

Natural Enemies of the Rice Gall Midge, *Orseolia oryzae* (Wood-Mason) Observed in Yala Season in Sri Lanka

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The rice gall midge, *Orseolia oryzae* (Wood-Mason) has become a very important insect pest of rice plant in Sri Lanka since heavy damages were observed on the following two resistant varieties; Bg. 400-1 and Bg. 276-5 in Matale District during the Maha season (a rainy season with northeast monsoon in the period September to February) in 1985 to 1986. The damages took place later on in all the recommended rice varieties throughout the country.

The development of biotypes of the rice gall midge suggests a difficulty in controlling the pest with a single control measure such as varietal resistance. In 1988, the Department of Agriculture, Sri Lanka set up a Task Force for formulating strategies to manage this important insect pest. On the basis of its survey work, the Task Force emphasized the need for in-depth studies on control measures, including varietal resistance, use of the selective insecticides and natural enemies, aiming at the early establishment of a method for the integrated pest control. This paper presents the results of the study which was conducted in 1989 to identify the natural enemies of rice gall midge in Sri

Lanka.

Materials and methods

Galls of the rice gall midge, *O. oryzae* were collected at 18 sampling sites of the following five districts; Gampaha, Kalutara, Kandy, Kegalla and Matale in the Wet zone (mean annual rainfall of 2,159 mm) and three sampling sites of Kurunegala District in the Intermediate zone (mean annual rainfall of 1,270-2,159 mm). The sampling of galls was made in paddy fields where the rice plants were in the vegetative growth stage during the period 14 June to 5 July in the Yala season (a rainy season with southwest monsoon from March to August) in 1989 (Table 1).

The samples were brought in the laboratory, where galls were split lengthwise by a razor blade to locate *O. oryzae* pupae, their parasitoids or predators. *O. oryzae* pupae and mummies containing parasitoid pupae were examined under a binocular microscope to detect egg, larva, or pupa of ectoparasitoids. Any parasitoid larvae or pupae parasitizing on host pupae were isolated in glass vials to

Table 1. Locations where the galls of the rice gall midge were collected

District	Location Village or town	Sampling date(1989)
Wet zone		
Gampaha	Giliulla	27 June
	Kandalamayaya	27 June
	Kithulwala, Mirigama	27 June
	Kosatadeniya, Mirigama	27 June
Kalutara	Galwalawatta, Bombuwela	5 July
	Udumulla, Bombuwela	5 July
Kandy	Aladeniya	16 June
	Ampitiya	20 June
	Angunawella	21 June
	Padudeniya, Hataraliyadda	16 June
	Ulapane	21 June
Kegalla	Weligalla (2 sites)	21 June
	Hingula	19 June
	Kurudupana	19 June
	Palpata	19 June
Matale	Yatavara (2 sites)	22 June
Intermediate zone		
Kurunegala	Batalagoda, Ibbagamuwa	14 June
	Nalawa, Pothuhera	15 June
	Thalanpitya, Pothuhera	15 June

rear up to the adult stage. Records on the number of the rice gall midge pupae, larvae or pupae of parasitoids or mummies and predator larvae and pupae were taken. Parasitism by *Platygaster oryzae*, and *Platygaster foersteri* of the rice gall midge was expressed by the ratios of galls containing mummies to the total number of galls sampled. Consequently, the values should also indicate accumulated parasitism by both parasitoids during the period from transplanting or sowing to gall collecting in the paddy fields. The parasitization of both of the parasitoid adults was confirmed, even after those adults had emerged from galls, by detecting empty mummies in the galls.

Results and discussion

1) *Hymenopterous parasitoids*

Five species were collected from galls. The species were *Platygaster oryzae* (Cameron), *P. foersteri* (Gahan), *Obtusiclava oryzae* Subba Rao, *Neanastatus cinctiventris* Girault

and *Eurytoma* sp.

Platygaster oryzae (Platygastridae) is a small (0.7 mm in length), gregarious, egg-larval parasitoid^{4,5}. Three hundred and fifty-nine mummies formed by *P. oryzae* were obtained from 2,661 galls collected at 21 sampling sites in six districts (Table 2). Proportion of galls containing mummies (Plate 1) was 13.5% in these districts. Rate of galls with mummies was higher in Matale District than in other districts. The incidence with the highest rate of 56%, took place at a site in Angunawella, Kandy District (Table 3). The survey by Fernando, H. E. in 1971 also showed that the rate of parasitism of *P. oryzae* was as high as 40–50% in the tillering stage and 80–95% by the end of the season¹. These results suggest that this parasitoid is likely to be a common species in Sri Lanka.

Platygaster foersteri (Platygastridae) is a solitary, egg-larval parasitoid 1.4 mm in length (Plate 2)^{4,5}. Nineteen mummies of this parasitoid were observed at only four sampling sites; 13 mummies at Aladeniya and Padudeniya in Kandy District and 6 mummies at two sites of Yatavara in Matale District (Table 2). Proportion of the galls containing mummies (Plate 2) was 0.7% in six districts. The highest rate of 4.3% was observed at a site in Padudeniya of Kandy District. This rate is much lower compared with *P. oryzae* (Table 3), the rate of which was 56%.

This report is possibly the first record of the habitation of *P. foersteri* in Sri Lanka, although its distribution had already been recorded in Thailand with results of the biological studies on that insect¹.

Obtusiclava oryzae (Pteromalidae) is a solitary, pupal parasitoid. Body length is 2.5–3.25 mm in female, and 1.75–2.5 mm in male⁸. Pupa measures 3.24 mm in length⁹. In this survey, only one pupa was collected at sampling site of Nalawa, Pothuhera in Kurunegala District on 15 June (Table 2). This parasitoid was originally described in 1973 from specimens collected in Peradeniya in Sri Lanka and India⁸. The species has

Table 2. Natural enemies of the rice gall midge, *Orseolia oryzae* observed in the Yala season in Sri Lanka, 1989

Natural enemies	Distribution (District)*						No. samples collected		
	Ga	Kl	Ka	Ke	Ma	Ku	Larva	Pupa	Mummy
Hymenopterous parasitoids									
<i>Platygaster oryzae</i> (Cameron)	+	+	+	+	+	+			359
<i>Platygaster foersteri</i> (Gahan)			+		+				19
<i>Neanastatus cinctiventris</i> G.	+	+	+	+	+	+	32	7	
<i>Obtusiclava oryzae</i> Subba Rao						+		1	
<i>Eurytoma</i> sp.	+	+					1	1	
Predator									
<i>Ophionea indica</i> Thunberg	+	+	+	+	+	+	61	1	

* Ga: Gampaha, Kl: Kalutara, Ka: Kandy, Ke: Kegalla, Ma: Matale, Ku: Kurunegala.

Table 3. Proportion of galls containing mummies formed by parasitoids, *P. oryzae* and *P. foersteri* collected in the Yala season, 1989

District	No. sampling sites	No. galls dissected	% galls containing mummies formed by					
			<i>P. oryzae</i>			<i>P. foersteri</i>		
			Max	Min	Mean	Max	Min	Mean
Wet zone								
Gampaha	4	438	5.8	0	1.7	0	0	0
Kalutara	2	327	1.9	1.7	1.8	0	0	0
Kandy	7	643	56.0	3.6	19.1	4.4	0	0.8
Kegalla	3	275	24.9	3.9	13.4	0	0	0
Matale	2	370	48.6	36.7	42.7	3.8	0.8	2.3
Intermediate zone								
Kurunegala	3	608	1.0	0	0.3	0	0	0

been reported from Thailand³⁾ and Indonesia⁷⁾.

Neanastatus cinctiventris (Eupelmidae) is a solitary, pupal parasitoid of approximately 3.2 mm in length (Plate 3). Thirty-two larvae and 7 pupae were found parasitizing on the rice gall midge pupae and 5 adults successfully emerged from these pupae (Table 2). These samples were collected from 349 gall midge pupae in 2,661 galls in six districts. Average parasitism rate was 8.7% at 21 sampling sites in six districts. Rates of parasitism were considerably higher at the sites of Kurudupana in Kegalla District and Kandalamayaya in Gampaha District, where the rates were 40% and 30.2%, respectively (Table 4). This is possibly the first record of *N. cinctiventris* (Eupelmidae) in Sri Lanka, although the species has been reported in

China⁶⁾.

In addition to the four species above, one larva and one pupa of *Eurytoma* sp. (Eurytomidae) were found parasitizing on the host pupa. Pupa was about 2.8 mm in length. Each larva and pupa was collected at Galwalawatta, Bombuwela in Kalutara District on 5 July 1989 and Kandalamayaya in Gampaha District on 27 June 1989, respectively (Table 2). These two specimens were isolated in a glass vials, but unfortunately it was not successful to rear them to the adult stage. Although they were confirmed to belong to the genus *Eurytoma* by a sample of pupa, more samples are needed to identify this parasitoid at a species level.

From the results described above, it is very likely that *P. oryzae* is the dominant species,



Plate 1. A mummy of *Orseolia oryzae* larva in which many pupae of *Platygaster oryzae* were seen

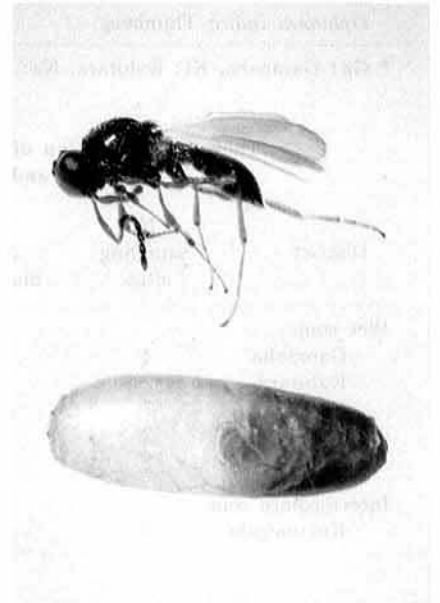


Plate 2. *Platygaster foersteri* adult (above) and a mummy of *O. oryzae* larva just after the parasitoid emerged (below)

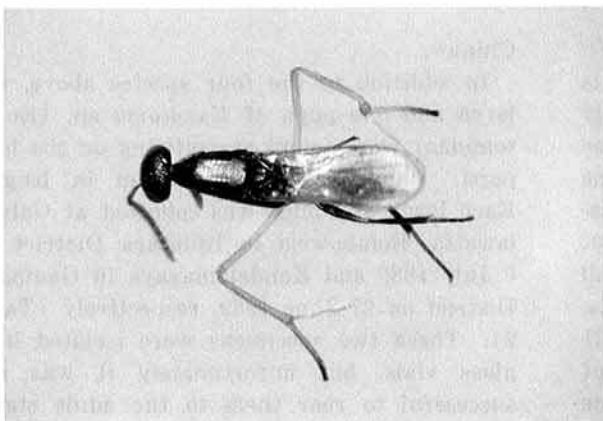


Plate 3. *Neanastatus cinctiventris* adult, a parasitoid of *O. oryzae*

Table 4. Parasitism by *N. cinctiventris* of the rice gall midge pupae in the Yala season in Sri Lanka, 1989

District	No. sampling sites	No. galls dissected	No. host pupae found	% host pupae with <i>N. cinctiventris</i>		
				Max	Min	Mean
Wet zone						
Gampaha	4	438	122	30.2	5.3	19.8
Kalutara	2	327	46	4.0	0	2.0
Kandy	7	643	25	25.0	0	3.6
Kegalla	3	275	29	40.0	0	20.6
Matale	2	370	13	12.5	0	6.3
Intermediate zone						
Kurunegala	3	608	114	0	0	0

Table 5. Predation by *Ophionea indica* on the rice gall midge pupae in the Yala season in Sri Lanka, 1989

District	No. sampling sites	No. galls dissected	% galls containing predator larva			% gall midge pupae attacked by predator
			Max	Min	Mean	
Wet zone						
Gampaha	4	438	12.2	1.9	6.2	15.6
Kalutara	2	327	8.6	3.4	6.0	30.4
Kandy	7	643	1.9	0	0.3	0
Kegalla	3	275	3.2	0	1.0	13.8
Matale	2	370	1.9	1.1	1.5	7.7
Intermediate zone						
Kurunegala	3	608	1.9	0	0.6	0

followed by *N. cinctiventris* among the five species observed at the six districts in the Yala season in Sri Lanka.

2) Predator

Only one species, *Ophionea indica* Thunberg (Carabidae) was collected. Adult is about 7 mm in length. Sixty-one larvae and one pupa of the predator were collected. The predator seemed to be widely distributed in paddy field in this country, for the larvae were observed in all the districts surveyed. One pupa was collected at a sampling site of Udumulla in Kalutara District on 5 July 1989 and an adult successfully emerged from the pupa (Table 2). Rate of galls containing predator larvae averaged 2.2% in 21 sampling sites ranging 0% in Kurunegala District to 12.2% in Gampaha District. Rate of gall midge pupae attacked by predator larvae

averaged 7.5% in 21 sites and the rate was higher in Kalutara District than in other districts (Table 5). The highest rate, or 36%, took place at the site of Udumulla in Kalutara District.

This paper might be the first record on *O. indica* as a predator of rice gall midge in Sri Lanka, although a report on this issue is already available in Thailand²⁾.

The levels of parasitism or predation varied among the sampling sites. However, it was not possible to identify the reasons whether the variation was due to the difference in insecticide application among the sites, since sufficient information on insecticide application in each site were not available. In order to evaluate toxicities of the insecticides to the parasitoids or predator in the paddy fields, information on the insecticide susceptibility of the natural enemies are

required.

As the survey for the present study was conducted only in six districts of Sri Lanka within a short period of time in the Yala season, further surveys will have to be undertaken in the Maha season. It is expected that the survey results on parasitoids and predator obtained in this study would provide useful information for implementing further studies on natural enemies and for developing strategies for rice gall midge control.

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