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# Toxicity of different insecticides against *Nesidiocoris tenuis* on sesame crop under laboratory conditions

**Muhammad Saleem, Dilbar Hussain, Iqra Shaheen, Abdul Ghafoor, Sadaf Nazar and Ayesha Mehmood**

**Abstract**
The study was conducted at Insecticide Resistance Lab in the Entomological Research Institute (ERI) of Ayub Agricultural Research Institute (AARI) Faisalabad during 2015-2016. The experiment was laid out in a complete randomized design (CRD) followed by five treatments with five replications to evaluate the efficacy of different insecticides against Mirid bug on sesame. The seven insecticides Acetamiprid 20SL, Fipronil, Profenophos 500EC, Confidor 200SL, Chlorpyrifos 40EC, Acephate 70SP and Imidor 25WP were used as treatments and water as a control. The maximum percentage mortality was recorded in insecticide Acephate 70SP which was 91%, followed by other insecticides Profenophos showed 81%, Chlorpyrifos 76%, Confidor 70%, Acetamiprid 71%, Fipronil 69%, Imidor have 72% respectively.

**Keywords:** Insecticides, efficacy, Mirid Bug, *Nesidiocoris tenuis*, *Sesamum indicum*

## 1. Introduction
Sesame (*Sesamum indicum*.) belongs to the family Pedaliaceae and order Tubiflorae which contains 60 species and 16 genera [2]. Sesame is also known as til, sesame, ajonjoli, simsim, gingelly, and benniseed. Sesame is an important oil crop because of great stability, resistance to drought and easiness of its extraction [2].
Sesame seeds are small and flat, after harvesting it is difficult to dry the seed because around the seed movement of air difficult by the small seed. As the seeds dry, they must be harvested and stored at 6% moisture condition [3]. Many commercial varieties of sesame plant are grown in Pakistan. The height of growing plant is 2 to 9 feet which depends on different varieties [6]. The outer covering of seed may be ribbed or smooth. Because of different varieties sesame seeds may be in many colors. Most of seeds are gray, black, reddish, buff, and tan, gold and brown [7].
In our country, during last two years' sesame seeds are grown almost 100,000 hectares of land. In these two years, overall average of production is 50.7 thousand tons per hectare and total production of this seed is greatest in Balochistan within all provinces of the Pakistan. During these two years Pakistan exported almost 46 thousand tons of sesame seed to more than thirty countries in whole world. Syria, Turkey, South Korea and Japan are our most significant importer. In our country local production of sesame seed is estimated 0.680 million tons, out of which 76% is imports and remaining 24% of domestic requirement of edible oil. Total availability from all sources is briefly estimated at 1.749 million tons. It means that more than 90% of our production is exported every year [6].
There are two types of insects, sucking and chewing insect. Young ones of sucking insects are called nymphs. These insects suck all sap from veins of plant and always found beneath the leaves. Sucking insects are small in size. Insects of the family Miridae are commonly called Mirid bug. The Mirid bug is large and diverse family of insects. Species of this insect are generally known as Mirid bugs or capsid bugs. Common names of Mirid bug may be grass bugs, plant bugs, and leaf bugs. It is the greatest family of true bugs. Mirid bug includes 10,000 described species and 1400 genera. The family of Mirid bug is Miridae (Plant Bugs), Kingdom: Animalia, Phylum: Arthropoda, Subphylum: Hexapoda, class: insecta, Order: Hemiptera, Suborder: Heteroptera [8].
There are three different types of Mirids are generally known as crop Mirid bug, green and brown Mirid bug. Except the northern areas the crop Mirid has been described from all Australian

states. The length of green Mirid adults are 7 mm, usually faint green with red markings and have definite wings crimped plain on their back. The green Mirid is a natural species highly dispersed in Australia. Brown Mirid may be minutely larger 8 mm in length and it is observed from the top the front part of the body is brown [8].

Some of species that are agricultural pests suck all sap from veins of plan that transmits viral plant diseases and sometimes damage the plant tissues. Various species of Mirid are predatory. Miridae contains a huge number of species. Some of Mirid species are quiet unknown, dispersed greater than 1400 genera. Mirid bugs are in different shape; terrestrial insects, usually small or elongate and less than 12 millimeters in length. Most of Mirids are shiny in color and attractively arranged, others are dull or dim. At specific stages of life few genera are ant like. In the presence of cuneus identifying the member of family is one of the useful features in Mirid bug. A cuneus is the trilateral tip of the corium, the solid horny part of the frontal wing known as hemelytron. The cuneus is present almost in all species of Mirid bug and some other Hemiptera, specially the family Anthocoridae, which are different to Mirid bug [4].

In November, the initial movement of Mirids in crops occurs as different host plants within the nearest cotton crops tend to dry off and Mirid searches a fresh food source. Mirids lay eggs on the leaf petiole with in a crop. The egg with an oval egg cap is implanted into the plant tissue inserting into the petiole surface or leaf. Egg hatching period is usually 7-10 days depending on temperature which is usually 30-32 ºC eggs hatch after 5-6 days and contain five nymph instars, each instars duration is 2-3 days. In summer season a generation of egg to adult is completed about three weeks. Adults of Mirid survive for 3-4 weeks. Mirid bug population increases with suitable climatic condition. Number of Mirids may reduce in continuous hot weather. After heavy rains or storms numbers of Mirid tend to decrease directly. During sampling of Mirid these climatic factors must be measured. Some other insects are feeded on Mirid eggs, nymphs and adults like predatory shield bugs, damsel bugs, big-eyed bugs, as well as lynx, jumping spiders and night stalker [1].

Mirid bug, (Hemiptera: Miridae) has an important insect pest of BT cotton and some other fruit trees in China. Now, the application of chemical and botanicals insecticides is the major control option for reducing the population of this pest. We examined the toxic effect of various neonicotinoid insecticides on *A. lucorum* adults, and check the lethal effect of different commercialized neonicotinoids and a novel one, cycloxaprid. Lethal effect of the insecticides was determined by using a topical exposure method: We tested the cycloxaprid, nitenpyram, clothianidin, acetamiprid, imidacloprid, thiamethoxam, dinotefuran against Mirid bug. Among these insecticides cycloxaprid against the adults was the higher toxic and showed high mortality rates; its $LD_{50}$ value was 2.54 ng a.i./adult. Both $LD_{10}$ (0.74 ng a.i./adult) and $LD_{40}$ (1.98 ng a.i./adult) of cycloxaprid induced sublethal effects in the adults. The results indicated that cycloxaprid is the best candidate insecticides for controlling population of *A. lucorum*, and it showed great lethal and sublethal effects on this Mirid bug [5].

Now a day, Mirid bug population is increasing day by day and causing heavy loss on sesame crop. So, the purpose of this research is to investigate the most effective insecticides against Mirid bug on sesame plant. We also examined the effect of treatments on the pest and checked the control strategy of sucking insects on sesame. Keeping in view above point, the main theme of this study to find out the efficacy of different insecticides against Mirid bug on sesame crop and to record the mortality and evaluate the toxicity of different insecticides.

## 2. Materials and Methods

### 2.1 Study period and place

The experiment was conducted at Insecticide Resistance Lab in the Entomological Research Institute Faisalabad (ERI) of Ayub Agricultural Research Institute Faisalabad (AARI) during 2015-2016. The experiment was laid out in complete randomize design (CRD) followed by five treatments of each insecticide with five replications of each treatment.

### 2.2 Use of insecticides

The insecticides Acetamiprid 20SL, Fipronil, Profenophos 500EC, Confidor 200SL, Chlorpyrifos 40EC, Acephate 70SP, Imidor 25WP at field commended doses were used. Series concentration of each insecticide in ppm (parts per million) against Mirid bug to check the % mortality.

### 2.3 Insect Collection

Mirid bug was collected from the sesame crop at AARI and brought them into the lab, sustain at 25 + 2 ºC and 60-65% relative humidity. The insects were collected in the plastic jar with the help of camel hair brush and shedding method. The leaves were brought into the lab from the field, washed and then dried these leaves with the help of tissue paper. The leaves were cut with the help of leaf cutter according to the size of Petri dishes. Dip the 25 leaves (with the help of fore sap) in each solution of insecticides (5x5=25) for a minute and left them to dry, after drying up the cut leaves were put into Petri dishes already taking filter paper with markings and insects transferred into Petri dishes (50 larvae/Petri dish). Water was used as a control in each insecticide.

### 2.4 Statistical Analysis

The data was recorded after 24, 48 and 72 hours. The collected data was subjected to the Statistically Analysis by using software Statistic 8.1. ANOVA (Statistic, version 8.1 Tallahassee, USA). Significantly different means ($P<0.05$) were separated using Duncan Multiple Range Test (DMRT) at 5% probability.

## 3. Results and Discussion

The present studied were conducted to find out the toxicity of different insecticides against Mirid bug in the insecticide resistance laboratory of Entomological Research Institute Faisalabad (ERI) at Ayub Agriculture Research Institute Faisalabad (AARI) during 2015-2016. Data concerning mortality rate of Mirid Bug (*Nesidiocoris tenuis*) against different insecticides were verified after various exposure of time. The collected data was subjected to statistically LSD design and elaborated in the light of earlier work.

Result revealed that maximum population reduction was observed in the treatments where Acephate was applied and minimum population reduction was observed in the treatments where Fipronil was applied. The other insecticides gave less effective result as compare to the Acephate and Profenophos against Mirid bug. So overall Acephate and Profenophos proved to be highly effective against Mirid bug followed by Chlorpyrifos, Confidor 200SL, Acetamiprid, Imidor and Fipronil. The data after 48 and 72 hours gave the same results as above.

**LSD: Least significant difference (LSD) for all insecticides against Mirid bug for different time periods.**

| SR No. | Treatments | 24 hrs | 48 hrs | 72 hrs |
|---|---|---|---|---|
| 1 | Acephate | 54.4 EF | 74.4 DE | 90.8 EF |
| 2 | Profenophos | 47.2 C | 59.6 C | 81.6 C |
| 3 | Clorpyrifos | 43.2 DE | 56.8 CDE | 75.4 CDEF |
| 4 | Imidor 25WP | 38.4 F | 53.2 F | 72 F |
| 5 | Acetamiprid | 36.4 A | 52.4 A | 71.2 A |
| 6 | Confidor200SL | 35.6 D | 52 CDE | 70 CDE |
| 7 | Fipronil | 35.6 B | 50.4 B | 68.8 B |
| | LSD at @ 0.05 | 1.71 | 1.45 | 1.78 |

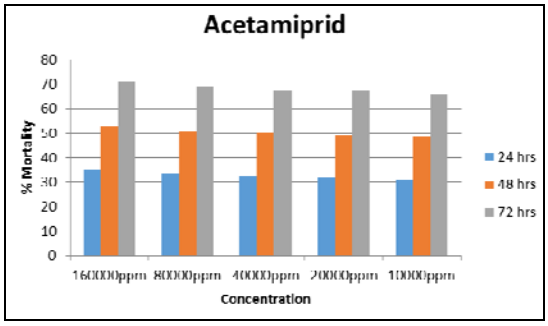


**Fig 1:** % mortality of Mirid bug against Acetamiprid.

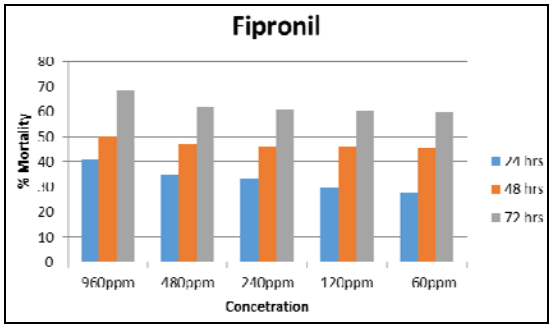


**Fig 2:** % mortality of Mirid bug against Fipronil.

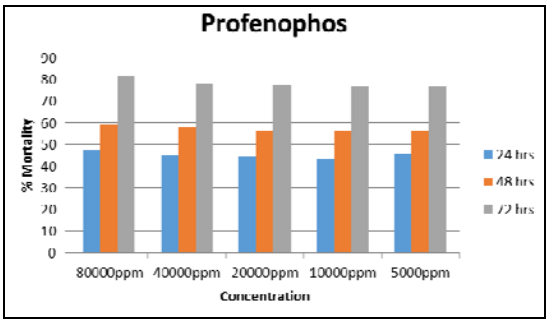


**Fig 3:** % mortality of Mirid bug against Profenophos.

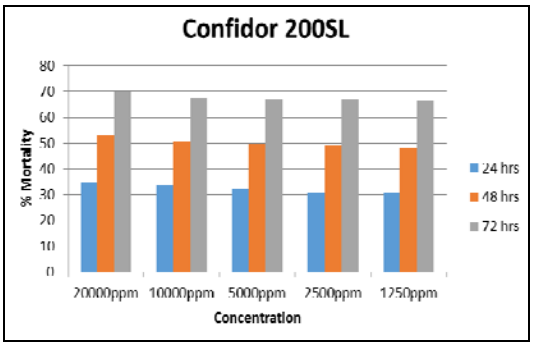


**Fig 4:** % mortality of Mirid bug against Confidor 200SL.

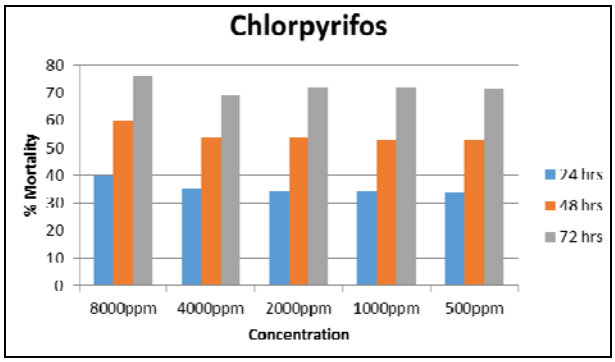


**Fig 5:** % mortality of Mirid bug against Chlorpyrifos.

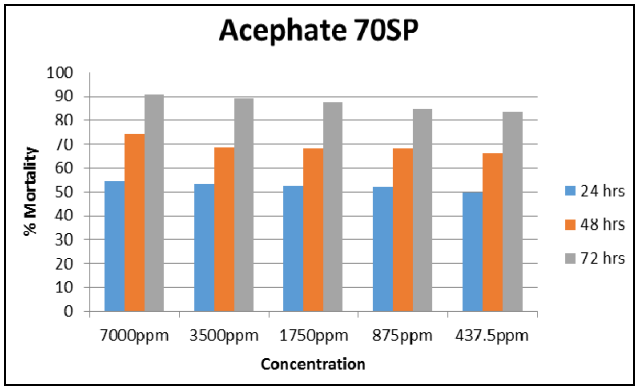


**Fig 6:** % mortality of Mirid bug against Acephate 70SP.

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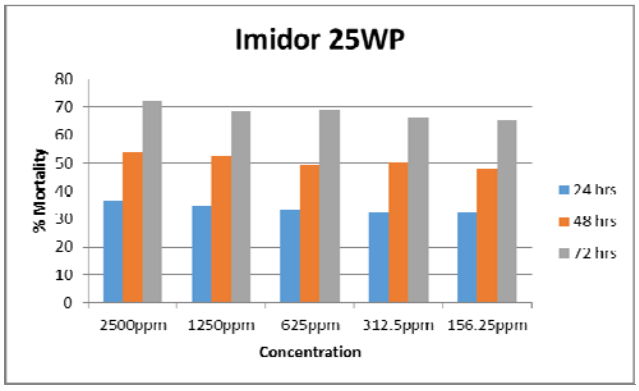
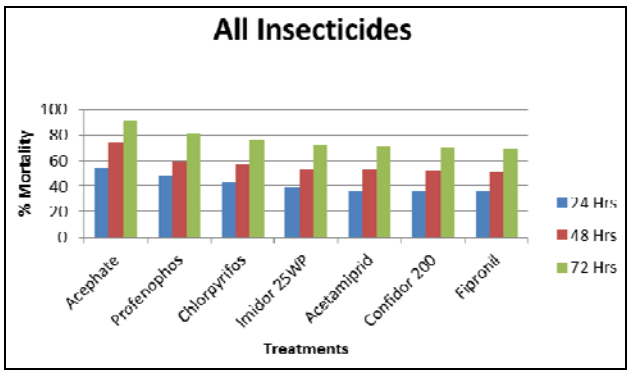



**Fig 7:** % age mortality of Mirid bug against Imidor 25WP.




The results indicated that minimum mortality occur after 24 hours of exposure period. While maximum mortality of Mirid bug (*Nesidiocoris tenuis*) occurs after 48 and 72 at highest concentration. In Statistical analysis all the insecticides show significant results at higher concentration. From the results it is clear that all the insecticides show significant effects on

Mirid bug. Among all the insecticides the Acephate 70SP and Fipronil have significant effects and show high mortality at higher concentration as compared to other insecticides against Mirid bug

## 4. Discussion

The current research work was carried out for the evaluation of efficacy of different seven insecticides viz., Acetamiprid 20SL, Fipronil, Profenophos 500EC, Confidor 200SL, Chlorpyrifos 40EC, Acephate 70SP and Imidor 25WP at different exposure (24, 48 & 72) of time against Mirid Bug (*Nesidiocoris tenuis*) under laboratory conditions. We tested these insecticides to check the toxic effect and determine the mortality rates against Mirid bug (*Nesidiocoris tenuis*). The major object of this research was to determine the toxicity of these given insecticides to control the Mirid Bug (*Nesidiocoris tenuis*) population.

The results showed that the maximum mortality of Mirid bug (*Nesidiocoris tenuis*) was observed at higher concentrations of Acephate 70SP and Profenophos. Acephate proved most effectual and powerful insecticide as compared to other insecticides in the management of Mirid bug (*Nesidiocoris tenuis*) in sesame field.

## 5. Conclusions

The purpose of this research was to evaluate the toxicity of different insecticides against Mirid bug (*Nesidiocoris tenuis*) under laboratory condition. The seven insecticides Acetamiprid 20SL, Fipronil, Profenophos 500EC, Confidor 200SL, Chlorpyrifos 40EC, Acephate 70SP and Imidor 25WP were used as treatment and water as a control. The most toxic insecticide is Acephate 70SP as compared to others and showed 91% mortality against Mirid bug (*Nesidiocoris tenuis*) after 72 hours. The other most effective insecticide is Profenophos 500EC and showed 81% mortality against Mirid bug (*Nesidiocoris tenuis*) after 72 hours at higher concentration Chlorpyrifos is also effective and showed 76% mortality against Mirid bug (*Nesidiocoris tenuis)* after 72 hours. The other most effective insecticide is Imidor 25WP and also got 72% mortality against Mirid bug (*Nesidiocoris tenuis*) after 72 hours at higher concentration Acetamiprid showed good results and have 71% mortality against Mirid bug (*Nesidiocoris tenuis)* after 72 hours at higher concentration. The result of Confidor 200SL is also significant and showed 70% mortality against Mirid bug after 72 hours at higher concentration. The less toxic insecticide is Fipronil and showed 69% mortality against Mirid bug after 72 hours at higher concentration the order of toxicity of 7 insecticides on the basis of mortality is as follows.

Acephate> Profenophos> Chlorpyrifos> Imidor> Acetamiprid> Confidor 200SL> Fipronil.

## 6. Acknowledgment

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