# Effect of certain insecticides on spider population in sesame

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## ABSTRACT

Population of spiders in TMV 4 was investigated in the two field experiments conducted during June to August 2011 in Karaikal district, U.T. of Puducherry, India. Four foliar applications were given and the population of spiders was higher in the untreated check (0.60 and 2.16/plant) while a low population was recorded in the newer insecticides and biopesticides treatments which ranged from 0.13 to 1.33/plant in the field experiment I. In the field experiment II, a higher population was recorded in the untreated check (0.60 to 1.90/plant) compared to the other newer insecticides and biopesticides treatments (0.13 to 1.43/plant).

**Key words:** Biosafety**,** Newer insecticides, sesame, spiders

## INTRODUCTION

Sesame (*Sesamum indicum* L.) commonly known as Til, is one of the most important edible oilseeds cultivated in India. It belongs to the family Pedaliaceae. In India, it occupies about 2.5 million ha (45% of world area) and the total production is nearly 52,000 tonnes (Anonymous, 2006). Sesame is the sixth most important oilseeds crop in the world with an area of 7.78 million ha and a total production of 3.66 million tonnes (Anonymous, 2008). It is grown in Aden, Burma, France, Russia, Italy, Spain, Cyprus, East and West Africa. In India, sesame is cultivated in Rajasthan, Maharashtra, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka, Uttar Pradesh, West Bengal, Orissa, Punjab and Tamil Nadu (Sankar Narayanan and Nadarajan, 2005). Damage caused by insect pests is one of the major causes limiting the yield of the sesame. Twenty nine insect-pests have been reported infesting this crop at various stages of plant growth (Biswas *et al.,* 2001; Rakesh Kumar *et al*., 2010).

Among the 29 insect species, sesame shoot and leaf webber, *Antigastra catalaunalis* (Duponchel) is considered a serious pest. The shoot and leaf webber attacks all parts of sesame, except the roots. It feeds on the tender foliage by webbing the top leaves and also bores into the shoots and pods (Sharma and Reddy, 1983; Sankar Narayanan and Nadarajan, 2005).

Among the various methods of pest management, the uses of insecticides form the first line of defence against the insect pests. Newer insecticide molecules may be a better alternative than the application of conventional synthetic insecticides in the context of environmentally benign management tactics so also in order to mitigate the adverse effects on the total environment. In many cases, alternative or ecofriendly method of insect pest management offer adequate level of pest control with less hazards and safe to non-target organisms. In the present study, the impact of natural enemies due to the application of newer insecticides and biopesticides were evaluated and presented.

## MATERIALS AND METHODS

Two field experiments were conducted to evaluate the newer insecticides against the insect pests of sesame during June to August 2011 at west and east farm of Pandit Jawaharlal Nehru College of Agriculture and Research Institute (PAJANCOA and RI) Farm, Karaikal. In this, the population of spiders in the sesame variety TMV 4 was studied. The experiment was laid out in a Randomized Block Design with three replications and ten treatments in a 5 x 3.5 square meter plots. The treatments includes profenofos 50 EC @ 500g a.i./ha, triazophos 40 EC @ 200 g a.i./ha, lambda cyhalothrin 5 EC @ 25 g a.i./ha, spinosad 45 SC @ 33.75 g a.i./ha, bifenthrin 10 EC @ 62.5 g a.i./ha,

**Table 1.** Effect of newer insecticides on the population of spiders in sesame variety TMV 4 (field experiment I)

| Treatment | Number of spiders/plant# | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I foliar application | | | | II foliar application | | | III foliar application | | | IV foliar application | | |
| | 30 DAS Pre count | 1 DAT | 7 DAT | 14 DAT (45 DAS) Pre count | 1 DAT | 7 DAT | 14 DAT (60 DAS) Pre count | 1 DAT | 7 DAT | 14 DAT ( 75 DAS) Pre count | 1 DAT | 7 DAT | 14 DAT (91 DAS) Pre count |
| Profenofos 50 EC @ 500 g a.i./ha | 0.93 | $0.26^{bc}$ | $0.90^{b}$ | $1.26^{b}$ | $0.03^{c}$ | $0.63^{bc}$ | $1.13^{cd}$ | $0.40^{bc}$ | $0.63^{bc}$ | $0.83^{b}$ | $0.23^{cd}$ | $1.13^{b}$ | $0.90^{b}$ |
| Triazophos 40 EC @ 200 g a.i./ha | 0.86 | $0.06^{cd}$ | $0.90^{b}$ | $1.26^{b}$ | $0.10^{bc}$ | $0.73^{bc}$ | $1.40^{bc}$ | $0.26^{bc}$ | $0.66^{bc}$ | $1.00^{b}$ | $0.30^{bc}$ | $1.03^{b}$ | $1.06^{b}$ |
| Lambda cyhalothrin 5 EC @ 25 g a.i./ha | 0.56 | $0.10^{cd}$ | $1.16^{b}$ | $1.20^{b}$ | $0.16^{bc}$ | $0.50^{bc}$ | $0.96^{d}$ | $0.20^{bc}$ | $0.36^{d}$ | $0.76^{b}$ | $0.16^{d}$ | $0.76^{c}$ | $1.20^{b}$ |
| Spinosad 45 SC 33.75 g a.i./ha | 0.66 | $0.10^{cd}$ | $1.00^{b}$ | $1.06^{b}$ | $0.20^{bc}$ | $0.63^{bc}$ | $1.30^{bcd}$ | $0.10^{c}$ | $0.53^{cd}$ | $0.86^{b}$ | $0.13^{d}$ | $1.20^{b}$ | $1.23^{b}$ |
| Bifenthrin 10 EC 62.5 g a.i./ha | 0.76 | $0.10^{cd}$ | $1.03^{b}$ | $1.13^{b}$ | $0.10^{bc}$ | $0.60^{bc}$ | $1.30^{bcd}$ | $0.30^{bc}$ | $0.70^{bc}$ | $1.13^{ab}$ | $0.23^{cd}$ | $1.00^{b}$ | $1.33^{b}$ |
| Thiamethoxam 25 WG 31.25 g a.i./ha | 1.10 | $0.03^{d}$ | $1.10^{b}$ | $1.20^{b}$ | $0.16^{bc}$ | $0.83^{abc}$ | $1.6^{ab}$ | $0.23^{bc}$ | $0.66^{bc}$ | $1.16^{ab}$ | $0.23^{cd}$ | $1.00^{b}$ | $1.20^{b}$ |
| Imidacloprid 17.8 SL 22.2 g a.i./ha | 0.80 | $0.20^{bcd}$ | $0.90^{b}$ | $1.20^{b}$ | $0.16^{bc}$ | $0.90^{ab}$ | $1.00^{d}$ | $0.30^{abc}$ | $0.76^{bc}$ | $1.10^{ab}$ | $0.23^{cd}$ | $1.06^{b}$ | $1.20^{b}$ |
| Azadirachtin 0.03% | 1.03 | $0.43^{b}$ | $1.26^{b}$ | $1.06^{b}$ | $0.36^{bc}$ | $0.43^{c}$ | $1.30^{bcd}$ | $0.23^{bc}$ | $0.90^{b}$ | $1.23^{ab}$ | $0.43^{b}$ | $0.96^{bc}$ | $1.13^{b}$ |
| *B. thuringiensis* var. *kurstaki* 50 g a.i./ha | 1.30 | $0.13^{cd}$ | $1.10^{b}$ | $1.23^{b}$ | $0.06^{bc}$ | $0.50^{c}$ | $1.03^{cd}$ | $0.30^{abc}$ | $0.80^{bc}$ | $1.16^{ab}$ | $0.30^{bc}$ | $1.03^{b}$ | $1.23^{b}$ |
| Untreated check | 0.76 | $1.23^{a}$ | $1.90^{a}$ | $2.16^{a}$ | $0.60^{a}$ | $1.20^{a}$ | $1.90^{a}$ | $0.66^{a}$ | $1.30^{a}$ | $1.60^{a}$ | $0.66^{a}$ | $1.53^{a}$ | $1.86^{a}$ |
| CD (P=0.05) | NS | 0.132** | 0.118* | 0.089** | 0.169* | 0.125* | 0.089* | 0.147* | 0.098** | 0.128* | 0.065** | 0.065** | 0.155* |

NS - Not significant; In a column mean followed by a common letter are not significantly different by DMRT (P=0.05); *****- Significant at P=0.05; Values in parentheses are transformed values √X+0.5; ******-Significant at P=0.01; DAS- Days after sowing; #-Mean of 10 plants; DAT- Days after treatment; Data are mean of 3 replications thiamethoxam 25 WG @ 31.25 g a.i./ha, imidacloprid 17.8 SL @ 22.2 g a.i./ha, azadirachtin @ 0.03%, *Bacillus thuringiensis* var. *kurstaki* @ 50 g a.i./ha along with untreated check. Four foliar applications were given for the management of pests of sesame. The agronomic practices were carried out as per the crop production guide of TNAU, Coimbatore. *In situ* counts were taken at weekly intervals in the middle two rows, leaving the border row plants. The total number of spiders were counted and expressed as number/plant. The data obtained from field experiments were analysed in a Randomized Block Design by 'F' test for significance as described by Panse and Sukhatme (1958). Critical difference values were calculated at 5% probability level and the treatment mean values of the experiment were compared using Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

## RESULTS

In the field experiments I and II, the effect of newer insecticides on the population of spiders was studied and the spiders namely *Leucange decorata*, *Salticus* sp. and *Oxyopes javana* were identified.

**Table 2.** Effect of newer insecticides on the population of spiders in sesame variety TMV 4 (field experiment II)

| Treatment | Number of spiders/plant# | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | I foliar application | | | II foliar application | | | III foliar application | | | IV foliar application | | |
| | 30 DAS Pre count | 1 DAT | 7 DAT | 14 DAT (45 DAS) Pre count | 1 DAT | 7 DAT | 14 DAT (60 DAS) Pre count | 1 DAT | 7 DAT | 14 DAT (75 DAS) Pre count | 1 DAT | 7 DAT | 14 DAT (91 DAS) Pre count |
| Profenofos 50 EC@ 500 g a.i./ha | 0.46 | $0.40^{b}$ | $0.90^{bc}$ | $1.13^{bc}$ | $0.33^{b}$ | $1.43^{ab}$ | $1.33^{bc}$ | $0.13^{c}$ | $0.96^{bc}$ | $0.96^{ab}$ | $0.16^{c}$ | $0.70^{bcd}$ | $0.86^{bc}$ |
| Triazophos 40 EC@ 200 g a.i./ha | 0.66 | $0.40^{b}$ | $1.03^{b}$ | $1.36^{b}$ | $0.23^{bc}$ | $1.16^{bc}$ | $1.43^{b}$ | $0.36^{b}$ | $0.93^{bc}$ | $0.70^{b}$ | $0.36^{b}$ | $0.73^{bcd}$ | $0.83^{bc}$ |
| Lambda cyhalothrin 5 EC @ 25 g a.i./ha | 0.50 | $0.13^{b}$ | $1.03^{b}$ | $1.00^{c}$ | $0.30^{b}$ | $1.26^{bc}$ | $1.43^{b}$ | $0.16^{c}$ | $0.63^{c}$ | $0.70^{b}$ | $0.13^{c}$ | $0.50^{e}$ | $0.86^{bc}$ |
| Spinosad 45 SC 33.75 g a.i./ha | 0.60 | $0.20^{b}$ | $1.03^{b}$ | $1.13^{bc}$ | $0.30^{bc}$ | $1.23^{bc}$ | $1.36^{bc}$ | $0.13^{c}$ | $0.83^{bc}$ | $0.86^{b}$ | $0.20^{bc}$ | $0.60^{de}$ | $0.73^{c}$ |
| Bifenthrin 10 EC 62.5 g a.i./ha | 0.73 | $0.26^{b}$ | $1.10^{b}$ | $1.20^{bc}$ | $0.26^{bc}$ | $1.16^{bc}$ | $1.16^{c}$ | $0.13^{c}$ | $0.90^{bc}$ | $0.93^{ab}$ | $0.20^{bc}$ | $0.86^{b}$ | $0.86^{bc}$ |
| Thiamethoxam 25 WG 31.25 g a.i./ha | 0.73 | $0.30^{b}$ | $0.90^{bc}$ | $1.03^{bc}$ | $0.26^{bc}$ | $1.06^{c}$ | $1.26^{bc}$ | $0.20^{bc}$ | $1.00^{bc}$ | $0.96^{ab}$ | $0.26^{bc}$ | $0.83^{bc}$ | $1.0^{b}$ |
| Imidacloprid 17.8 SL 22.2 g a.i./ha | 0.80 | $0.23^{b}$ | $0.73^{c}$ | $1.13^{bc}$ | $0.13^{c}$ | $1.26^{bc}$ | $1.33^{bc}$ | $0.16^{c}$ | $1.00^{b}$ | $0.93^{ab}$ | $0.23^{bc}$ | $0.80^{bcd}$ | $0.96^{bc}$ |
| Azadirachtin 0.03% | 0.76 | $0.30^{b}$ | $0.80^{bc}$ | $1.20^{bc}$ | $0.40^{b}$ | $1.23^{bc}$ | $1.26^{bc}$ | $0.30^{bc}$ | $1.10^{ab}$ | $1.03^{ab}$ | $0.23^{bc}$ | $0.63^{cde}$ | $0.83^{bc}$ |
| *B. thuringiensis* var. *kurstaki* 50 g a.i./ha | 0.63 | $0.23^{b}$ | $0.90^{bc}$ | $1.10^{bc}$ | $0.26^{bc}$ | $1.06^{c}$ | $1.23^{bc}$ | $0.20^{bc}$ | $1.03^{ab}$ | $0.90^{b}$ | $0.26^{bc}$ | $0.76^{bcd}$ | $0.83^{bc}$ |
| Untreated check | 1.00 | $0.8^{a}$ | $1.63^{a}$ | $1.90^{a}$ | $1.00^{a}$ | $1.63^{a}$ | $1.76^{a}$ | $0.66^{a}$ | $1.43^{a}$ | $1.33^{a}$ | $0.60^{a}$ | $1.53^{a}$ | $1.63^{a}$ |
| CD (P=0.05) | NS | 0.125** | 0.080** | 0.081** | 0.076** | 0.068* | 0.050** | 0.087** | 0.100* | 0.097* | 0.092** | 0.060** | 0.062** |

NS - Not significant; In a column mean followed by a common letter are not significantly different by DMRT (P=0.05); *****-Significant at P=0.05; Values in parentheses are transformed values $\sqrt{X+0.5}$; ******-Significant at P=0.01; DAS- Days after sowing; #-Mean of 10 plants; DAT- Days after treatment; Data are mean of 3 replications

**Field experiment I**

The population of spiders was observed from 30 DAS. The population of spiders ranged from 0.56 to 1.30/plant at 30 DAS and there was no significant difference in the population of spiders among the treatments. After the first foliar application, the population of spiders ranged from 0.03 to 2.16/plant at 1,7 and 14 DAT. A low population of spiders was noticed in the insecticides and biopesticides treatments (Table 1). Before the second round of foliar application, the population of spiders ranged from 1.06 to 2.16/plant. After the second foliar application, a low population of spiders was observed in the insecticides and biopesticides treatments which ranged from 0.03 to 1.63/plant while a higher population was observed in the untreated check which ranged from 0.60 to 1.90/plant at 1,7 and 14 DAT. Similar trend was observed after the third and fourth foliar applications.

**Field experiment II**

The population of spiders was observed from 30 DAS. Before the first foliar application, the population of spiders ranged from 0.46 to 1.00/plant and found that there was no significant difference in the population of spiders among the treatments. After the foliar application, the population of spiders ranged from 0.13 to 1.90/plant at 1,7 and 14 DAT (Table 2). It was found that a low population of spiders was observed in the insecticides and biopesticides treatments which ranged from 0.13 to 1.36/plant while a higher population was observed in the untreated check which ranged from 0.83 to 1.90/plant at 1,7 and 14 DAT. Before the second round of foliar application, the population of spiders ranged from 1.00 to 1.90/plant. After the foliar application, the population of spiders ranged from 0.13 to 1.76/plant at 1,7 and 14 DAT. It was found that a low population of spiders was observed in the insecticides and biopesticides treatments which ranged from 0.13 to 1.43/plant while a higher population was observed in the untreated check which ranged from 1.00 to 1.76/plant at 1,7 and 14 DAT. Similar trend was observed after the third and fourth foliar application.

## DISCUSSION

The present findings revealed that the population of spiders in sesame was low in all the treatments except in untreated check. Hence it is concluded that no treatment had inhibitory effect on the population of spiders. This finding is in accordance with the reports of several authors. Biswas *et al*. (2001) reported that spiders, coccinellids, predatory stink bugs, preying mantids, black ants, parasitoids belonging to braconidae and ichenumonidae and fungal pathogens were found to attack insect pests of sesame. Misra (2008) reported that the newer insecticides like rynaxpyr 20 EC and flubendamide 48 SC were found to be safe to natural enemies. Jyoti and Basavana (2008) and Sabry and El-Sayed (2011) found that organic amendments in combination with biorationals, botanicals and microbial pesticides (Spinosad 45 SC, emamectin benzoate 5 SG, avermectin 1.9 EC, *Bacillus thuringiensis* var. *kurstaki* 5 WP and diafenthiuron 50 WP) were completely safe to natural enemies (coccinellids, chrysopids and spiders).

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## REFERENCES

Anonymous. 2006. The Hindu Survey of Indian Agriculture, The National Press, Kasturi Building, Chennai, 6: 139-140 **PP.**

Anonymesymous.2008. World sesame situation, A merican sesame growers association.html:file://c :/world state of sesame.mht (14/01/08).

Biswas, G. C., Kabir, S. M. H. and Das, G. P. 2001. Insect pests of sesame, *Sesamum indicum* Linn. in Bangladesh, their succession and natural enemies. *Indian Journal of Entomology*, **63**:117-124.

Gomez, K. A. and Gomez, A. A. 1984. Statistical procedures for agricultural research. Wiley International Science Publications,John Wiley and Sons, New York. 680 **P.**

Jyoti, D. P. and Basavana, G. K. 2008. Safety of organic amendments and microbial pesticides to natural enemies in brinjal ecosystem. *Annals of Plant Protection Sciences*, **16**(1): 111-114.

Misra, H. P. 2008. New promising insecticides for the management of brinjal shoot and fruit borer, *Leucinodes orbonalis* (Guen.). *Pest Management in Horticultural Ecosystems*,**14**(2): 140-147.

Panse, V. G. and Sukhatme, P. V. 1958. Statistical methods for agricultural works. Indian Council of Agricultural Research, New Delhi, 327 **P**.

Rakesh Kumar, Shamshad Ali and Umesh Chandra. 2010. Seasonal incidence of sap feeders on sesame (*Sesamum indicum* L.) and correlation with abiotic factors. *Annals of Plant Protection Sciences*, **18**(1): 41-48.

Sabry, K.H. and El-Sayed, A.A. 2011. Biosafety of a biopesticide and some pesticides used on cotton crop against green lacewing, *Chrysoperla carnea* (Stehens) (Neuroptera: Chrysopidae). *Journal of Biopesticides,* **4**(2): 214-218.

Sakthivel, N., Balakrishna, R., Ravikumar, J., Samuthiravelu, P., Isaiarasu L. and Qadri, S. M. H. 2012. Efficacy of botanicals against jassid *Empoasca flavescens* F. (Homoptera: Cicadellidae) on mulberry and their biosafety to natural enemies. *Journal of Biopesticides,* **5**(Supplementary): 246-249.

Sankar Narayanan, U. and Nadarajan, L. 2005. Evidence for a male-produced sex pheromone in sesame leaf webber, *Antigastra catalaunalis* Duponchel (Pyraustidae: Lepidoptera). *Current Science*, **88**(4): 631-634.

Sharma, S. M. and Reddy, B. N.1983. Research on Sesamum makes headway. *Indian farming,* **32**(12):3-10.

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