Site of pupation of the rice leaffolder *Cnaphalocrocis medinalis* (Guenee) (Lepidoptera : Pyralidae) and its larval parasitoids

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ABSTRACT

Pupation behaviour of the rice leaffolder, Cnaphalocrocis medinalis (Guenee) studied under field condition (April-May) in dry and (November-December) in wet season. Pupae were observed on the leaf, followed by inbetween tillers and within the leaf sheath below junctura. Leaf blade as the site of pupation was positively correlated with maximum temperature whereas percent pupae found within the leaf sheath, below junctura was negatively correlated. Pupae of its larval endo-parasitoids Apanteles cypris Nixon, Macrocentrus sp. and Cardiochiles nr. nigricollis Cameron followed a similar trend with that of the host. Pupae of Goniozus sp. a gregarious ecto-parasitoid was mostly observed on the leaf irrespective of season.

Key words: *Cnaphalocrocis medinalis, larval parasitoids, site of pupation*

The rice leaffolder *Cnaphalocrocis medinalis* Guenee (Lepidoptera : Pyralidae) in its larval stage feeds on the chlorophyll contents of the foliage and causes damage to the crop. Detailed biology of the pest has been studied both in laboratory and green house. It is reported to pupate in a specially made cocoon in the leaf or leaf sheath hanging from the rice plant (Hattori, 1968; Lingappa, 1972; Velusamy and Subramanian, 1974 and Fujiyoshi *et al*., 1980). Eggs and larvae of the pest are usually observed on the leaf whereas pupae are occasionally observed on the leaf. Detail information on the pupation behaviour of the pest under natural condition is not available.

Observations were taken under field conditions to determine the site of pupation of the pest and some of its larval parasitoids on rice. Random sample of 100 hills, each of variety Lalat grown in dry season and Savitri grown in wet season were uprooted at weekly intervals at maturing stage of the crop and thoroughly examined in the laboratory to locate the pupae of the pest and its larval parasitoids. During the study period the average ambient temperature ranged from 27.4^{o} C to 38.5^{o} C in the dry and 14.9^{o} C to 28.1^{o} C in the wet season. The percent leaves damaged by leaffolders were 42.8% and 18.5% during the dry season and wet season respectively.

Pupae of *C. medinallis* and four of its larval parasitoids viz. *Macrocentrus* sp., *Apanteles cypris* Nixon, *Goniozus* sp. and *Cardiochiles nigricollis* Cameron were located on the leaf, in between tillers and within the leaf sheath below junctura (Table 1). Among the parasitoids *Macrocentrus* sp., *A. cypris* and *C. nigricollis* are solitary endoparasitoids whereas *Goniozus* sp. is a gregarious ectoparasitoid. During the study period percent parasitism due to *Macrocentrus* sp., *A. cypris* and *Goniozus* sp. ranged from 9.6 – 16.8, 11.2 –27.3 and 3.33 – 8.5, respectively in the dry season and 8.3 – 22.2, 2.5 – 4.7 and 5.4 – 7.4 respectively in the wet season. *C. nigricollis* was not observed during the dry season. However, in wet season its extent of parasitism ranged from 4.25 to 14.68 %.

Maximum *C. medinalis* pupae were observed on leaf and within leaf sheath below juncture during dry and wet seasons respectively (Table 1). During cooler part of the wet season (October-December) pest pupae were also observed covered with thick covering of silk threads. Average distance below junctura at which pupae were located within leaf sheath was more in wet season than in the dry season. Percent pupae located in between tillers ranged from 2.00 to 15.12 in the dry season and 7.14 to 50.00 in the wet season.

Table 1 Site of pupation of *Cnaphalocrocis medinalis* (Guenee) and four of its larval parasitoids

Sampling date	Total number of pupa collected				Per cent pupa found on leaf				Percent pupa found in between tillers				Percent pupa found within leaf sheath below junctura				Average distance below junctura (in cm)		
Dry season	Cm	Mac.	Apa.	Gon.	Cm	Mac.	Apa.	Gon.	Card.	Cm	Mac.	Apa.	Gon.	Card.	Mac.	Apa.	Gon.	Card.	Cm	Mac.	Card.
70 DAT	102	3.0	76.0	19.0	0	42.15	66.6	67.1	100.0	0	13.720	32.8	0	0	44.11	33.3	0	0	0	4.47	0.25	NF
77 DAT	119	2.0	71.0	7.0	0	63.86	100.0	74.6	100.0	0	15.120	25.3	0	0	15.21	0	0	0	0	5.81	NF	NF
84 DAT	52	5.0	29.0	8.0	0	90.38	80.0	86.2	87..5	0	9.61	0	13.7	12.4	0	20.0	0	0	0	NF	0.20	NF
91 DAT	150	1.0	31.0	15.0	0	87.33	100.0	96.7	100.0	0	2.00	0	3.22	0	0	0	0	0	0	2.28	NF	NF
98 DAT	87	6.0	24.0	9.0	0	79.31	100.0	91.6	100.0	0	12.640	8.3	0	0	0	0	0	0	0	4.16	NF	NF
105 DAT	84	3.0	13.0	2.0	0	79.76	100.0	100.0	100.0	0	13.090	0	0	0	7.14	0	0	0	0	5.08	NF	NF
Wet season																						NF
80 DAT	14	11.0	0	8.0	0	0.00	9.0	0	100.0	0	10.840	0	0	0	85.71	90.9	0	0	0	3.45	3.8	NF
87 DAT	08	4.0	1.0	0	0	0.00	0	100.0	0	0	50.000	0	0	0	50.00	100.0	0	0	0	3.50	3.7	NF
94 DAT	05	1.0	0	6.0	2.0	0.0	100.0	0	100.0	0	20.000	0	0	0	80.00	0	0	0	100.0	5.50	NF	3.5
101 DAT	14	3.0	0	2.0	18.0	7.14	0	0	100.0	11.1	14.280	0	0	0	78.57	100.0	0	0	88.9	6.90	4.2	5.2
108 DAT	24	9.0	0	3.0	12.0	8.33	0	0	100.0	8.4	20.830	0	0	0	70.83	100.0	0	0	91.6	8.33	3.4	3.5
115 DAT	19	4.0	2.0	1.0	0	5.26	0	50.0	100.0	0	15.780	50.0	0	0	78.94	100.0	0	0	0	6.39	7.0	NF

DAT – Days after transplanting; Cm – *C. medinalis;* Apa. – *Apanteles cypris;* Card.–*Cardiochiles nigricollis;* Gon. – *Goniozus sp.;* Mac. – *Macrocentrus* sp.; NF – Not found

During examination of samples fewer pupae of *Marasmia exigua* Butler, another common rice leaffolder were observed on the leaf and 1.0 to 2.0 cm below the junctura within leaf sheath in the wet season.

Cocoons of *Macrocentrus* sp. were located in uniform numbers in both the seasons. In the dry season cocoons of *Macrocentrus* sp. were located in maximum numbers on the leaf and in the wet season within leaf sheath below junctura. Average distance below junctura at which cocoons were located ranged from 3.4 to 7.0 cm in the wet season. Cocoons of *A. cypris* were observed in good numbers mainly in the dry season and they were found both on the leaf and in between tillers. Pupae of *Goniozus* sp. were found on the leaf mainly in both the seasons. Pupae of *C. nigricollis* were found below the junctura within leaf sheath in the wet season.

The leaffolder larvae after completion of feeding in the fifth instar, pupated at different sites on the rice plant. Leaf blade as the site of pupation of *C. medinalis* was positively correlated (r =8.07) with maximum temperature in the dry season. Per cent pupae located within leaf sheath below junctura were negatively correlated (r =-8.23) with maximum temperature. As an abiotic factor temperature appears to be an important component in limiting the site of pupation of *C. medinalis* in the field.

Goniozus sp. usually parasitized fourth and fifth instar larvae feeding within the leaf fold. Once the parasitoid eggs hatched and the larvae started feeding, movement of the host larva completely stops and the parasitoid pupate inside cocoons within the leaf fold (Behera *et. al.*, 2002) Hence cocoons of *Goniozus* sp. were mostly found on the leaf in both the seasons although maximum numbers of pest pupae were found within leaf sheath below junctura in the wet season.

Macrocentrus sp., A. cypris and *C. nigricollis* parasitized third to fifth instar leaffolder larvae. Active feeding and movement of the host larva was observed till the endoparasitoids emerged out to pupate inside cocoons. Thus the site of pupation of these parasitoids closely resembled that of the host in both the seasons.

RREFERENCES

Behera KS, Rao VN and Mathur KC 2002. Aspects of the reproductive biology of *Goniozus* sp. (Hymenoptera : Bethylidae) a larval parasitoid of rice leaffolders. J Appl Zoo Res 13 (2 and 3), 190-192

Fujiyoshi N, Nozumu N and Sakai H 1980. Simple mass rearing method of the green leaf roller *Cnaphalocrocis medinalis* Guenee on young rice seedlings. Japanese J Applied Ent and Zoo 24 (3): 194 -196

Hattori Isoko 1968. Identification of grass leaf roller (*Cnaphalocrocis medinalis* Guenee) and rice leaf roller (*Susumia exigua* Butler). Plant Protection (Japan) 23 (4): 164-170

Lingappa S 1972. Bionomics of rice leaf roller *Cnaphalocrocis medinalis* Guenee, (Lepidoptera :Pyralidae). Mys J Agric Sci 6 : 123-134

Velusamy R and Subramanian, TR 1974. Bionomics of the rice leaf roller *Cnaphalocrocis medinalis* (Pyralidae :Lepidoptera) Indian J Ent 36 (3) :185-189