International Journal of Science, Environment and Technology, Vol. 6, No 2, 2017, 1134 – 1139

ISSN 2278-3687 (O)
2277-663X (P)

BIOLOGY OF CASTOR SHOOT AND CAPSULE BORER, *CONOGETHES PUNCTIFERALIS* GUENEE ON CASTOR (*RICINUS COMMUNIS* L.)

K P Kumar[1*], A K Chakravarthy[2] and H Khader Khan[1]

[1]Department of Agricultural Entomology, College of Agriculture, UAS, GKVK, Bengaluru-560065, Karnataka, India

[2]Division of Entomology and Nematology, ICAR-Indian Institute of Horticultural Research, Hessaraghatta, Bengaluru-560089, Karnataka, India

E-mail: kumarkp4830@gmail.com (**Corresponding Author*)

Abstract: The shoot and capsule borer, *Conogethes punctiferalis* Guenee (Lepidoptera: Crambidae) is a serious pest of castor, commonly called as peach yellow moth and incurring huge yield losses. Hence, the present study was conducted on biology of shoot and capsule borer under laboratory conditions. Our biological study revealed that gravid female lays pale yellowish, oval flat eggs singly on capsules, inflorescence (raceme). The incubation, larval, prepupal, and pupal periods were 2.51±0.85, 13.25±3.35, 2.75±0.80 and 9.50±0.70 days respectively. The adult longevity of male and female was 7.50 – 9.00 and 8.00±0.70 days, respectively. C. *punctiferalis* took about 30.37 – 35.30 days with on an average 30.65±3.70 days to complete life cycle from oviposition to adult emergence on castor.

Keywords: Adult longevity, Biology, Castor, Shoot and capsule borer.

Introduction

Castor (*Ricinus communis* L.) is one of the important non-edible oilseed crop, belonging to belonging to *Euphorbiaceae* family. India is the leading country in castor production and dominates the castor oil exports market to the industrialized nations in the world. Castor seed has 48% oil but only 4% can be extracted, while the cake retains the rests (Ganesh *et al.,* 2013). The major constraint for lower productivity due to the damage caused by the insect pests *viz*., castor semilooper, shoot and capsule borer, leaf miner, red hairy caterpillar, castor butterfly etc.. Among them, shoot and capsule borer, *Conogethes punctiferalis* Guenee (Lepidoptera: Crambidae) is the most destructive pest, commonly called as yellow peach moth and is distributed in tropical Asia, East Asia, Australia and various parts of the world. The caterpillars of this pest are typically polyphagous attacking more than 120 wild and cultivated plants *viz*., durian, pomegranate, peach, chestnut, citrus, papaya, eggplant and maize (Sekiguchi, 1974; Ganesh *et al.,* 2013), and is incurring about 16-72% yield loss in Maharastra (Bilapate and Talati, 1977). In view of importance of shoot and capsule borer on

*Received Feb 9, 2017 * Published Apr 2, 2017 * www.ijset.net*

castor crop, the present study was undertaken on biology of *C. punctiferalis.* Our study will provide information, which may prove to be valuable in developing strategies for the management of this pest.

Materials and methods

Study on the biology of *C. punctiferalis* was carried out in the laboratory of the Division of Entomology and Nematology, ICAR-Indian Institute of Horticultural Research, Hessaraghatta Lake PO, Bengaluru ($12^0$58'N and $77^0$35'E; 890 m MSL) during August to December, 2015-16 at ambient temperatures and RH. Larvae/pupae contained in infested shoots and capsules were collected from Gandhi Krishi Vignan Kendra (GKVK), Bengaluru and farmers field, and kept in plastic container (90 cm x 30 cm x 45 cm) for insect rearing. Fresh capsules were provided in every four days interval. After pupation, pupae were transferred to specimen tubes for adult emergence used for further studies. 15 pairs (15 female and 15 male) of freshly emerged adults were released into the ventilated glass cages (60 x 60 x 60 cm) containing castor inflorescence (raceme) with flowers and young capsules were placed in 500 ml conical flask with water to mimic natural ambience and fed with 10 per cent honey solution soaked in cotton swabs/wads for mating, oviposition and to record the longevity of adults. The plant parts containing the freshly laid eggs were transferred to petridishes for hatching. The emerged larvae were provided with fresh capsules and rearing was continued till adult emergence. Observations were recorded on duration of egg, larvae of each instar, pre-pupa, pupa and adult stages.

Result and discussion

Gravid female moth laid whitish yellow, oval flat eggs singly on capsules, inflorescence (raceme). The incubation period varied from 2.51±0.85 days (Table 1; Figure 1) which are close arguments with the observations made by Patel and Gangrade (1971); Stanley *et al.* (2009) and Ganesh *et al.* (2013), they observed the egg period of 2-4 days.

C. punctiferslis caterpillar moulted four times and thus, there were five larval instars. The newly hatched larvae actively moved on the surface of capsules for 9-14 minutes to find suitable feeding site. The first instar larva was minute, light pinkish brown colour with pale black spots on all over the body but they were less visible, and dark coloured head and prothorax. The average duration of first instar larval was 2.85 ±0.70 days (Table 1). The second and third instar larvae were light brown with eye spot and dark mandibles. The average duration of second and third instars larvae was 2.50 ±0.55 and 2.25±0.75 days, respectively (Table 1).

The last two instars of the castor shoot and capsule borer were similar to earlier instars in colour and morphological characters except the size. The larvae of these instars were light brown with dark brown head, with very dark spots on the body. The larvae hang on with a fine silken thread when disturbed. The average durations of fourth and fifth instar larvae were 2.70±0.85 and 2.95±0.50 days, respectively (Table 1).

In the laboratory total larval period ranged from13.50- 16.60 days with an average of 13.25±3.35 days (Table 1; Figure 1). While total larval period reported to be 12.73 days, when it reared on castor (Bilapate and Talati, 1978), 17, 11.25-12.50 and 12.78 days as reported by Gour and Sriarmulu (1992); Yatihish (2012) and Ganesh *et al.* (2013), respectively, however, the slight variation in relation to other authors may reveal the effect of host plant and locality of the insect. Duration of larval stage occupied 23.82 days on cocoa and 32 days on apple was reported by Alagar *et al.* (2013) and Kadoi and Kaneda (1990), respectively.

The growth and development of different stages of larva varied with varying temperature and relative humidity. The results of biology of *C. punctiferalis* revealed that each larval instar lasted for 2.5-3 days and the total larval period extended upto 13-16 days with varying 29.50^{0}C and 85-90 per cent RH. The larvae after hatching feed on immature capsules and shoots, affected shoots show bore holes covered with frass and capsules are webbed together with dark excreta and other matter. These results were in line with, Thyagaraj (2003) revealed that the larval period varied from 12.55±2.00 to 19.59±5.50 days and the per cent survival varied from 49.6±0.18 to 92.8±1.39, 28.0±1.0^{0}C and 80.0±5.0 percent RH were most favorable for the development of larval stages. The duration of the larval stage varied from 20-23 days in August-September (at 21-35ºC) to 22-26 days in October - January (at 14-28ºC) and larvae were present in the field until February (Patel and Gangrade, 1971).

The colour of the pre-pupa was light greenish with dark spots over the body. Pre-pupal period lasted from 2.50 to 3.20 days (Table 1). The freshly formed pupa was brownish yellow with dark compound eyes. Later the pupa turned light brown. Pupation takes place inside the infested capsule. Pupal period lasted for 9.00 to 10.50 days (Table 1; Fig.1). These results were in accordance with Ganesh *et al.* (2013), who reported the pupal duration of 7-9 days. Yathish (2012) recorded that 2.55- 2.88 days and 9.50 -12.00 days of pre-pupal and pupal period.

The adults were medium sized moth, brownish yellow body with a straw yellow wings having number of dark spots (Figure 1). Generally, female moths were bigger in size, having

bulged abdomen and male moths were smaller in size and tufts of hairs are absent in the abdomen tip. Adult longevity of female and male ranged from 8.75 – 10.00 and 7.50 -9.00 days, respectively (Table 1). The longevity of female and male moth was 6.5 and 5.7 days (Sekiguchi, 1974; Alagar *et al.,* 2013). Ganesh *et al.* (2013) observed that longevity of male and female moths 8.00-9.45 days and 9.00 – 10.65 days. This variation may be due to changed weather conditions.

In the present investigation on bioecology of the insect pest is highly variable depending upon the weather parameters, host plant and habitat strategy of the pest under different cultivated ecosystems is difficult. Hence, location-specific studies on *C. punctiferalis* are necessary for evolving rational pest management strategies.

Table 1. Duration of different life stages of *Conogethes punctiferalis* on castor

Insect Stages	**Duration (Days)**	
	Range	**Mean±SD**
Egg	3-4	2.51±0.85
I instar	2.5 – 3.5	2.85±0.70
II instar	2.00 – 3.00	2.50±0.55
III instar	2.00 – 3.50	2.25±0.75
IV instar	2.50 – 3.00	2.70±0.85
V instar	2.50 – 3.50	2.95±0.50
Total larval period	13.50 – 16.60	13.25±3.35
Pre-pupa	2.50 – 3.20	2.75±0.80
Pupa	9.00 – 10.50	9.50±0.70
Adult longevity of male	7.50 – 9.00	8.00±0.70
Adult longevity of female	8.75 – 10.00	9.50±0.25
Total developmental period (Egg-Adult)	30.37 – 35.30	30.65±3.70

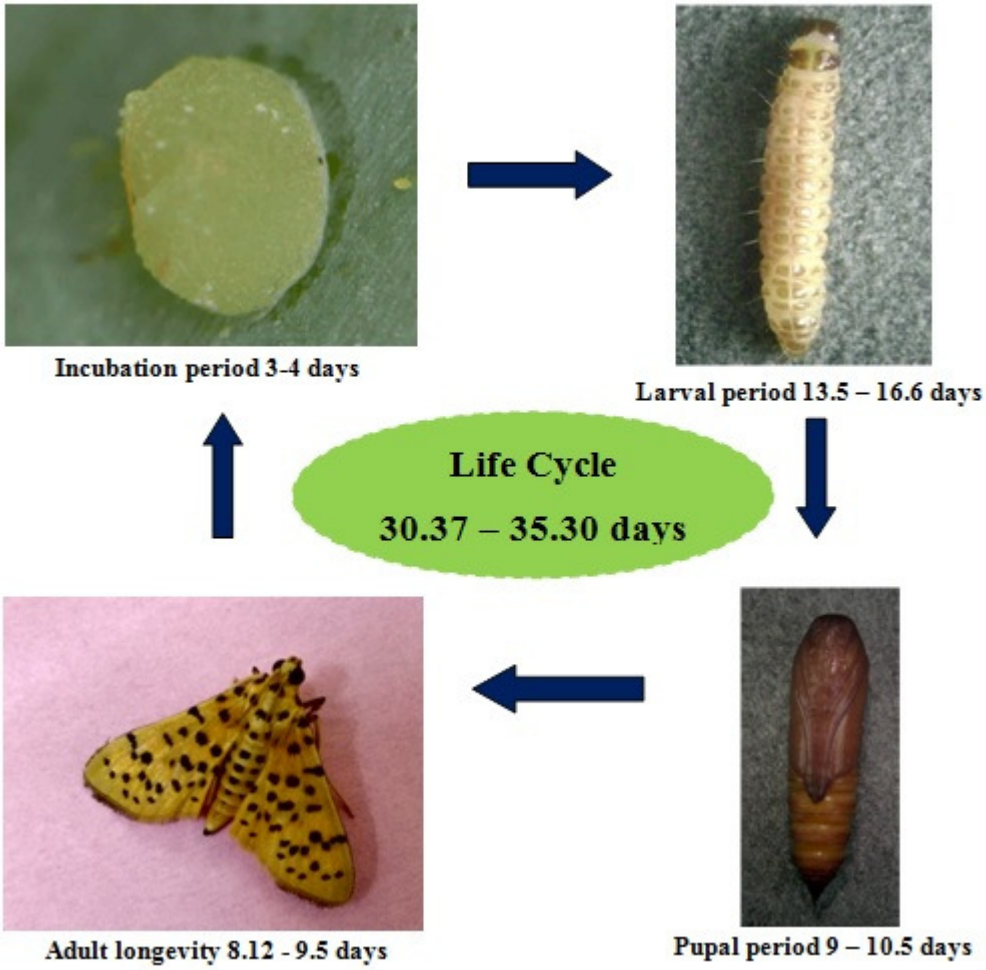

Figure 1. Life stages of *Conogethes punctiferalis*

Acknowledgment: The authors are thankful to the Director, Indian Institute of Horticultural Research, Hessaraghatta Lake PO, Bengaluru, Karnataka, India for providing the facilities to carry out this study, and to Head of the department of Agricultural Entomology, UAS, GKVK, Bengaluru, Karnataka, India for their guidance and support.

References

[1] Alagar, M., Rachana K.E., Keshava Bhat, S., Rahman, S. and Rajesh, M.K., 2013. Biology, damage potential and molecular identification of *Conogethes punctiferalis* Guenee in cocoa (*Theobroma cacao* Linn.). *Journal of Plantation Crops*, 41(3): 350-356.

[2] Bilapate, G.G. and Talati, G.M., 1977. Studies on the life tables of *Dichocrocis punctiferalis* Guenee on castor. *Journal of Maharashtra Agriculture University,* 2: 246-248.

[3] Bilapate, G.G. and Talati, G.M., 1978. Some studies on bionomics of castor shoot and capsule borer, *Dichocrocis punctiferalis* (Guenee). *Journal of Maharashtra Agriculture University***,** 3: 47-49.

[4] Ganesha, Chakravarthy, A.K., Mohan, I. Naik., Basavaraj, K. and Manja Naik, C., 2013. Biology of castor shoot and capsule borer, *Conogethes punctiferalis* Guenee (Lepidoptera: Pyralidae). *Current Biotica,* 7(3): 188-195.

[5] Gour, T.B. and Sriramulu, M., 1992. Grapevine, *Vitis vinifera* Linn. a new host of castor shoots and capsule borer, *Conogethes punctiferalis* (Guenee). *Tropical Pest Management*, 38: 459.

[6] Kadoi, M. and Kaneda, M., 1990. Development of yellow peach moth, *Conogethes punctiferalis* (Guenee) on apple fruit. *Research Bulletin Plant Protection Service*, Japan, 26: 61-63.

[7] Patel, R.K. and Gangrade, G.A., 1971. Note on the biology of castor capsule borer, *Dichocrocis punctiferalis* Gn. (Lepidoptera: Pyralidae). *Indian Journal of Agriculture Science,* 41: 443-444.

[8] Sekiguchi, K., 1974. Morphology, biology and control of the yellow peach moth, *Dichocrocis punctiferalis* Guenee (Lepidoptera: Pyraustidae). *Bulletin Ibaraki-ken Horticulture Experiment Station,* 44: 1-90.

[9] Stanley, J., Chandrasekaran, S. and Preetha, G., 2009. *Conogethes punctiferalis* (Lepidoptera: Pyralidae). Its biology and field parasitization. *ndian Journal of Agriculture Science,* 79: 906–909.

[10] Thyagaraj, N.E., 2003. Integrated Management of some important cardamom pests of hill region of Karnataka, South India. *Ph.D Thesis*, *Dr. B.R Ambedkar University,* Uttara Pradesh, India. Pp. 213.

[11] Yathish, K.R., 2012. Life table studies of castor shoot and capsule borer, *Conogethes punctiferalis* Guenee. *M.Sc. (Agri.) Thesis*, *Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishinagar PO*, Akola, Maharastra, India, pp. 19-23.