

## **Efficacy Of Various Synthetic And Botanical Insecticides Against Citrus Psylla (*Diaphorina Citri* Kuwayama) (Homoptera: Psyllidae) In Citrus**

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### **ABSTRACT**

This research has conducted on efficacy of three synthetic insecticides (Emamectin Benozate, Acetamiprid and Lambda cyhalothrin) and one botanical insecticide (Need seed extract) against Citrus psyllid *Diaphorina citri* Kuwayama (Homoptera: Psyllidae) the objective of this study was to evaluate the most effective insecticide among the four insecticide that are Emamectin Benozate, Acetamiprid, Need seed extract and Lambda cyhalothrin for management of *Diaphornia citri* in citrus plants. Experiment was conducted at New Developmental Farm The University of Agriculture, Peshawar in spring 2018, using Randomized Complete Block Design (RCBD) in which fifteen plants were selected and each plant characterized into four sides then 5 leafs were selected per side for data recording after application of these insecticides at various time durations continuously for 2months as counting of *Diaphornia citri* numbers per leaf. Data were statistically analyzed by statistix 8.1 software version 2012. As result from this research exhibit that lambda cyhalothrin was found best and shows significant difference among all other four insecticides.

**Key words.** Citrus plant, synthetic, botanicals insecticides, Citrus Psylla.

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### **INTRODUCTION**

Citrus is the one of major fruits grown in Pakistan. Citrus fruit in all sizes, shapes and different colours. They are the richest source of vitamin "C" and contain 3 -4% sugar and minerals such as calcium and magnesium which are essentially needed for human health. Citrus fruit has been reported to prevent liver, lungs, skin cancers, heart diseases, birth defects and contributes to a balanced and healthy life style (Shah, 2004).

The total production of citrus fruit in Pakistan during 2019-2020 was 2367308 thousand tonnes cultivated on an area of 156321 thousand hectares. In Punjab the total production was 2297847 thousand tonnes grown on an area of 145173 thousand hectare, Sindh production was 32867 thousand tonnes cultivated on an area of 5633 thousand hectare, Balochistan production was 8644 thousand tonnes cultivated on an area of 1707 thousand hectare while Khyber Pakhtunkhwa the total production was 27950 thousand tonnes cultivated on an area of 3808 thousand hectare (Anonymous, 2020).

In Pakistan Citrus orchards are attacked by many different insects' species and diseases which are very detrimental (Iqbal et al., 2009). Different insect's species attack on citrus orchards are citrus psyllid *Diaphorina citri* kuwayama (Homoptera: Psyllidae), citrus caterpillar (*Papilio demoleus* linnaeus), citrus leaf minor (*Phyllocnistis citrella*), citrus whitefly (*Dialeurodes citri* Ashmead). Among these Asian Citrus Psyllid (*Diaphorina citri* kuwayama) are the most destructive and important insect pest of citrus cause heavy losses through the greening diseases of citrus being a viral vector *Tristeza* colesterovirus, (Hall et al., 2012) and also act as a carrier of the bacteria *Candidatus liberibacter asiaticus* that cause fatal citrus disease, known as Citrus Greening Disease (CGD) or Huanglongbing (Mahmood et al., 2014).

Citrus Psyllid *Diaphorina citri* attack more plants including different Citrus spp., jasmine, orange, jasmine, boxwood, Chinese boxthorn and Rutaceae family (Halbert and Manjunath, 2004). It was first time identified from South-East Florida during 1998, known as Asian Citrus Psyllid (ACP) (Bové, 2006). Asian citrus psyllid *Diaphorina citri* is the most damaging in the flowering and blooming stage of citrus crop. Both nymph and adult suck the cell sap from the young foliage, leaves and tender shoots which change the colour to become yellowish with stunted growth. In case of severe attack, defoliation and premature fruit dropping occurs and these sucking insects pest can damage upto 50 percent if not controlled (Hall et al., 2012)

The appropriate and timely management of *Diaphorina Citri* is necessary to avoid direct and indirect damage to fruit quality and yield. Insecticides are broadly used against different insect species due to their rapid knock down effect (Monzo et al., 2014).

Management included different control measures like insecticides, botanicals, insect growth regulators and biological control (Khan et al., 2013). Application of these control measures against *Diaphorina citri*, were recommended at 10-15days interval (Shivankar et al., 2000). Insecticides are best strategic measure to control *Diaphorina citri*, populations. Imidacloprid and Aldicarb are suggested effectively in the period of November and April (Qureshi and Stansly, 2007). Similarly, broad spectrum insecticides are used in winter, spring and summer season as foliar sprays (Qureshi and Stansly, 2009), but they give short term protection against immature psyllids (Qureshi and Stansly, 2007).

Keeping in view the importance of citrus fruit and the damages caused to it by *Diaphornia citri*, the present research aimed with the objective to test efficacy of three synthetic and one botanical insecticides against it on citrus at New Developmental Farm, The university of Agriculture Peshawar spring 2021.

## **Materials and Methods**

### **Study Area**

The present research work was carried out to test “Efficacy of various synthetic and botanical insecticides against Citrus psylla *Diaphornia citri* on citrus at the New Developmental farm in Agriculture University Peshawar” in 2021.

### **Material Used**

The following materials were used in this experiment: Gloves, Mask, Safety Glasses, Sprayer, Chemicals, Tape, Muslin cloth, Detergents and Neem Seeds

**Collection of Plant Material:** The leaves of Neem *Azadirachta indica* seeds were purchased from local market during summer 2021. The seeds were exposed in shade up to 4-5 days for drying (Rashmiet et al., 2011)

**Preparation of Plant Extract:** The dried seeds were chopped and grinded with the help of binder in laboratory on percent basis (Inam et al., 2012). The grinded leaves up to half kg wrapped in muslin cloth were put in 2.5 liters warm water (80 C) and retained for sixteen hours at room temperature. After sixteen hours the dipped material was squeezed which made 20 % of aqueous solution (Begum et al., 2010).

### **Methodology**

For the experiment fifteen plants were selected in the citrus orchard and each plant was divided into four sides (north, west, south, and east) and then tagged one branch of each side. Data of population of *D. citri* were recorded on five leaves of each branch of the selected side of the plants before spray. Blank spray was conducted to determine the amount of chemical insecticide against the pest on each plant and in each treatment. Three insecticides, namely Emamectin benzoate, lambda cyhalothrin and Acetamiprid were used on three plants, botanical extract (neem seed) was applied on one plant and one plant was left as control (no chemical and botanical). Data were collected at 24h before treatment and then 1 day, 2 days, 4 days, 8 days, 15 days, 30 days and 60 days intervals after treatment. The collected was statistically analyzed using RCB design and means were separated by using LSD test.

### **RESULTS**

The results of the experiment on to test efficacy of three synthetic and one botanical insecticides against *Diaphornia citri* on citrus at New Developmental Farm in the Agriculture University Peshawar in 2021 is presented and discussed in this chapter.

Results in Table 1 show the effect of three synthetic and one botanical insecticide against *Diaphornia citri*. The results revealed that density of the pest was significantly reduced after application of the synthetic and botanical insecticides. 24h after treatment pest density was significantly lower (1.60 per leaf) in lambda cyhalothrin treated plant while higher in control (1.90 per leaf). 2days after treatment, density of *Diaphornia citri* was significantly lower (1.85 per leaf) in lambda cyhalothrin treatment and higher in control (4.15 per leaf). 4 days after treatment density of *Diaphornia citri* was significantly lower (1.50 per leaf) in lambda cyhalothrin treatment and higher in control (4.20 per leaf). 8 days after treatment density of *D. citri* was significantly lower in lambda cyhalothrin treatment (1.50 per leaf) while higher in control (4.25 per leaf). 15 days after treatment density of *Diaphornia citri* was significantly lower in lambda

cyhalothrin treatment (1.40 per leaf) while higher in control (4.20 per leaf). 30 days after treatment density of *Diaphornia citri* was significantly lower in lambda cyhalothrin treatment (1.40 per leaf) while higher in control (4.15 per leaf). 60 days after treatment density of *Diaphornia citri* was significantly lower in lambda cyhalothrin treatment (1.30 per leaf) while higher in control (3.80 per leaf). Overall mean density of the pest was significantly lower with lambda cyhalothrin treatment (1.94 per leaf) and higher in control (3.83 per leaf).

## DISCUSSION

The study was conducted in to evaluate the comparative study of chemicals and botanical extract against citrus leaf miner during 2021 at New Developmental farm in Agriculture University Peshawar.

The results showed that all the tested chemicals and botanical extract showed significant results against citrus leaf miner. The experiment was carried out (RCBD) randomized complete block design and total five plants were selected in orchard at new developmental farm in Agriculture University Peshawar. The data were recorded before spray applications and the after 1, 2, 4, 8, 15, 30 and 60 days of spray application. Percent infestation were recorded by counting healthy and infested leaves in the braches of the tree. Before spray application the infestation of was nonsignificant Hussain et al., (2022) also reported that before spray application the infestation were nonsignificant. After all the spray application the highest percent mortality were recorded in tree treated with chemical insecticides Lambda cyhalothrin as compared to control. These findings are similar to the finding of Bughdady et al, (2020) Nesreen et al. (2016), Kar (2017) and Bala et al. (2019) who recorded lambda cyhlothrin as most effective against tomato leaf miner. Similarly Alam et al, (2019) and Illakwahhi et al, (2019) found that Neem extract was also effective against leaf minor in tested insecticide which is at par with findings of the current study.

## CONCLUSIONS

Lambda cyhalothrin exhibit as best management practice dealing with *Diaphornia citri* from all other Insecticides that are Acetamiprid, Emamectin benzoate and Neem seed extract (botanical insecticide) which shows the same effect upon *Diaphornia citri*, However not as effective as in comparison with lambda cyhalothrin. Lambda cyhalothrin insecticide is recommended for managing *Diaphornia citri* among all other four insecticides.

**Authors' Contributions:** All authors listed, have made substantial, direct and intellectual contribution to the work, and approved it for publication.

**Table 1. Effect of different insecticides of *Diaphornia citri* population recorded on citrus plants during summer 2021.**

Treatments	Before spray	Population after spray application (days)							Mean
		1	2	4	8	15	30	60	
Emamectin benzoate	5.00ab	2.55ab	2.25b	1.80b	1.70b	2.50b	1.80bc	2.15b	2.4688b

Neem seed	4.95ab	1.90ab	1.90b	1.95b	1.70b	2.15bc	2.00b	2.00b	2.3188b
lambda cyhalothrin	5.00ab	1.60b	1.85b	1.50b	1.50b	1.40d	1.40c	1.30c	1.9438c
Acetamiprid	6.30a	2.60a	2.00b	1.90b	1.50b	2.00c	2.00b	1.85bc	2.5187b
Control	4.20b	1.90ab	4.15a	4.20a	4.25a	4.20a	4.15a	3.60a	3.8313a
LSD <sub>(0.05)</sub>	1.8203	0.9621	0.7770	0.6451	0.6150	0.4774	0.4920	0.5533	0.3453

Mean followed by different letters in rows are significantly different at 0.5 level of probability followed by LST test.

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