BIONOMICS OF PREDATORY RED STINK BUG, *EUTHYRHYNCHUS FLORIDANUS* LINNAEUS (HEMIPTERA: PENTATOMIDAE) ON TURMERIC LEAF SKIPPER BUTTERFLY, *UDASPES FOLUS* AT RAIPUR (C.G.)

C.M. Sahu*, Y.P.S. Nirala, S.K. Ghirlahre and J.L. Ganguli

Department of Entomology, College of Agriculture, Indira Gandhi Agricultural University, Raipur(C.G.) 492012

*Email: chandrasahu2111@gmail.com

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Abstract: Studies on the biology of predatory red stink bug, *Euthyrhynchus floridanus* Linnaeus (Hemiptera: Pentatomidae) on Turmeric, *Curcuma longa* L. conducted under laboratory conditions at Raipur C Chattisgarh, revealed that the bug, *E. floridanus* was found predating on the larvae of *Udaspes folus* and observed to be an extremely beneficial insect which killed their prey by sucking the body contents through a long, stout proboscis. the eggs were laid on upper surface of leaves. The eggs were laid in cluster with 68-70 per cluster and about 80 % eggs hatchability. Eggs were hatched 2 to 3 days after egg laid. The 1st instar nymph was approximately 1.0 mm long along with a blue-black head and thorax with red abdomen having dark central and lateral “stripes” composed of dorsal and lateral dark colored plates. The first instar nymphs were lived in groups or masses but later instar lived in individually because later instar cannibalism was observed. The 5th instar nymph was medium sized, approximately 1.2 to 1.5 cm in length. It was mottled brown or grey in colour and could easily be recognised by the presence of sharp spines on either side of the thorax. Nymph passed through 5 instars in about 30 to 38 days. Their total life cycle took about 39-50 days. Population of *E. floridanus* observed maximum during the month of November last week, which was recorded to be 0.063 bug per plant and minimum population recorded to be 0.026 bug per plant during the month of December second week.

Keywords: Red stink bug, Eggs, Nymphs, Adults, Population

INTRODUCTION

The present studies on insect pests of Agro-forestry system included karanja, *Pongamia pinnata* L. Pierre with intercropping of paddy, *Oryza sativa* var. mahamaya and multi-tier agro-forestry system consisting of Mangium (*Acacia mangium*), Aonla (*Emblica officinalis*), Meetha neem (*Murraya koenigii*) and turmeric (*Curcuma longa*) as the herbal layer. Aonla (*Emblica officinalis*) forming a layer with meetha neem (*Murraya koenigii*), as the middle layer and Mangium (*Acacia mangium*) forming the top most layer. Turmeric, *Curcuma longa* is a flowering perennial that belonging to the *Zingiberaceae* or ginger family. It was found mainly infested by turmeric leaf roller skipper butterfly, *Udaspes folus*. The other insects found associated were shoot borers, grasshopper and predatory stink bug. In Turmeric, *C. longa*, only two insect pest was observed causing maximum damage and that was turmeric skipper butterfly, *U. folus* and grasshopper (unidentified). The other insects, which were recorded the natural enemies like red stink bug; *Euthyrhynchus floridanus* on larvae of *U. folus* its as a major predator. The predatory stink bug, *E. floridanus* L., is considered a beneficial insect because most of its prey consists of plant damaging bugs, beetles, and caterpillars. It seldom plays more than a minor role in the natural control of insects in Florida, but its prey includes a number of economically important species. (Mead, 1976).

*MATERIAL AND METHOD*

The present studies on the biology of predatory red stink bug, *E. floridanus* L. was conducted under lab conditions during October to November 2013. Immature stages viz., eggs and nymphs were collected from the field of agro-forestry, IGKV, Raipur and brought to the laboratory department of Entomology, IGKV, Raipur (C.G.) and kept in petridish, along with 4th and 5th instar larvae of *U. folus* Cramer was provided daily. Nymphs were checked regularly for the exuviae to ensure moulting. Details of various stages up to adult emergence and their dimensions were recorded. Studied the population dynamics of *E. floridanus*, turmeric; *C. longa* was planted in 16 rows in the experimental field of multiter agro-forestry system, each row had about 50 plants. Observations were recorded on the various types and number of insect pests and their related natural enemies at weekly intervals.

*RESULT AND DISCUSSION*

Studies on the biology of the Red stink bug, *E. floridanus* was conducted on turmeric Leaf skipper butterfly, *U. folus* under laboratory conditions during December to January, 2013-14 at the department of Entomology, College of Agriculture, IGKV, Raipur.
Predating behavior
The bug was observed predating on the larvae of U. folus and noticed to be an extremely beneficial insect. They killed their prey by sucking the body contents through a long, stout proboscis (or beak). Once a bug detects a caterpillar of U. folus it extends its proboscis and inserts it into the body of caterpillar for sucking the body fluid.

Life history stages
1) Eggs: The females laid eggs in masses on the upper surface of leaves. Eggs of E. floridanus were approximately 1 mm in diameter, with short projections around the operculum, barrel shaped and laid in cluster about 68-70 eggs at a time.

2) Nymphs: Nymph passed through 5 instars in about 30-38 days. Mead (2000), similarly noticed that the identification of the nymphs is less certain, particularly the earlier instars. The available keys are based on the last instar (5th), but key characters often apply to the 4th instar as well. De Coursey and Allen (1968) published a key to the 5th instar nymphs of 25 genera of eastern U.S. stink bugs.

   1st instar: The 1st instar was approximately 1.0 mm long. Nymphs had a blue-black head and thorax with red abdomen having dark central and lateral "stripes" composed of dorsal and lateral dark colored plates. Predatory activity began from the 1st instar stage and captured the larvae of Udaspes folus as prey. It was observed during the studies that the 1st instar nymph could kill four larvae of U. folus. This period lasted for 2-3 days.

   2nd instar: The 2nd instar was 1.5 to 1.8 mm long. Colouration of nymphs were similar to 1st instar and a total six larvae were consumed by 2nd instar nymphs. This period lasted for 3-4 days.

   3rd instar: The 3rd instar nymph was approximately 3-5 mm long and it could consume about nine larvae. This period lasted for 3-4 days.

   4th instar: The 4th instar was 7.0 to 9.0 mm long, could consume 19 larvae: This period lasted for 4-5 days.

   5th instar (Adult): The 5th instar nymph was medium sized, approximately 1.2 to 1.5 cm in length. It was mottled brown/grey in colour and could easily be recognised by the presence of sharp spines on either side of the thorax. Females were larger than males. Total 25 larvae were consumed by 5th instar nymph (Adult). This period lasted for 18-22 days. In field condition we had seen 1st instar nymphs were lived in groups or masses but later instar lived in individually because later instar cannibalism was observed.

The mature nymphs reared by Oetting and Yonke (1975) size were recorded 10 to 12.5 mm in length. An occasional mistake of beginners is to confuse Euthyrhynchus nymphs with beetles. The latter would have elytra forming a suture dorsally, and the mouthparts would be of the chewing type. Also, the young stink bugs lack wings and have tubelike piercing sucking mouthparts.

E. floridanus has been reared in the laboratory by Ables (1975), Oetting and Yonke (1975), and Richman and Whitcomb (1978). At 26 to 27°C, and with a photoperiod of 14:10, both Ables (1975) and Richman and Whitcomb (1978) found that the length of time from egg to adult was 58 days. The egg stage lasted 18 to 19 days.

Table 1. Showing details of the various development stages of the predatory red stink bug, Euthyrhynchus floridanus Linnaeus on turmeric leaf roller skipper butterfly, U. folus

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Development stage</th>
<th>Approximate Date</th>
<th>Total duration (days)</th>
<th>Body length (mm.)</th>
<th>No. alive at beginning</th>
<th>No. dying</th>
<th>% mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Eggs laid</td>
<td>15-10-2014</td>
<td>-</td>
<td>-</td>
<td>68</td>
<td>13</td>
<td>19.1</td>
</tr>
<tr>
<td>2.</td>
<td>Eggs hatching</td>
<td>24-10-2014</td>
<td>9-12</td>
<td>-</td>
<td>55</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Hatchability % = 80.88%</td>
<td></td>
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<tr>
<td>3.</td>
<td>Nymphal stage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1st instar</td>
<td>24-10-2014</td>
<td>2-3</td>
<td>1.0-1.3</td>
<td>55</td>
<td>21</td>
<td>61.7</td>
</tr>
<tr>
<td></td>
<td>2nd instar</td>
<td>27-10-2014</td>
<td>3-4</td>
<td>1.5-1.8</td>
<td>34</td>
<td>2</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>3rd instar</td>
<td>30-10-2014</td>
<td>3-4</td>
<td>3.0-5.0</td>
<td>32</td>
<td>5</td>
<td>18.5</td>
</tr>
<tr>
<td></td>
<td>4th instar</td>
<td>03-11-2014</td>
<td>4-5</td>
<td>7.0-9.0</td>
<td>27</td>
<td>4</td>
<td>17.3</td>
</tr>
<tr>
<td></td>
<td>5th instar</td>
<td>25-11-2014</td>
<td>18-22</td>
<td>12.0-15.0</td>
<td>23</td>
<td>0</td>
<td>0.0</td>
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<tr>
<td></td>
<td>Full grown adult</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>Total life cycle</td>
<td>Between 22-10-2014 to 25-10-2014 and lasted about 39-50 days</td>
<td></td>
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</tbody>
</table>
Plate no. 1: Life cycle of the Predatory red stink bug, *E. floridanus*, photograph by C.M. Sahu, IGKV, Raipur (C.G.)
Population index

The Florida predatory red stink bug was recorded as the major predatory bug of *Udaspes folus*. Maximum population of red stink bug, *E. floridanus* was observed during the month of November last week, which was recorded to be 0.063 bug per plant and minimum population recorded to be 0.026 bug per plant during the month of December second week. (Fig.1)

The correlation analysis of population of red stink bug with weather parameters showed that highly significantly positively correlated with maximum temperature (0.130**) and highly significant negatively correlated with minimum temperature (-0.269**), rainfall(-0.573**), relative humidity-I (-0.579**) & II (-0.460**).

Correlation of predatory red stink bug, *E. floridanus* with its host larvae *Udaspes folus* depicted a highly significant positive correlation (0.208**).

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