Original Research Article

Population Dynamics of Predators and Parasitoids of Shoot and Fruit Borer, Earias spp in Okra Ecosystem

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A B S T R A C T

A field experiment was conducted during the Kharif seasons 2012 and 2013 at Students Instructional Farm and Vegetable Research Farm, NDUA&T, Kumarganj, Faizabad (UP) to find out the natural enemies of shoot and fruit borer in okra. The eggs parasitoids Trichogramma chilonis, parasitized 6.25 and 7.40% egg of Earias spp Kharif, 2012 and Kharif, 2012 respectively. Among predators, maximum population of Coccinellids 4.36 and 4.05 adult per 5 plants was recorded in third week of August. The maximum population of spiders 6.40 and 6.22 individuals per 5 plant were in the last week of July, Ants population were 4.38 and 4.22 in the mid July of and Mirid bug ranged from 1.42 to 3.88 and 1.08 to 3.56 adult/5 plant. The population of Coccinellids, spiders, ants and mirid bugs were positive correlated with minimum temperature i.e. (0.921, 0.809, 0.777 and 0.810) and (0.595, 0.407, 0.347 and 0.399) respectively during Kharif, 2012 and 2013.

Keywords
Trichogramma spp, Coccinellids, Spider, Earias spp, okra

Introduction

Okra (Abelmoschus esculentus L. Moench.) is also known as Lady’s finger, is a popular home garden vegetable in India and also cultivated in tropical and subtropical part of the world. It is a good source of vitamins, minerals, protein, fat, carbohydrate and has high calorific value. India has area under okra 511 thousand ha and production 5849 thousand MT during 2015-16. About 13 insect pests have been recorded that are known to cause damage to okra (Mandal et al., 2006). The shoot and fruit borers, Earias vittella is one of the major limiting factors in the production of quality fruits of okra (Kharbade et al., 1998). The infestation to okra accounted for nearly 22.5% in Uttar Pradesh (Verma et al., 1985), 25.9% to 40.9% in Madhya Pradesh by the shoot and fruit borer (Dhamdhare et al., 1984). Among natural enemies Spider, ants and Coccinellids are some that contributed to the reduction of insect pest of okra.

Keeping in view the importance of losses caused by different insect pests, the present study population dynamics of insect pests and its natural enemies were carried on okra.
Materials and Methods

The experiment was conducted during the Kharif seasons 2012 and 2013 at Students Instructional Farm and Vegetable Research Farm, NDUAT, Kumarganj, Faizabad (UP).

The seed of okra (variety- Arka Anamika) was sown in the month of last week of June in both season and all the agronomic and cultural practices recommended for its cultivation were followed as per the requirement. The crop was sown in the plots of 4.5 m x 3 m with row to row and plant to plant spacing 60 cm x 45 cm respectively.

Observations

The eggs, larvae and pupa of okra shoot and fruit borer were collected along with their natural enemies from the experimental field and farmer’s field at weekly interval and reared them in the laboratory in natural medium till the emergence of eggs, larval and pupal parasitoids.

The collected natural enemies were identified by taxonomic key and percentage of eggs, larval and pupal Parasitization were work out. The predators associated with the insect- pest of okra were recorded on five randomly selected plants at each replication and mean number of individual predator were calculated.

The data on meteorological parameters viz. temperature (minimum and maximum °C), relative humidity (%), rain fall (mm) and sunshine hours taken from the department of Agro Meteorology have been used to find out the correlation between natural enemies population with abiotic factors.

Results and Discussion

The natural enemies observed during experimentation are given in Table 1.

Parasitoids

A total number of 112 and 135 eggs of shoot and fruit borers were collected but only 7 and 10 eggs were parasitized by the egg parasitoid, Trichogramma chilonis during both the seasons.

The egg parasitization was 6.25 and 7.40 per cent during Kharif, 2012 and Kharif, 2013 respectively.

Predators

The large numbers of predators were collected from the experimental field of okra were collected and placed in four groups i.e. coccinellids, spiders, ants and mirid bugs.

Lady bird beetle

The coccinellids i.e. (Coccinella septempunctata, Microspis discolor and Brumoides suturalis) were first appeared in the last week July (2.80 and 2.57 adult /5 plants) i.e. 31 Standard Week (SW) and there after continuously present throughout the crop season during Kharif, 2012 and 2013 respectively.

The maximum population of coccinellids (4.36 and 4.05 adult /5 plant) was recorded in third week of August (34th SW) followed by (4.15 and 3.80 adult /5 plant), (3.93 and 3.72 adult/5 plant) in 33rd and 36th SW, respectively and minimum was recorded (1.25 and 0.80 adult/5 plant) in 40th SW respectively during Kharif, 2012 and Kharif, 2013.

Spiders

The spiders were recorded throughout the crop season of okra and their population was ranged 2.88 to 6.40 and 2.51 to 6.22 individuals/ 5 plant during Kharif, 2012 and Kharif, 2013 respectively.
### Table 1: Population of predators in okra ecosystem during Kharif, 2012 and 2013

<table>
<thead>
<tr>
<th>Standard Week</th>
<th>Mean number of Predators per five plants</th>
<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coccinellids</td>
<td>Spiders</td>
<td>Ants</td>
<td>Mirid bugs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>2.80</td>
<td>2.57</td>
<td>3.50</td>
<td>3.35</td>
<td>2.25</td>
<td>2.05</td>
<td>1.87</td>
</tr>
<tr>
<td>32</td>
<td>3.38</td>
<td>3.15</td>
<td>4.30</td>
<td>3.80</td>
<td>2.80</td>
<td>2.66</td>
<td>2.40</td>
</tr>
<tr>
<td>33</td>
<td>4.15</td>
<td>3.80</td>
<td>4.85</td>
<td>4.62</td>
<td>4.38</td>
<td>4.22</td>
<td>2.85</td>
</tr>
<tr>
<td>34</td>
<td>4.36</td>
<td>4.05</td>
<td>6.20</td>
<td>5.88</td>
<td>3.80</td>
<td>3.56</td>
<td>3.60</td>
</tr>
<tr>
<td>36</td>
<td>3.65</td>
<td>3.35</td>
<td>5.12</td>
<td>4.66</td>
<td>2.75</td>
<td>2.50</td>
<td>2.82</td>
</tr>
<tr>
<td>37</td>
<td>3.05</td>
<td>2.86</td>
<td>4.26</td>
<td>3.88</td>
<td>2.37</td>
<td>2.15</td>
<td>2.08</td>
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<tr>
<td>38</td>
<td>2.70</td>
<td>2.54</td>
<td>3.55</td>
<td>3.37</td>
<td>2.05</td>
<td>1.86</td>
<td>1.66</td>
</tr>
<tr>
<td>39</td>
<td>2.32</td>
<td>1.95</td>
<td>3.16</td>
<td>2.96</td>
<td>1.88</td>
<td>1.72</td>
<td>1.53</td>
</tr>
<tr>
<td>40</td>
<td>1.25</td>
<td>0.80</td>
<td>2.88</td>
<td>2.51</td>
<td>1.67</td>
<td>1.35</td>
<td>1.42</td>
</tr>
<tr>
<td>Mean</td>
<td>3.16</td>
<td>2.88</td>
<td>4.42</td>
<td>4.13</td>
<td>2.74</td>
<td>2.52</td>
<td>2.41</td>
</tr>
<tr>
<td>SEM±</td>
<td>0.12</td>
<td>0.09</td>
<td>0.11</td>
<td>0.10</td>
<td>0.15</td>
<td>0.14</td>
<td>0.14</td>
</tr>
<tr>
<td>CD at 5%</td>
<td>0.36</td>
<td>0.29</td>
<td>0.34</td>
<td>0.30</td>
<td>0.45</td>
<td>0.43</td>
<td>0.44</td>
</tr>
</tbody>
</table>

### Table 2: Correlation coefficient between natural enemies with abiotic factors in okra (Kharif, 2012 and 2013)

<table>
<thead>
<tr>
<th>Natural Enemies</th>
<th>Temperature</th>
<th>Relative Humidity</th>
<th>Rainfall</th>
<th>Sunshine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coccinellids</td>
<td>0.921**</td>
<td>-0.078</td>
<td>0.595</td>
<td>0.517</td>
</tr>
<tr>
<td>Spiders</td>
<td>0.809**</td>
<td>-0.119</td>
<td>0.407</td>
<td>0.204</td>
</tr>
<tr>
<td>Ants</td>
<td>0.777**</td>
<td>0.094</td>
<td>0.343</td>
<td>0.184</td>
</tr>
<tr>
<td>Mirid Bugs</td>
<td>0.810**</td>
<td>-0.045</td>
<td>0.399</td>
<td>0.170</td>
</tr>
</tbody>
</table>

** Significant at 1 per cent level  
* Significant at 5 per cent level
The maximum population of spider was recorded in 35th SW (6.40 and 6.22 individuals/5 plant) due to maximum host availability followed by (6.20 and 5.88 individuals/5 plant), (5.12 and 4.66 individuals/5 plant) at 34th and 36th SW. The minimum population was 2.88 and 2.51 in 40th SW during Kharif, 2012 and Kharif, 2013 respectively.

**Parasitoids**

The shoot and fruit borer’s eggs parasitized by the egg parasitoid, *Trichogramma chilonis* during both the seasons. The egg parasitization was 6.25 and 7.40 per cent during Kharif, 2012 and Kharif, 2013 respectively. Maximum parasitization was recorded by egg parasitoid during Kharif, 2013. These finding collaborate with the studies of Telang et al., (2004) where the authors had noticed the 9.50% eggs of *E. vittella* parasitization by the *Trichogramma chilonis*. Yadav et al., (2009) reported 10 to 12 per cent parasitism of *E. vittella* eggs by *Trichogramma chilonis*.

**Predators**

The four groups of predators i.e. coccinellids, spider, ants and mirid bug were seen during crop season of okra. The population of lady bird beetle, coccinellids appeared first time in the last week of July (2.80 and 2.57 adult/5 plants) i.e. 31 Standard Week (SW) and that prevailed throughout the crop season during Kharif, 2012 and Kharif, 2013 respectively. The maximum population of coccinellids (4.36 and 4.05 adult/5 plant) was recorded in third week of August (34th SW) followed by (4.15 and 3.80 adult/5 plant), (3.93 and 3.72 adult/5 plant) in 33rd and 36th SW, respectively and minimum was recorded (1.25 and 0.80 adult/5 plant) in 40th SW. The results of the present study are in conformity with the result of Mohanasundaram et al., (2012) who has reported that the coccinellids population was highest when okra was intercropped with cluster bean (4.6 and 4.3 individuals/5 plants) and was on par intercropped with baby corn (4.6 and 4.1).

The spiders were present constantly throughout the crop season and their populations were higher in 35th SW (6.40 and 6.22 individuals/5 plant) due to maximum host...
availability followed by (6.20 and 5.88 individuals/5 plant), (5.12 and 4.66 individuals/5 plant) at 34th and 36th SW. The minimum population was 2.88 and 2.51 in 40th SW during Kharif 2012 and Kharif, 2013 respectively. On the basis of two years population, the spider judged as dominant predator.

The maximum number of black ants was noticed during the infestation of okra mealy bug because the ant feed on the honey dew secreted by mealy bug. The population of ants ranged 1.67 to 4.38 and 1.35 to 4.22 during Kharif, 2012 and 2013. The maximum population of ants was recorded 4.38 and 4.22 in 33th SW followed by (3.80 and 3.56) in 34th SW and minimum in 40th SW (1.67 and 1.35 adult/5 plants) during Kharif, 2012 and Kharif, 2013 respectively.

The maximum population of mirid bugs was recorded 3.88 and 3.56 in 35th SW followed by (3.60 and 3.25 adult/5plant), (2.88 and 2.66 adult/5plant) in 34th and 33th SW and minimum 1.42 and 1.08 adult/5plant in 40th SW during Kharif, 2012 and 2013 respectively. The population of mirid bugs ranged from 1.42 to 3.88 and 1.08 to 3.56 adult/5plant during Kharif 2012 and Kharif, 2013 respectively.

**Correlation between predators with abiotic factors in okra**

The correlation coefficient of different predators i.e. Coccinellids, spiders, ants and mirid bugs with abiotic factors showed positive correlation with minimum temperature i.e. (0.921**, 0.809**, 0.777** and 0.810**) and (0.595, 0.407, 0.347 and 0.399) respectively during Kharif, 2012 and Kharif, 2013. It was significantly correlated at 1% level during Kharif, 2012 but non-significant during Kharif, 2013. The negative correlation was observed between the maximum temperature in coccinellids, spiders and mirid bugs i.e. -0.078, -0.119 and -0.045 but with ant the relation was positive (0.094) during Kharif, 2012 respectively. In Kharif 2013, the correlation with maximum temperature was positive with the predators. The relative humidity was positively correlated with the spiders (0.704**, 0.295), ants (0.570 and 0.885) and mirid bugs (0.646* and 0.266) during Kharif, 2012 and 2013, respectively but in coccinellids it was positive (0.786**) in Kharif, 2012 and negative in Kharif, 2013. Rainfall was positively correlated with natural enemies (0.073 to 0.256) in Kharif, 2012 and significantly negative with spiders (r-0.632*) and mirid bugs (-0.681*) at 5% level during Kharif, 2013. The sunshine was negatively correlated with the predators and varied (-0.234 to -0.485) and (-0.097 to -0.395) during Kharif, 2012 and Kharif, 2013 respectively. The result obtained on predatory population of shoot and fruit borer in okra during both Kharif season of study were similar to the finding of Mohanasundaram et al., (2012) and Sardana et al., (2005) who had reported that a large buildup of natural enemies viz, spiders and coccinellids were observed in unprotected crop module. Shinde et al., (2007) found that neem seed powder and NSKE 5% recorded maximum population of lady bird beetles and spiders on okra. Abdalla (2012) reported that Chrysopids and spiders were the predominant predators in autumn and summer seasons, whereas syrphids, chrysopids and coccinellids were the abundant groups during winter. Singh et al., (2013) reported that the coccinellids showed negative correlation with minimum and maximum temperature, rain fall and relative humidity.

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