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Efficacy of insecticides against the seasonal incidence of major insect-pests of sesamum (*Sesamum indicum* L.)

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Abstract
An experiment was conducted during Kharif 2013-14 at student instructional farm CSAUAT, Kanpur on seasonal incidence of major insect-pests of sesamum and their management. The experimental results revealed that, the incidence of larval population was 1.17 larvae / plant of *Spilarctia obliqua* Walk. and 0.39 larvae / plant of *Antigastra catalaunalis* Dup. in third week of August and maximum population i. e. 2.32 and 1.26 larvae /plant of *Spilarctia obliqua* Walk. and *Antigastra catalaunalis*, respectively. Larval population showed increasing trend with the increase in temperature, relative humidity and rainfall and decreases while the larval population got decreases with decrease in temperature, relative humidity and rainfall of both the insect. After spraying of Imidacloprid 17.8 SL (0.01%), Profenophos+Cypermethrin 44 EC (0.05%), Profenophos 50 EC (0.05%), Chlorpyrifos 20 EC (0.05%), Monocrotophos 36 SL (0.05%), Quinalphos 25 EC (0.05%), Fipronil 5 EC (0.05%), Dimethoate 35 EC (0.05%) and Neemarin 15 EC (1.0%), the most effective treatments were found Imidacloprid, Profenophos+Cypermethrin, Profenophos and Chlorpyrifos while least effective treatment was Neemarin. The maximum yield (4.52 q/ ha) was found in Imidacloprid treated plot followed by Profenophos+Cypermethrin (4.45q/ ha), Profenophos (4.20q / ha), Chlorpyrifos (4.13q/ ha), Monocrotophos (4.12q/ ha), Quinalphos (3.95q/ ha), Fipronil (3.95q/ ha) Dimethoate (3.80q/ ha), respectively, while minimum yield (3.42q/ ha) was obtained from Neemarin treated plot.

Keywords: Sesamum, pests, pesticides, seasonal incidence

1. Introduction
Sesamum or Ginglly (*Sesamum indicum* L.) commonly known as Til (hindi) is an ancient oilseed crop grown in India. The origin place of this crop is believed to be South West Africa. [2] India is largest producer of sesamum in world. It also ranks first in the world. In India sesamum seeds are used for oil extraction 78%, for edible purpose 20%, and for seed purpose 2%. The sesamum crop suffers from several insect- pest like Thrips (*Frankliniella sulphurea* schm), Jassids (*Orosius albicinctus* Dist.), leaf webber and pod borer (*Antigastra catalaunalis* Dup.), Bihar hairy caterpillar (*Spilarctia obliqua*) Sesamum gall fly (*Asphondylia sesami* Felt.), Sesamum blossom midge (*Dasineuria sesame* Grower). When the pod formed, the larvae enter inside the pod and damage the developing seeds. The infested pod by this insect carry 53.1% less seed than healthy ones. [1] *A. catalaunalis* is one of the key pests of sesame in India and causes economic loss in crop yield. This pest is active in the sesame field from the seedling stages up to the harvest of the crop. [9] Bihar hairy caterpillar (*Spilarctia obliqua* Walk.) cause extensive damage by eating the leaves of the plants and retarding the process of photosynthesis. Sesamum is one of the most preferred hosts of *Spilarctia obliqua* Walk. [3]. Keeping in view the seriousness, losses caused by various insect-pests of sesamum, it was considered necessary to evaluate the effectiveness of some insecticide against the pest of sesamum.

2. Materials and Methods
2.1 Lay out
Research trial was conducted at Student's Instructional Farm, C. S. Azad University of Agriculture and Technology, Kanpur (U.P.) during 2013-14. The field experiment was laid out in Randomized Block Design (RBD) with three replications. The size of the trial field was 560 sq meters. In order to eliminate the side effect of neighboring crops and to facilitate the cultural operations, field border of one meter was provided all around the experimental field.

Three replications were divided into 10 equal plots of 4.5 x 3 meter leaving a border of 0.5 meter between the two plots. A main irrigation channel of 1.5meter width was provided at one side of the field, within the field border and also a sub-irrigation channel or block border of 1 meter width was provided between two replications.

2.2 Preparation of spray solution

In case of EC the desired amount of insecticidal solution were prepared by calculating their quantity with the help of following formula-

$$\text{Amount of formulation} = \frac{\text{concentration required}(\%) \times \text{volume required(litres)}}{\text{concentration of toxicant in insecticidal formulation}}$$

2.3 Spraying of pesticides

Various insecticides sprayed with the help of hand compression sprayer. The spraying was done after 20 days of sowing the control plot of each replication was sprayed with plain water in the same quantity and the same time to observe the infestation of pest for comparisons.

2.4 Observation of insect-pests of sesamum

(a) Bihar hairy caterpillar: The infestation of *Spilarctia obliqua* Walk. was recorded by counting the total larvae of 5 randomly selected plants as well as leaves damaged by the insect and the percentage of damaged leaves as calculated for each treatment. The per cent leaf infestation was recorded by counting the total leaves of 5 randomly selected plants as well as the damaged leaves [7].

(b) Leaf webber & pod borer: For recording the infestation of *Antigastra catalaunalis* Dup damaging shoots, the total number of shoot damaged by webbing of top leaves of shoot were counted. Similarly, the number of affected pods, and total number of pods in randomly selected 5 plants were also counted to find out its infestation on pods.

2.5 Chemical control

The observation on the infestation of *A. catalaunalis* on leaves and pods, *Spilarctia obliqua* on leaves were recorded after 3, 7, & 14 days of spraying so as to find out the efficacy of different insecticidal application against these pests.

Yield: The yield of sesamum seed was recorded plot wise to observe the production per hectare. The yield obtained in treated plots was compared with control plots.

2.6 Statistical analysis

The data noted on the various aspects were subjected to the statistical analysis after suitable transformation. Analysis of variance was calculated to find out the significant difference between the treatments on the basis of CD values.

3. Results and Discussion

3.1 Efficacy of insecticide on the larval count of *S. obliqua* Walker

The results of assessing toxicity of different pesticides on the *S. oblique* after treatment are shown in Table 1. The data obtained that Imidacloprid (0.01%), Chlorpyrifos (0.05%), Profenofos+Cypermethrin (0.05%) and Profenofos (0.05%) were proved same effective insecticide and they significantly reduce the larval population of *S. obliqua* Walker in the field and provided 2.74, 2.95, 3.49 and 3.71 mean cumulative larvae / plant after 3, 7 and 14 days of spraying, respectively. Monocrotophos, Quinalphos and Fipronil showed the intermediatory effect and provided 4.10, 4.23 and 4.35 mean cumulative larvae / plant, respectively. Other treatment like Dimethoate and Neemarin were least effective which gave 5.15 and 5.66 mean cumulative larval population / plant. All the treatments were significantly superior to control (13.33 larvae / plant). These finding comparable with the result of Thakur and Kaistha [8] who have also found the efficacy of *Bacillus thuringiensis* var Kurstaki, Chlorpyriphos, Cypermethrin, Deltamethrin, Fenvalerate, Fluorinate and the Neem based insecticide like Neemarin against *S. obliqua* Walk on sesamum.

3.2 Efficacy of insecticide on the larval count of *A. catalaunalis* Dup

It is clear from the Table 2 that Imidacloprid was the most effective insecticide provided 1.60 mean cumulative larvae / plant after 3, 7 and 14 days of spraying, followed by Profenofos+Cypermethrin, Profenofos and Chlorpyrifos were also effective and reduces the larval population to the extent of 1.65, 1.86 and 1.97 mean cumulative larval count per plant, respectively after 3, 7 and 14 days of spraying. Monocrotophos and Quinalphos were intermediatory effective gave 2.11and 2.29 mean cumulative larvae / plant, respectively. Fipronil, Dimethoate and Neemarin were the least effective insecticide provided 2.83, 3.04 and 3.57 mean cumulative larvae / plant. All the treatments were significantly reduced the larval population after 3, 7 and 14 days of spraying and proved better than control having 6.61 larvae / plant. This findings may be compared with the findings of Rai *et al.* [6] has also tested number of insecticide against *A. catalaunalis* Dup attacking on sesamum and is inconfirming with findings of present investigation. The finding of Mishra [5] who has used combination of insecticide such as Rocket (Profenofos + Cypermethrin), Carina (Profenofos), Nurelle D, Spark (Deltamethrin + Triazophos), Virat (Cypermethrin +Quinalphos), and Nagata (Ethion + Cypermethrin) and found the best result and are very much similar to the present finding.

3.3. Percentage sesamum pod damage by *A. catalaunalis* Dup in different treatments

It is obvious from the Table 3 that the Imidacloprid treated plot has least pod damage percentage i. e. 9.33 %, followed by Profenofos + Cypermethrin, Profenofos, Chlorpyrifos and Monocrotophos did not differ significantly and at par with 15.75, 17.65, 18.30 and 18.55 per cent pod damage, respectively. Quinalphos and Fipronil showed the intermediatory effect resulting 20.50 and 21.50 per cent pod damage, respectively. Dimethoate show the less effectiveness and produces 24.10 per cent pod damage. Neem product like Neemarin was the least effective which gave 33.15 per cent pod damage. All the treatment was significantly superior to control (49.15 %) pod damage. The present finding is quite in agreement with the findings of Gupta *et al.* [4] who have also tested the various schedules which depicted minimum percentage of pod by *A. catalaunalis*.

3.4 Efficacy of insecticides on the yield of sesamum

Overall effectiveness of different insecticide on the yield of sesamum showed (Table 4.) that Imidacloprid (0.01%) gave the highest yield to the extent of 0.271 kg / plot followed by Profenofos + Cypermethrin, Profenofos, Clorpyrifos and Monocrotophos 0.267, 0.265, 0.252 and 0.247 kg / plot, respectively. Quinalphos, Fironil and Dimethoate showed the intermediatory effect and provided the yield of 0.237, 0.237 and 0.228 kg yield / plot, respectively. Neemarin was the least effective treatment provided only 0.205 kg yield / plot. In control plot there was 0.185 kg yield / plot. All the treatments were significantly superior in comparison to the control. This result clearly showed that, Imidacloprid found to be the best insecticide which reduced the population of *Spilarctia obliqua* Wak and *Antigastra catalaunalis* Dup during different crop growth period and maturation of sesamum crop. Profenofos + Cypermethrin and Profenofos were second and third most effective insecticide provided the best result. This result is quitesimilar to that of Mishra (2003) [5] who have tested various combinations of insecticides against *A. catalaunalis* Dup infesting sesamum and yield potential. The work of Gupta (2002) [4] is also clarifies that yield increased with the use of combination of insecticides.

4. Conclusion

The overall discussion of present experimental finding showed that Imidacloprid (0.01%), Profenofos+Cypermethrin (0.05%), Profenofos (0.05%) and Chlorpyrifos (0.05%) may be utilized for reducing the population of *Antigastra catalaunalis* Dup larvae in field. It is concluded that the Imidacloprid, Profenofos+Cypermethrin, Profenophos and Chlorpyriphos were found to be very effective insecticide for the control of these two insects and can be recommended to the famer for protection of sesamum crop against these pest.

Table 1: Larval count of *S. obliqua* Walk. after 3, 7 and 14 days of spraying

S. No.	Treatments	Formulations	Doses	3 days	7 Days	14 Days	Cumulative	Cumula-tive mean
1.	Monocrotophos	36SL	0.05%	5.80 (2.608)	3.62 (2.149)	2.90 (1.961)	12.32	4.10
2.	Carina (Profenphos)	50EC	0.05%	5.65 (2.579)	3.50 (2.121)	1.98 (1.726)	11.13	3.71
3.	Rocket (Profen.+cyperme.)	44EC	0.05%	5.40 (2.530)	3.10 (2.025)	1.97 (1.723)	10.47	3.49
4.	Fipronil	5SC	0.05%	6.25 (2.692)	3.80 (2.175)	3.00 (2.000)	13.05	4.35
5.	Dimethoate	30EC	0.05%	6.40 (2.720)	5.75 (2.598)	3.30 (2.073)	15.45	5.15
6.	Imidacloprid	17.8SL	0.01%	4.25 (2.302)	2.50 (1.871)	1.49 (1.556)	8.23	2.74
7.	Chlorpyrifos	20EC	0.05%	4.56 (2.344)	2.80 (1.910)	1.51 (1.584)	8.87	2.95
8.	Quinalphos	25EC	0.05%	6.10 (2.645)	3.65 (2.156)	2.95 (1.965)	12.70	4.23
9.	Neemarin	15EC	1.0%	7.35 (2.890)	5.90 (2.622)	3.75 (2.179)	17.00	5.66
10.	Control	-	-	13.10 (3.824)	13.25 (3.847)	13.65 (3.859)	40.00	13.33
	CD at 5% SE(d)			0.400 0.189	0.365 0.172	0.307 0.189	-	-

*Figures are Transformed value

Table 2: Larval count of *Antigastra catalaunalis* Dup after 3, 7 and 14 days of spraying

S. No	Treatments	Formulations	Doses	3 days	7 Days	14 Days	Cumulative	Cumulative mean
1.	Monocrotophos	36SL	0.05%	2.68 (1.836)	2.12 (1.747)	1.54 (1.588)	6.34	2.11
2.	Carina (Profenphos)	50EC	0.05%	2.59 (1.895)	1.61 (1.616)	1.39 (1.546)	5.59	1.86
3.	Rocket (Profen.+cyperme.)	44EC	0.05%	2.39 (1.841)	1.48 (1.575)	1.10 (1.449)	4.97	1.65
4.	Fipronil	5SC	0.05%	3.83 (2.189)	2.93 (1.982)	1.73 (1.652)	8.49	2.83
5.	Dimethoate	30EC	0.05%	3.84 (2.200)	3.16 (2.040)	2.12 (1.766)	9.12	3.04
6.	Imidacloprid	17.8SL	0.01%	2.37 (1.836)	1.40 (1.549)	1.04 (1.428)	4.81	1.60
7.	Chlorpyrifos	20EC	0.05%	2.77 (1.961)	1.71 (1.646)	1.45 (1.565)	5.93	1.97
8.	Quinalphos	25EC	0.05%	2.83 (1.933)	2.46 (1.847)	1.59 (1.602)	6.88	2.29
9.	Neemarin	15EC	1.0%	4.30 (2.302)	3.72 (2.173)	2.71 (1.926)	10.73	3.57
10.	Control	-	-	6.40 (2.702)	6.65 (2.780)	6.80 (2.788)	19.85	6.61
	CD at 5% SE(d)			0.335 0.158	0.288 0.136	0.191 0.145	-	-

*Figures are Transformed value

Table 3: Average sesamum pod damage per cent due to *A. catalaunalis* Dup at harvesting

S. No.	Tretments	formulation	Doses	% pod damage at harvesting
1.	Monocrotophos	36SL	0.05%	18.55
2.	Carina (Profenphos)	50EC	0.05%	17.65
3.	Rocket (Profen.+cyperme.)	44EC	0.05%	15.75
4.	Fipronil	5SC	0.05%	21.50
5.	Dimethoate	30EC	0.05%	24.10
6.	Imidacloprid	17.8SL	0.01%	9.33
7.	Chlorpyrifos	20EC	0.05%	18.30
8.	Quinalphos	25EC	0.05%	20.50
9.	Neemarin	15EC	1.0%	33.15
10.	Control	-	-	49.15
	SE ± (d) CD at 5%			1.095 2.319

Table 4: Effect of insecticide on the yield of sesamum

S. No.	Treatments	Formulation	Doses	Yield kg/plot	Quintal/ ha	Per cent increased yield over control
1	Monocrotophos	36 SL	0.05%	0.247	4.12	33
2	Carina (Profenofos)	50 EC	0.05%	0.265	4.20	43
3	Rocket (Profenofos+cypermethrin) Fipronil	44EC	0.05%	0.267	4.45	44
4	Dimethoate	5 EC	0.05%	0.237	3.95	28
5	Imidacloprid	35EC	0.05%	0.228	3.80	23
6	Chlorpyrifos	17.8 SL	0.01%	0.271	4.52	46
7	Quinophos	20 EC	0.05%	0.252	4.13	36
8	Neemarin	25 EC	0.05%	0.237	3.95	28
9	Control	15 EC	1.0%	0.205	3.42	10
10		-		0.185	3.08	-
	SE(d) CD at 5%			0.015 0.032	0.210 0.445	

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