

REPORT ON DIVERSITY OF *LEPTOCORISA* SPP. AND THEIR EGG PARASITIDS IN RICE AT SABOUR, BIHAR

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Abstract: A study on diversity of *Leptocorisa* spp. and their egg parasitoids in rice at Sabour, Bihar, India was conducted in the year 2019. The study revealed that two species of rice earhead bugs, namely, *Leptocorisa oratorius* (Fabricius) and *L. acuta* (Thunberg) prevailed in the location of the study. However, more than 90 percent of the *Leptocorisa* were *oratorius*. Two egg parasitoids of *Leptocorisa*, namely, *Gryon* sp. and *Ooencyrtus* along with field parasitisation rates are also being reported from the same location through the present study.

Keywords: *Leptocorisa*, Parasitoids, Rice, Bihar.

Introduction

Paddy, *Oryza sativa*, is infested by more than 128 insect pests (Kalode, 2005) and rice gundhi bug *Leptocorisa* spp. (Hemiptera: Alydidae) are one of the important grain sucking pests among them. They also are among the few pests which feed directly on the spikelet of paddy. Therefore, they are probably the most recognized insect pests by farmers. The crop failure by *Leptocorisa* in tropical Asia was reported from Java in 1878 by Koningsberger for the first time. As far as India is concerned, Lefroy, in 1908, first reported the *Leptocorisa* outbreak in paddy. It has been reported that out of the nine species of *Leptocorisa*, in Asia and Oceania, *L. oratorius* is the most important in tropical climates, whereas *L. acuta* and *L. chinensis* prevail in upland areas or temperate climates (Litsinger et al. 2015). From Bihar, the diversity of *Leptocorisa* as well as its egg parasitoids is not well documented till date. Therefore, the present study aims to register the availability of different species *Leptocorisa* and their egg parasitoids at Sabour region of Bihar.

Materials and Methods

From seed production plots of paddy (Variety: MTU 7029) of Bihar Agricultural University Research Farm, Sabour [GPS: 25° 13' 33.6612" N (latitude), 87° 2' 56.184" E (longitude)], collection of adult gundhi bugs were carried out with the help of standard insect collecting net (length of handle 75cm; 75cm long net bag fitted in ring through 5cm wide

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cloth rim; Diameter of bag at free end 25cm; Ring diameter 30cm; Make Rescholar Equipment) starting from the second fortnight of September till second fortnight of October, 2019 at fortnightly interval. Each time the collected bugs were brought to the laboratory and preserved in 70% ethanol in separate glass jars. A total of 2500 earhead bugs were collected during the said period. The bugs were preliminary classified into two different species, namely, *Leptocorisa oratorius* and *L. acuta* on the basis of presence of black coloured ventro-lateral spots on the abdomen. The identification was confirmed by following the identification key as given by Siwi and Doesburg (1984).

During the months of September-October, 2019, a total of 145 egg masses were collected from the same paddy field and brought to the laboratory of department of Entomology. On the same day, the egg masses were observed under stereo zoom binocular (make-Olympus). The un-emerged egg masses were separated from the emerged out egg masses and were kept in cotton plugged test tubes for further observations. Out of the 145 collected egg masses (during the said period), 114 egg masses were already hatched out. Therefore, a total of 31 un-hatched egg masses were taken for further observation regarding field parasitisation by egg parasitoids of *Leptocorisa* spp. (irrespective of *L. oratorius* or *L. acuta*). The test tubes were then placed inside BOD incubator (at 27 °C). The count of eggs per egg mass was also noted before the individual egg masses were inserted into the test tube. After keeping the egg masses in the individual test tubes for 12 days, the test tubes were observed regarding emergence of parasitoids/nymphs of *Leptocorisa*. The number emerged out *Leptocorisa* nymphs/parasitoids/un-hatched eggs were counted egg mass wise. After taking the count of emerged out egg parasitoid from individual egg masses, the adults of those were quickly preserved in 70% ethanol for identification of those. The images of the parasitoids (two suspected genus namely Scelionidae and Encyrtidae) were sent to Dr. Kamalanathan Veenakumari, and Dr. J. Poorani, National Bureau of Agricultural Insect Resources, Bengaluru 560 024, India for getting their help in genus level identification.

Results and Discussion

Species composition of *Leptocorisa* at Sabour

Following the keys of Siwi and Van Doesburg (1984), two different species of *Leptocorisa*, namely, *Leptocorisa oratorius* (Fabricius) (Plate 1) and *L. acuta* (Thunberg) (Plate 2) were identified in the present study. The counts of the two different species were taken from the preservation glass jars of three different dates. The quantitative data of species composition of the *Leptocorisa* spp. is given in table 1.

Table 1: Species composition of *Leptocorisa* at Sabour

Fortnight	Total <i>Leptocorisa</i> collected	Number of <i>L. oratorius</i>	% of <i>L. oratorius</i>	Number of <i>L. acuta</i>	% of <i>L. acuta</i>
2 nd , September, 2019	550	475	86.4	75	13.6
1 st , October, 2019	950	895	94.2	55	5.8
2 nd , October, 2019	750	685	91.3	65	8.7

The table depicted that out of the total 2250 *Leptocorisa*, 2055 were belonging to *L. oratorius*, where as rest of the 195 belonged to the other species, ie. *L. acuta*. The table also suggested that on an average 90.6 percent of the *Leptocorisa* were belonging to *L. oratorius* and rest 9.4% were of *L. acuta*. Therefore, the study indicated that out of the two existing species of earhead bugs of rice at Sabour, *L. oratorius* was found to be predominant one.

The global database of EPPO (2020) illustrated that in India, *Leptocorisa acuta* is distributed in the states like Assam, Bihar, Delhi, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Odisha, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal, whereas, the other species (*L. oratorius*) is distributed in the states like Andaman and Nicobar Islands, Assam, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal. In the present study, the species level identification of the *Leptocorisa* has been done following the standard taxonomic key. From the global data base it is clear that *Leptocorisa oratorius* has not yet been reported from Bihar state of India. The present study not only reports the *Leptocorisa oratorius* from Bihar and also quantifies that more than 90 percent of the *Leptocorisa* belongs to *L. oratorius* and about 10 percent belongs to *L. acuta*. The present study clearly demonstrates that out of the two existing species of *Leptocorisa* of rice at Sabour, *L. oratorius* is the predominant one. Similar study on the diversity of earhead bugs in rice was conducted by Elanchezhyan (2015) at Rice Research Institute, Ambasamudram (Tamil Nadu). He collected a total of 987 earhead bugs from the field at Rice Research Institute, Ambasamudram during Kar and Pishanam seasons, 2013 - 2014. He found that among the 987 earhead bugs, *L. oratorius* was found to be the predominant species (96.82 %).

Egg parasitoids of *Leptocorisa* spp. at Sabour

During the course of the laboratory study, two different species of egg parasitoids were found. The parasitoids belonged to the families Scelionidae (Hymenoptera) and Encyrtidae

(Hymenoptera). As per the experts, on the basis of photographs sent to them, the scelionid parasitoid was *Gryon* sp. (Plate 3) and the Encyrtid parasitoid was *Ooencyrtus* sp. (Plate 4). The original photographs taken regarding the series of steps before emergence of the egg parasitism are given in the plates 5-8.

Observation regarding field parasitism rates by egg parasitoids

Being no-taxonomists, during the time of observation on the percent parasitism, we could not take the species wise percent parasitism. Therefore, the detail of the laboratory study regarding the percent parasitism by the egg parasitoids (irrespective of *Gryon* and *Ooencyrtus*) of *Leptocorisa* is given in Table 2.

Table 2: Overview of emergence from 31 (thirty one) *Leptocorisa* egg masses

Sl No.	Number of eggs	Number of emerged out parasitoids (irrespective of species)	Number of emerged out <i>Leptocorisa</i> nymphs	Number of un-hatched eggs	Percent parasitism
1	15	13	0	2	86.7
2	12	9	0	3	75.0
3	15	11	0	4	73.3
4	12	9	0	3	75.0
5	14	11	0	3	78.6
6	16	9	0	7	56.3
7	5	0	5	0	-
8	12	0	12	0	-
9	14	13	0	1	92.9
10	12	0	10	2	-
11	13	9	0	4	69.2
12	16	13	0	3	81.3
13	17	15	0	2	88.2
14	5	0	5	0	-
15	8	0	8	0	-
16	7	0	6	1	-
17	10	0	9	1	-
18	15	15	0	0	100.0
19	11	0	9	2	-
20	12	0	11	1	-
21	13	11	0	2	84.6
22	12	0	12	0	-
23	5	0	5	0	-
24	12	0	12	0	-
25	16	13	0	3	81.3
26	6	0	6	0	-
27	16	12	0	4	75.0
28	7	0	7	0	-

29	12	0	12	0	-
30	15	13	0	2	86.7
31	11	0	9	2	-
Maximum	17	15	12	7	100.0
Minimum	5	0	0	0	56.3
Mean	11.8	5.7	4.6	1.7	80.3
SD	3.6	6.1	4.8	1.7	10.5
Total	366	176	138	52	48.1

It could be noted from the table 2 that number of eggs of *Leptocorisa* in the egg masses varied from 5 to 17 and the mean number of egg was 11.8 per mass. Number of field parasitized eggs (out of 31 studied egg masses), varied from 0-15 and the number of un-hatched eggs ranged from 0-7. The table also summarised that the percent field parasitism (from the point of view of number of emerged out parasitoids from a single egg mass) was as high as 100 percent with minimum of 56.3 percent. The mean percent parasitism (where ever an egg mass was parasitized) was found to be very high which was 80.3. However, if the total number of eggs was considered, out of 366 individual eggs, 176 eggs, ie. 48.1 percent of the total eggs were found to be field parasitized. If we look at the number of egg masses parasitized, then out of 31 egg masses, 15 egg masses were parasitized. Therefore, from the point of view of percent parasitisation of the egg mass, it was 48.4 %.

From Tropical Asia, Barrion et al (1981) reported three most prevalent egg parasitoids in that region, *Gryon (Hadronotus) nixonii (flavipes)* and *Telenomus camperei* under the family Scelionidae, and *Ooencyrtus malayensis* under the family Encyrtidae. Huang and Noyes (1994) reported that eggs of *Leptocorisa* spp. of India, Nepal, Thailand, China, Filipina, Malaysia, Indonesia, and Papua New Guinea commonly were parasitized by *Ooencyrtus utetheisae* (Family: Encyrtidae). Purohit et al. (2013), from NAU, Navsari, Gujarat observed multiple parasitism of *Leptocorisa* eggs by two egg parasitoids viz. *Trissolcus* sp. (Hymenoptera: Scelionidae) and *Ooencyrtus utetheisae* (Hymenoptera: Encyrtidae) which occurred from last week of September and remained active till the third week of October with a peak in the second week of October. The present investigation reports two egg parasitoids of *Leptocorisa* spp. at genus level only i.e., *Gryon* sp. and *Ooencyrtus* sp., but the findings are in line with those by Barrion et al. (1981), Morrilland Almazan (1990), Huang and Noyes (1994) and partly by Purohit et al. (2013). To determine the species of parasitoid, diversity index, parasitization level, and parasitoid mortality found in *Leptocorisa* eggs in rice fields in West Sumatra, a research was carried out by Maulina et al.

(2020) unveiled that the egg parasitoids found were *Hadronotus leptocorisae* and *Ooencyrtus malayensis* with parasitization level as 22.3 ± 11.1 % and 4.2 ± 5.3 %. Islam *et al.* (2003) reported 21% egg parasitism on boro rice in 1998 but only 5% in 1999. Rai (1981) recorded 16% parasitism in Maharashtra, India. Sands (1977) found egg mass parasitism of 49% and egg parasitism of 23% (0-39%) in Papua New Guinea. The present investigation registered an average of 48.1 egg parasitism (irrespective of species although) which is much higher than the available reports but the egg mass parasitism (48.4 %) was almost equal to the report of Sands (1977).

Conclusion

The present study unveiled that *Leptocorisa oratorius* dominated over *L. acuta* as more than 90 percent of *Leptocorisa* associated with rice at Sabour were *L. oratorius*. The study also registered that two different egg parasitoids (irrespective of *Leptocorisa* species) at the location of study were *Gryon* sp. (Hymenoptera: Scelionidae) and *Ooencyrtus* sp. (Hymenoptera: Encyrtidae).

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Plate 1: *Leptocorisa oratorius* (Fabricius) with clear ventro-lateral spots on the abdomen



Plate 2: *Leptocorisa acuta* (Thunberg) without ventro-lateral spots on the abdomen



Plate 3: *Gryon* sp. (Hymenoptera: Scelionidae), one of the egg parasitoids of *Leptocorisa* sp. recorded from Sabour, Bihar



Plate 4: *Oenocyrtus* sp. (Hymenoptera: Encyrtidae), one of the egg parasitoids of *Leptocorisa* sp. recorded from Sabour, Bihar



Plate 5: Needle showing the parasitized egg



Plate 6: Extreme left egg remained un-emerged where as the right one indicating the head of the parasitoid



Plate 7: Extreme right egg with ready to emerge parasitoid with antenna outside the egg



Plate 8: Fully developed parasitoid almost emerged out