

Life Cycle Of The Coffee Berry Borer Parasitoid, *Cephalonomia Stephanoderis* (Hymenoptera: Bethylidae) On Parchment And Cherry Coffee

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Abstract: *Cephalonomia stephanoderis*, imported from Mexico is largely used in India as a successful exotic natural enemy of coffee berry borer. Present study compares the life cycle of the parasitoids in cherry and parchment coffee. Study reveals no great variation in the life cycle in both. Study also indicate that naturally infested cherry coffee is the suitable host than parchment for coffee berry borer breeding as the fecundity is found to be very low in parchment.

Index Terms: Bethylidae, Biological control of berry borer, *Cephalonomia stephanoderis*, Coffee berry borer

1 INTRODUCTION

The Coffee berry borer, *Hypothenemus hampei* (Ferrari) , Coleoptera: Curculionidae , is the world's most important coffee pest causing severe crop loss. In India coffee berry borer was first encountered in February 1990[6]. Berry borer attack leads to poor quality coffee which is difficult to market. The bethylid parasitoid *Cephalonomia stephanoderis* (Betrem) imported from Mexico during the year 1995 [5] ,and is largely used in India as a successful exotic natural enemy. It is a black wasp measuring about 2mm in length. Feeding on larvae or pupae of berry borer is essential for oogenesis of the parasitoid. Pupae are preferred over pre pupae for egg laying [1]. Very rarely more than one egg may be laid on a single host.

2 MATERIALS AND METHODS

Parchment was prepared in the laboratory (treated with Bavistin 20 WP to prevent fungal growth) and spread in plastic trays with ventilation. Berry borers were inoculated to parchment at the rate of 3 per bean. Trays were maintained in a breeding room at 25-27°C with 80-85 % RH. Daily split opened the parchment to trace the life cycle of berry borer. One fifty numbers of artificially infested beans were placed in plastic boxes of convenient size and parasitoids, released at the rate of 1-2 per beans. The containers were covered with lids having muslin cloth and ventilation and maintained at 25°C. regularly split opened the parchment and observed under microscope to trace the life stages of *Cephalonomia stephanoderis*

3 RESULT

It was observed that *C. stephanoderis* enters into the coffee berry through the holes made by the CBB, and found searching for berry borer stages, feeding the CBB eggs. It lays eggs singly on the ventral side of the larva and prepupa and dorsal side of the abdomen of pupae. Egg laying commenced from 5 days after entering the berry. Data is presented in Table 1 and projected graphically in Fig:1

Eggs: Eggs are oval shaped about 0.4mm in length, creamy white in colour and translucent. They are laid at the rate of 3- 4 a day.

Larval stage: On hatching from the egg grub measured on an average 0.7 mm and the second instar about 1mm. The grub is white in colour with sparsely projecting hairs on the body and is segmented. Larval stages extend upto 5 days.

Prepupae: It is observed for a short period of one day. The prepupae are white in colour with translucent body measuring about 1.5 mm in length. It was found feeding on larval stages of coffee berry borer. It constructs a cocoon using the threads coming from the mouth and enters the pupal stage.

Pupae: Pupae live inside the white coloured cocoon and are noticed in clusters. Adult emerges 14-16 days after by making holes using its mouth parts.

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Adult: It is black in colour, females measured 2mm and males 1.5mm- 1.7mm in length.

4 DISCUSSION

Bustillo et al studied the biology at 24 0 C and 70% RH and observed that eggs hatched in 3-4 days[2]. The larvae feed externally, exhausting the host tissues, for 4-5 days. There was a short prepupal period lasting 15 to 20 hours. The pupal stage lasted for 13-17 days. Oviposition to adult emergence took 20-26 days. The optimum temperature for development was close to 27 o C at 75% RH and development is completed in 18.5 days. After emergence the wasps remain in the berry for a few days. Mating takes place inside or outside the berries. Unfertilized eggs develop into males. Pre oviposition period takes 4-5 days under laboratory conditions. Upto 71 eggs are laid in a span of 30 days with upto 9 eggs per day[1,3]., Barrera et al also stated that *C. stephanoderis* is an ectoparasite that prefers to oviposit on the pre pupae and pupae of berry borer[4]. [1] found that *C. stephanoderis* always constructs a cocoon under field conditions, the threshold temperature of 13.7 degrees is most suitable. Adult longevity is inversely related to temperature. In the present study life cycle of *C. stephanoderis* on parchment and cherry coffee indicate that there is slight difference in the duration of different stages of development on parchment and cherry coffee. Preoviposition period of *C. stephanoderis* is 4-5 days on parchment coffee and it takes 5 days on cherry coffee and there was no variation observed on parchment and cherry coffee. It agrees with the findings of Barrera et al., found upto 71 eggs are laid in a span of 30 days with upto 9 eggs per day under laboratory condition in Mexico[4]. Eggs hatch in 4 days after incubation in parchment coffee and in cherry also 3-4 days of incubation period is noticed at temperature of 250 C and RH 80%. Three larval instars were noticed with slight variation in size which agrees with the findings of Infante[1]. During laboratory observations conducted in Mexico 26±10C the development cycle of *C. stephanoderis* on *Hypothenemus hampei* in coffee took about 20 days for both males and females[4].

Table 1: Life cycle of *C. stephanoderis* on parchment and cherry coffee

Variety	Pre oviposition period	Egg s/day	Size of egg	Duration in days							Adult
				Egg	Larval instars			pre pupa	Pupa	Ad	
					1st	2nd	3rd				
S.274 Parchment	4.5 days	3	1 mm	4	2	3	1	1	14 - 16	26 - 30	
S.274 Cherry	5 days	7	1 mm	3-4	2	3	1	1	13 - 17	23 - 27	

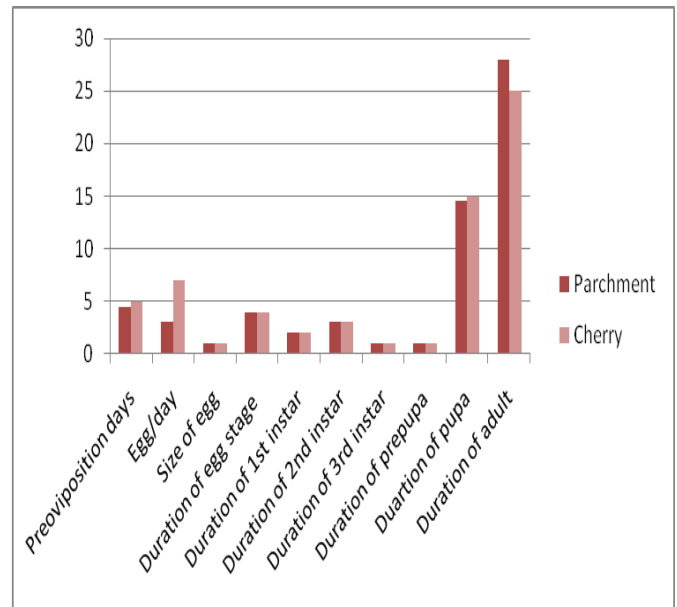


Fig:1 Growth pattern of *C. stephanoderis* on CBB stages

5 CONCLUSION

The study on the life cycle of *C. stephanoderis*, the coffee berry borer parasitoid in the laboratory reveals that it is an effective parasitoid, as it is found to feed and parasitize the berry borer stages, devastating the entire brood. *C. stephanoderis* in the field especially after harvest will devastate the residual population of coffee berry borer and its stages. Study also indicate that naturally infested cherry coffee is the suitable host than parchment for coffee berry borer breeding as the fecundity is found to be very low in parchment.

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