

**Efficacy of Different Synthetic Insecticides against *Citrus psylla* Population Liviidae: Hemiptera at District Peshawar**

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**ABSTRACT**

The study was conducted to check the efficacy of different insecticides against *Citrus psylla* at ARI Tarnab Peshawar during the year 2024. Randomized complete block design (RCBD) was used having five treatments including control via Malathion, Lambda Cyhalothrin, Pyriproxifen, Polytrin-c replicated three times. After first spray application lowest mean population was recorded in Polytrin-c followed by Lambda cyhalothrin and highest mean population was recorded in control. Second spray data indicated that lowest mean population was recorded in Lambda cyhalothrin followed by Polytrin-c and highest mean population was recorded in control. All the insecticides were influential in regulating the population of *Citrus psylla*, and revision of spray significantly reduced their occurrence. Lambda cyhalothrin and Polytrin-c proved to be highly effective and it should be sprayed twice with an interval of three weeks.

**Keywords:** Insecticides, *Citrus psylla*, Malathion, Tarnab, Peshawar

**INTRODUCTION**

The Asian citrus psylla (ACP) *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae) is a major insect pest of citrus and is known to be highly destructive. ACP transmits the phloem-limited bacterium, *Candidatus Liberibacter asiaticus*, which is responsible for causing huanglongbing (HLB) or citrus greening disease (Halbert and Manjunath, 2004; Catling, 1969). This disease is one of the most devastating citrus diseases in the world, leading to the decline and eventual death of infected trees (Bové, 2006; Roistacher, 1996).

The distortion and defoliation of leaves, as well as premature fruit dropping, are common symptoms observed in plants that have been attacked by both nymphs and adults of *D. citri*. Honey dew production may also occur, which can lead to an infection of sooty mould fungus (Shah and Saleem, 2000). In

extreme cases, the plant may not survive more than 4-5 years due to the heavy infestation of the pest (Bove, 2006). Toxic saliva from the pest is believed to cause the distortion observed (Dennis, 1983).

The widespread distribution of the Asian citrus psyllid and HLB in citrus growing regions worldwide (Halbert and Manjunath, 2004; Halbert and Nunez, 2004; Pluke *et al.*, 2008) has led to increased research on ACP and HLB over the past several decades, enhancing our understanding of the insect, the disease, and their interactions.

In the management of pests and diseases, the use of soil and foliar applied insecticides is considered crucial (McCoy *et al.*, 2009). Foliar sprays are particularly effective against adult psyllids because they are more exposed compared to immature psyllids that are concealed in young shoots and are more susceptible to systemic poisons. Moreover, adult psyllids are responsible for transmitting *C. Liberibacter asiaticus* from infected to healthy trees in their vicinity (McCoy, 1985; Stansly and Qureshi, 2008).

According to the Food and Agriculture Organization (FAO, 2020), citrus production in Pakistan has been increasing steadily over the years. In 2020, Pakistan produced about 2.5 million tons of citrus fruits, making it the 11th largest producer of citrus fruits in the world. Citrus fruits are grown in different regions of Pakistan, with Punjab being the largest producer, followed by Sindh, Khyber Pakhtunkhwa, and Baluchistan.

The most commonly grown varieties of citrus fruits in Pakistan are oranges, mandarins, and grapefruits. However, citrus crops in the region have recently been severely affected by citrus psylla infestation, leading to a significant reduction in production. Given the considerable global commercial importance of citrus fruits, particularly in Khyber Pakhtunkhwa, whose climate is ideal for growing various citrus species that have been cultivated since ancient times in the region (MINFA, 2010-11), effective pest management strategies are crucial for the sustainable production of high-quality citrus crop.

As ACP and HLB pose a serious threat to citrus production in Pakistan and conventional control methods are unable to control this factor, therefore, the present study was carried out to evaluate the effectiveness of insecticides against citrus psylla with the following objectives:

## **MATERIAL AND METHODS**

This experiment was conducted at Agriculture Research Institute Tarnab, Peshawar, during 2024. The experiment was designed as RCBD having 05 treatments including control (untreated plants), replicated 03 times. The population of pest was counted on 3 leaves of selected branch (total 12 leaves/tree). Infestation was observed on both the upper and lower surface of the leaf. High infestation was observed in the month of October.

Four insecticides (Malathion, Lambda Cyhalothrin, Pyriproxifen and Polytrin-c) were sprayed at their recommended dose at morning time. Two sprays were given during peak infestation at 21 days interval.

### **Parameters**

1. Mean number of *citrus psylla* adults per leaf.
2. Percent decrease in mean population over control.

**Statistical Analysis**

The recorded data were subjected to ANOVA by repeated measurement analysis using Statistics 8.1 taking spray as repeated measure factor, whereas time and treatments were arranged in randomized complete block design.

**RESULTS AND DISCUSSION**

**Table 1. Mean number of *Citrus psylla* population per plant after 1<sup>st</sup> Spray Application.**

Treatment	DBS	1 DAS	2 DAS	3 DAS	7 DAS	14 DAS	21 DAS	Mean
Malathion	16.807	10.41 B	7.50C	6.08C	3.41C	3.66C	2.83C	17.24A
Lambda Cyhalothrin	23.537	8.383 B	5.60C	4.58C	2.75CD	0.58D	1.16D	6.65C
Pyriproxifen	18.55	11.33 B	11.91B	9.33B	6.25B	7.08B	6.08B	10.07B
Polytrin-C	18.183	8.183 B	6.16C	5.55C	1.25D	0.58D	0.66D	5.79C
Control	18.75	18.00 A	19.08A	19.0A	18.58A	17.41A	18.10A	18.41A
LSD	2.144	3.313	2.124	2.566	1.774	1.4	1.621	1.591
CV	<b>5.94</b>	<b>15.62</b>	<b>11.22</b>	<b>15.3</b>	<b>14.61</b>	<b>12.68</b>	<b>14.93</b>	<b>8.77</b>

Table 1 showed that before spray application data recorded was non-significant. Application of treatments after 24hrs of spray shows that there was no significant difference in Malathion, lambda cyhalothrin, Pyriproxifen and Polytrin-c, however minimum number of citrus infestation was found in Polytrin-c followed by lambda cyhalothrin and maximum number of citrus infestation was found in control. Similarly data recorded after 48hrs shows that there was no significant difference in Malathion, lambda cyhalothrin and Polytrin-c however minimum number of citrus infestation was found in lambda cyhalothrin followed by Polytrin-c and maximum no of citrus infestation was found in control. Data recorded after 72hrs of spray shows that there was no significant difference in Malathion, lambda cyhalothrin and Polytrin-c however minimum number of citrus infestation was found in lambda cyhalothrin followed by Polytrin-c and maximum number of infestation was recorded in control. Data recorded after 7 days of application shows that lambda cyhalothrin and Polytrin-c are significant however minimum infestation was recorded in Polytrin-c and maximum infestation was recorded in control. Data recorded after 14 and 21 days after application shows that lambda cyhalothrin and Polytrin-c are significant and others are non-significant respectively. Minimum infestation was recorded in Polytrin-c followed by lambda cyhalothrin and maximum infestation was recorded in control. Overall mean showed that after 1<sup>st</sup> spray application lowest mean number of *citrus psylla* population was recorded in Polytrin-c (5.79), which was statistically similar to Lambda cyhalothrin (6.65) followed by Pyriproxifen (10.07). the highest mean population was recorded in untreated plant (18.41) which was insignificant to Malathion (17.21).

**Table 2. Mean number of *Citrus psylla* population per plant after 2<sup>nd</sup> Spray Application.**

Treatment	DBS	1 DAS	2 DAS	3 DAS	7 DAS	14 DAS	21 DAS	Mean
Malathion	14.58B	11.33C	8.41BC	6.587BC	4.75B	3.66C	2.75C	7.440C
Lambda cyhalothrin	10.75C	9.91C	7.50C	5.750C	4.75B	0.58D	1.16D	5.773C
Pyriproxifen	18.33A	14.58B	10.83B	8.333B	6.16B	6.83B	6.00B	10.15B
Polytrin-c	12.93BC	11.41C	9.66BC	7.00BC	5.58B	0.75D	0.66D	6.86C
Control	18.58A	18.25A	18.33A	18.41A	18.08A	17.41A	18.10A	18.16A
LSD	2.542	3.095	2.6053	2.3237	1.8671	1.3216	1.5502	1.9148
CV	<b>8.98</b>	<b>12.55</b>	<b>12.64</b>	<b>13.39</b>	<b>12.61</b>	<b>12</b>	<b>14.35</b>	<b>10.51</b>

Table 2 shows that before 2<sup>nd</sup> Spray Application data recorded was non-significant. Data recorded 24hrs after 2<sup>nd</sup> Spray shows that Malathion, lambda cyhalothrin and Polytrin-c are significant and others are non-significant, however minimum citrus infestation was recorded in lambda cyhalothrin and maximum infestation was recorded in control. Data recorded 48hrs after application shows that lambda cyhalothrin and Polytrin-c are significant as compared to other and minimum infestation was recorded in lambda cyhalothrin while maximum infestation was recorded in control. Data recorded 72hrs after application shows that lambda cyhalothrin and Polytrin-c are significant as compared to other and minimum infestation was recorded in lambda cyhalothrin while maximum infestation was recorded in control. Data recorded 7 days after application shows that all the treatment are significant as compared to control. Data recorded 14 and 21 days after application shows that lambda cyhalothrin and Polytrin-c are significant and others are non-significant respectively. Minimum population was recorded in Polytrin-c followed by lambda cyhalothrin and maximum population was recorded in control. Overall mean showed that after 2<sup>nd</sup> spray application lowest mean number of *citrus psylla* population was recorded in Lambda cyhalothrin (5.773), which was statistically similar to Polytrin-c (6.86) followed by Malathion (7.440). the highest mean population was recorded in untreated plant (18.16) which was insignificant to Pyriproxifen (10.15).

Citrus psylla is the most harmful insect pest of citrus orchards all over the Pakistan (Abbas, 2001), which causes curling and defoliation of leaves, flowers and die back of branches leading to premature fruit dropping, by sucking cell sap (Shah and Saleem, 2000). There are three nymphal populations per year of citrus psylla at peak, observed in April, June and September (Sharma, 2008). But cold conditions have adverse effects on psyllid population due to high humidity and low temperature especially in January (Arora *et al.*, 1997).

Four insecticides were used to control *D. citri* in the field, out of which pyriproxifen was less effective than other three ones. All insecticides reduced 90% population up to the first week after spraying (Rao and Shivankar, 2011), but the effectiveness was declined up to 70% after one month. Thus, two sprays of Polytrin-C, lambda cyhalothrin and Malathion at 15 days interval were found to be successful against citrus psylla (Shivankar *et al.*, 2000).

In present data, Polytrin-c was found very effective exhibiting highest population reduction range of *D. citri* at 3–7 days after first and second insecticidal sprays which is in accordance with the findings of Sharma (2008) regarding very high population reduction with Polytrin-c at the same time range. Farmanullah and Gul (2005) stated Polytrin-c as highly effective to decrease *D. citri* population.

Polytrin-C and Imidacloprid provided the almost complete control of the 7 days of application, confirmed by the findings of (Shivankar *et al.*, 2000; Sétamou *et al.*, 2010).

Lambda Cyhalothrin was the second effective insecticide after Polytrin-c against *D. citri* at 7 Days after first and second spray, respectively. Lambda Cyhalothrin exhibited 100% mortality of *D. citri* after 4 days in comparison with methomyl, lambda-cyhalothrin and neem (*Azadirachta indica*) based solutions (Khan *et al.*, 2012). Lambda Cyhalothrin significantly control the attack of *D. citri* in the leaf tissue of grape fruit *Citrus paradisi* after two weeks of its soil treatment (Setamou *et al.*, 2010). Malathion was the third most effective insecticide that gave population control at 7-14 days after first and second spray, respectively.

The current study concluded that all the insecticides were influential in regulating the population of *Citrus psylla*, and revision of spray significantly reduced their occurrence. Although some insecticides affected the pest gradually

### CONCLUSIONS AND RECOMMENDATIONS

The current study concluded that all the insecticides were influential in regulating the population of *Citrus psylla*, and revision of spray significantly reduced their occurrence. Although some insecticides affected the pest gradually. Lambda cyhalothrin and Polytrin-c proved to be highly effective and it should be sprayed twice with an interval of at least three weeks.

Based on the current study it is recommended that further study should be conducted at various agro-climatic conditions for the effectiveness of these insecticides and identification of other species of *Citrus psylla*.

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