

Diversity of Rice Leaf Folders and Their Natural Enemies

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Abstract: Three species of rice leaf folders occur in Madurai district viz., *Cnaphalocrocis medinalis* (Guenee), *Marasmia patnalis* (Bradley) and *Marasmia ruralis* (Walker) among which the former was dominant. The incidence of *M. ruralis* was very meager and found throughout the year. Sex ratio varied amongst the species. Males dominated the females. The biology of *C. medinalis*, *M. patnalis* and *M. ruralis* differed. Natural enemies were prevalent in rice ecosystem on rice leaf folders. The egg parasitoid *Trichogramma* spp., the larval parasitoids *Cardiochiles Philippinensis* Ashm., *Apanteles* sp., *Goniozus* sp., *Copidosomopsis nacoleiae* Eady and *Trichomma cnaphalocrocis* Uchida and the Pupal parasitoid *Xanthopimpla flavolineata* Cameron and larval and pupal parasitoid *Brachymeria* sp. were prevalent in the rice ecosystem on rice leaf folders.

Keywords: Rice, Leaf folders - Three species, Biology, Natural enemies.

INTRODUCTION

Rice is cultivated in 112 countries covering every continent and is consumed by 2500 million people in the developing countries^[4]. In Tamil Nadu, rice is cultivated in 21.1 million hectares with a total production of 8.19 metric tonnes at an average yield of 3.4 t/ha. Insect pests damage rice crop at different stages of crop growth of which leaf feeding insect pests are of major importance because of their ability to defoliate or to remove the chlorophyll content of the leaves leading to considerable reduction in yield. Rice leaf folder, *Cnaphalocrocis medinalis* (Guen.) was considered as pests of minor importance have increased in abundance in late 1980's and have become major pests in many parts of India including Tamil Nadu. The yield loss is from 30 to 80 per cent due to leaf folder epidemic situation^[11]. Every unit of increase in infestation by *C. medinalis* decreased the yield by 14 and 1.46 per cent during summer and wet season, respectively^[12]. In most of the rice eco systems studied more than one species of leaf folder exist in complex, thus the management of rice leaf folder is a complicated one. Hence, this study was taken up and the result of which will be useful for the scientists to work out for an Eco-friendly Integrated Pest Management, thus it will support the ultimate beneficiary the farming community.

MATERIALS AND METHODS

Species Diversity: Rice leaf folder moths were collected by using a sweep net from the maximum

tillering to flowering stages of the crop, brought to the laboratory and was examined under binocular microscope. The species of leaf folders were differentiated based on wing markings, colourations and size as described by Barrion and Lit singer^[2]. The species of leaf folder larvae was distinguished based on the colouration, characters of pro notum and sub dorsal spots on the pro thorax and size of larvae.

The seasonal incidence was recorded on ADT 36, IR 20, IR 50, MDU 2, MDU 3, MDU 4 and PMK 2 rice varieties. In addition the biology of rice leaf folder species were also studied.

Natural Enemies of Leaf Folders: Observations were made on the important larval and pupal parasitoids and predators of leaf folders. The larvae of leaf folder collected from the fields during the study period were transferred into glass tubes of 15cm x 2cm size. Leaf bits of 5cm length taken from the middle portion of the top leaves of 40 days old plants were provided for feeding, to maintain the turgidity of leaf bits, moistened cotton wool covered with filter paper cover was used. The leaf bits were changed every 24 hours till the larvae pupated. The pupae were observed for the emergence of parasitoids which were identified under binocular microscope^[13].

RESULTS AND DISCUSSIONS

Three species of rice leaf folder were identified, i.e. *Cnaphalocrocis medinalis*, *Marasmia patnalis* and *Marasmia ruralis*. The larval, pupal and adult morphologically differed (Fig 1,2,3).

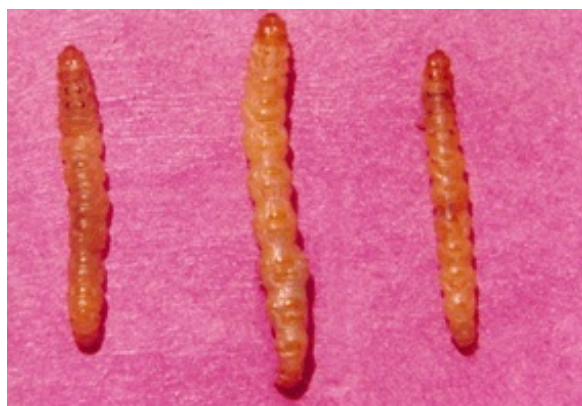


Fig. 1: C.medinalis, M.patnalis M.ruralis



Fig. 2: C.medinalis, M.patnalis M.ruralis

Biology of Rice Leaf Folder Species Complex: The biology of rice leaf folder was studied on the susceptible variety IR 20 and the duration of different stages of the three species varied:

Stage	<i>Cnaphalocrosis medinalis</i>	<i>Marasmia patnalis</i>	<i>Marasmia ruralis</i>
larval stage	The larval period had five instars and the total duration was 23.67 days	The larval stage passed six stadia in 30 days	The larval stage lasted 15 days.
Pupal stage	The pupal period was completed in 7 days.	The pupal period lasted for 9.33 days.	pupation lasted for 8.1 days
Adult stage and total period	The period from egg laying to adult emergence was 36.67 days.	From egg stage to adult emergence, the period was 46.87 days.	From egg stage to adult emergence, the period was 33.51 days.



Fig. 3: C.medinalis, M.patnalis M.ruralis

Table 1: Sex ratio of leaf folder adults on different rice varieties

Variety	Total no of moths	Males %	Females %	Sex ratio (M:F)
<i>C.medinalis</i>				
IR 20	206	108	98	1.10:1
ADT 36	195	99	96	1.03:1
PMK 2	187	97	90	1.08:1
IR 50	188	96	92	1.04:1
MDU2	217	116	101	1.15:1
MDU3	192	74	68	1.09:1
MDU4	197	99	98	1.01:1
<i>M.patnalis</i>				
IR 20	142	70	72	0.99:1
ADT 36	107	53	54	0.98:1
PMK 2	113	56	57	0.98:1
IR 50	106	54	52	1.04:1
MDU2	102	50	52	0.96:1
MDU3	94	44	50	0.88:1
MDU4	101	49	52	0.94:1
<i>M.ruralis</i>				
IR 20	59	30	29	1.03:1
ADT 36	34	16	18	0.89:1
PMK 2	41	19	22	0.86:1
IR 50	38	20	18	1.11:1
MDU2	31	16	15	1.07:1
MDU3	19	10	9	1.11:1
MDU4	37	19	18	1.06:1

The total life cycle period of the three species is in the following order, *M. patnalis* (46.87 days), *C. medinalis* (36.67days) and *M. ruralis* (35.51days) in the susceptible variety IR 20. These results are in agreement with Barrion *et al.*,^[2].

Sex Ratio:

Canphalocrocis Medinalis: The male was higher than female. The ratio of male to female ranged from 1.01 to 1.15:1 (Table 1).

Marasmia Patnalis: The ratio of male to female ranged from 0.88:1 males were less than female is all varieties excepts IR 50 (0.97:1).

Marasmia Ruralis: Males are higher than female in all varieties except ADT 36 and PMK 2 (0.89:1, 0.86:1). The results pertaining to the sex ratio on different rice varieties are given in the table 1.

In *C. medinalis* the ratio of male dominated female. Similar report was reported from Orissa^[14]. In *M. patnalis* the males to females' ratio had no

Table 2: Population dynamics of rice leaffolder

Moths collected	<i>C. medinalis</i>		<i>M. patnalis</i>		<i>M. ruralis</i>	
	Numbers	%	Numbers	%	Numbers	%
Andipatty –Vaigaidam						
491	342	69.25	137	27.90	12	2.45
Azhakarkovil						
549	147	26.78	385	70.13	17	3.10
Chozhavandan						
238	186	78.15	47	19.75	5	2.10
Melur						
448	301	67.22	127	28.35	20	4.46
Therkutheru						
682	512	75.07	151	22.14	19	2.79
Thirumangalam						
376	236	62.77	127	33.78	13	3.46
Usilampatty						
283	155	54.77	116	41.00	12	4.29
Vikkiramangalam						
348	261	75.00	79	22.70	8	2.30

Table 3: Natural enemies of rice leaf folder and their percent parasitization

Natural enemies	(%)
<i>Apanteles</i> sp.	3.1
<i>Cardiochiles philippinensis</i>	3.4
<i>Brachymeria</i> sp.	6.5
<i>Xanthopimpla flavolineata</i>	0.7
<i>Goniozus</i> sp.	0.8
<i>Copidosomopsis nacoleia</i>	3.1
<i>Trichomma cnaphalocrocis</i>	3.3
<i>Macrocentus philippinensis</i>	2.0
<i>Trichogramma</i> spp.	3.0

difference unlike *C. medinalis* where the females dominated the males. This was in opinion with the report that the females outnumbered the males in *M. patnalis*^[10].

Population Dynamics Leaf Folders: Observations were made on rice leaf folder complex in eight different rice ecosystems are presented in Table 2. In Andipatti area the populations of *C. medinalis* dominated (491moths), where as *M. patnalis* and *M. ruralis* recorded 137 and 12 moths respectively. Similar trend was noticed on different rice growing areas such as Chozavandan, Melur, Therkutheru, Thirumangalam, Usilampatty and Vikkiramangalam (Table 2). Continuous monitoring on the species composition in Madurai district revealed the occurrence of three species rice leaffolder viz., *C. medinalis*, *M. patnalis*, *M. ruralis*. Of these the former was the dominant species. The occurrence of leaf folder species complex with the dominance of *C. medinalis* was reported in Cuttack district of Orissa state^[6], Madurai^[8], North

Arcot district^[9], Killikulam^[12], Thirurkuppam^[11]. The present investigations at AC & RI, Madurai and in PVP area of Madurai district indicated the prevalence of *M. ruralis* in very low proportion. This was in concurrence with the report that the occurrence of *M. ruralis* was very meager in Coimbatore^[13].

Natural Enemies: During the study, a number of natural enemies, egg, larval and pupal parasitoids were recorded (Table. 3).

Trichogramma spp. was the only egg parasitoid recorded with minimum incidence of 9.3 per cent. It was earlier reported in India by Subramanian^[13] and in the Philippines by Barrion *et al.*,^[2]. The parasitization by larval parasitoids, *Apanteles* sp., *Goniozus* sp., and *T. cnaphalocrocis* was up to 3.4, 4.9, and 10.4 per cent respectively. It is in agreement with Subramanian^[13] and Barrion *et al.*,^[2]. The occurrence of these larval parasitoids on *M. ruralis* was also reported by Barrion *et al.*,^[2] in the Philippines. The parasitization by pupal parasitoid *X. flavolineata* was only 1.3 per cent, and the larval-pupal parasitoid *Brachymeria* sp. Parasitized up to 9.7 per cent. The same larval and larval-pupal parasitoids were earlier reported by Greathead^[5], Subramanian^[13] and Barrion *et al.*,^[2].

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