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Incidence of Rice Earhead Bug, *Leptocorisa oratorius* (F.) (Hemiptera : Alydidae) in Bhadra Command Area and Effect of Its Feeding on Grain Damage

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Abstract

Field and laboratory experiments were conducted during *kharif* of 2006 and summer of 2007 to study the occurrence and intensity of paddy earhead bug *Leptocorisa oratorius* (F.) in different rice growing tracts of Bhadra command area. During the period, alternate hosts, loss caused by the pest in terms of grain damage and its effect on germination were also studies. Higher incidence of earhead bug was recorded in Bhadravathi and Shimoga talukas where the crop is grown both in *Kharif* and summer seasons on large area. Earhead bug was observed to breed on number of weed hosts belongs to Poaceae and Cyperaceae family. Higher grain damage was recorded in Bhadravathi and Shimoga talukas with 4 to 6% and corresponding lower germination percentage compared to Shikaripura taluka (1.96%). Monitoring of earhead bug using light trap indicated that higher activity of earhead bug was noticed during the April—May in summer and September—October in *kharif* respectively which synchronized with flowering and milky stages of the crop. The studies are important in designing the integrated pest management strategies for rice earhead bug.

Key words : Rice, Earhead bug, Incidence, Damage.

Rice is the most important crop in India and plays a major role in food security. India has the largest area under rice (44.6 m ha) with a production of 900 m t and ranks next to china. Bhadra command area is one of the largest rice growing tracts in Karnataka state. Not much work has been done in this area about the production constraints of rice. The rice earhead bug, *Leptocorisa oratorius* (F.) is in limelight as a major pest of rice in this area. Its damage is mainly confined to milky stage of the crop, but is a major pest throughout tropical Asia (1). Even though three species of rice earhead bugs viz. *L. oratorius, L. acuts* and *L. lepida* have been reported (2) from India, only *L. oratorius* incidence has been reported from Bhadra command area (3). Earlier reports indicate that the pest can cause 10—40% reduction in yield (3). Gupta et al. (4) reported that the total grain damage caused by *Leptocorisa* spp. was 6.90 to 14.8% during the drying season and 2.30 to 8.10% during wet season. Its prevalence and importance are due to its ability to survive when food is scarce and delay in ovipositon until favorable breeding conditions prevail. It infests the maturing rice from flowering stage onwards. The nymphs and adults damage the crop by removing fluid material from the grain during development of the grain (1). The injury results in unfilled grains, discoloration of mature grains and also development of week points in the kernels. The information on the incidence and its potential effect on grain damage is lacking for the Bhadra command area. Hence, surveys were conducted on the occurrence and intensity of *L. oratorius* in grower's field during *kharif* of 2006 and summer of 2007 representing entire Bhadra command area. Further, grain damage due to *L. oratorius* and effect of its damage on seed germination were assessed. Apart from this the survival of this pest on other alternate hosts was also recorded.

Methods

Occurrence and Intensity of Paddy Earhead Bug

A rowing survey was undertaken during *kharif* of 2006 and summer of 2007 when the crop was at milky stage. Survey was conducted in three different

Table 1. Occurrence and intensity of earhead bug in Bhadravathi taluk during *kharif* of 2006 and summer of 2007.

Place of observation	*Kharif* 2006 Mean number of bugs/hill Adults	Nymphs	Total	Summer 2007 Mean number of bugs/hill Adults	Nymphs	Total
1. Holehonnur	5.23	2.45	7.31	5.07	2.31	3.54
2. Sanyasi Kodamagi	4.96	2.12	6.21	4.91	2.37	6.91
3. Hosur	4.51	1.86	5.62	4.47	1.71	5.76
4. Sidlipura	3.98	1.23	4.88	4.11	1.49	5.38
5. Kenchanahalli	3.62	0.96	4.12	3.46	0.81	3.88
6. Barandur	3.71	0.93	4.19	3.92	1.18	4.78
7. Mavinakere	3.54	0.87	4.06	3.36	0.73	3.78
8. Mosrahalli	3.30	0.80	3.69	3.79	0.00	3.79
9. Karehalli	2.21	0.00	2.21	1.92	0.18	1.98
10. Sunnadahalli	2.23	0.60	2.62	2.51	0.91	3.13
11. Kudligeri	0.53	0.00	0.53	0.37	0.00	0.37
12. Babahalli	0.87	0.40	0.98	1.26	0.56	1.66
13. Doddagopenahalli	1.23	0.01	1.36	1.01	0.12	1.07
14. Aralahalli	0.16	0.00	0.16	0.31	0.00	0.31
15. Nagathi Belagalu	0.37	0.00	0.37	0.28	0.04	0.25
Taluk average	2.70	0.82	3.21	2.72	0.83	3.34

talukas of Shimoga district, viz. Shiamoga, Bhadravathi and Shikaripura. Rice is grown both during *kharif* and summer in Shimoga and Bhadravathi talukas whereas it is grown only during *kharif* in Shikaripura taluka. A total of 15 locations were surveyed in each taluka. The intensity of bugs was determined by counting the nymphs and adults from 20 randomly selected hills in each field. In each location, five fields were selected and average number of adults and nymphs per hill was calculated.

Alternate Hosts of Paddy Earhead Bug

The activity of bugs on different weed hosts was observed in and around paddy fields during the survey. The presence of paddy earhead bugs and dam-

Table 2. Occurrence and intensity of earhead bug in Shimoga taluk during *kharif* of 2006 and summer of 2007.

Place of observation	*Kharif* 2006 Mean number of bugs/hill Adults	Nymphs	Total	Summer 2007 Mean number of bugs/hill Adults	Nymphs	Total
1. Gondi chetnalli	1.89	0.49	1.9	2.01	0.67	2.24
2. Holeansodi	2.01	0.23	2.12	1.89	0.17	1.92
3. ARS, Honnavile	5.38	2.51	7.15	5.31	2.67	7.57
4. Holebenavalli	1.56	0.67	1.80	1.92	1.01	2.57
5. Hosalli	1.62	0.23	1.76	1.51	0.18	1.55
6. Bullapura	1.28	0.00	1.28	1.37	0.07	2.13
7. Chelur	3.71	1.03	4.22	3.68	0.92	4.33
8. Sugur	1.14	0.56	1.57	1.51	0.86	2.18
9. Hasudi	1.25	0.40	1.39	1.03	0.28	1.16
10. Shettikeri	1.17	0.14	1.14	1.36	0.27	1.43
11. Hadenahalli	0.53	0.00	0.53	0.21	0.00	0.21
12. Holalur	0.87	0.40	1.06	1.17	0.61	1.62
13. Vaddarahatti	1.23	0.01	1.33	1.01	0.07	0.47
14. Navile	0.16	0.00	0.37	0.56	0.01	0.38
15. Tavarachatnalli	0.07	0.00	0.37	0.21	0.08	0.29
Taluk average	1.61	0.45	1.79	1.65	0.53	2.01

Table 3. Occurrence and intensity of earhead bug in Shikaripur taluk during *kharif* of 2006.

Place of observation	*Kharif* 2006 Mean number of bugs/hill Adults	Nymphs	Total
1. Kappanahalli	8.13	0.34	2.26
2. Goddanakoppa	1.68	0.31	1.86
3. Ambaragoppa	1.18	0.04	1.22
4. Mugalageri	0.96	0.12	1.20
5. Nevagalu	0.56	0.00	0.56
6. Mathikoti	0.41	0.06	0.56
7. Kalavatti	1.11	0.23	1.23
8. Gama	0.24	0.02	0.24
9. Easur	0.05	0.00	0.05
10. Begur	0.12	0.00	0.12
11. Baganakatti	0.08	0.20	0.25
12. Kengatti	0.14	0.04	0.51
13. Surugihalli	1.40	0.19	1.53
14. Sunnadakoppa	0.10	0.00	0.10
15. Hosur	1.23	0.51	1.59
Taluk average	0.76	0.14	0.93

age on weeds or other hosts was recorded. Alternate host were collected and identified.

Assessment of Loss

To asses the grain damage, the bug infested fields were visited during harvest and samples were collected randomly. Percentage grain damage was worked out using the following formula adopted by Gupta et al. (5).

$$\text{Percent grain damage} = \frac{\text{Number of damaged grains}}{\text{Total number of grains in the sample}} \times \frac{\text{Number of damaged grains}}{\text{Weight difference of healthy and infested grains (\%)}}$$

Further, viability of infested grains in terms of percent germination was studied in laboratory at College of Agriculture, Shimoga. From each sample 100 infested grains was selected randomly and allowed to germinate using germination paper. Percent germination of the grains was recorded by using the formula

Table 4. Alternate weed hosts recorded during survey undertaken in different locations of Bhadra command area.

Weed hosts	Family	Infestation (%)
1. *Echinocloa crusgalli*	Poaccae	39.00
2. *E. colona*	Poaccae	32.00
3. *E. glabrescens*	Poaccae	15.00
4. *Digitaria ciliaris*	Poaccae	7.00
5. *D. marginata*	Poaccae	3.00
6. *Elensinae indica*	Poaccae	2.00
7. *Cyperus rotundus*	Cyperaceae	1.00
8. *C. iria*	Cyperaceae	1.00

$$\text{Percent germination} = \frac{\text{Number of germinated seeds}}{\text{Total number of seeds tested}} \times 100$$

Monitoring Using Light Trap

Population of bugs was monitoring using modified Robinson light trap both during *kharif* of 2006 (from August to October 2006) and *summer* of 2007 (from March to May 2007) in the paddy fields at Agricultural College, Navile, Shivamogga. Dichlorovos was used for killing the trapped insects. Number of bugs trapped were collected and counted once in two days.

Results and Discussion

Results shown in Tables 1 to 3 revealed that maximum intensity of the bugs was noticed in Bhadravathi taluk followed by Shimoga taluk in both the seasons. Both these taluks represents command area situations and least incidence was recorded in Shikaripura taluk which represents tank fed situation.

In Bhadravathi taluk, the incidence of bugs (adults + nymphs) ranged from 2.39—4.02 bugs/hill during *kharif* of 2006 and 2.81—3.86 during aummer of 2007. Table 1 indicates that the incidence of bugs varied with in the taluk itself. Higher incidence was noticed in Holehonnur, Sanyasi Kodamadagi, Hunsur and Barandur area in both *kharif* and summer. Here paddy is grown in large areas which may explain the higher incidence of bugs. Incidence was lower in other areas.

In Shimoga taluk, the incidence of the bugs

Table 5. Percent grain damage and germination of damaged grainsin different taluk during *kharif* of 2006 and summer of 2007.

Taluks	Grain damage (%)		Germination (%)	
	Kharif	Summer	*Kharif*	Summer
1. Bhadravathi	5.79	5.57	37.49	54.45
2. Shimoga	4.08	3.84	64.96	54.44
3. Shikaripura	1.96	–	74.22	–
4. Healthy			94.80	95.00

Table 6. Number of bugs attracted to light trap during *kharif* of 2006 and summer of 2007.

Number of bugs trapped			
Fortnight	*Kharif* 2006	Fortnight	Summer 2007
I Aug	10	I Mar	7
II Aug	15	II Mar	17
I Sep	63	I April	57
II Sep	94	II April	101
I Oct	87	I May	103
II Oct	23	II May	24

ranged from 1.31—2.26 bugs/hill during *kharif* of 2006 and 1.49—2.52 bugs/hill during summer of 2007. Higher incidence of bugs was noticed at ARS, Honnavile and Chelur with a mean of 7.15 and 4.22 bugs/hill, respectively.

In Shikaripur taluk, the incidence of bugs ranged from 0.21—1.62 bugs/hill, when compared to other two taluks, the incidence was found to be the least. This may be due to the reason that in this taluk, paddy is grown mainly under tank fed areas and in most of the cases single crop is raised. The absence of bugs in these areas may possibly be due to inadequate coverage of the area under paddy and non-availability of suitable alternate hosts for their sustenance in the absence of paddy.

Bhadravati and Shimoga taluks were found to have higher incidence of bugs due to the following reasons. Early summer showers during April-May enabled sprouting of grasses and appearance of bugs was noticed on them during June. Since the emergence of earheads on grasses was continuous unlike in paddy. The grasses provided sufficient food for their feeding and breeding till emergence of paddy earheads in the adjoining fields. On emergence of paddy earheads, bugs bread on grasses moved to paddy and multiplied in large numbers. Continuous cropping in succession, staggered planting and variation in maturity provided constant availability of earheads at milky stage for a long period. These conditions might have favored the bugs to multiply in large numbers to become endemic in these areas.

Alternate Hosts

Documentation of alternate hosts of paddy earhead bug in Bhadra command area revealed that *L. oratorius* found feeding on six species of graminaceous and two cyperaceous plant (Table 4). These host plants were observed in paddy fields and in the vicinity of main field before the emergence of paddy earheads and during the off season. Hosts included *Echinocloa crusgulli* (39% infestation), *E. colona* (32%), *E. glabreseens* (15%), *Digitaria ciliaris* (7%), *D. marginata* (3%), *Eleusinae indica* (2%), *Cyperus rotundus*(1%) and *C.iria* (1%). In addition to these plants, adult *L. oratorius* were also found congregating on the tender leaves of areca nut, beetle vine, maize, banana, cinnamon, carambola and papaya which may act as shelter during sunny hours. A number of workers (3, 6) reported feeding and breeding of these bugs on a number of alternate hosts as also observed in our study. However, presence of *L. oratorius* on host plants like carambola, cinnamon and papaya are also observed in our study. Breeding and multiplicative ability of *L. oratrrius* on these plants need confirmation.

Assessment of Loss Caused by Earhead Bug

Table 5 indicates that higher grain damage occurred in Bhadravathi taluk (5.79 and 5.57%) during *kharif* and summer, respectively) followed by Shimoga taluk (4.08 and 3.84% during *kharif* and summer, respectively) and Shikaripur taluks (1.96%). This indicates that as the bug density increased, percent damage was also increased. This proves that the bug infestation is reflected on grain damage and reduction in yield. It has also been reported that the percent infestation of rice kernels by *L. acuta* was of the same magnitude as the subsequent yield loss (7). Similarly average per cent of germination of bug infested grains

was found to be 37.40 and 54.45% during *kharif* and summer in Bhadravathi taluk. Same found in Shimoga taluk with 64.96 and 54.40% during *kharif* and summer, respectively. However, higher germination was recorded from grains collected from Shikaripur taluks. The logical assumption of relationship between intensity of damage and grain germination was found to be proved. Similar reports on the relationship between these two factors which led to serious reduction in fertile grains is well established (8, 9).

Monitoring Using Light Traps

In *kharif* season, light trap catches were found to be in peak numbers from September first fortnight to October first fortnight. While in summer season, catches were found to be in peak numbers from April first fortnight to May first fortnight. Flowering and milking stages of rice crop were synchronized with these periods. Our earlier studies showed higher activity during these periods of crop growth which may be the reason for higher trap catches. The results indicate that the pest population can be monitored using light traps as also reported earlier (10).

Conclusion

Following conclusions can be drawn. Incidence of the *L. oratorius* varies with season and area where different cropping pattern is followed. Alternate hosts of *L. oratorius* support their multiplication during crop growth and in off season. Its activity not only affects grain filling but also germination. This will reduce yield when paddy is grown for seed purpose. Hence, a measurement of *L. oratorius* activity can be monitored by using light traps. These results are important while designing management strategies for the pests of paddy.

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