Evaluation of certain insecticides to control shoot and fruit borer, *Leucinodes orbonalis* Guenee on brinjal (*Solanum melongena* L)

Annem Siva Sankar and Ashwani Kumar

Abstract

The present investigation entitled was carried out at Mahewa, Prayagraj, Uttar Pradesh, India. The experiment was conducted during kharif season of 2021-22 in Randomized Block Design (RBD) on three replications. Two applications of eight treatments viz., Spinosad 45SC (T1), Flubendiamide 480SC (T2), Neem oil 0.2% (T3), Indoxacarb 14.5SC (T4), Emamectin benzoate 5SG (T5), Cartap Hydrochloride 25SG (T6), Chlorantraniliprole 18.5SC (T7) and untreated Control (T8). Among all the treatments minimum percent shoot infestation, percent fruit infestation and B:C ratio were observed in Spinosad 45SC (10.756%, 11.581% and 1:3.54), Flubendiamide 480SC (15.756%, 17.143% and 1:4.31) is found to be the next best treatment followed by Emamectin Benzoate 5SG (16.86%, 18.348% and 1:4.74), Chlorantraniliprole 18.5SC (18.493%, 18.406% and 1:4.54) and Indoxacarb 14.5SC (19.821%, 20.547% and 1:4.16), Cartap Hydrochloride 25SG (21.501%, 20.622% and 1:3.73) and Neem oil 0.2% (23.892%, 23.467% and 1:3.55) is found to be least effective but comparatively superior over the control (27.534%, 34.725% and 1:2.59) respectively.

Keywords: Brinjal shoot and fruit borer, evaluation, insecticides, *Leucinodes orbonalis*

Introduction

Vegetable cultivation is one of the most profitable and dynamic branches of agriculture. Vegetables are an important constituent of the human diet. Brinjal is an important dietary vegetable crop. Brinjal (*Solanum melongena* Linnaeus) also known as eggplant is referred to as the “King of vegetables” originated from India and now grown as a vegetable throughout the tropical, sub-tropical and warm temperate areas of the world. It is the most important vegetable in the Indian Subcontinent that accounts for almost 50% of the world’s area under its cultivation. Kolhe (2017) [8] Under sustainable farming, brinjal provides regular daily income to meet the day-to-day expenditure. Murugeson (2009) [9] It has become an important source of income for both farmers and field labourers, service charges for the machinery, serving as a vehicle for reducing poverty in rural areas. Nawale (2018) [10] Brinjal occupies an important position among the other regular vegetable crops that are available throughout the year and popular vegetable grown as a poor man’s crop in India. Brinjal, *Solanum melongena* L., is one of the major vegetables in India extensively grown under diverse agro-climatic conditions throughout the year. Singh (2018) [11].

Brinjal (*Solanum melongena* L.) is one of the popular vegetables favoured by the people of many countries viz., Central, South and South East Asia, some parts of Africa and Central America Harish et al. (2011) [6]. Apart from India, the other major brinjal growing countries are China, Turkey, Japan, Italy, Indonesia, Iraq, Syria, Spain, and Philippines. Brinjal is one of the most commonly grown vegetable crop in the country Yadav and Tayde (2018) [12].

*Leucinodes orbonalis* Guenee (Pyralidae: Lepidoptera) is the most important insect pest of brinjal and the apparent yield loss varying from 20-90% in various parts of the country Raju et al. (2007) [14] 85-90% have been reported Patnaik (2000) [12] Jagginavar et al. (2009) [7]. The Larvae of this pest cause 12-16% damage to shoots and 20- 60% damage to fruits. The pest is very active during rainy and summer season and often causes more than up to 95% in India. It is also reported that the infestation of fruit borer causes reduction in Vitamin C content to an extent of 68% in the infested fruits Anwar et al. (2015) [11].
Materials and Methods
The experiment was conducted during kharif season 2021 at the Central Research Farm (CRF) of Sam Higgins bottom University of Agriculture, Technology and Sciences, Naini, Prayagraj, Uttar Pradesh, India, in a randomized block design with eight treatments replicated three times using Banaras purple round (Local variety) in allot size of 2m×2m at a spacing of 60×60 cm with a recommended package of practices excluding plant protection. Seven treatments were evaluated against, *Leucinodes orbonalis* i.e., Spinosad 45% SC @ 0.5 ml/l (T1), Flubendiamide 480SC @ 0.4 ml/l (T2), Neem oil 0.2% 2 ml/l (T3), Indoxacarb 14.5SC @ 0.25 ml/l (T4), Emamectin benzoate 5 SG @ 0.4 gm/l (T5), Cartap Hydrochloride 25SG @ 2 ml/l (T6), Chlorantraniliprole 18.5SG 0.5 ml/l (T7) and control plot (T0) The population of brinjal shoot and fruit borer was recorded on 5 randomly selected and tagged plants from each plot and then it was converted into per cent of infestation by following formula.

\[
\text{Percent shoot damage = } \frac{\text{No. of Shoots affected}}{\text{Total no. of shoots}} \times 100
\]

\[
\text{Percent fruit damage = } \frac{\text{No. of fruits affected}}{\text{Total no. of fruits}} \times 100
\]

Based on the yield data, the gross returns and net returns were calculated for each treatment. The benefit cost ratio (BCR) was determined by dividing the additional returns with the additional cost of imposing the respective treatment on hectare basis.

\[
\text{Gross Returns}
\]

\[
\text{B.C.R} = \frac{\text{Total Cost of Protection}}{\text{Cost benefit ratio}}
\]

Results and Discussion
The results of the experiment Evaluation of different insecticides against brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) to study cost benefit ratio during kharif season of 2021. The data so obtained through observation on various aspects were subjected to statistical analysis wherever necessary and the compiled mean data are tabulated in the following pages. Results obtained are presented aspect wise here under.

The data on the per cent infestation of shoot borer on brinjal 3rd, 7th and 14th day after first spray revealed that all the chemical treatments were significantly superior over control. Among all the treatments Spinosad 45SC (10.756%) was the most effective chemical. Flubendiamide 480SC (15.756%) recorded the lowest percent infestation of shoot and fruit borer. Next to that Emamectin benzoate 5SG recorded 16.86% infestation. And the next effective were Chlorantraniliprole 18.5SC (18.493%) which was followed by Indoxacarb 14.5SC (19.821%). Cartap Hydrochloride 25SG (21.501%) and Neem oil 0.2% (23.892%) was found to be least effective but superior over control (27.534%).

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Per cent shoots infestation of <em>L. orbonalis</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One day before spray</td>
</tr>
<tr>
<td></td>
<td>3 DAS</td>
</tr>
<tr>
<td>T1 Spinosad 45SC</td>
<td>22.337</td>
</tr>
<tr>
<td>T2 Flubendiamide 480SC</td>
<td>22.487</td>
</tr>
<tr>
<td>T3 Neem oil 0.2%</td>
<td>24.663</td>
</tr>
<tr>
<td>T5 Emamectin benzoate 5SG</td>
<td>25.940</td>
</tr>
<tr>
<td>T7 Chlorantraniliprole 18.5SC</td>
<td>25.447</td>
</tr>
<tr>
<td>T0 control</td>
<td>23.510</td>
</tr>
<tr>
<td>Overall Mean</td>
<td>20.49</td>
</tr>
<tr>
<td>F- test</td>
<td>NS</td>
</tr>
<tr>
<td>S. Ed. (±)</td>
<td>0.81</td>
</tr>
<tr>
<td>C. D. (P = 0.05)</td>
<td>22.337</td>
</tr>
</tbody>
</table>

The data on the per cent infestation of fruit borer on brinjal 3rd, 7th and 14th day after second spray revealed that all the chemical treatments were significantly superior over control. Among all the treatments lowest per cent fruit, infestation was recorded Spinosad 45SC (11.581%) was the most effective chemical. Flubendiamide 480SC (17.143%) recorded the lowest percent infestation of shoot and fruit borer. Next to that Emamectin benzoate 5SG recorded 18.348% infestation. And the next effective were Chlorantraniliprole 18.5SC (18.493%) which was followed by Indoxacarb 14.5SC (19.821%). Cartap Hydrochloride 25SG (21.501%) and Neem oil 0.2% (23.892%) was found to be least effective but superior over control (27.534%).

<table>
<thead>
<tr>
<th>S. No</th>
<th>Treatments</th>
<th>Yield of q/ha</th>
<th>Cost of yield q/qtt</th>
<th>Total cost of yield (₹)</th>
<th>Common cost (₹)</th>
<th>Treatment cost (₹)</th>
<th>A/L cost(₹)</th>
<th>C:B ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spinosad 45SC</td>
<td>162.4</td>
<td>1800</td>
<td>292320</td>
<td>47848</td>
<td>3960</td>
<td>51808</td>
<td>5.64</td>
</tr>
<tr>
<td>2</td>
<td>Flubendiamide 480 SC</td>
<td>145.3</td>
<td>1800</td>
<td>261540</td>
<td>47848</td>
<td>1400</td>
<td>49248</td>
<td>5.31</td>
</tr>
<tr>
<td>3</td>
<td>Neem oil 0.2%</td>
<td>100.8</td>
<td>1800</td>
<td>181440</td>
<td>47848</td>
<td>3200</td>
<td>51048</td>
<td>3.55</td>
</tr>
<tr>
<td>4</td>
<td>Indoxacarb 14.5SC</td>
<td>114.5</td>
<td>1800</td>
<td>206100</td>
<td>47848</td>
<td>1580</td>
<td>49428</td>
<td>4.16</td>
</tr>
<tr>
<td>5</td>
<td>Neem Benzoate 55G</td>
<td>130.7</td>
<td>1800</td>
<td>235260</td>
<td>47848</td>
<td>1800</td>
<td>49648</td>
<td>4.74</td>
</tr>
<tr>
<td>6</td>
<td>Hydrochloride 25SG</td>
<td>106.1</td>
<td>1800</td>
<td>190980</td>
<td>47848</td>
<td>3320</td>
<td>51168</td>
<td>3.73</td>
</tr>
</tbody>
</table>
Fig 1: Graphical representation of economics of different treatments

### Discussion

All the treatments are found to be superiorly over control on first and second spray and revealed that Spinosad 45 SC was more effective in per cent infestation of fruit and shoot borer with (10.75 & 11.58%) infestation over control respectively. Similar findings made by Chandar et al., (2020) [3] (10.98)

After that, Flubendiamide 480 SC is found to be more effective treatment in reducing per cent infestation of shoot and fruit borer with (15.75 & 17.14) which is in line with the findings of Kushwaha and Painkra (2016) [9] shoot infestation of first spray (3.06) and fruit infestation (3.56), Sharma et al., (14.03) reported that Chlorantraniliprole 18.5 SC was found most effective in reducing first spray (18.49) and fruit infestation (16.21) per cent infestation of Leucinodes orbonalis as well as increasing the yield in similar findings with Patra et al. (2016) [13] (7.96). Profenofos 50 EC (17.84 and 14.39%) is found to be the next effective treatment followed by Cypermethrin 25 EC (18.64 and 15.41%) is found to be more effective treatment in reducing per cent infestation of shoot and fruit borer with which is in line with the findings of (7.41). The result of is in Imidacloprid SL (19.15 and 16.63%) followed by Neem oil 0.2% (19.56 & 17.41%) is found to be best effective among all the treatments these findings are supported by Bhagawan and Kumar (2017) [2] (9.83) Cost benefit ratio and Brinjal yield:

The yields among the treatments were significant. The highest yield was recorded in Spinosad 45SC (162.4 q/ha), followed by Flubendiamide 480SC (145.3 q/ha), Emamectin Benzoate 5SG (130.7 q/ha), Chlorantraniliprole 18.5SC (127.2 q/ha), Indoxacarb 14.5SC (114.5 q/ha), Cartap Hydrochloride 25SG (106.1 q/ha) and Neem oil 0.2% (100.8 q/ha), as compared to control plot (69 q/ha). These findings are supported by Tripura et al. (2017) [17] who concluded that Chlorantraniliprole recorded highest marketable fruit yield of 250.30q/ha and Gupta et al. (2017) [5] concluded that spinosad recorded the maximum fruit yield 280.42 q/ha and Choudhury et al. (2021) [44] revealed that spinosad-treated plot attained the highest yield of 8.65 t/ha.

The highest increased yield over control was recorded in Spinosad 45SC (93.4 q/ha), followed by Flubendiamide 480SC (76.3 q/ha), Emamectin Benzoate 5SG (61.7 q/ha), Chlorantraniliprole 18.5SC (58.2 q/ha), Indoxacarb 14.5SC (45.5 q/ha), Cartap Hydrochloride 25SG (37.1 q/ha) and Neem oil 0.2% (31.8 q/ha). When cost benefit ratio was worked out, interesting result was achieved. Among the treatments studied, the best and most economical treatment was Spinosad 45SC (1:5.64), followed by Flubendiamide 480SC (1:5.31), Emamectin Benzoate 5SG (1:4.74), Chlorantraniliprole 18.5SC (1:4.54), Indoxacarb 14.5SC (1:4.16), Cartap Hydrochloride 25SG (1:3.73) and Neem oil 0.2% (1:3.55), as compared to control plot (1:2.59). These findings are supported by Kushwaha and Painkra (2016) [9] revealed in his findings with Flubendiamide (1:4.91), Chlorantraniliprole (1:5.48) and indoxacarb (1:4.44) cost benefit ratio and Sharma et al. (2017) [15] revealed that the spinosad outweighed 1:7.63 and emamectin benzoate with 1:7.54 and neem oil with 1:6.01 cost benefit ratio.

### Conclusion

From the critical analysis of the present findings of, The present investigation entitled Evaluation of certain insecticides to control shoot and fruit borer, Leucinodes orbonalis Guenee on brinjal (Solanum melongena), It is concluded that among all the treatment Spinosad 45SC is most effective out of seven treatments. It also gave the highest cost benefit ratio and marketable yield i.e. 1:5.64 and 162.4 q/ha. It was followed by Flubendiamide 480SC, Emamectin Benzoate 5SG, Chlorantraniliprole 18.5SC, Indoxacarb 14.5SC, Cartap Hydrochloride 25SG and Neem oil 0.2% is least effective among the treatments. Future study may be conducted to validate the findings.

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### References


