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Biological Studies on Paddy Earhead Bug, *Leptocorisa oratorius* Fabricius (Hemiptera:Alydidae)

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Abstract: Studies on biology and morphometric studies of Paddy earhead bug, *Leptocorisa oratorius* Fabricius (Hemiptera:Alydidae) revealed that eggs had an incubation period of 7 and 6.98 days under field and greenhouse conditions respectively. The nymphs were observed to pass through five instars and the duration of each instar was 3.98, 3.30, 3.48, 3.83 and 4.15 days for I,II,III,IV and V instars respectively. The nymphal period averaged 18.9 and 18.7 days under field and greenhouse conditions respectively. The average fecundity was recorded to be 50-135 and 75-137 eggs per female under greenhouse and field conditions respectively. The total development period was seen to be 25.76 and 26 days under greenhouse and field conditions. Only a little variation was noticed in its biology under both conditions. The length and width of the eggs was ranged from 1.00 to 1.20 mm (1.10±0.07), 0.80 to 0.86 mm (0.83 to±0.02) respectively. The length of adult females was measured to be 17.50 to 18.50mm (18.00±0.37) in length and 2.40 to 3.00 mm (2.63±0.21) in width and that males length was varied from 18.00 to 19.00 mm (18.49 to 0.42) and width from 1.95 to 2.50 mm (2.19±0.22) respectively.

Key words: Paddy earhead bug · Morphometry · Biology · Leptocorisa oratorius

INTRODUCTION

The rice earhead bug is the major sap sucking pest of paddy. It poses serious problems in the successful cultivation of paddy in India. Both the nymphs and adults suck the sap of grains during milking stage and thus make them chaffy. Whole panicle becomes white coloured (chaffy) under severe infestation. For the control of this pest, growers resort to indiscriminate use of pesticides which directly add to problems like increased expenditure on cultivation, build up of resistance to insecticides and health hazards etc. To overcome all this, an effective pest management system has to be developed for which studies on bionomics and its morphometry of this pest are most essential. The information available on these aspects of the pest under Indian conditions is very scanty. Keeping in view the need of information particularly on this species, the present studies were undertaken in the field as well as greenhouse conditions at College of Agriculture Navile, Shimoga, University of Agricultural Sciences, Bangalore, India.

MATERIALS AND METHODS

The experiment was conducted in greenhouse and field conditions to study the bionomics and morphometric features of Paddy earhead bug, *Leptocorisa oratorius* Fabricius (Hemiptera:Alydidae) during *kharif* 2006 at College of Agriculture Navile, Shimoga, India and Agricultural Research Station, Honnavile, India. For studying the biology, rice seedlings were raised in earthen pots. A group of 20 adults of either sex of *L. oratorius* were collected from the paddy fields and were released on flowering rice plants covered with nylon net cages. The eggs were collected from the cage, by clipping the leaf portion containing the eggs and placed in a Petri dish containing moist filter paper and eggs were kept for hatching. Ten emerged nymphs were released on rice earheads at milky stage and covered with nylon net cage. Cages were provided with sleeves to enable easy release of bugs. Ten such cages served as replicates. The observations were recorded on incubation period, nymphal period and feeding behavior of the nymph at

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12 hr intervals. A pair of freshly emerged male and female bugs were enclosed in each cage covered by nylon net to study the biological characters like feeding behavior, mating behavior, pre-oviposition period, fecundity, ovipositon period, adult longevity, nature of damage and habits of adults. Observations were made on the above mentioned parameters.

RESULTS AND DISCUSSION

The studies on the biology and morphometry of *L.oratorius* are presented below.

Eggs: The eggs were blackish in colour, oval in shape and seed like in appearance and shiny. They were flattened dorsally and ventrally convex in shape. They were laid on the tip of upper surface of the leaves and up to 19 eggs in a batch were observed. Each egg was placed in contact with previous egg and cemented to the surface. A crescent shaped egg burster on the head of the nymph aided egg hatching. Even though lack of operculum, a line of weakness was seen prior to hatching and dorsal surface of the egg neatly broken off from the micropylar and leaving a cup shaped portion. The length of eggs ranged from 1.00 to 1.20 mm with a mean of 1.10±0.07 mm and width varied from 0.80 to 0.86 mm with mean of 0.83±0.02 mm (Table 1).

Nymphs: Five nymphal instars were observed in this species and each instar is described here under along with period of their duration and morphometric data (Table 1).

First Instar: Freshly hatched nymphs were pale greenish in colour and had long reddish antennae with whitish bands. The antennae were longer than the body. Eyes were reddish and legs were reddish brown in colour. The length of the first instar nymph varied from 1.80 to 2.10 mm with an average of 1.95±0.10 mm and width varied from 0.30 to 0.60 mm, with an average of 0.42±0.11 mm (Table 3). The duration of the first instar nymph lasted for 3 to 5 days with an average of 3.98±0.79 days under greenhouse condition (Table 1).

Table 1: Morphometric data of different stages of *L. oratorius*

		Length (mm)		Width (mm)	
Sl. No.	Stages	Range	Mean±S.D	Range	Mean±S.D
1.	Egg	1.00-1.20	1.10±0.07	0.80-0.86	0.83±0.02
2.	Nymph				
	1 Instar	1.80-2.10	1.95±0.10	0.30-0.60	0.42±0.11
	2 Instar	5.80-6.20	5.97±0.14	0.60-0.90	0.78±0.12
	3 Instar	8.80-11.00	9.51±0.70	0.90-1.10	0.98±0.07
	4 Instar	12.50-14.50	13.48±0.68	1.20-1.40	1.30±0.07
	5 Instar	14.00-16.00	14.88±0.66	1.45-1.75	1.59±0.10
3.	Adult				
	Female	17.50-18.50	18.00±0.37	2.40-3.00	2.63±0.21
	Male	18.00-19.00	18.49±0.42	1.95-2.50	2.19±0.22

Table 2: Duration of life stages of *Leptocorisa oratorius* on paddy under greenhouse and field conditions

Sl. No.	Developmental stages	Range (days)	Mean±S.D
Green house conditions			
1.	Incubation period	6-8	6.98±0.55
2.	Nymph		
	1 Instar	3-5	3.98±0.79
	2 Instar	3-5	3.30±0.61
	3 Instar	3-4	3.48±0.27
	4 Instar	3-4	3.83±0.31
	5 Instar	3-5	4.15±0.58
3.	Total nymphal period	15-23	18.70±2.08
4.	Total developmental period (egg to adult)	21-31	25.76±2.73
Field Conditions			
5.	Incubation period	6-9	7.00±1.41
6.	Total nymphal period	14-25	18.90±3.54
7.	Total developmental period (egg to adult)	20-34	26.00±3.91
n=10			

Table 2: Reproductive Biology of *Leptocorisa oratorius* on paddy under green house and field conditions

Sl.No.	Parameter	Range	Mean±S.D
Green house conditions			
1.	Preoviposition period (Days)	3-5	4.10±0.76
2.	Oviposition period (Days)	6-29	19.00±5.89
3.	Mating period (Hours)	2-6	3.84±1.44
4.	Fecundity (Number of eggs/female)	50-135	98.30±27.59
5.	Adult longevity (Days)		
	Female	50-83	71.00±11.48
	Male	20-37	30.30±5.21
Field Conditions			
1.	Preoviposition period (Days)	8-17	11.10±2.92
2.	Oviposition period (Days)	5-17	13.10±3.67
3.	Fecundity (Number of eggs/female)	75-132	92.90±19.99
4.	Adult longevity (Days)		
	Female	35-80	65.70±12.96
	Male	23-61	47.70±10.85

Second Instar: Second instar nymph was similar to that of first instar in appearance except for the size. The second instar nymph measured 5.80 to 6.20 mm in length with a mean of 5.97±0.14 mm and width ranged from 0.60 to 0.90 mm with an average of 0.78±0.12 mm. The duration of this instar lasted for three to five days with an average of 3.30±0.61 days.

Third Instar: The third instar nymph was dark greenish in colour. Antennae and legs were brownish in colour. In this stage, the antennae were not much longer than the body. Pale green wing pads were appeared in this instar. Third instar nymph measured 8.80 to 11.00 mm in length with an average of 9.51±0.70 mm and width ranged from 0.90 to 1.10 mm with an average of 0.98±0.07 mm. The duration of third instar lasted for 3 to 4 days with an average of 3.48±0.27 days.

Fourth Instar: The fourth instar nymph was greyish green in colour with reddish to reddish brown eyes. The dark greenish stripe on the lateral side of the head becomes reddish brown, lateral margins of the pronotum became cream-coloured and femora became reddish brown as the days progressed. The nymph measured 12.50 to 14.50 mm in length with an average of 13.48±0.68 mm and 1.20 to 1.40 mm in width with an average of 1.30±0.07 mm. This instar occupied 3 to 4 days with an average of 3.83±0.31 days.

Fifth Instar: The fifth instar nymph was larger and pale brown in colour with well developed wings. The length and width of the fifth instar nymph varied from 14.00 to 16.00 mm and 1.45 to 1.75 mm with an average of 14.88±0.66 mm and 1.59±0.10 mm respectively (Table 4). The duration of this instar ranged from 3 to 5 days with an average of 4.15 to±0.58 days (Table 1).

Adult: Adult bugs were more slender, robust with variation in colour ranging from green to brownish-orange and they can be distinguished from other species of this genus by the presence of brownish to black coloured ventro-lateral spots on the abdomen.

The female bug was slightly smaller than the male and measured 17.50 to 18.50 mm (mean 18.00±0.37 mm) in length and 2.40 to 3.00 mm (mean 2.63±0.21 mm) in width. The male bug was slightly larger than female measured 18.00 to 19.00 mm in length (mean 18.49±0.42 mm) and 1.95 to 2.50 mm (mean 2.19±0.22 mm) in width (Table 3). Female bugs were more robust compared to male bugs.

Adult Longevity: The adult females lived for 50 to 83 days (mean 71±1.48 days) and males lived for 20 to 37 days (mean 30.30±5.21) under greenhouse condition. Whereas under field condition female and male lived for 35 to 80 days (mean 65.70±12.96 days) and 23 to 61 days (mean 47.70±10.85 days), respectively (Table 3).

Mating: The bugs mated during morning hours and late evening hours. The mating period ranged from 0.08 to 0.25 days with an average of 0.16±0.06 days. The male and female faced in opposite directions and moved about during copulation. They separated with slightest disturbances. Mating was also observed on grassy weeds present on bunds, plantation areas and in paddy fields. Some time copulation took place on leaves of banana and arecanut plants present adjacent to the paddy fields. Sex ratio observed from the life history indicated that male to female ratio was 1:1.20 (Table 3).

Fecundity: The female bugs laid varied number of eggs. However, fecundity ranged from 50-135 eggs per female and 75-132 eggs per female under greenhouse and field conditions, respectively.

The incubation period lasted for 7.0±1.41 and 6.98±0.55 days under field and green house conditions (Table - 2) respectively which is in agreement with the studies of Rothschild [1], Sands [2] and Cobblah and Denhollander [3]. Total nymphal period lasted for 18.9±3.54 and 18.7±2.08 days under field and greenhouse conditions respectively which is in conformity with the findings of Li [4] and Nayak [5] The pre-oviposition period under field and greenhouse conditions lasted for 11.10±2.92 and 4.10±0.76 days respectively (Table 2) which is in similarity with the results of Sands [2] and Rai [6]. The total development period under greenhouse and field conditions was 25.76±2.73 and 26.00±3.91 days respectively which is in conformity with the results of Rothschild [1]. Mated females laid an average of 98.30±27.59 and 92.90±19.99 eggs in their oviposition period of 19.00±5.89 and 13.10±3.67 days under greenhouse and field conditions respectively. Similar results were also obtained by Rai [6] and Li [4]. Adult females and males lived for 71.00±11.48, 30.30±5.21 and 65.70±12.96 and 47.70± 10.85 days under greenhouse and field conditions respectively. Similar results were obtained by Nayak [5]. The results on morphometric data (Table 3) are in conformity with the reports of Nayak [5], Li [4] and Cobblah and Denhollander [3].

Habits of Nymphs and Adults: The bugs were found to feed and breed on alternate hosts present on paddy field bunds till the crop reached flowering stage. As the paddy earheads emerged, they moved to paddy fields. After the harvest of paddy they found on grasses. The bugs bred on early maturing varieties and migrated to late maturing varieties. They were more active during cooler hours of the day in the field and took shelter under shady portions of the plant during hot period of the day. Both nymphs and adults emit pungent odour when disturbed.

Nature of Damage: Both nymphs and adults started feeding on the grains soon after emergence of earheads and continued to feed on them till the grain gets hardened due to sucking of milky juice from the developing grains resulted in partial or complete chaffyness of grains. At the site of feeding small yellowish brown spot developed initially and enlarge later to form yellowish brown elliptical spot with greyish centre.

Ecology: Warm weather, over cast sky and frequent drizzle favored the build up of the pest in the field during flowering season. Temperature range of 25.30-26.75°C and relative humidity of 73.75-74.92 per cent favored the infestation. Intermittent rains accompanied by high temperature during April - May were highly favorable for increased activity of the pest.

CONCLUSION

Our results indicated that eggs of *L. oratorius* had an incubation period of 7 and 6.98 days under field and green house conditions, respectively. The nymphs were observed to undergo five instars. There was little variation in development between green house and field conditions. Adults took 8 to 17 days of pre oviposition period under field condition whereas it was 3 to 5 days under green house. The oviposition period was higher (6-29 days) under green house. How ever, the fecundity did not vary much. Considering the importance of this pest, the data generated is useful in understanding the insect and for integrated management of *L. oratorius*.

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