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TOXICITY OF DIFFERENT INSECTICIDES AGAINST COTTON WHITEFLY (BEMESIA TABACI) UNDER LABORATORY CONDITIONS

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Abstract:

The toxicity of three new chemistry insecticides i.e Fenpropathrin 30 EC (Danitol), Pyriproxyfen 10.8 EC (Priority) and Diafenthiuron 500 SC (Polo) along with control were tested against cotton whitefly (*Bemesia tabaci*) under laboratory conditions. Mortality was recorded after 24 hours. Pyriproxyfen was recorded to be more toxic with LC_{50} of 133.28 ppm followed by fenpropathrin and diafenthiuron with $LC_{50's}$ of 361.79 ppm and 4146.95 ppm respectively at highest doses of serial dilutions.

Key words: *Bemesia tabaci,* Toxicity, Fenpropathrin, Pyriproxyfen, Diafenthiuron.

Introduction:

Cotton plays the role of backbone in the economy of Asian countries. It is a cash crop and known as ‘white gold’ and ‘silver fiber’ in Pakistan due to its worldwide economic importance. Pakistan is the fourth biggest producer of cotton after USA, China and India. It is the source of big amount of foreign exchange and contributed about 2.9 % of GDP and about 11.7 % of value added in agriculture. It also shares about 69.5 % of contribution in national oil production (Aslam *et al., 2004*). But relative contribution of this crop to send out profit is per over 68 % which shows that per hectare national average yield is low (Hakim Ali sahito 2017).

This crop is damaged by 145 species of insect pests that causes 30 percent reduction in cotton yield in Pakistan. (Rashid *et al.,* 2012). A wide variety of sucking insect pests (up to 96 %), Particularly (*Bemesia tabaci*), aphids (*Aphis gossypii*), jassid (*Amrasca biguttula*), and mealybug (*Phenacoccus solenopsis*) attack different phases of crop growth due to enrich of greenish leaves (Hakim Ali sahito 2017). Sucking insect pests and cotton boll worms caused up to 50-60 percent decrease in cotton production (Rajput *et al*., 2017).

History of cotton whitefly, *Bemesia tabaci* infestation is very old i.e earlier than the introduction of modern insecticides. Many agricultural crops are infested by this polyphagous insect. It is cosmopolitan in distribution and along with the direct damage to crop, it constrains photosynthetic activity and impairs quality of cotton fiber. It also carries vector of various well-known viral diseases of several economic crops (Razaq *et al*., 2003).

Use of chemicals is necessary and unavoidable part of IPM (Integrated pest management) in crop protection. Even, the technologically progressive countries expended about 3 % of market value of agriculture on toxic pesticides and their application. In Pakistan, more than ten billion worth chemicals are imported, out of which about 70 to 80 percent are used against cotton insect pests (Aslam *et al*., 2004). Chemicals are the main intend to control massive infestation and to control sudden outbreak of insect pests. 1n 1950, the pesticides were used to combat insect invasion in Pakistan very interestingly (Hakim Ali sahito 2017). Many researchers in the past have evaluated different insecticides to test their comparative toxicity against this insect pest under different environmental conditions (Razaq *et al*., 2003).

Different insecticides were examined in this study to test their toxicity against adult cotton whitefly (*Bemesia tabaci*).

Materials and Methods

The experiment was conducted at Toxicology Laboratory Entomological Research Institute, Ayub Agricultural Research Institute, Faisalabad to test the efficacy of three different insecticides namely Pyriproxyfen 10.8 EC (Priority), Fenpropathrin 30 EC (Danitol) and Diafenthiuron 500 SC (polo) against cotton white fly under laboratory conditions. The experiment was laid out in completely randomized design including control. The insecticides used in the experiment were purchased from local market and laboratory doses (ppm) were calculated from field recommended doses using formula given below (1). There were 8 treatments including control, having 5 repeats each. The insecticides were tested using leaf dip bioassay IRAC method. Serial dilutions of each dose of insecticide were made and leaves cut with leaf disc cutter according to the size of small plastic petri dishes (5 cm), were dipped in the insecticide solution. Treated leaves were then air dried at ambient room temperature. 25 adults of white fly were released per treatment i.e 5 insects per leaf. The control leaves were dipped in water only. To study the LC50, insect mortality was recorded after 24 hours. Insects showing no movement on pressing them with needle were considered as dead. Corrected mortality was calculated by Abbott's formula (2). values of LC50 were calculated using polo pc software. Graphs were prepared by GraphPad Prism 6.

1. µl = Required ppm x water in ml
   %Fx10
2. Corrected Mortality= No. of Insects in Control- No. of Insects Treated
   No. of Insects in Control

Results and Discussion

Among the tested insecticides, Fenpropathrin caused significant toxicity to white fly after 24 hours' exposure. Whereas, the other two insecticides i.e. pyriproxyfen and Diafenthiuron showed non-significant results. The percent mortality of Fenpropathrin was high (92 %) followed by diafenthiuron (84%) and pyriproxyfen (80%). This trend showed that rate of mortality increases along with increase in dose of the insecticide (Fig 1,2,3).

Statistically, pyriproxyfen depicted highest toxicity against cotton white fly with LC_{50} of 133.28 ppm followed by fenpropathrin and diafenthiuron with $LC_{50's}$ of 361.79 ppm and 4146.95 ppm respectively. The collective results (Table 1) showed that all the insecticides provided better control under laboratory conditions but the most effective among all was Pyriproxyfen from statistical point of view. The other two insecticides i.e Fenpropathrin and Diafenthiuron also exhibited good results in terms of percent mortality but statistically these were less toxic as compare to Pyriproxyfen.

These results are in conformity with those of Qureshi *et al*., (2009) who observed that pyriproxyfen provided better control of *Bemesia tabaci* eggs and adults. The results are in contradiction with results of Lee *et al*., (2002) which depict that Pyriproxyfen was not effective against the adults of white fly *B. Tabaci*. These results also favor the findings of Ishaya *et al*., 1993 who reported that Diafenthiuron reduces progeny development of the whitefly. Results of the study of Ahmad *et al.,* 2002 are also similar to this study who observed that resistance of whitefly to fenpropathrin was generally very low.

Further research is needed to test these insecticides in the field to confirm their effects against cotton white fly, *Bemesia tabaci*.

Sr. No.	Insecticide	LC_{50} (FL95%)	Slope ± SE	X^2	df	P	n
1.	Fenpropathrin	361.79(207.61-548.62)	0.92±0.09	7.7995*	6	0.253164	200
2.	Pyriproxyfen	133.28(64.13-214.55)	0.54±0.08	0.72^{NS}	6	0.994049	200
3.	Diafenthiuron	4146.95(3001.799-5460.17)	0.841±0.836	0.677^{NS}	6	0.994974	200

Table. 1: LC_{50} of different Insecticides against Cotton Whitefly (*Bemesia tabaci*)

* = Significant NS= Non Significant

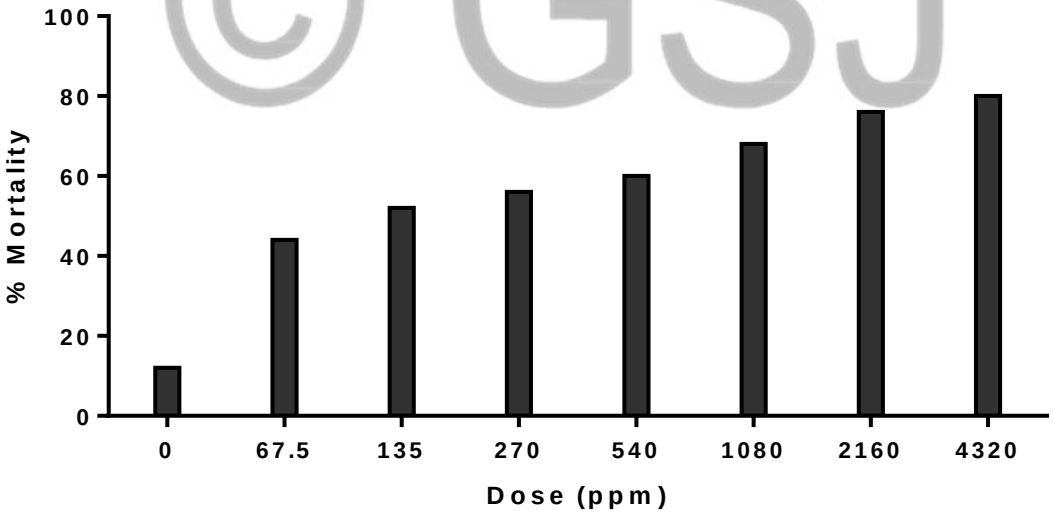

Fig. 1: Percent mortality of *Bemesia tabaci* against Pyriproxfen 10.8 EC (Priority)

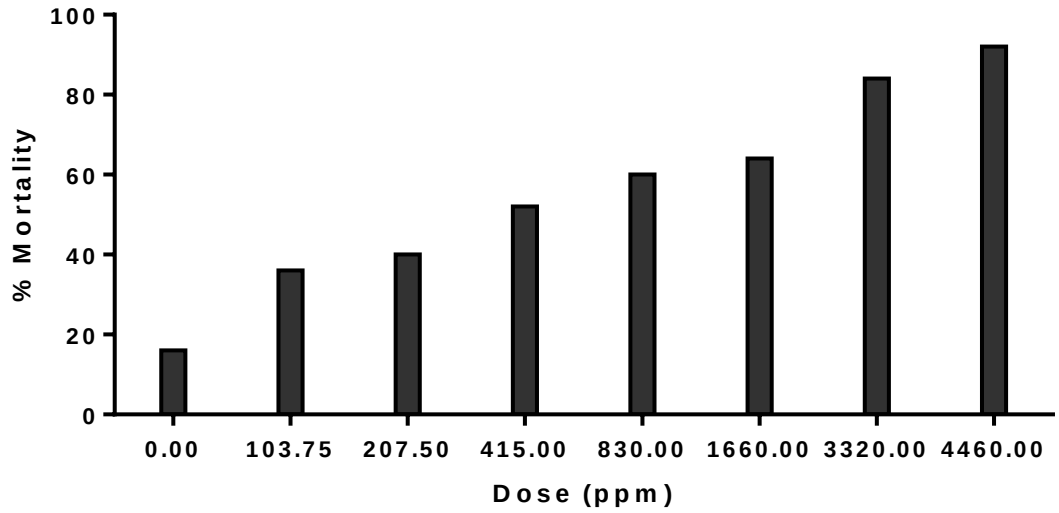

Fig. 2: Percent mortality of *Bemesia tabaci* against Fenpropathrin 30 EC (Danitol)

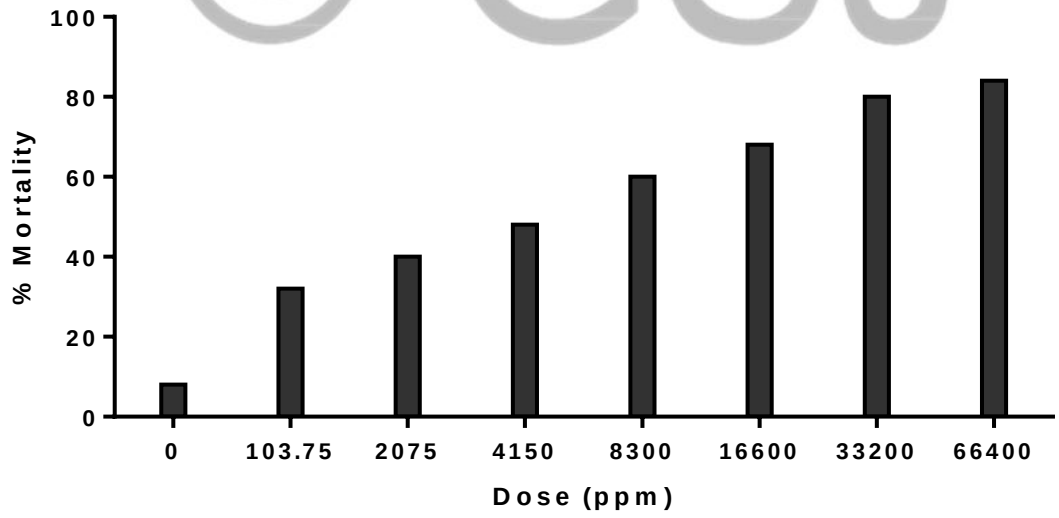

Fig. 3: Percent mortality of *Bemesia tabaci* against Diafenthiuron 500 EC (Polo)

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