Effect of certain chemicals and bio-pesticide on the 3rd instar larvae of the Cabbage butterfly, *Pieris brassicae* (Linn.) (Lepidoptera: Pieridae)

Hadi Husain Khan and Ashwani Kumar

Abstract

The experiment was carried out to study the mortality of 3rd instar larvae of the Cabbage butterfly, *Pieris brassicae* (Linn.) (Lepidoptera: Pieridae) in the Department of Entomology, Naini Agricultural Institute, SHUATS, Allahabad, U.P. under laboratory condition. The mean data (Mean of 24, 48 and 72 hours after treatment) on population mortality per cent of cabbage white butterfly, *Pieris brassicae* of 3rd instar larvae 24, 48 and 72 hours after treatment showed that mortality per cent in all the treatments were significantly superior over control. Maximum mortality was observed with T$_2$; Spinosead (98.33 %); T$_{12}$; Cypermethrin (96.67 %); T$_6$; Imidacloprid (93.33 %); T$_{10}$; Neem oil + Cypermethrin (88.05 %) and T$_{11}$; NSKE + Cypermethrin (86.39 %). Followed by T$_5$, Neemarin; T$_6$, Neem oil; T$_8$, NSKE and T$_7$; NPV with (81.39 %), (79.17 %), (76.94 %) and (63.06 %) respectively. The remaining insecticides are Ta$_9$, *B. thuringiensis* (57.22 %); Ts$_5$, *B. bassiana* (48.89 %) and Ta$_7$, *M. anisopilae* (44.17 %). *B. thuringiensis*, *B. bassiana* and *M. anisopilae* were recorded as least effective treatments of all the treatments excluding control.

Keywords: biopesticides, cabbage butterfly, chemicals, larvae, mortality, *Pieris brassicae*

Introduction

The cabbage white butterfly, *Pieris brassicae* (Lepidoptera: Pieridae) is a serious pest of cabbage (Bhalla and Pawar, 1977) [6]. *P. brassicae* Linn. is one of the major constraints in commercial cultivation of the crop in hill and plain areas of Uttarakhand (Mishra and Ram, 1997 and Singh et al., 2003) [14, 21] and also it is reported in some parts of East Uttar Pradesh (Bhati et al., 2015) [7]. The yield loss of *P. brassicae* can be reach up to 40 % annually (Ali and Rizvi, 2007) [9]. The damage is also found in almost all parts of India including north eastern states (Lal and Bhajan, 2004; Younas et al., 2004) [10, 20]. During the past six decades chemical preparations have played an important role and dominated in pest control. This has led to pollution of environment, danger to humans and developing resistance against toxicants of over 500 species of insects and mites (Thomas, 1999) [24]. So for present research work was evaluated under laboratory condition.

Materials and Methods

The certain chemicals and bio-pesticide are evaluated for their effect against for cabbage butterfly. The cabbage larvae were collected and dipped in different treatments and then air dried. Four replication for each treatment were taken and in each replication 30 larvae were used. Therefore, 120 larvae were used for each treatment. For the control treatment, leaves were dipped in distilled water only. The treated leaves were placed into the petri dishes on moistened filter paper (one leave per petri dish) with the adaxial surface upper most. *Pieris brassicae* larvae were placed on the leaf disc. The experiment was conducted in the laboratory with a temperature of 25 ± 1°C light regime of 14 h light 10 h dark and relative humidity of 65 ± 5%. Mortality was assessed every 24 hrs, 48 hrs and 72 hrs. by using following formula (Abbott W.S. 1925) [1].

Mortality % formula

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\text{Mortality} \% = \frac{\text{No. of dead larvae}}{\text{No. of released larvae}} \times 100
\]
Results and Discussion

The data on population mortality per cent of cabbage white butterfly, *Pieris brassicae* of 3rd instar larva 24 hours after treatment showed that mortality per cent in all the treatments were significantly superior over control. Maximum mortality was observed with T2, Spinosad (96.67 %), T12, Cypermethrin (94.17 %), T1, Imidacloprid (90.00 %), T10, Neem oil + Cypermethrin (82.50 %) and T11, NSKE + Cypermethrin (80.83 %). Followed by T8, Neemarin®, T6, Neem oil; T8, NSKE and T7, NPV with (75.83 %), (74.17 %), (72.50 %) and (57.50 %) respectively. The remaining insecticides are T6, *B. thuringiensis* (52.50 %); T3, *B. bassiana* (36.67 %) and T4, *M. anisopilae* (34.17 %). *B. thuringiensis, B. bassiana* and *M. anisopilae* were recorded as least effective treatments of all the treatments excluding control.

The data on population mortality per cent of cabbage white butterfly, *Pieris brassicae* of 3rd instar larva 48 hours after treatment showed that mortality per cent in all the treatments were significantly superior over control. Maximum mortality was observed with T2, Spinosad (98.33 %), T12, Cypermethrin (96.67 %), T1, Imidacloprid (91.67 %), T10, Neem oil + Cypermethrin (85.83 %) and T11, NSKE + Cypermethrin (84.17 %). Followed by T8, Neemarin®, T8, Neem oil; T6, NSKE and T7, NPV with (79.17 %), (76.67 %), (75.00 %) and (64.17 %) respectively. The remaining insecticides are T6, *B. thuringiensis* (55.00 %); T3, *B. bassiana* (40.83 %) and T4, *M. anisopilae* (40.00 %). *B. thuringiensis, B. bassiana* and *M. anisopilae* were recorded as least effective treatments of all the treatments excluding control.

The data on population mortality per cent of cabbage white butterfly, *Pieris brassicae* of 3rd instar larva 72 hours after treatment showed that mortality per cent in all the treatments were significantly superior over control. Maximum mortality was observed with T2, Spinosad (99.17 %), T1, Imidacloprid (98.33 %), T10, Neem oil + Cypermethrin (95.83 %) and T11, NSKE + Cypermethrin (94.17 %). Followed by T8, Neemarin®; T8, Neem oil; T9, NSKE and T5, *B. bassiana* with (89.17 %), (86.67 %), (83.33 %) and (69.17 %) respectively. The remaining insecticides are T7, NPV (67.50 %); T6, *B. thuringiensis* (64.17 %) and T4, *M. anisopilae* (58.33 %). NPV, *B. thuringiensis* and *M. anisopilae* were recorded as least effective treatments of all the treatments excluding control.

The mean data (Mean of 24, 48 and 72 hours after treatment) on population mortality per cent of cabbage white butterfly, *Pieris brassicae* of 3rd instar larva 24, 48 and 72 hours after treatment showed that mortality per cent in all the treatments were significantly superior over control. Maximum mortality was observed with T2, Spinosad (98.33 %), T12, Cypermethrin (96.67 %), T1, Imidacloprid (93.33 %), T10, Neem oil + Cypermethrin (88.05 %) and T11, NSKE + Cypermethrin (86.39 %). Followed by T8, Neemarin®, T8, Neem oil; T8, NSKE and T7, NPV with (81.39 %), (79.17 %), (76.94 %) and (63.06 %) respectively.

The remaining insecticides are T6, *B. thuringiensis* (57.22 %); T4, *B. bassiana* (48.89 %) and T7, *M. anisopilae* (44.17 %). *B. thuringiensis, B. bassiana* and *M. anisopilae* were recorded as least effective treatments of all the treatments excluding control.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>24 hours</th>
<th>48 hours</th>
<th>72 hours</th>
<th>Mean of 24, 48 &amp; 72 hrs</th>
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<tbody>
<tr>
<td>T1</td>
<td>Imidacloprid</td>
<td>90.00</td>
<td>91.67</td>
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<tr>
<td>T2</td>
<td>Spinosad</td>
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<td>98.33</td>
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<tr>
<td>T3</td>
<td>Neemarin®</td>
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<td>79.17</td>
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<tr>
<td>T4</td>
<td><em>M. anisopilae</em></td>
<td>34.17</td>
<td>40.00</td>
<td>58.33</td>
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<tr>
<td>T5</td>
<td><em>B. bassiana</em></td>
<td>36.67</td>
<td>40.83</td>
<td>69.17</td>
</tr>
<tr>
<td>T6</td>
<td><em>B. thuringiensis</em></td>
<td>52.50</td>
<td>55.00</td>
<td>64.17</td>
</tr>
<tr>
<td>T7</td>
<td>NPV</td>
<td>57.50</td>
<td>64.17</td>
<td>67.50</td>
</tr>
<tr>
<td>T8</td>
<td>Neem oil</td>
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<tr>
<td>T9</td>
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<td>75.00</td>
<td>83.33</td>
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<tr>
<td>T10</td>
<td>Neem oil + Cypermethrin</td>
<td>82.50</td>
<td>85.83</td>
<td>95.83</td>
</tr>
<tr>
<td>T11</td>
<td>NSKE + Cypermethrin</td>
<td>80.83</td>
<td>84.17</td>
<td>94.17</td>
</tr>
<tr>
<td>T12</td>
<td>Cypermethrin</td>
<td>94.17</td>
<td>96.67</td>
<td>99.17</td>
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<tr>
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<td>Control</td>
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<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Over all mean</td>
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<td>68.27</td>
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<td>F-test</td>
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<td>19.827</td>
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<tr>
<td>Due to hours</td>
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<td>NS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Due to treatments</td>
<td></td>
<td>NS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Spinosad was showing highest mortality percentage as Spinosyns, act by inducing allosteric activation of nicotinic acetylcholine receptors, causing death of the insects (Perry et al. 2011) [19], Nirmal and Mahal (2005) [16] and Hamed and Khan (2003) [8] reported that, Spinosad has great efficacy against third instar bollworm compared to Acephate and Endosulfan insecticides. Compared chemical insecticides in the field and laboratory, Spinosad had the great toxicity for *H. armigera* after application of insecticides (Ahmed et al. 2004) [4], Tayde and Simon (2010) [22] and Patra et al. (2009) [18] also reported Spinosad as effective treatment. Padwal and Kumar (2014) [17] and Nenavati and Kumar (2014) [15] reported that Cypermethrin was effective against *Earias viitella*. Similar finding was also reported by Hole et al. (2009) [9] with 52.2% mortality after 48 hrs of application which reached up to 68.2% after 72 hrs. against *Spodoptera litura*. The toxicity of Cypermethrin was more and findings are in agreement with those who reported earlier by (Rai et al. 2001; Mandal et al. 2007 and Ahirwar et al. 2008) [20, 13, 3]. Imidacloprid treatment in combination with the NPV at moderate concentration shown highest mortality was reported by Trang et al. (2002) [25].

The present results of Neem product was in agreement with the Thangapandian et al. (2011) [23] who also reported that commercial Neem product, caused 62.4 to 90.3 per cent mortality of Lepidoptera larva. Maghori et al. (2014) [12] reported that by increasing the concentration of Polynclusion bodies per ml, the mortality has been increased. Remaining
insecticides (B. thuringiensis and M. anisopilae) results are in agreement with the Loc and Chi (2007) [11] and (Aggarwal et al. 2006) [2].

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References
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