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Seasonal incidence and biology of *Conogethes punctiferalis* Guenee (Lepidoptera: Pyralidae) on Guava

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Abstract

Studies on seasonal incidence of castor capsule borer, *Conogethes punctiferalis* Guenee (Lepidoptera: Pyralidae) in guava crop were carried out under field conditions at horticultural research farm, Chaudhary Charan Singh Haryana Agricultural University, Hisar. The results revealed that the pest was found to infest both the rainy as well as winter season guava crop. During rainy season, peak infestation (16%) of *C. punctiferalis* on guava was recorded in 3rd & 5th week of August in picked fruits while in dropped fruits, peak infestation (11.63%) was recorded in 3rd week of August. During winter season, peak infestation (8%) of *C. punctiferalis* on guava was recorded in 2nd week of December and March in picked fruits while in dropped fruits, peak infestation (11.11%) was recorded in 2nd week of March. The life cycle of *C. punctiferalis* was completed in 34-46 days and the pest completed multiple generations in a year.

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Introduction

Conogethes punctiferalis Guenee is one of the most destructive pests of the castor. It is polyphagous pest and was found infesting 36 crop plants belonging to 23 families in India (Thyagaraj et al. 2003). Its host plants include cardamom, chestnut, castor, sunflower, cotton, ginger, peach, mango etc. It was also found to cause serious damage to guava throughout the plains of India. This pest was observed to cause 9-14 per cent fruit damage in guava orchards in Punjab (Sharma and Batra 1999; Haldhar & Deshwal 2017; Haldhar & Maheshwari 2021). Studies on seasonal incidence of any insect pest in a crop help in

providing the information regarding its emergence and periods of peak infestation whereas, the studies on biology provides information on various life stages through which the insect passes and its behavior during different seasons in a year. The management techniques can only be decided after knowing the activity of the insect pest and behavior of its different stages. Keeping in view the importance of this pest on guava crop, especially in rainy season, an attempt was made to study the seasonal incidence and biology of this pest on guava.

Material and Methods

The seasonal incidence of castor capsule borer in guava crop was studied under field conditions at horticultural research farm of CCS HAU, Hisar. For studying the seasonal incidence, 50 guava fruits were collected randomly from the five unsprayed / untreated trees at 10 days interval and examined in the laboratory for incidence of the pest. These observations were initiated from at least one month old fruits (>2 cm diameter) till harvest, both during rainy and winter season. Further, all the dropped/fallen fruits (maximum 50) were collected from the five unsprayed/untreated trees at 10 days interval and examined in the laboratory for incidence of the pest and per cent infestation was worked out. For biology of this pest, studies were done under field as well as under laboratory condition. Field collected larvae were used to initiate the culture of *Conogethes punctiferalis*. The larvae were reared on fresh castor capsules in glass jars. The open end of glass jars were covered with muslin cloth fastened with rubber bands. Fresh capsules were provided in every three days interval. After pupation, the pupae were transferred to glass jars for adult emergence to be used for further studies. Freshly emerged (male and female) moths were paired in glass jars and given castor inflorescences and guava fruits as ovipositional substrate but no egg laying was observed under laboratory conditions. Therefore, field cages were installed in the castor field (Fig. 1). Ten pairs (ten males & ten females) of freshly emerged adults were released into the cages for mating and oviposition. The cages were provided with castor inflorescence with capsules. Cotton

swabs soaked in 10 per cent honey solution served as food for the adults. Thus, inflorescences with freshly laid eggs were brought to the laboratory daily for recording observations. The freshly emerged larvae were released on fresh guava fruits with the help of moist camel hair brush. The larvae were provided with fresh food once in 2-3 days as per requirement and rearing was continued till adult emergence. Various biological parameters were studied in the laboratory and observations on fecundity, incubation period, duration of each larval instar, prepupal period, pupal period, total developmental period and sex ratio were recorded. There were 20 replications with CRD design.



Figure 1. Field cages for oviposition of *C. punctiferalis* on castor crop

Result and Discussion

Seasonal Incidence of *Conogethes punctiferalis*

The knowledge of seasonal incidence of the insect pest is essential for determining the ET (economic threshold) level of the pest so that decision about the appropriate management measures can be made. Incidence of castor capsule borer on guava was studied from July, 2015 to March, 2016. During rainy season (July to September), no infestation was recorded in the second week of

July. In picked fruits, maximum infestation (16 %) was recorded in 3rd and 5th week of August while minimum infestation (10 %) was found in 3rd week of July and in dropped

fruits, maximum infestation (11.63 %) was recorded in 3rd week of August while minimum infestation (6.25 %) was found in 3rd week of July (Table 1) (Fig. 2).

Table 1. Seasonal incidence of castor capsule borer, *Conogethes punctiferalis* on guava

Date of observation	Infestation in picked fruits (%)	Infestation in dropped fruits (%)
Rainy season (July, 2015 to September, 2015)		
10-7-15	0	0
20-7-15	10.00	6.25
30-7-15	12.00	8.33
10-8-15	14.00	10.00
20-8-15	16.00	11.63
30-8-15	16.00	10.53
10-9-15	14.00	9.75
Winter season (November, 2015 to March, 2016)		
20-11-15	6.00	3.84
30-11-15	6.00	7.69
10-12-15	8.00	8.69
20-12-15	6.00	8.33
30-12-15	4.00	4.76
10-01-16	4.00	9.09
20-01-16	4.00	10.52
30-01-16	6.00	10.00
10-02-16	6.00	8.00
20-02-16	4.00	8.33
29-02-16	6.00	9.09
10-03-16	8.00	11.11
20-03-16	6.00	10.00
30-03-16	4.00	4.76



Figure 2. Infested guava fruits by *C. punctiferalis*

During winter season (November to March), the maximum infestation (8 %) in picked fruits was observed at two times i.e. 2nd week of December, 2015 and March, 2016 while minimum infestation (4 %) was recorded during end of December (5th week) to 3rd week of January. In dropped fruits, maximum infestation (11.11 %) was reported in 2nd week of March followed by 10.52 % in 3rd week of January whereas minimum infestation (3.84 %) was found in 3rd week of November (Table 1). The results revealed that the pest was active during both the seasons, rainy as well as winter season but it caused more damage to rainy season guava crop in terms of its infestation to the fruits. Also, incidence of castor capsule borer in guava was reported by Devi et al., (2021) from South India who observed the occurrence of *C. punctiferalis* in guava cv. Taiwan white at the College of Horticulture and farmer's orchards, Venkataramannagudem, West Godavari, Andhra Pradesh. The occurrence of *C. punctiferalis* larvae in guava cv. Taiwan white commenced from first week of November 2019 and continued till last week of February 2020 i.e. 44th SMW to 9th SMW. Its activity reached to a peak level of 5 larvae/plant and 32.79 per cent fruit infestation during last week of February (9th SMW) followed by 8th SMW (32.10 per cent) and minimum density (1 larva/plant and 7.90 per cent) during first week of November (44th SMW).

Biology of *Conogethes punctiferalis*

The knowledge of the biology of the pest is important for determining the weakest stages of insect pest life cycle and for developing the appropriate management strategy.

Fecundity: Number of eggs laid by per female varied from 43 to 74.

Egg: Twenty eggs were observed under microscope for their shape and colour. Freshly laid eggs were yellowish white in colour, oval,

lay singly on capsules and glued on the surface (Fig. 3). The findings of Ganesha et al. (2013) are in confirmation with present results who reported that the eggs are pale yellow and oval in shape. The eggs turn pinkish before hatching and all the eggs hatched within 4-5 days (Table 2).

Larva: Twenty newly hatched larvae each maintained in separate plastic boxes having guava fruits as a source of food, were kept under observation (Fig. 3). These fruits were examined at daily (24 h) interval for the presence of exuviate to record the number of instars and their respective duration. The first instar larval duration ranged from 2-3 days with an average 2.40 ± 0.50 days. The second instar larval duration ranged from 2-3 d with an average 2.45 ± 0.51 days. The third instar larval duration ranged from 3-4 days with an average 3.50 ± 0.51 days. The fourth instar larval duration ranged from 4-5 days with an average 4.20 ± 0.41 days. The fifth instar larval duration ranged from 4-6 days with an average 5.10 ± 0.85 days. Under laboratory conditions, total larval period ranged from 15-21 days with an average 17.65 ± 1.23 days (Table 2). The total larval period was reported to be 25-40 days when castor capsule borer was reared on cardamom in Karnataka (Krishnamurthy et al. 1989). Similar findings are reported by Gour and Sriramulu (1992) who recorded 17 days as larval duration for this pest. These findings are in line with the observations of present investigation whereas Ganesha et al. (2013) reported that larval period lasted for 11.33 ± 1.92 days.

Prepupa: The post larval stage showing inactivity spun loose cocoon (Fig. 3). The period between complete inactivity and formation of pupa was considered as prepupal period. It ranged from 2-3 days (Table 2).

Pupa: After separating the pupae from cocoons, these were placed in glass jars for adult emergence. Pupal period lasted for 8-10

d with an average of 9.00 ± 0.46 days (Table 2) (Fig-3). Similar observations are made by Gour and Sriramulu (1992) who reported pupal period of 8 days, Kang et al. (2004) who reported pupal period of 9-11 days and Ganesha et al. (2013) who reported that pupal period lasted for 10.51 ± 0.85 days.

Adult: For recording the longevity of adults of both sexes, ten pairs of moths emerged on same day were enclosed on castor inflorescence with capsules held in flasks containing water. Cotton swabs soaked in 10 per cent honey solution were provided as food for adults (Fig. 3). The longevity of male and female ranged from 5-6 days with an average of 5.5 ± 0.53 days and 6-7 days with an average of 6.4 ± 0.52 days, respectively

(Table 2). Bilapate and Talati (1978) reported longevity of female and male moths to be 15.80 ± 2.50 d and 14.00 ± 3.80 days, respectively which are not in accordance with the present study. Total life cycle of male and female varied from 34-45 and 35-46 days, respectively.

Sex Ratio: Fifty pupae were collected from laboratory culture during the period of investigation and placed in glass jars. Out of fifty pupae, 48 adults emerged, 21 were males and 27 were females. The ratio of male to female was recorded as 1: 1.28. Total life cycle completed in 34-46 days (Table 2). Ganesha et al. (2013) reported that the total developmental period of *C. punctiferalis* occupied 25.60 -27.25 d.

Table 2 Duration of different life stages of *Conogethes punctiferalis* under laboratory conditions

Biological parameters	Duration (days)	
	Range	Mean \pm S.D
Incubation period	4-5	4.15 ± 0.37
Larva		
1 st instar	2-3	2.40 ± 0.50
2 nd instar	2-3	2.45 ± 0.51
3 rd instar	3-4	3.50 ± 0.51
4 th instar	4-5	4.20 ± 0.41
5 th instar	4-6	5.10 ± 0.85
Total larval period	15-21	17.65 ± 1.23
Prepupa	2-3	2.10 ± 0.31
Pupa	8-10	9.00 ± 0.46
Adult		
Adult male	5-6	5.5 ± 0.53
Adult female	6-7	6.4 ± 0.52
Total life cycle of male	34-45	
Total life cycle of female	35-46	

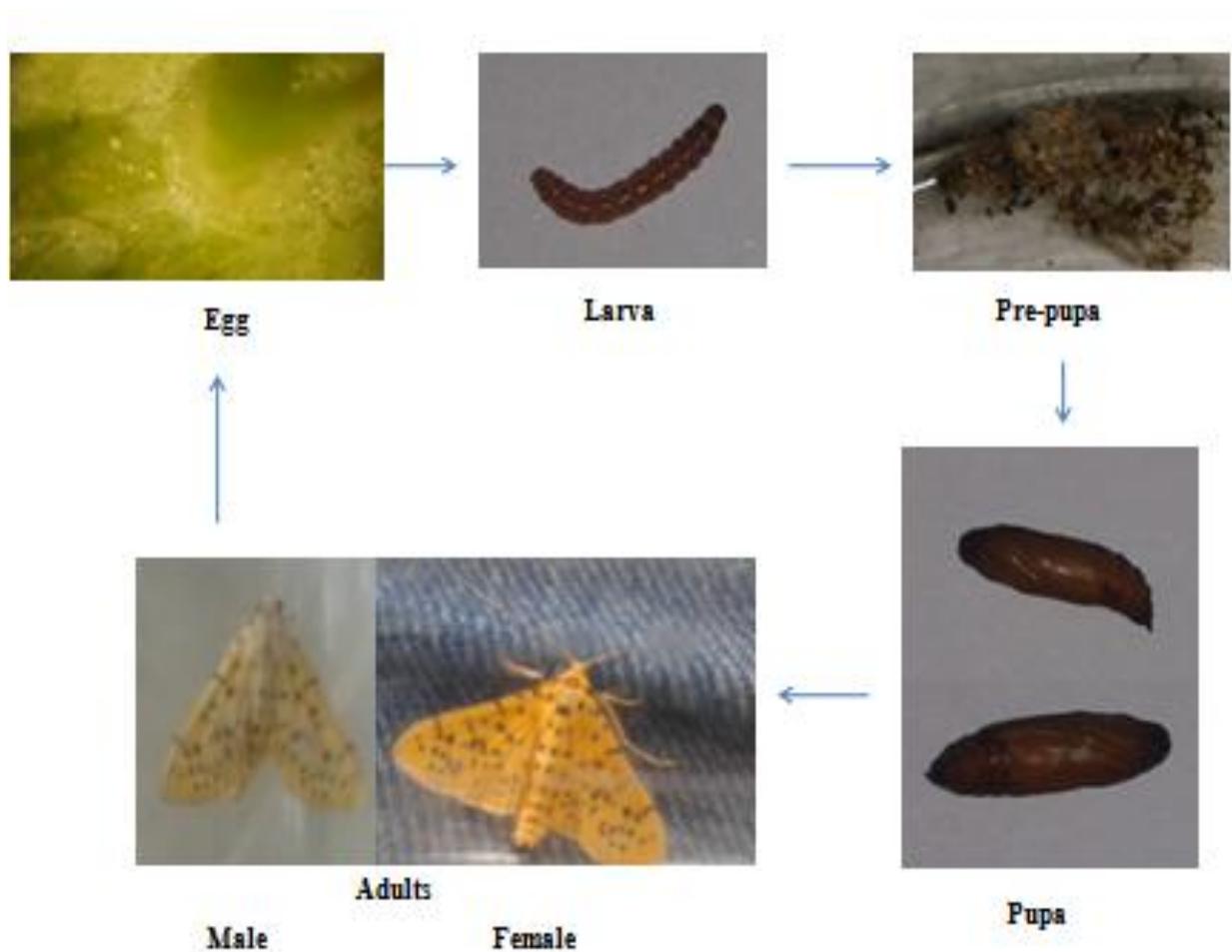


Figure 3. Life stages of *C. punctiferalis*

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