1.42	1.18	1.352	1.17	2.98	1.83
14	6.30	1.50	2.00	3.27	0.50	0.10	0.40	0.33	1.04	1.015	1.90	1.32	1.427	1.3	2.00	1.58
15	7.10	1.25	2.60	3.65	0.60	0.20	0.80	0.53	1.113	1.08	1.93	1.37	1.505	1.14	2.06	1.57
16	6.40	1.40	1.80	3.20	0.30	0.25	0.20	0.25	1.066	0.761	2.19	1.34	1.439	1.2	2.32	1.65
Average	6.24	2.13	2.06	3.48	0.49	0.23	0.31	0.34	1.02	1.14	2.06	1.41	1.45	1.35	2.49	1.77
	2.60	1.62	1.60	1.99	0.99	0.85	0.90	0.92	1.23	1.28	1.60	1.38	1.40	1.36	1.73	1.51
t value(pooled mean)=10.87**									**Significant(t =2.13 5%,2.94%)							

Figures in bold are square root transformed values.

Authors' affiliations :

SADASHIV S. GOSALWAD AND MILIND M. SONKAMBLE, Department of Agricultural Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, PARBHANI (M.S.) INDIA

REFERENCES

Anonymous (2013). Status report on pest of groundnut ,Oilseeds Research Station, Latur.

Basappa, H. (1997). Incidence of bio-control agent *Zygogramа bicolorata* Pallister on *Parthenium hysterophorus* L.p. 81-84. Mahadevappa, M and Patil, V.C. (eds). *In:* First International conference on Parthenium Management,University of Agricultural Sciences, Dharwad, Karnataka, India, Vol. 2, 182 pp.

Basappa, H. (1998). Strategies for insect pest management in sunflower. *In*: Abstracts- International Conference on Pest and Pesticide Management for Sustainable Agriculture, 11-13 December, 1998, C.S.A. University of Agriculture and Technology, Kanpur, India. 374p.

Deepa, Sunkad, Gururaj, Govindappa, M.R., Naik, M.K. and Suresh, S.R. (2015). Estimation of yield loss in sunflower due to new sunflower leaf curl virus disease at different stages of crop growth. *Internat. J. Plant Protec.*, **8**(1):138-141.

Pradhan, S. (1969). Insect pests of crops. *National Book Trust*, New Delhi, India, 80 pp.

Rajnna, D. (1995). Assesment of yield losses due to defoliator insect in Sunflower (*Helianthus annus* L.). M.Sc. (Ag.), University of Agricultural Sciences, Bangalore, KARNATAKA (INDIA).

Saharan, G.S., Naresh, M. and Sangwan, M.S. (2005). *Diseases of oilseed crops.* pp ISBN-81-7387-176-0, Indus Publishing Company,New Delhi. 38 pp.

Singh,K.N. and Sacchan, G.C. (1992). Assesment of yield loss due to insect pest at different growth stages of groundnut in Pantnagar , Uttar Pradesh, India. *Crop Protection*,**11**(5) :414-418. (Source RAE(1993), 81(2) :1764).