Original Research Article

FIELD EVALUATION OF INSECTICIDES ON ONION THRIPS & THEIR SUBSEQUENT EFFECT ON BUDWORM INFESTATION AT MANSEHRA

ABSTRACT

Efficacy of three different insecticides Lannate 40 SP (2.5g/Lit), Karate 2.5 EC (3ml/lit) and Curacron 500 EC (4 ml/lit) were tested for the control of Onion pests Thrips tabaci and Helicoverpa armegra on onion crop at National Tea & High Value Crops research Institute, Shinkiari, Mansehra during 2016-17. Evaluation of insecticides testing was based on average population of thrips and budworm, thousand grains weight inflorescence/plant, stalk/plant, umbel size, plant width, no. of florets/plant and stalk length. The insecticides were sprayed three times for the control of thrips and one time against budworm. Average population of pests were recorded by counting number of alive pests on randomly selected plants at interval of 24, 48 and 72 hours and then on weekly basis. Results indicated that all insecticides gave significant control of both pests. However, Curacron 500 EC (4 ml/lit) prove best showing minimum pests population after every application as compared to other two insecticides and has least negative effect on vegetative and reproduction structure of onion bulbs.

Keywords: Onion; Thrips tabaci; Helicoverpa armegra; Lannate; Karate; Curacron; KPK.

1. INTRODUCTION

Onion, Allium cepa locally known as piaz belongs to family Alliaceae, is a biennial herbaceous and cross pollinated winter vegetable. The name "Onia" is most likely ranked to a city built by Onia in 1703 BC near the bank of Suez [1]. Onions differ in color, shape and taste. Bulbs can be white, yellow or red and round, flattened or torpedo-shaped. Some are sweet while others are highly spices. It is mostly used almost every day in a large variety of dishes [2]. The use of onion is not restricted to any climate or related with any nationality of vegetable crops listed by onion ranks second after tomatoes in term of total world production [3]. Onion is a condiment crop, which is consumed fresh salad or added in cooking dishes as a flavor. Hazara division, in general plays an essential role in onion seed and bulb production. Like any other crop, onion is also attacked to the attack of many pests including insects, bacterial and fungal diseases [4]. There are two very well known insect species threatening onion production, the onion thrips, Thrips tabaci (Thysanoptera, Thripidae, Lind,) and budworm, Helithis armigera (Lepidoptera, Noctuidae, Hub,). Damage is caused by both nymphs and adults with their rasping and sucking mouth parts [5].

The pest is very energetic at the time of flowering badly affecting both the yield and viability of the seed [6]. Onion thrips have a stylet that is used to penetrate plant tissue; additional stylet form of feeding tube which is used to pump out plant liquids. It causes an annual yield loss of 10-15 per cent in onion [7]. Besides the economic cost, environmental problems and remains persistence, it is difficult to control this pest with insecticides because of its small size and hidden habits [8]. Bud worm (Heliothis armigera) belongs to a group of caterpillar pests commonly known as heliothis and is a close relative of another major pest species known as the cotton bollworm or corn earworm (Helicoverpa armigera). The bud worm is native to Australia and can develop large populations over large areas on native plants. These population often transfer into agricultural regions in late winter and spring, causing damage to a wide range of broad acre and horticultural crops. Migratory flights are irregular, as moths may be carried hundreds of kilometers from breeding areas by high altitude air currents.

Various control measures are used to keep the population of onion thrips and budworm below economic injury level (EIL) and to get high production of onions. One of which is the chemical control method. Onion thrips feed on leaves and kill young plants, but most often their injury results in reduced onion yield and bulb size. If onion thrips are not controlled, onion yield reduction can reach levels from 34 % to nearly 50 % [9]. It is important for
growers to have several classes of insecticides with different modes of action to use against thrips so that they
have a balanced insecticide resistance management plan. However, pyrethriods will continue to be promoted
because of their effectiveness in some areas and their relative low cost. The specific objectives of the present
study were to find out the effective chemical product for the control of onion thrips and to determine the
alternative effects of the applied chemical insecticides on the budworm a serious pest of onion seed crop.

2. MATERIALS AND METHODS

District Mansehra is located at the eastern border of the Khyber Pakhtunkhwa, 244 km away from Peshawar
and 170 km away from Islamabad. The district is geographically located at latitude (34.34 degrees) 34° 20' 24"
North of the Equator and longitude (73.2 degrees) 73° 12' 0" East of the Prime Meridian on the Map of the
world. It contains the town of Mansehra and Kaghan Valley (a popular tourist destination in Pakistan) and three
Tehsils Mansehra, Balakot and Oghi. The Karakoram Highway passes through it. The experiment will be
carried out at National Tea and High Value Crops Research Institute (NTHRI) Shinkiari, Mansehra-Pakistan
during 2016-17, for the field evaluation on insecticides on onion thrips & their subsequent effect on budworm
infestation at Dist. Mansehra.

2.1 EXPERIMENTAL DESIGN

Before experiment the field was prepared for seed sowing. Seeds were sowed on 05/10/2016. The experiment
was laid out in Randomized Complete block Design (RCBD). The field was divided into four sub plots
randomizely as indicated in Table 1. Replications and treatments were separated from each other by keeping a
row as a buffer zone. The plant to plant distance was 30 cm and row to row distance was 70 cm. Size of each
sub plot was 15m$^2$ and total experimental area was 3060 m$^2$.

Each treatment was treated with specific insecticide with respective dose as shown in Table 2. These
insecticides were applied on these treatments with the help of Knap sack sprayer. Data was taken 24 hours
before and after insecticide application and similarly 48,72 hours after insecticide application and then on
weekly basis. Second treatment will be applied as and when the pest population exceeding from economic
injury level. To achieve minimum error the data was recorded from 15 randomly selected plants per plot but the
data for infestation of bud worm was taken from 10 randomly selected plants per plot. Besides thrips and bud
worm infestation the following parameters was also studied: width of plants, stalk length, no of florets per
umbel, no of inflorescence per plant, umbel size, no of stalk per plant and 1000 grains weight per treatment.

The data of all experiment was statistically analyzed by using STATISTIX V 8.1 a statistic program with
one way ANOVAs. The mean was separated by Duncan multiple range test.
Table 1. Layout of an experimental field

<table>
<thead>
<tr>
<th>Replications</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rep 1</td>
<td>T2</td>
</tr>
<tr>
<td>Rep 2</td>
<td>T4</td>
</tr>
<tr>
<td>Rep 3</td>
<td>T1</td>
</tr>
</tbody>
</table>

Table 2. Insecticides and their respective doses

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Chemical Name</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1: Lannate 40SP</td>
<td>Methomyl</td>
<td>2.5 g/ lit H₂O</td>
</tr>
<tr>
<td>T2: Karate 2.5EC</td>
<td>Lambda-cyachlothrin</td>
<td>3 ml/ lit H₂O</td>
</tr>
<tr>
<td>T3: Curacron 500EC</td>
<td>Profenophos</td>
<td>4 ml/ lit H₂O</td>
</tr>
<tr>
<td>T4: Check</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. RESULTS AND DISCUSSION

The current study was conducted to know the effectiveness of different insecticides against the population of Thrips tabaci and Helicoverpa armegira on Swat-1 variety onion (Allium cepa L.) bulbs crop. The data regarding the population dynamics of T. tabaci and H. armegira are depicted in Tables 3-7 on onion bulb crop, grown at National Tea & High Value Crops Research Institute, Shinkiari, District Mansehra, during 2016-17 growing season.

Data presented in table 3 showed the average population of Thrips after 1st application of chemical insecticides (Lannate “T1”, Karate “T2” and Curacron “T3”). Although, all the three insecticides used were effective initially after 24 hours of the treatment. The average population of Thrips after 24 hrs of the 1st application of T1, T2 and T3 was 0.942, 0.088 and 0.544 respectively. The long lasting and durable effect was shown by T3 (Curacron), as after 3 weeks of the treatment, the average population of Thrips was 3.864, 2.444 and 1.377 for T1, T2 and T3 respectively. Comparatively, T3 (Curacron) was found to be effective and showed long lasting effect by controlling and minimizing the population of Thrips. After 1 week of the treatment the control has maximum average population of Thrips, 34.31, but due to the effect of Curacron (T3) at the same stage, Thrips has comparatively the least average population (0.688).

Table 3. Average population of thrips after 1st application of chemical Insecticides.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Dose</th>
<th>Pre treatment</th>
<th>24 hrs after</th>
<th>48 hrs after</th>
<th>72 hrs after</th>
<th>1 week after</th>
<th>2 week after</th>
<th>3rd week after</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1: Lannate 40SP</td>
<td>2.5 g/ lit H₂O</td>
<td>6.55 A</td>
<td>0.942 B</td>
<td>2.711 B</td>
<td>0.900 B</td>
<td>5.174 B</td>
<td>1.844 B</td>
<td>3.864 B</td>
</tr>
<tr>
<td>T2: Karate 2.5EC</td>
<td>3 ml/ lit H₂O</td>
<td>4.36 A</td>
<td>0.088 B</td>
<td>0.576 B</td>
<td>0.744 B</td>
<td>3.444 B</td>
<td>1.400 B</td>
<td>2.444 B</td>
</tr>
<tr>
<td>T3: Curacron 500EC</td>
<td>4 ml/ lit H₂O</td>
<td>6.12 A</td>
<td>0.544 B</td>
<td>0.488 B</td>
<td>0.755 B</td>
<td>0.688 B</td>
<td>1.511 B</td>
<td>1.377 B</td>
</tr>
<tr>
<td>T4: Check</td>
<td>-</td>
<td>5.36 A</td>
<td>22.30 A</td>
<td>15.67 A</td>
<td>15.97 A</td>
<td>34.31 A</td>
<td>13.66 A</td>
<td>10.20 A</td>
</tr>
</tbody>
</table>

By the applying second application of chemical insecticides on T1, T2 and T3, the average population of Thrips after 24 hours of the treatment decreased up to a significant level of 0.044, 0.667 and 0.441 respectively. With the passage of time the pest increase its population frequency in the plot where Lannate (T1)
was applied and reached to an average of 44.90 after 2 weeks of the treatment. Comparatively, Karate (T2) and Curacron (T3) restricted the population of Thrips to values 11.25 and 16.45 respectively even after 2 weeks of the treatment. The population of Thrips before treatment were easily observed at T2 and T3 and equally effective upon the 2nd application.

During the present survey Lannate was not effective in reducing population of budworm which is different from the research work of [10].

Table 4. Average population of thrips after 2nd application of chemical Insecticides.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Dose</th>
<th>Pre treatment</th>
<th>24 hrs after</th>
<th>48 hrs after</th>
<th>72 hrs after</th>
<th>1 week after</th>
<th>2 week after</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1: Lannate 2.5 g/ lit H2O</td>
<td>58.60 A</td>
<td>0.044 B</td>
<td>0.566 B</td>
<td>0.435 B</td>
<td>3.440 B</td>
<td>44.90 A</td>
<td></td>
</tr>
<tr>
<td>T2: Karate 3 ml/ lit H2O</td>
<td>30.5 A</td>
<td>0.667 B</td>
<td>0.785 B</td>
<td>0.315 B</td>
<td>1.023 C</td>
<td>11.25 B</td>
<td></td>
</tr>
<tr>
<td>T3: Curacron 4 ml/ lit H2O</td>
<td>49.2 A</td>
<td>0.441 B</td>
<td>0.468 B</td>
<td>0.552 B</td>
<td>2.853 BC</td>
<td>16.45 B</td>
<td></td>
</tr>
<tr>
<td>T4:Check</td>
<td>-</td>
<td>46.5 A</td>
<td>11.8 A</td>
<td>13.01 A</td>
<td>3.200 A</td>
<td>8.720 A</td>
<td></td>
</tr>
</tbody>
</table>

The present work was conformity with [11] because in the present study Karate was not so effective and the effect of Karate was decrease day by day after application as shown in Table 3, 4, 5 & 6 because in the present study applications of Karate were applied at the rate of 3 ml after at interval of about three weeks but in the previous work it was used four time at the quantity of about 40 ml.

After the 3rd application of chemical insecticides, the average population of Thrips is minimized to mean values of 0.148, 0.275 and 0.423 for T1, T2 and T3 respectively after 24 hours of the treatment. This indicate that initially all the insecticides used were effective but with the passage of time trivial fluctuation were observed in terms of their effectiveness after 1st, 2nd and 3rd week of the treatment. The average population of Thrips after 1 week of the 3rd treatment of Lannate (T1) was 1.600, Karate (T2) 0.678 and Curacron (T3) 0.587. After 3 weeks the values were 4.025, 4.010 and 1.689 respectively. The effective measures of the chemical insecticides were compared and observed.

Table 5. Average population of thrips after 3rd application of chemical Insecticides in onion bulbs crops.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Dose</th>
<th>Pre treatment</th>
<th>24 hrs after</th>
<th>48 hrs after</th>
<th>72 hrs after</th>
<th>1 week after</th>
<th>2 week after</th>
<th>3rd week after</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1: Lannate 2.5 g/ lit H2O</td>
<td>125.8 A</td>
<td>0.148 B</td>
<td>0.345 B</td>
<td>0.427 B</td>
<td>1.690 B</td>
<td>4.251 A</td>
<td>4.025 B</td>
<td></td>
</tr>
<tr>
<td>T2: Karate 3 ml/ lit H2O</td>
<td>29.02 A</td>
<td>0.275 B</td>
<td>0.145 B</td>
<td>0.431 B</td>
<td>0.678 B</td>
<td>1.989 C</td>
<td>4.010 B</td>
<td></td>
</tr>
<tr>
<td>T3: Curacron 4 ml/ lit H2O</td>
<td>53.07 B</td>
<td>0.423 B</td>
<td>0.187 B</td>
<td>0.498 B</td>
<td>0.587 B</td>
<td>2.358 BC</td>
<td>1.689 B</td>
<td></td>
</tr>
</tbody>
</table>
In light of the results obtained, after three successive applications of chemical insecticides in onion bulb crop, it was found that Curacron (T3) is the most effective chemical insecticide followed by Karate (T2) and Lannate (T1) against the T. tabaci, by inhibiting or restricting its growth and population.

Data in Table 6 demonstrate the effect of chemical insecticides on the average population of budworm in onion bulb crop. All the three insecticides i.e., Lannate (T1), Karate (T2) and Curacron (T3) were also evaluated for their effectiveness and controlling the budworm population. The population of budworm was at its peak after 48 hours of the treatment, as can be observed in Table 6 reaching to it maximum value of 0.4668 in the plot labeled as control. At this stage karate (T2) failed to control the population of budworm having an average value of 0.678. On the other hand Curacron (T3) is inhibiting the growth of budworm for about three weeks after treatment, as no growth was observed from pre-treatment (0.000) till the end of 2nd week (0.000).

On the other hand Lannate (T1) was found to be important too, as it minimize the population of budworm from pre-treatment (0.1000) to 72 hours after the treatment (0.000). This indicates that Curacron (T3) can be used as a precautionary measure in order to prevent the inception of Budworm while Lannate (T1) can be used as a treatment for budworm.

In the present study it was concluded that Lannate was not effective against onion thrips and budworm. The results of present experiment were parallel to the work of [12] & [13]. Both experiments showed that Lannate was least effective against onion thrips and budworm as compared to other pesticides.

### Table 6. Average population of budworm

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Dose</th>
<th>Pre treatment</th>
<th>24 hrs after</th>
<th>48 hrs after</th>
<th>72 hrs after</th>
<th>1 week after</th>
<th>2 week after</th>
<th>3rd week after</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1: Lannate</td>
<td>2.5 g/ lit H₂O</td>
<td>0.1000 AB</td>
<td>0.0000 C</td>
<td>0.000 B</td>
<td>0.000 B</td>
<td>0.1433 A</td>
<td>0.1000 A</td>
<td>1.000 AB</td>
</tr>
<tr>
<td>T2: Karate</td>
<td>2.5EC</td>
<td>0.2000AB</td>
<td>0.1766 B</td>
<td>0.678 B</td>
<td>0.0335 B</td>
<td>0.0354 BC</td>
<td>0.0333B</td>
<td>0.0668 B</td>
</tr>
<tr>
<td>T3: Curacron</td>
<td>4 ml/ lit H₂O</td>
<td>0.0000 B</td>
<td>0.0000 C</td>
<td>0.000 B</td>
<td>0.000B</td>
<td>0.000 C</td>
<td>0.000 B</td>
<td>0.0354 B</td>
</tr>
<tr>
<td>T4: Check</td>
<td>-</td>
<td>0.3333 A</td>
<td>0.3333 A</td>
<td>0.4668 A</td>
<td>0.4500A</td>
<td>0.1000 BC</td>
<td>0.10000 A</td>
<td>0.1675 A</td>
</tr>
</tbody>
</table>

Data illustrated in Table 7 showed the effect of the chemical insecticides used, on different parameters of onion bulbs crop. Slight decrease in 1000 grains weight of onion bulbs crop was observed after the application of Lannate (T1), Karate (T2) and Curacron (T3) each. As shown in Table 7 thousand grains weight of control has a mean value of 4.23, while decrease in 100 grains weight was observed after applying insecticides as 3.02, 3.25 and 3.05 for T1, T2 and T3 respectively. Unlike Lannate (T1) and Karate (T2), no major effect of Curacron (T3) was observed on Inflorescence / plant and stalks / plant. In both parameters the values (10.3) are nearly the values of control (11.33). As shown in data improvement in umbel size was observed in all cases along with another positive effect of Curacron (T3) on width of plant, which was found to be a little improved than the control. Over all no negative effect was found.

Consequently, it was observed that Curacron (T1) was the insecticide of choice for controlling the T. tabaci. On the other hand Lannate (T1) and Curacron (T3) were found to be equally effective against Budworm.
and its onset. Data regarding different parameters in Table 7 shows that over all Curacron (T3) has least negative effect on vegetative and reproductive structures of onion bulbs crop.

Table 7. Data of Different parameters.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Dose</th>
<th>1000 grain wt.</th>
<th>Inflorescence/Plant</th>
<th>Umbel size</th>
<th>Width of plant</th>
<th>Stalks/Plant</th>
<th>No. of florets/plant</th>
<th>Stalk length</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1: Lannate 40SP</td>
<td>2.5 g/ lit H2O</td>
<td>3.02 B</td>
<td>8.987 B</td>
<td>23.689 A</td>
<td>48.00 B</td>
<td>8.96 B</td>
<td>1770 B</td>
<td>654.3 B</td>
</tr>
<tr>
<td>T2: Karate 2.5EC</td>
<td>3 ml/ lit H2O</td>
<td>3.25 B</td>
<td>8.869 B</td>
<td>21.030 B</td>
<td>46.25 B</td>
<td>8.86 B</td>
<td>2081 A</td>
<td>727.9 AB</td>
</tr>
<tr>
<td>T3: Curacron 500EC</td>
<td>4 ml/ lit H2O</td>
<td>3.05 B</td>
<td>9.698 A</td>
<td>21.360 B</td>
<td>55.33 A</td>
<td>10.3 A</td>
<td>1870 B</td>
<td>778.7 A</td>
</tr>
<tr>
<td>T4: Check</td>
<td>-</td>
<td>4.23 A</td>
<td>11.356 A</td>
<td>18.965 C</td>
<td>55.33 A</td>
<td>11.33 A</td>
<td>1788 B</td>
<td>682.3 B</td>
</tr>
</tbody>
</table>

Another chemical insecticide used in present research work for the control of onion thrips and budworm was Curacron. In the present study it was shown that among the three insecticides used in this work Curacron was most effective against onion thrips and budworm and the effect of Curacron was long lasting as the population of both pests were not increased after long interval of application of Curacron. This statement is strongly agreed with the [14].

4. CONCLUSION

Curacron 4 ml/lit H2O is recommended against onion thrips and budworm in Swat Valley. The onion should be regularly checked for the attack of pest. If the population increased above economic injury level (EIL) that is 20 thrips per plant then crop should be sprayed with Curacron on recommended dose. Sprayed can be repeated if pest population exceed this number.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES


