FIELD PARASITISM OF *CEPHONODES HYLAS* LINNAEUS (LEPIDOPTERA: SPHINGIDAE), AN INSECT PEST OF ROBUSTA COFFEE *COFFEA CANEPHORA* (PIERRE EX. FROEHNER) IN NIGERIA.

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(*Received*: November, 2005; *Accepted*: December, 2007)

Abstract

Studies on field parasitism by four natural enemies of *Cephonodes hylas* (Linnaeus) were carried out at two robusta coffee (*Coffea canephora* Pierre ex. Froehner) experimental plots at the Headquarters of Cocoa Research Institute of Nigeria, Ibadan. The parasites comprised two egg parasitoids *Telenomus* sp. (Hymenoptera: Sceliondae) and *Ooencyrtus* sp. nr. *epilachne* (Hymenoptera: Encyrtidae) and two larval parasitoids *Euplectrus* sp. (Hymenoptera: Eulophidae) and *Ceromya femorata* Mesnil (Diptera: Tachinidae).

The results showed that *Telenomus* sp., the most important egg parasitoid accounted for 5.6 to 57.1% (mean 24.4%) parasitism of the eggs of *C. hylas* in the open coffee plot and 0 to 53.3% (mean 19.2%) in the shaded plot. The major larval parasitoid *Euplectrus* sp. was responsible for 1.2 to 33.3% (mean 13%) and 20.0 to 100% (mean 51%) levels of parasitism of the larvae at the open and shaded plots respectively. Notes are also given on the developmental periods and the host parasite relationship of the parasitoids.

Key words: Parasitism, *Cephonodes hylas,* Robusta Coffee.

1. Introduction

In Nigeria, the two commercial coffee species cultivated are *Coffea canephora* Pierre ex. Froehner (Robusta coffee) and *Coffea arabica* (L.) (Arabica coffee). *C. canephora* constitutes over 98% of the nation's coffee production. Like many other crops, insect infestation, amongst other factors, posed one of the greatest threats to cultivation of the Robusta coffee; whereas disease attack threatens production of arabica coffee (Okelana *et al.*, 1985). *Cephonodes hylas* (L.) (Lepidoptera: Sphingidae) is one of the three important defoliators of robusta coffee in Nigeria. Caterpillars of the moth are capable of stripping coffee shrubs with great rapidity quite unsurpassed by the other leaf eating insect pests (Okelana, 2000). Le Pelley, (1978) reported a number of natural enemies of various stages of the moth. However, a survey conducted in Nigeria has revealed that myriads of natural enemies especially various parasitic and predatory arthropods abound in the coffee ecosystem (Okelana, 2000). In this study, it was suggested that some of these biological control agents seem promising and could therefore be harnessed in future for control of the Sphingid defoliator. This paper therefore provides some information on some of the key parasites of the eggs and caterpillars of the moth.

2. Materials and Methods

Two well established and routinely managed (coppiced, pruned, decapped and weeded.) robusta coffee experimental plots located at the Headquarters of the Cocoa Research Institute of Nigeria, Idi-Ayunre in Ibadan, Nigeria were utilized for the study. *Idi-Ayunre lies between latitude7° 252 N and longitude 3° 252 E with altitude of about 122 m above sea level. One of the plots was an open coffee plot i.e. with no overhead shade and of light intensity well above 2,000 Lux (S8/1) while the other had an overhead shade of forest trees with varying light intensities of 600-1,500 Lux (S2/4). For the duration of the study, pesticide treatment of any form was avoided.

Weekly sampling of eggs and caterpillars of *C. hylas* were made from 50 stands of coffee in each plot when the pest was in season especially during the high rainfall months of the year (March – July) for two years (1992 & 1993).

All eggs and caterpillars encountered were collected and incubated in the laboratory at a temperature of 24.5-28.5 °C and relative humidity of 69-80%. Strip (30x10 mm) of leaf bearing an egg was cut out from each lamina and placed separately in a small glass

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specimen tube (75 x 10 mm) and covered with muslin which was held in place with a rubber band. The eggs were observed daily until the larva hatched and or any parasitoid emerged. Similarly instar/stages of all larvae including aberrant, moribund or sluggish ones were identified and placed separately in cylindrical muslin sleeved cages (20 x 12 cm) and reared on cut shoots with soft leaves which were replaced with fresh ones every 48 hours. The shoots were dipped in water in a small tube. The larvae were observed regularly until emergence of the adult moths or parasitoids. Furthermore, each field-collected dead larva of *C. hylas* was also taken to the laboratory and placed on moist cotton wool in a small vial (4 x 2.5 cm). The vial was placed in a tilted position in a 200 ml beaker with dry tissue paper shreds at its bottom to serve as pupation medium for mature larva of any parasitoid. The beaker with the vial was then enclosed in a cheese cloth for possible emergence of adult parasitoids.

All parasitoids bred out from the host's eggs and larvae were preserved and subsequently identified from standard reference collection of insects at home (CRIN's Insect Museum and Insect Museum of the Department of Crop Protection and Environmental Biology, University of Ibadan). In addition, the percentage parasitism of each stage was computed on monthly basis for the two years by recording the number of individuals parasitized against the total number of individuals collected and finding the percentage.

3. Results and Discussion

Egg Parasites:

There were two hymenopterous egg parasites of *C. hylas*; namely *Telenomus* species (Scelionidae) and *Ooencyrtus* species nr. *epilachne* (Encyrtidae). The Scelionid *Telenomus* species, which predominates, parasitized between 5.6 and 57.1% of eggs sampled at the S8/1 open plot (Fig. 1) and 0 to 53.3% at the S2/4 shaded plot (Fig.2). For example out of the total of 249 eggs sampled in 1992 and 1993 at the shaded plot, 89 were parasitized by *Telenomus* while only 12 were parasitized by *Oencyrtus*. At the open plot, *Telenomus* parasitized a total of 147 eggs out of the total of 532 eggs sampled while parasitism due to *Oencyrtus* was just 29 out of the 532 eggs sampled. (Table 1).

Unparasitised eggs of *C hylas* were translucent and light green to greenish yellow in color while eggs parasitised by *Telenomus* sp were opaque and brownish black in color. Only one parasite emerged per host egg. The developmental period of *Telenomus* ranged from 8-12 days.

Eggs at an advanced stage of parasitism by the Encyrtid *Ooencyrtus* sp. usually had a blackish brown color or spot (the young parasitoid imago) within the transparent egg shell. Only one parasite emerged per host egg and the developmental period ranged from 7-10 days. A higher level of parasitism was observed at the unshaded (open) S8/1 coffee plot than at the shaded S2/4 plot. (Figs. 1 & 2 and Table 1).

Fig. 1: Parasitism of eggs of *C. hylas* at the open/unshaded (S8/1) robusta coffee plot

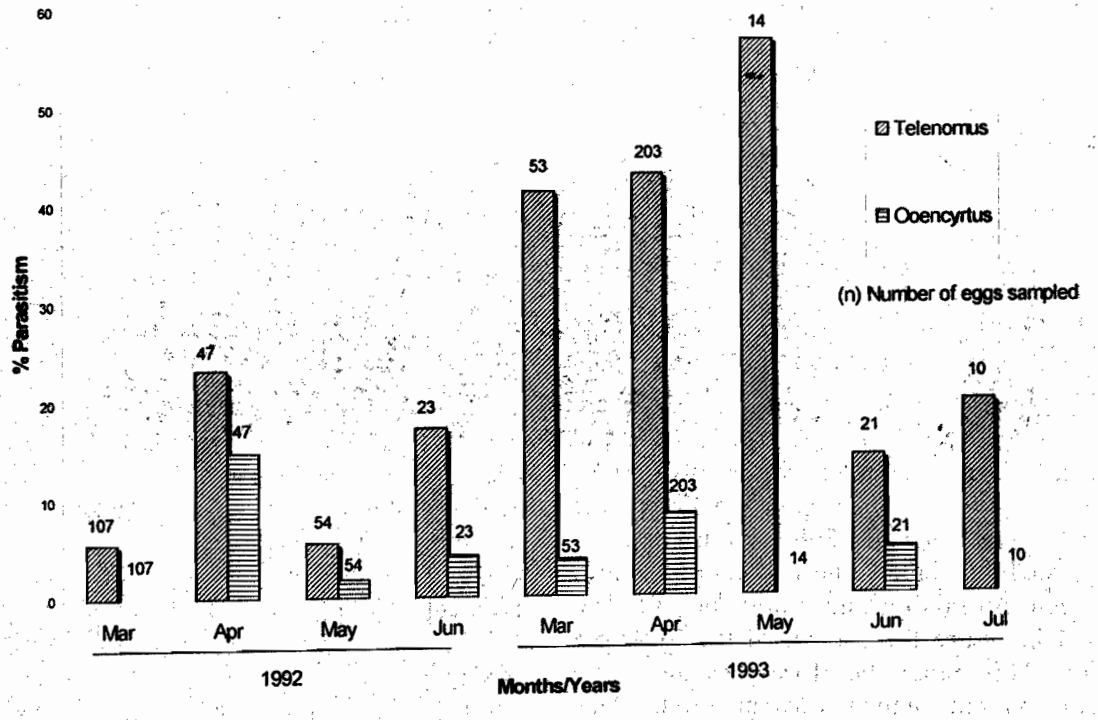

Fig. 2: Parasitism of eggs of *C. hylas* at the shaded (S2/4) robusta coffee plot

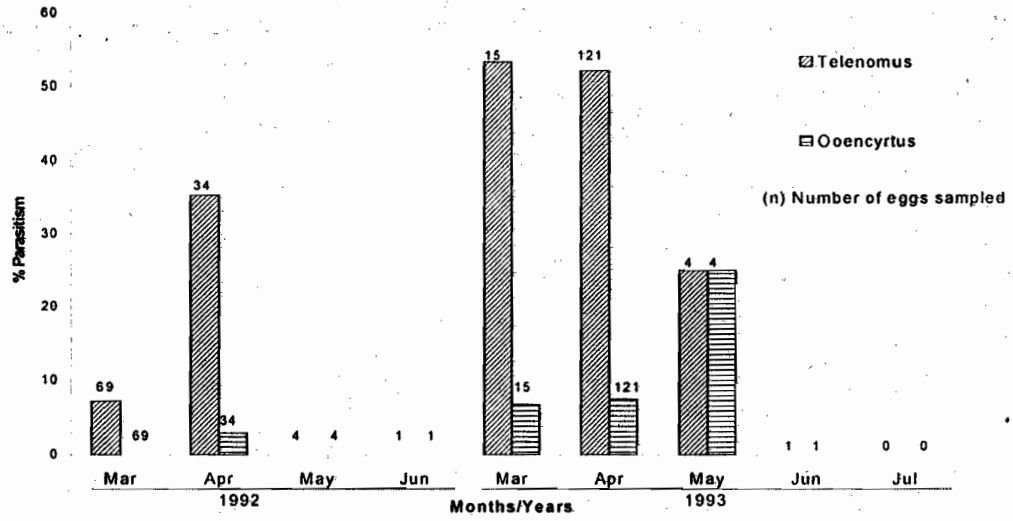

Fig. 3: Parasitism of larvae of *C. hylas* at the shaded (S2/4) and unshaded (S8/1) robusta coffee plot

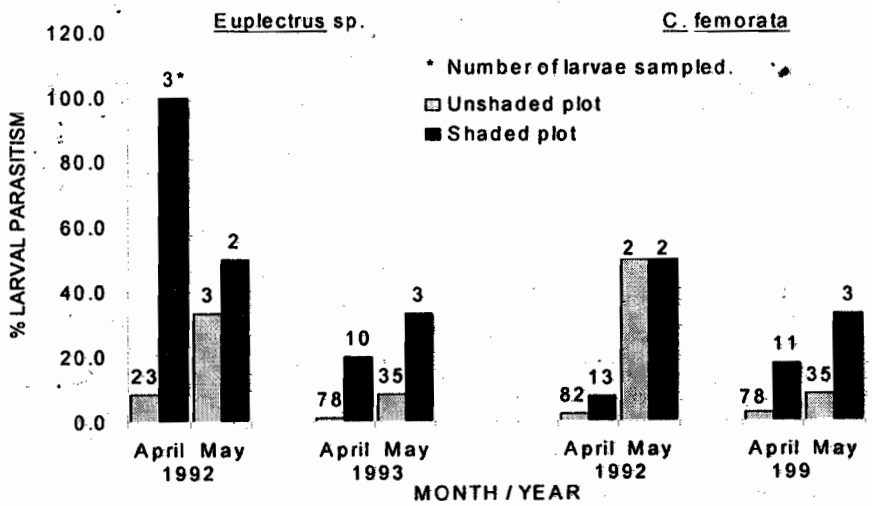

Table 1: Parasitism of Eggs of *C. hylas* at the Shaded (S2/4) and open (S8/1) Robusta coffee plots by *Telenomus* and *Ooencyrtus*

Year	Month	SHADED PLOT			OPEN PLOT		
		Number of eggs parasitized by		No. of eggs sampled	Number of eggs parasitized by		No. of eggs sampled
		Telenomus	*Ooencyrtus*		*Telenomus*	*Ooencyrtus*	
1992	March	5	0	69	6	0	107
	April	12	1	34	11	7	47
	May	0	0	4	3	1	54
	June	0	0	1	4	1	23
	Sub Total	17	1	108	24	9	231
1993	March	8	1	15	22	2	53
	April	63	9	121	88	17	203
	May	1	1	4	8	0	14
	June	0	0	1	3	1	21
	July	0	0	0	2	0	10
	Sub Total	72	11	141	123	20	301
	Grand Total	89	12	249	147	29	532

Larval Parasitoids:

An eulophid parasitoid *Euplectrus* species parasitized the 1st and 2nd instar larvae of *C. hylas* with 70% of the larvae sampled being the 2nd instar. A higher level of parasitism was observed at the shaded S2/4 coffee plot than at the unshaded (open) S8/1 plot (Fig.3). The percentage parasitism ranged from 20.0-100.0% (mean 38.9%) at the S2/4 plot and from 1.3-33.3% (mean 5.0%) at the S8/1 plot (Fig.3). The parasitized larva was often pale and sluggish but twitched violently when touched, whereas the healthy larva was sharp coloured and calm while feeding and in reaction to touch. On the trunk of the parasitised larva, especially on the dorsal and dorso-lateral parts, from one to six, mostly 2 or 3 (70%) tiny pale-colored spherical bodies could be seen. These were the encased eggs of the parasitoid which had hatched into the grubs. By 48 hours the encased grubs grew bigger and turned light green and within 5-7 days after parasitization, the host larva was killed, while the whitish ovoid grubs of the parasite moved out of the host onto the under side of the host's cadaver. The cadaver, which served as shield for the developing grubs, turned brown within 24 hours with the parasitoid grubs lying between the host's carcass and the leaf. A mat of white silken thread was then secreted enclosing the grubs and webbing the cadaver to the leaf. The grubs turned brownish black (on pupation) within 2 to 3 days. The adult parasite emerged from the field-collected larvae within 5 to 11 days after host's death.

The tachinid, *Ceromya femorata* possibly attacked the larva at an early stage but sign of attack was often visible on the 3rd instar larva in particular, and also the early 4th instar larva. A higher incidence of parasitism of *C. hylas* by the tachinid was also recorded at the S2/4 plot than the S8/1 with the level of parasitism ranging from 7.7-50.0% (mean 17.6%) and 2.4-5.0% (mean 4.8%) at the S2/4 and S8/1 plots respectively (Fig.3). Larva parasitized by *C. femorata* was often pale yellow, translucent and moribund. On its trunk, especially on the dorsal aspect of the mid-abdominal region, there was often a tiny dark spot, which was the point of attack by the parasite. Such a parasitized larva lived for 24-48 hours and within few hours of death, one or two cream-colored, spindle-shaped parasitoid grubs of about 7-8 mm long and 2 mm wide emerged from the rear of the larva, dropped into the soil/litter and moved around frantically seeking suitable pupation site. Pupation took place within 2-3 hours; the pupa was enclosed in a brown barrel-shaped puparium 4.5-5 mm long and 1.7-2.0 mm wide and the adult parasitic fly emerged 8-9 days after pupation. The cadaver of a larva parasitized by *C. femorata* was usually seen drooping from a coffee leaf, hanging head downwards and attached to the leaf by the larval crochets on the anal pro-leg and at times also by means of the crochets of other rear pro-legs.

Telenomus species has as its other hosts, a number of cocoa pests (Entwhistle, 1972) and the coffee tailed caterpillars – *Epicampoptera andersoni* sub sp *glauca* and *E. strandi* sub sp. *glauca* (Okelana, 1985). Idowu (1971) had earlier reported the species as an egg parasite of *C. hylas*. As for *Ooencyrtus* sp, Corbett *et al.* (1932) reported that the minute egg parasite *O. malayensis* Ferr. was the most important enemy of *C. hylas* in Malaya.

From this study, *Telenomus* and *Euplectrus* species, egg parasite and larval parasitoid respectively, could be harnessed in future for biological control of *C. hylas*. A deliberate restriction on the use of insecticides in the coffee ecosystem should be encouraged in order to conserve the parasitoids with the view of controlling *C. hylas*.

Acknowledgement

This study is part of a Ph.D. thesis submitted by the first author to the University of Ibadan, Nigeria. The author is grateful to the Cocoa Research Institute of Nigeria (CRIN) Ibadan, Nigeria for sponsoring the project and granting permission to publish this paper.

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