Evaluation of different insecticides for management of onion thrips (Thrips tabaci Lindeman)

MK Pathak, Sujay Pandey, MK Pandey, RC Gupta, HP Sharma and PK Gupta

Abstract
A field experiment was conducted at Regional Research Station, National Horticultural Research and Development Foundation, Nashik in three consecutive years during rabi 2015-16, 2016-17 and 2017-18. The seedlings of onion variety NHRDF Red-2 were transplanted in a bed size of 3.0 x 1.20 m at 15 cm x 10 cm spacing. Randomized Block Design with 4 replications was followed. The treatments evaluated were T1 (Chlorantarniliprole@0.30 ml/L), T2 (Emamectin Benzoate @ 0.40 gm/L), T3 (Buprofezin@1.0 ml/ L) T4 (Spinosad@0.3ml/ L), T5 (Fenpropathrin@0.6ml/ L) and T6 (Control). The applications were started at 30 DAT and a total of 4 sprays were given at 10 days interval. Silicon based sticker @0.5ml/L invariably mixed in each spray as sticky agent. The data on thrips population (Nymphs/plant) were counted at the inner most leaves visually with the help of hand lens on 10 plants marked randomly in each treatment at ten days interval after appearance. The application of fungicides viz. Mancozeb @2.5g/L and Carbendazim @1.0g/L were sprayed at 15 days interval alternatively in all treatments to protect the crop from diseases. All other agronomical practices were performed uniformly as per need in all the treatments. The crop was harvested after attaining the maturity. The statistical analysis data was done.

Keywords: Onion, thrips, insecticides, management

Introduction
Onion (Allium cepa L.) is an important vegetable or spices crop cultivated in almost all the states of the country. In India onion is cultivated in 3 seasons viz, rabi, kharif and late kharif seasons and maximum area under cultivation is being covered in rabi season (about 65%). Thrips attack onion at all the stages of crop growth but their count increases from bulb initiation and remain high up to bulb development and maturity. Both nymphs and adults cause damage directly through feeding and indirectly through the transmission of lethal plant viruses. Waiganjo et al. (2008) [20] estimated the foliage damage of crop around 40-60% which led to yield losses of 10-20% in the crop. Shibru and Negeri (2014) [13] recorded that onion thrips cause loss in yield as 23-85%. Asgar et al. (2018) [6] reported that the bifenthrin 10 EC and dimethoate 40EC proved to be significantly effective against onion thrips. Khanzada et al. (2018) [5] found that chlorophenpyre 5SC@50g a.i./ha was most effective for control of onion thrips. This study was, thus, undertaken to evaluate the efficacy of different insecticides for the management of onion thrips during the rabi 2015-16, 2016-17 and 2017-18 seasons.

Materials and Methods
A field experiment was conducted at Regional Research Station, National Horticultural Research and Development Foundation, Nashik in three consecutive years during rabi 2015-16, 2016-17 and 2017-18. The seedlings of onion variety NHRDF Red-2 were transplanted in a bed size of 3.0 x 1.20 m at 15 cm x 10 cm spacing. Randomized Block Design with 4 replications was followed. The treatments evaluated were T1 (Chlorantarniliprole@0.30 ml/L), T2 (Emamectin Benzoate @ 0.40 gm/L), T3 (Buprofezin@1.0 ml/ L) T4 (Spinosad@0.3ml/ L), T5 (Fenpropathrin@0.6ml/ L) and T6 (Control). The applications were started at 30 DAT and a total of 4 sprays were given at 10 days interval. Silicon based sticker @0.5ml/L invariably mixed in each spray as sticky agent. The data on thrips population (Nymphs/plant) were counted at the inner most leaves visually with the help of hand lens on
Results and Discussion

I year: Data presented in Table-1 and Fig.1 revealed that lowest thrips population (13.0 nymphs/plant) at 30 DAT were recorded in treatment T₁ (foliar spray of bifurofenizin@1.0ml/L) while highest (15.65 nymphs/plant) in control plot. At 40 DAT, the lowest thrips population (13.50 nymphs/plant) were recorded in treatment T₁ (foliar spray of spinosad@0.3ml/L) and it was found at par with treatment T₁, while the highest thrips population (37.10 nymphs/plant) were recorded in control plot. At 50 DAT, the lowest thrips population (11.55 nymphs/plant) were recorded in treatment T₁ and highest thrips population (35.0 nymphs/plant) in control plot. At 60 DAT, the lowest thrips population (15.05 nymphs/plant) were recorded in treatment T₁ and it was found at par with treatment T₁ and highest thrips population (29.55 nymphs/plant) in control plot. At 70 DAT, the lowest thrips population (17.10 nymphs/plant) were recorded in treatment T₁ and it was found at par with treatment T₁ while highest thrips population (34.80 nymphs/plant) were recorded in control plot. At 80 DAT, the lowest thrips population (13.0 nymphs/plant) were recorded in treatment T₁ while highest thrips population (41.15 nymphs/plant) in control plot. The overall lowest thrips population (14.16 nymphs/plant) was recorded in treatment T₁, while highest was recorded (32.21 nymphs/plant) in control plot. The highest gross yield (361.05 q/ha) and marketable yield (343.10q/ha) were recorded in treatment T₁, while lowest gross yield (295.88q/ha) and marketable yield (290.68q/ha) were recorded in control plot. The present study is in conformity with the result obtained by Pathak et al. (2018) [8] who reported lowest thrips population and highest onion seed yield with the application of fipronil insecticide. Tirkey and Kumar, (2017) [18] reported that the insecticides reduced thrips population as compared to control and highest yield was obtained by the use of dimethoate. Pandey et al. (2013) [7] recorded that lowest thrips population and highest bulb yield by applying fipronil.

Thrips population control over control plot (%) Data revealed that the thrips population could be controlled by 56.03% in treated plot with spray of spinosad@0.3ml/L at 10 days interval in comparison to the control.

Yield increase over control plot (%) The data showed that the yield was increased by 22.02% in treated plot of onion with spray of spinosad@0.3ml/L in comparison to the control plot.

II year Data presented in Table-2 and Fig.2 revealed that lowest thrips population (32.25 nymphs/plant) at 30 DAT was recorded in treatment T₁ (Emamectin benzoate @ 0.40 gm/L) while it was highest (42.28 nymphs/plant) in treatment T₁ (Fenpropathrin@0.6ml/L). At 40 DAT, the lowest thrips population (19.95 nymphs/plant) was recorded in treatment T₁ (Spinosad@0.30ml/L) while the highest thrips population (40.13 nymphs/plant) was observed in control plot. At 50 DAT, 60 DAT, 70 DAT and 80 DAT lowest thrips populations were recorded in treatment T₁. The overall lowest thrips population (12.42 nymphs/plant) was recorded in treatment T₁, while highest (46.99 nymphs/plant) was found in control plot. The highest gross (316.08q/ha) and marketable (299.31q/ha) yield were recorded in treatment T₁, while lowest gross (265.67q/ha) and marketable (245.89q/ha) yield were found in control. The present study is in conformity with the result obtained by Ibrahim and Adesiyum, (2010) [4] reported that planting early is the best way to achieve higher yield of onion and using Lambda-cyhalothrin reduced thrips population as well as increased the yield. Aslam et. al. (2018) [11] reported that Profenofos @4.0 ml/L was more effective for control of onion thrips and bud worm. Ansari et. al. (2016) [2] reported that insecticides caused significant reduction of thrips as compared to control.

Thrips population control over control plot (%) The data revealed that the thrips population was reduced by 73.56% with spray of spinosad@0.3ml/L at 10 days interval in comparison to the control plot.

Yield increase over control plot (%) The data showed that the yield was increased by 18.97% in treated plot of onion with spray of spinosad@0.3ml/L in comparison to the control plot.

III year Data presented in Table -3 and Fig.3 revealed that lowest thrips population (19.70 nymphs/plant) at 30 DAT was recorded in treatment T₁ and it was found at par with treatment T₁ and highest (22.08 nymphs/plant) population was recorded in control plot. At 40 DAT, the lowest thrips population (32.43 nymphs/plant) was recorded in treatment T₁ (Spinosad@0.30ml/L) while highest thrips population (61.23 nymphs/plant) was observed in control plot. At 50 DAT, 60 DAT, 70 DAT and 80 DAT, the lowest thrips populations were also recorded in T₁. Similarly the overall lowest thrips population (15.23 nymphs/plant) was recorded in treatment T₁, while highest (75.39 nymphs/plant) was recorded in control plot. Further, highest gross yield (315.36q/ha) and marketable yield (295.60q/ha) were recorded in treatment T₁, while lowest gross yield (234.10q/ha) and marketable yield (210.12q/ha) were recorded in control plot. The present study is in conformity with the results obtained by Das et al. (2017) [3] who found the spry of imidacloprid treatment at 15 days interval with lowest thrips population as well as highest gross yield. Patil and Patil (2018) [10] reported that fipronil was effective for control of onion thrips. Shweta et al. (2019) [14] confirmed that the spray of spinosad at 10 days interval was effective for managing onion thrips.

Thrips population control over control plot (%) The data revealed that the thrips population was controlled by about 79.79% in treated plot of onion with spray of spinosad@0.3ml/L at 10 days interval in comparison to the control plot.

Yield increase over control plot (%) The data showed that the yield increased by 34.71% in treated plot with spray of spinosad@0.3ml/L in comparison to the control plot.
Combined result of three years

The pooled data presented in Table 4 and Fig.4 revealed that the overall lowest thrips population (13.94 nymphs/plant) was recorded in treatment T₃ (Spray of spinosad @0.3 ml/L) while it was highest (51.93 nymphs/plant) in treatment T₆ (control). The highest gross yield (330.0 q/ha) and marketable yield (312.70 q/ha) were recorded in treatment T₅. The lowest gross yield (265.22 q/ha) and marketable yield (248.89 q/ha) were observed in control plot. The highest B:C ratio of 4.5:1 was recorded in treatment T₅. The present study is in conformity with the result obtained by Pandey et al. (2014) [⁹] and Singh et al. (2011) [¹⁵] who reported that spinosad at 10 days interval was effective for managing onion thrips. Similarly, Ullah et al. (2010) [¹⁰] reported that the insecticides thiodan, imidacloprid and spinosad were more effective against onion thrips as compared to control. Patil et al. (2009) [¹¹] reported that spray of deltamethrin + triazophos and spinosad reduced the thrips population as well as increased yield. Seal et al. (2006) [¹⁶], Srinivas et al. (2007) [¹⁷], Prasad and Ahmed, (2009) [¹²] also advocated that spinosad is an effective insecticide against thrips.

Combined over all thrips population control over control plot (%)

The data revealed that the overall thrips population was controlled by about 72.94% in treated plot of onion with spray of spinosad@0.3 ml/L at 10 days interval in comparison to control Fig.6.

Yield increase over control plot (%)

The data showed that the overall yield was increased by 24.73% in treated plot with spray of spinosad@0.3ml/L in comparison to the control plot Fig.5.

Table 1: Evaluation of different insecticides for management of onion thrips 2015-16

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Average number of thrips/plant</th>
<th>Average of Nymphs Population</th>
<th>Gross yield (q/ha)</th>
<th>Marketable yield (q/ha)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>30 DAT</td>
<td>40 DAT</td>
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</table>

![Fig 1: Revealed that lowest thrips population](image)

Table 2: Evaluation of different insecticides for management of onion thrips 2016-17

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Average number of thrips/plant</th>
<th>Average of Nymphs Population</th>
<th>Gross Yield (q/ha)</th>
<th>Marketable Yield (q/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 DAT</td>
<td>40 DAT</td>
<td>50 DAT</td>
<td>60 DAT</td>
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Table 3: Evaluation of different insecticides for management of onion thrips 2017-18

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Thrips (Nymphs/plant)</th>
<th>Gross yield (q/ha)</th>
<th>Marketable yield (q/ha)</th>
<th>Overall average Thrips</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 DAT</td>
<td>40 DAT</td>
<td>50 DAT</td>
<td>60 DAT</td>
</tr>
<tr>
<td>T1</td>
<td>19.70 (4.49)</td>
<td>41.58 (6.43)</td>
<td>53.20 (7.31)</td>
<td>80.90 (9.02)</td>
</tr>
<tr>
<td>T2</td>
<td>20.55 (4.58)</td>
<td>48.48 (6.99)</td>
<td>61.65 (7.88)</td>
<td>81.70 (9.07)</td>
</tr>
<tr>
<td>T3</td>
<td>20.25 (4.55)</td>
<td>52.68 (7.29)</td>
<td>69.05 (8.33)</td>
<td>88.15 (9.41)</td>
</tr>
<tr>
<td>T4</td>
<td>20.83 (4.61)</td>
<td>32.43 (5.73)</td>
<td>15.85 (4.04)</td>
<td>19.25 (4.44)</td>
</tr>
<tr>
<td>T5</td>
<td>19.78 (4.50)</td>
<td>46.20 (6.81)</td>
<td>84.48 (9.22)</td>
<td>88.43 (9.43)</td>
</tr>
<tr>
<td>T6</td>
<td>22.08 (4.75)</td>
<td>61.23 (7.85)</td>
<td>99.38 (9.99)</td>
<td>117.73 (10.87)</td>
</tr>
</tbody>
</table>

S. Em±      | - 0.07               | - 0.37             | - 0.24                  | - 0.16                |
CD at 5%    | - 0.15               | - 0.79             | - 0.51                  | - 0.34                |
CV %        | - 2.27               | - 7.56             | - 4.30                  | - 2.66                |

Note: Data in the parenthesis shows Square root transformed values.
Table 4: Evaluation of different insecticides for management of onion thrips (2015-18)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>30 DAT</th>
<th>40 DAT</th>
<th>50 DAT</th>
<th>60 DAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>T₁</td>
<td>23.03</td>
<td>(4.78)</td>
<td>30.26</td>
<td>(5.45)</td>
</tr>
<tr>
<td>T₂</td>
<td>23.43</td>
<td>(4.85)</td>
<td>32.71</td>
<td>(5.66)</td>
</tr>
<tr>
<td>T₃</td>
<td>23.01</td>
<td>(4.75)</td>
<td>34.32</td>
<td>(5.76)</td>
</tr>
<tr>
<td>T₄</td>
<td>25.87</td>
<td>(5.01)</td>
<td>21.96</td>
<td>(4.65)</td>
</tr>
<tr>
<td>T₅</td>
<td>25.96</td>
<td>(5.02)</td>
<td>33.28</td>
<td>(5.73)</td>
</tr>
<tr>
<td>T₆</td>
<td>25.47</td>
<td>(5.00)</td>
<td>46.15</td>
<td>(6.78)</td>
</tr>
</tbody>
</table>

S.E. m±: 0.10 - 0.12 - 0.11 - 0.22 - 0.54 - 0.74 - 1.08 - 1.50
CD at 5%: 0.20 - 0.22 - 0.22 - 0.22 - 0.22 - 0.22 - 0.22 - 0.22

Note: Data in the parenthesis shows Square root transformed values

Fig 4: Effect of different treatments on thrips population, gross and marketable yield (2015-2018)

Fig 5: Percent yield increased over control in different treatments (2015-2018)
Conclusion
Based on the studies made during rabi 2015-16, 2016-17 and 2017-18 it could be concluded that the spray of spinosad@0.3 ml/L at 10 days interval can be advocated as an effective strategy for management of thrips in onion during rabi season.

References

Fig 6: Overall thrips population control (%) (2015-2018)