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## Field evaluation of different insecticides against green peach aphid *Myzus persicae* (Sulzer)

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**Abstract**

The green peach aphid is important sucking lice on many fruits, vegetables and other crops belonging to over forty different plant families. It has prominent morphological dark green longitudinal stripe on its pale green body. It can damage plants by sucking the sap resulting in water stress wilting and retarding growth of plant leaves especially the growths of seedlings. Their feeding on young leaves causes distortion and transmission of viral diseases. Different management practices have been adopted for their effective and timely management. Proper monitoring was done using different traps including water tray trap, yellow sticky trap and degree days models based on their developmental threshold are used for early diagnosis of their presence. Despite many options available for their control, many producers usually use insecticides for their effective management. Present study focuses to investigate the available insecticides to check their efficacy against this important aphid. Six insecticides i.e., Acetamiprid, Diafenthiuron, Imidacloprid, Thiacloprid, Bifenthrin and Plenum tested against green peach aphids under field conditions on peach trees in Horticultural garden, PMAS-Arid Agriculture University Rawalpindi using Randomized Complete Block Design for statistical analysis. Two frequent applications were used to analyze aphid mortality. Data were taken from the leaves, three replication branches for each insecticide treatment and total of thirty branches after 24hrs and up to ten days.

**Keywords:** Peach, Aphids and Insecticides.

**1. Introduction**

Peach tree grows to be about 4-10 m high and stands among one of the very important stone fruits in Pakistan<sup>[1]</sup>. A single peach fruit amounts 30 calories of energy with 7g carbohydrates and 8% vitamin C<sup>[2]</sup>. Its leaves are soft and leathery making them suitable for sucking insects like peach aphids which easily pierce and affect their normal fruit production by affecting plant photosynthesis. It damages the fruits directly with leaves and stem indirectly<sup>[3]</sup>. This damage ultimately leads to marketable fruit, down in quality and price with huge losses for economic returns<sup>[4]</sup>. Aphids, Scales and whiteflies usually infest the premature leaves of peach, mango, and guava and then on fruits<sup>[5]</sup>. Aphids are generally managed with insecticides, however, their method of application differs depending upon the mode and type of infestation. These insecticides differ in their mode and method of application for fruits, vegetables and other field crops as baits, repellants, and attractants and cover sprays<sup>[6]</sup>. Such control measures focus to get maximum benefit in form of pest control to decrease economic yield losses<sup>[7]</sup>. Peach aphid infests ornamental plants in dormant plant stage of peach trees and wind carries them from one place to another<sup>[8]</sup>. These aphids have body size of about 1.8-2.1mm, long head and thorax both are black in color, abdomen with dark patch on back and usually yellow-green in color<sup>[9]</sup>. Nymphs become yellow in color after some days of growth in warm weather.

These can be controlled with natural enemies (lady beetles, lacewings, damsel bugs) suppressing aphid population<sup>[10]</sup>. Regular monitoring of peach trees for pest presence at early stage leads to less frequent insecticide application which play vital role in their management. Keeping in view the importance of new chemistry insecticides for management of peach aphids these are commonly preferred. This emphasizes to find suitable field doses for efficient management of peach aphids.

**2. Materials and Methods**

The research was conducted to find out the efficacy of different insecticides against green peach aphid under field conditions during the year 2015 with two consecutive applications on peach trees in Horticultural garden, PMAS-Arid Agriculture University Rawalpindi using Randomized Complete Block Design for statistical analysis.

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### 2.1. Insecticides $\mu\text{l}$ (use proper symbol)

Six insecticides namely Mospilon® (acetamiprid), Polo® (diafenthiuron), Confidor® (imidacloprid), Calypso® (thiacloprid), Talstar® (bifenthrin) and Plenum® (pymetrozine) were purchased from the pesticide companies. The insecticides were applied at their recommended doses for other aphid species or sucking insect pests on field crops. Field dose rate prepared in 200 ml water each of Mospilon @ 300  $\mu\text{l}$ , Polo @ 240  $\mu\text{l}$ , Confidor @ 200  $\mu\text{l}$ , Clypso @ 160  $\mu\text{l}$  and Plenum @ 400  $\mu\text{l}$ , respectively. These were applied with small sprayer on selected branches labeled properly.

### 2.2 Selection of Peach Trees Branches for Insecticide Trial

Peach trees (8-10 years old) monitored on weekly basis for sufficient number of *M. persicae* aphids to plan for insecticide comparison trials. There were seven treatments including six insecticide treatments and one control. For each treatment, ten branches were tagged properly and three leaves per branch with total of thirty leaves per treatment (replications) were observed for aphid population. For tagging branches under each treatment, different colored tags of red, green, yellow, blue, pink and rust brown respectively attached for each treatment except for control where white tags were used. The tree branches were selected according to randomized complete block design. It is used in field trials to control variation in an experiment by secretarial for three-dimensional effects in field or greenhouse. The suitable and defining character of the Randomized Complete Block Design is that each block sees each treatment exactly once. Advantages of the RCBD generally more exact than the completely randomized design. There is no specific restriction on the number of treatments or replicates. Some treatments may be replicated more times than others. Estimation is very easy and clear in missing plots.

### 2.3. Application of Insecticides and Aphid Population Changes

Insecticide solutions at desired concentration of field dose rate for each insecticide prepared in 500 ml glass beakers, labeled properly. These beakers with micro spray machine taken for spray application after counting the aphid population in each treatment from the specified number of leaves per treatment. After application of all insecticide treatment data were taken on an interval of 24 hours till seven day and then the tenth day. Next application of these treatments applied two weeks after the first application in the same procedure as adopted for first application. After second application, the number of living aphids was not same as for the first application.

### 2.4. Data Analysis

Number of aphids counted would use to assess the mortality rate and percent mortality after correcting the mortality with the control. Data was analyzed by using Analysis of Variance. Means were compared for significance by Duncan's Multiple Range Test (DMR) at 5% probability level.

## 3. Results and Discussion

The Research was conducted in Horticulture Peach Garden located at Pir Mehr Ali Shah Arid Agriculture University Rawalpindi research field on six different insecticides to check their efficacy against green peach Aphid (*Myzus persicae*).

### 3.1. 1<sup>ST</sup> Application of Different Insecticides

#### 3.1.1 Mortality percentage after 24 hours interval

Analysis of variance of insecticides in 1<sup>st</sup> application after 24

hours is given in Table.1. Whereas the means were compared by DMR Test at P=0.05 that presents mortalities after 24 hours in the 1<sup>st</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities by Acetamiprid recorded 27.94 percent while the lowest number of mortalities were recorded 18.05 percent in case of Plenum. These results are in close conformity with earlier reports that the neonicotinoids viz., imidacloprid, thiamethoxam and acetamiprid are the most effective insecticides against many aphid species including *M. persicae* [11-16].

#### 3.1.2 Mortality percentage after 48 hours interval

Analysis of variance of insecticides in 1<sup>st</sup> application after 48 hours is given in Table. 1. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after 48 hours in the 1<sup>st</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 32.10 percent in case of Acetamiprid. Results regarding the performance of synthetic insecticides to control aphid on various vegetable and agronomic crops match with many earlier studies in which Acetamiprid Endosulfan and imidacloprid have been found successful in reducing the population of aphids, (*Sitobion avenae* (F.); *Rhopalosiphum maidis* (Titch) [17-23].

#### 3.1.3 Mortality percentage after 72 hours interval

Analysis of variance of insecticides in 1<sup>st</sup> application after 72 hours is given in Table. 1. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after 72 hours in the 1<sup>st</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 41.86 percent in case of Acetamiprid followed by 24.29 percent in case of Bifenthrin while the lowest number of mortalities were recorded 21.68 percent in case of Plenum. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides. The mortality range of insecticides was 21.68 percent to 41.86 percent after 72 hours in the 1<sup>st</sup> application of insecticides.

#### 3.1.4 Mortality percentage after 96 hours interval

Analysis of variance of insecticides in 1<sup>st</sup> application after 96 hours is given in Table. 1. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after 96 hours in the 1<sup>st</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 48.70 percent in case of Acetamiprid while the lowest number of mortalities were recorded 22.00 percent in case of Plenum. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides. Results regarding the performance of synthetic insecticides to control aphid on various vegetable and agronomic crops match with many earlier studies in which Acetamiprid, Endosulfan and imidacloprid have been found successful in reducing the population of aphids, (*Sitobion avenae* (F.); *Rhopalosiphum maidis* (Titch) [17- 23]

#### 3.1.5 Mortality percentage after 120 hours interval

Analysis of variance of insecticides in 1<sup>st</sup> application after 120 hours is given in Table. 1. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after 120

hours in the 1<sup>st</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 52.67 percent in case of Acetamiprid followed by 31.59 percent in case of Bifenthrin while the lowest number of mortalities was recorded 24.52 percent in case of Plenum. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides. The mortality range of insecticides was 24.52 percent to 52.67 percent after 120 hours in the 1<sup>st</sup> application of insecticides. These results were in conformity with that of [24] where by foliar applied insecticide reduced *M. persicae* pest damage and increased yields significantly. According to [25] chemical control resulted in a significantly higher yield.

### 3.1.6 Mortality percentage after 144 hours interval

Analysis of variance of insecticides in 1<sup>st</sup> application after 144 hours is given in Table. 1. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after 144 hours in the 1<sup>st</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 55.31 percent in case of Acetamiprid followed by 32.67 percent in case of Bifenthrin while the lowest number of mortalities was recorded 24.81 percent in case of Plenum. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides.

### 3.1.7 Mortality percentage after 168 hours interval

Analysis of variance of insecticides in 1<sup>st</sup> application after 168 hours is given in Table. 1. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after 168 hours in the 1<sup>st</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 63.84 percent in case of Acetamiprid followed by 33.52 percent in case of Bifenthrin while the lowest number of mortalities was recorded 36.73 percent in case of Plenum. Acetamiprid was considered as comparatively effective against green peach aphid from all

other insecticides. The mortality range of insecticides was 36.73 percent to 63.84 percent after 168 hours in the 1<sup>st</sup> application of insecticides. Results regarding the performance of synthetic insecticides to control aphid on various vegetable and agronomic crops match with many earlier studies in which Acetamiprid, Endosulfan and imidacloprid have been found successful in reducing the population of aphids, (*Sitobion avenae* (F.); *Rhopalosiphum maidis* (Titch) [17-23]

### 3.1.8 Mortality percentage after Ten days interval

Analysis of variance of insecticides in 1<sup>st</sup> application after ten days is given in Table. 1. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after ten days in the 1<sup>st</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 69.77 percent in case of Acetamiprid followed by 40.34 percent in case of Imidacloprid while the lowest number of mortalities was recorded 25.34 percent in case of Plenum. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides. The results are in compatibility with [26] that the insecticides can control the Peach aphids effectively. According to [27] the chemical control of aphids in potato can minimize Potato leaf roll virus. The results are also in similarity with that of [28] they managed the aphid population by using different chemicals and Acetamiprid was found to be the most effective then other insecticides.

## 3.2. 2<sup>nd</sup> Application of Different Insecticides

### 3.2.1 Mortality percentage after 24 hours interval

Analysis of variance of insecticides in 2<sup>nd</sup> application after 24 hours is given in Table. 2. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after 24 hours in the 2<sup>nd</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 22.38 percent in case of Acetamiprid followed by 19.80 percent in case of Thiachloprid while the lowest number of mortalities was recorded 14.80 percent in case of Plenum. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides.

**Table 1:** Mean comparison of insecticides after 1<sup>st</sup> application of insecticides

Insecticides	24hrs	48hrs	72hrs	96hrs	120hrs	144hrs	168hrs	Ten days
Aceta	27.94 a	32.09 a	41.85 a	48.70 a	52.67 a	55.31 a	63.84 a	69.77a
Difen	19.77 b	21.10 b	23.83 b	29.43 b	29.65 b	29.72 b	30.26 b	31.01 b
Imida	20.98 b	21.24 b	21.72 b	23.48 b	23.38 b	31.94 b	31.44 b	40.34 b
Thia	22.49 b	22.43 b	23.75 b	25.79 b	26.83 b	27.76 b	28.04 b	28.59 b
Bifen	19.99 b	22.30 b	24.29 b	27.52 b	31.59 b	32.67 b	33.52 b	39.57 b
Plenum	18.05 b	19.47 b	21.68 b	22.00 b	24.52 b	24.81 b	36.73 b	25.34 b
LSD	4.49	5.50 b	9.36 b	9.36	13.43	14.14	16.46	19.91
Analysis	F6,17=5.87 P<0.0000***	F6, 17=6.72 P<0.0001***	F6, 17=8.91 P<0.0001***	F6, 17=10.84 P<0.0019**	F6, 17=6.47 P<0.0140*	F6,17=5.97 P<0.0060**	F6,17=6.50 P<0.0060**	F6, 17=6.54 P<0.0687**

Acetamiprid, Diafenthuron, Imidacloprid, Thiachloprid, Bifenthrin and Plenum

### 3.2.2 Mortality percentage after 48 hours interval

Analysis of variance of insecticides in 2<sup>nd</sup> application after 48 hours is given in Table.2. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after 48 hours in the 2<sup>nd</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 25.82 percent in case of Acetamiprid followed by 19.46 percent in case of Thiachloprid while the lowest number

of mortalities was recorded 2.43 percent in case of Imidacloprid. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides.

### 3.2.3 Mortality percentage after 72 hours interval

Analysis of variance of insecticides in 2<sup>nd</sup> application after 72 hours is given in Table.2. Whereas the means were compared by DMR Test at P=0.05 presents the mortalities after 72 hours in the 2<sup>nd</sup> application of insecticides. It has been observed that

all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 30.80 percent in case of Acetamiprid followed by 20.12 percent in case of Bifenthrin while the lowest number of mortalities was recorded 17.51 percent in case of Imidacloprid. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides. The mortality range of insecticides was 17.51 percent to 30.80 percent after 72 hours in the 2<sup>nd</sup> application of insecticides.

### 3.2.4 Mortality percentage after 96 hours interval

Analysis of variance of insecticides in 2<sup>nd</sup> application after 96 hours is given in Table. 2. Whereas the means were compared by DMR Test at  $P=0.05$  presents the mortalities after 96 hours in the 2<sup>nd</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 39.80 percent in case of Acetamiprid followed by 28.19 percent in case of Diafenthiuron while the lowest number of mortalities was recorded 20.86 percent in case of Plenum. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides. Thus, it can be inferred from these results that among the six insecticides, Acetamiprid and Imidacloprid were significantly more toxic to the aphid as compared to other insecticides. Earlier workers have also found neonicotinoids viz. Acetamiprid and Imidacloprid quite effective against *M. persicae* in different crops [28-31] Studied effectiveness of Imidacloprid and Acetamiprid against *Myzus persicae* and reported that both these insecticides significantly reduced the aphid infestation.

### 3.2.5 Mortality percentage after 120 hours interval

Analysis of variance of insecticides in 2<sup>nd</sup> application after 120 hours is given in Table. 2. Whereas the means were compared by DMR Test at  $P=0.05$  presents the mortalities after 120 hours in the 2<sup>nd</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 44.35 percent in case of Acetamiprid followed by 22.71 percent in case of Imidacloprid while the lowest number of mortalities was recorded 19.08 percent in case of Bifenthrin. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides. The mortality range of insecticides was 19.08 percent to 44.35 percent after 120 hours in the 2<sup>nd</sup> application of insecticides.

### 3.2.6 Mortality percentage after 144 hours interval

Analysis of variance of insecticides in 2<sup>nd</sup> application after 144 hours is given in Table. 2. Whereas the means were compared by DMR Test at  $P=0.05$  presents the mortalities after 144 hours in the 2<sup>nd</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum

number of mortalities was recorded 48.02 percent in case of Acetamiprid followed by 24.54 percent in case of Imidacloprid while the lowest number of mortalities was recorded 19.40 percent in case of Thiacloprid. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides. The results are in compatibility with [22] that the insecticides can control the Peach aphids effectively. According to [23] the chemical control of aphids in potato can minimize Potato leaf roll virus. The results are also in similarity with that of [24] they managed the aphid population by using different chemicals and Acetamiprid was found to be the most effective then other insecticides.

### 3.2.7 Mortality percentage after 168 hours interval

Analysis of variance of insecticides in 2<sup>nd</sup> application after 168 hours is given in Table. 2. Whereas the means were compared by DMR Test at  $P=0.05$  presents the mortalities after 168 hours in the 2<sup>nd</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 52.69 percent in case of Acetamiprid followed by 33.66 percent in case of Imidacloprid while the lowest number of mortalities was recorded 26.54 percent in case of Plenum. Acetamiprid was considered as comparatively effective against green peach aphid from all other insecticides. The mortality range of insecticides was 26.54 percent to 52.69 percent after 168 hours in the 2<sup>nd</sup> application of insecticides. Similar results were observed by [25] but they used different insecticides including Imidacloprid, Acetamiprid and Endosulfan against mustard and turnip aphid, *Lipaphis erysimi* (Kalt.) and found Imidacloprid and Acetamiprid the most effective insecticide up to 7 days

### 3.2.8 Mortality percentage after Ten days interval

Analysis of variance of insecticides in 2<sup>nd</sup> application after ten days is given in Table. 2. Whereas the means were compared by DMR Test at  $P=0.05$  presents the mortalities after ten days in the 2<sup>nd</sup> application of insecticides. It has been observed that all the insecticides were statistically similar with each other except Acetamiprid. The maximum number of mortalities was recorded 63.53 percent in case of Acetamiprid followed by 39.48 percent in case of Imidacloprid while the lowest number of mortalities was recorded 28.19 percent in case of Plenum. Acetamiprid was considered as comparatively effective. Thus, it can be inferred from these results that among the six insecticides, Acetamiprid and Imidacloprid were significantly more toxic to the aphid as compared to other insecticides. Earlier workers have also found neonicotinoids viz, Acetamiprid and Imidacloprid quite effective against *M. persicae* in different crops [17, 18]. [19] Studied effectiveness of Imidacloprid and Acetamiprid against *M. persicae* and reported that both these insecticides significantly reduced the aphid infestation.

**Table 2:** Mean comparison of insecticides after 2<sup>nd</sup> application of Insecticides

Time	24hrs	48hrs	72hrs	96hrs	120hrs	144hrs	168hrs	10days
Aceta	22.38 a	25.82 a	30.80 a	39.80 a	44.35 a	48.02 a	52.69 a	63.55 a
Difen	16.32bc	18.10 b	17.82 b	28.19 b	22.70 b	22.97 b	27.70 b	31.00 b
Imida	18.36bc	2.43 b	17.51 b	22.40 b	22.71 b	24.54 b	33.66 b	39.48 b
Thia	19.80 ab	19.46 b	18.12 b	24.29 b	21.40 b	19.40 b	27.04 b	32.60 b
Bifen	17.00bc	17.69 b	20.12 b	24.26 b	19.08 b	22.67 b	31.93 b	37.52 b
Plenum	14.80 c	16.54 b	18.40 b	20.86 b	20.08 b	22.07 b	26.54 b	28.19 b

LSD	3.46	5.04	3.00	8.18	7.06	8.19	18.24	15.63
Analysis	F6, 17=6.05 <i>P</i> <0.0000***	F6, 17=23.25 <i>P</i> <0.0001***	F6, 17=29.05 <i>P</i> <0.0000***	F6, 17=7.05 <i>P</i> <0.0003***	F6, 17=18.17 <i>P</i> <0.0002***	F6, 17=16.68 <i>P</i> <0.0004***	F6, 17=2.94 <i>P</i> <0.0125*	F6, 17=6.70 <i>P</i> <0.0067**

Acetamiprid, Diafenthiuron, Imidacloprid, Thiacloprid, Bifenthrin and Plenum

### 3.3. Recommendations

From the present research it is concluded, that Mospilon® (Acetamiprid) was found to be the most effective insecticide as highest mortality has been observed against Green Peach Aphid *Myzus persicae* (Sulzer). So it is recommended for the management of Green peach aphid to get maximum yield production of peaches.

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