The Pharma Innovation Journal 2022; SP-11(8): 1147-1150

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(8): 1147-1150

www.thepharmajournal.com
Received: 08-05-2022
Accepted: 12-06-2022

Vishali P
PG Scholar, Department of Agricultural Entomology, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, Tamil Nadu, India

Jayaraj J
Professor, Department of Agricultural Entomology, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, Tamil Nadu, India

Shanthi M
Director, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

Vellaikumar S
Associate Professor (Agricultural Chemicals), Department of Biotechnology, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, Tamil Nadu, India

Corresponding Author
Vishali P
PG Scholar, Department of Agricultural Entomology, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, Tamil Nadu, India

Studies on biology of cigarette beetle *Lasioderma serricorne* (Fabricius), (Anobiidae: Coleoptera) in stored dry chillies

Vishali P, Jayaraj J, Shanthi M and Vellaikumar S

Abstract
Chilli (*Capsicum annuum* L.) is an economically important spice crop cultivated throughout India. Though chillies found to be affected by several insect pests, chilli thrips and mite are the most destructive pest and is also attacked by the storage pest *viz*. cigarette beetle *Lasioderma serricorne*. The present investigation was carried out to study the biology of cigarette beetle in stored chillies. The average egg, larval, pupal, adult, total developmental period was 8.0, 24.0, 8.0, 14.0, 54.0 days in mundu chilli pods, while in buttermilk chilli pods was 6.0, 21.0, 5.50, 11.0, 43.50 days respectively. The maximum hatchability, survival per cent of larvae and pupae, adult emergence and fecundity was 60.13, 62.87, 74.93, 78.29 per cent and 93.85 no. of eggs / female respectively in buttermilk chilli pods while minimum was in mundu chilli pods 34.50, 49.41, 59.42, 58.60 per cent and 71.62 no. of eggs / female respectively.

Keywords: Chilli, *Lasioderma serricorne*, biology and survival per cent

Introduction
Chilli (*Capsicum annuum* L.) commonly known as mirch/ mirchi belongs to the family Solanaceae. India is the largest producer in chilli production. In India total production of chilli is about 17.64 lakh tones. Andhra Pradesh ranks first with the production of 6.30 lakh tons followed by Telangana with 3.04 lakh tonnes. Tamil Nadu produces about 21,693 tonnes (NHB, 2020). The different types of chillies grown in India are Kashmiri, Guntur, Jwala, Byadgi, Naga, Boriya, Kanthari, Mundu, Khammam, Warangal, Teja, Sannam, Buttermilk chilli. Among these types, the biology was studied in Mundu and Buttermilk chilli pods.
Cigarette beetle (Tobacco beetle) *Lasioderma serricorne,* (Anobiidae: Coleoptera) is very similar in appearance to the drugstore beetle and as indicated by its common name, it's a pest of tobacco products. Tobacco and turmeric are the main hosts of cigarette beetle (Ashworth, 1993; Saeed *et al.*, 2008) [2]. Besides, the infestation of cigarette beetle has also been reported in various commodities like yeast (Dowd and Shen, 1990) [7], corn flour, chilli powder (Mahroof and Phillips, 2008) [9], wheat flour, black sesame seeds (Moura *et al.*, 2017) [11], onion seeds (Verma, 2011) [18], dried raisins, dates, figs, cocoa, dried bread, chocolates, biscuits, herbarium specimens (Retief and Nicholas, 1988) [14], preserved insects and animal matter such as dried fish, leather products *etc*., (Cabrera, 2001; Azmiera *et al.*, 2020) [6, 3]. Both adults and larvae are capable of penetrating many types of packaging material to reach their food source. Hence the present investigation studies the biology of cigarette beetle *Lasioderma serricorne* in stored chillies.

Materials and Methods
The current study, "Studies on biology of the cigarette beetle *Lasioderma serricorne* (Coleoptera: Anobiidae) in stored dry chillies," was conducted at the UG Laboratory, Department of Agricultural Entomology, Agricultural College and Research Institute, Madurai, during the year 2021- 2022.

Mass culturing of Cigarette beetle, *Lasioderma serricorne*
Adults of *Lasioderma serricorne* were gathered from various sources of infestation such as market places and storage godowns and mass multiplied in an appropriate rearing medium of wheat flour + 5% dried yeast and coriander seeds. The raising medium was kept at a temperature of 30 °C and a relative humidity of 70%.

To keep them free of infestation, the growing material was sterilized. The adults were placed in broad cylindrical jars with muslin cloth coverings and placed on raising media. Forty pairs of *L. serricorne* were released in a jar for the initial culture. The first generation was completed r 45 days, and there were overlapping generations in the culture media. The emerging adults were gathered in order to preserve the subcultures. The insects were sub-cultured at 20 days interval for constant supply of insects for the study.

Studies on developmental period

The freshly laid eggs were collected and observed every day and until the eggs hatched. The change in colour of the eggs were observed with the help of stereo zoom microscope Different larval instars were carefully removed and dropped into the food sources. The larval period were observed from the day of hatching of the first instar until the day on which the larvae construct the protective case to initiate pupation. The pupal development period were observed from the time the larva constructed a protective case to the emergence of the adult. The adult period were observed from the day of emergence from the pupa to the final day of the death. The total developmental period were calculated during the period from egg laying to adult emergence. The duration between the date of adult emergence and the date of adult death was used to calculate male and female lifespan. The period from the day of egg laying to the death of an adult was referred to as the complete life cycle.

Survival percentage

For survival percentage, various parameters such as hatchability, larval survival, pupal survival, adult emergence and fecundity were calculated by following the formulae:

$$\text{Hatchability (\%)} = \frac{\text{No. of eggs hatched}}{\text{Total no. of eggs laid}} \times 100$$

$$\text{Larval survival (\%)} = \frac{\text{No. of larvae developed}}{\text{Total no. of eggs hatched}} \times 100$$

$$\text{Pupal survival (\%)} = \frac{\text{No. of pupae formed}}{\text{Total no. of larvae matured}} \times 100$$

$$\text{Adult emergence (\%)} = \frac{\text{No. of adults emerged}}{\text{Total no. of pupae formed}} \times 100$$

Fecundity is the total number of eggs laid during the entire life span of the female. (Naveena, 2019) [13].

Result and Discussion

The freshly laid eggs were creamy white in colour and oval shaped. Before hatching, it turned into yellow and further to light brown in colour. The egg period was 8.00 ± 0.35 days and 6.00 ± 0.50 days on Mundu and Buttermilk chilli pods respectively (Table.1). The larva was pale white in colour with dense hairs, scarabaei form with brown head. The larval duration was 24.00 ± 0.60 and 21.00 ± 0.78 days respectively on Mundu and Buttermilk chilli pods (Table.1).

The full grown larvae stopped feeding and formed an exarate pupal case, affixed to the inner surface of the media. The pupal period lasted for shorter duration (5.50 ± 0.35 days) on Buttermilk chilli pods and relatively longer on Mundu pods (8.00 ± 0.50 days) (Table. 1).

The adult beetles were oval in shape with the head and pro-thorax bent downward, giving the insect a humped, convex appearance. Adults were brown in colour, non-striated elytra and body covered with fine hairs appeared in smooth surface. The females survived longer when compared to males. The longevity of adults was 14.00 ± 1.50 days and 11.00 ± 1.20 days on Mundu and Buttermilk chilli pods respectively (Table.1). The longevity of male and female was longer in Mundu pods (13.00 ± 0.30 and 15.00 ± 0.55 days) than in Buttermilk chilli pods (9.00 ± 0.25 and 12.00 ± 0.45 days) (Table. 1). The total life span of male and female was (67.00 ± 3.25 and 69.00 ± 3.50 days) in Mundu pods and in Buttermilk chilli pods (52.50 ± 3.08 and 55.50 ± 3.16 days) (Table. 1).

The hatchability per cent of *L. serricorne* was in (60.13 ± 0.80%) Buttermilk chilli pods and in Mundu pods (34.00 ± 1.62%). The larval survival per cent was in (62.87 ± 2.32%) Buttermilk chilli pods and (49.41 ± 1.89%) in Mundu pods (Table. 2). The pupal survival per cent was (74.93 ± 1.66%) in Buttermilk chilli pods and (59.42 ± 1.35%) in Mundu pods (Table. 2). The adult emergence per cent in Buttermilk chilli was (78.29 ± 1.28%) and (58.60 ± 1.58%) in Mundu pods (Table. 2). The eggs were laid singly in crevices, folds or depressions in the food/host materials. The fecundity of *L. serricorne* was respectively 93.85 ± 0.91 eggs/female and 71.62 ± 0.72 eggs/female on Buttermilk and Mundu chilli pods respectively (Table. 2)

The present investigation reported that Buttermilk chilli pods was more suitable for *L. serricorne* multiplication than Mundu chilli pods. Insects reared on Mundu chilli pods had a longer total developmental period (69.00 ± 3.50 days) with a larval duration of (24.00 ± 0.60 days) as compared to Buttermilk chilli pods (43.50 ± 0.08 days) of total development period with a larval duration of (21.00 ± 0.22 days) (Fig.1). The Buttermilk chilli was found to be more suitable for oviposition, feeding and shelter of *L. serricorne*. The present findings are in conformity with the reports of Marimuthu (2003) [10] who reported the biology of *L. serricorne* senna pod. The study on biology of *L. serricorne* by Arifa (2015) [1]. Similarly, Tamang (2015) [17] reported that the egg period was 8 days and 9 days in turmeric powder which are comparable with our studies. Kavin Raj (2017) [8] also found similar trends in cumin powder and cumin seeds. The present study coincides with the findings of Tamang, 2015 [17] with larval period (27.1 days) and Chaitanya *et al.*, 2016 [5] larval period (30.0 days) in turmeric. The pre-pupal period in the present finding is also supported by the reports of Tamang, 2015 [17] (4 to 6 days), Ashworth, 1993 [2] (2 to 4 days) but found controversial with Basheer *et al.* 2013 [4] (8 days) who reared *L. serricorne* in tobacco leaves. The present findings of pupal period are corroborate with the results of Ashworth, 1993 [2] (4 - 12 days) and Tamang, 2015[17] (7 - 10 days). The total developmental period of *L. serricorne* varied between 46.00 and 109.20 days (Mahroof and Phillips, 2007)[9] on different food sources (Ground chilli, paprika, cayenne pepper, chewing leaf tobacco, cigar tobacco, wheat flour and NOW bait) which are comparable with our present findings. However, the variations might be due to the changes in the quality, quantity of the food and changes in the environment.

The highest survival per cent of larvae was recorded in Buttermilk chilli pods (62.87 ± 2.32%) while the lowest level of survival observed in Mundu chilli pods (49.41±1.89%) (Fig.2). Sivik *et al.* (1957) [16] and Tamang (2015) [17] recorded that the hatching percentage was 68.00 per cent in tobacco and 67.20 ± 8.44 in turmeric powder which are in accordance with the present findings. Arifa (2015) [1] reported that the generation survival was high in coriander seeds (0.3) than coriander powder (0.26) and in cumin Kavin Raj (2017) [8] found that the generation survival was high in seeds (0.96) than the powder (0.86). The observed fecundity was different from the findings of Tamang (2015) [17], who recorded 50.20 eggs in turmeric powder.

Table 1: Developmental period of *Lasioderma serricorne* in Mundu and Buttermilk chilli pods

Developmental Period (days)		Mundu Chilli pods (Mean ± SE)*	Butter milk Chilli pods (Mean ± SE)
Egg period		8.00 ± 0.35	6.00 ± 0.50
Larval period		24.00 ± 0.60	21.00 ± 0.78
Pupal period		8.00 ± 0.50	5.50 ± 0.35
Adult period		14.00 ± 1.50	11.00 ± 1.20
Total developmental period		54.00 ± 2.95	43.50 ± 2.83
Longevity	Male	13.00 ± 0.30	9.00 ± 0.25
	Female	15.00 ± 0.55	12.00 ± 0.33
Total life cycle	Male	67.00 ± 3.25	52.50 ± 3.08
	Female	69.00 ± 3.50	55.50 ± 3.16

Mean of thirteen replications
SE-Standard Error

Table 2: Survival per cent of *Lasioderma serricorne* in Mundu and Buttermilk chilli pods

Survival Parameters	Mundu chilli pods (Mean ± SE)	Butter milk chilli pods (Mean ± SE)
Hatchability%	34.50 ± 1.62	60.13 ± 0.80
Larval%	49.41 ± 1.89	62.87 ± 2.32
Pupal%	59.42 ± 1.35	74.93 ± 1.66
Adult emergence%	58.60 ± 1.58	78.29 ± 1.28
Fecundity (nos)	71.62 ± 0.72	93.85 ± 0.91

Mean of thirteen replications
SE-Standard Error

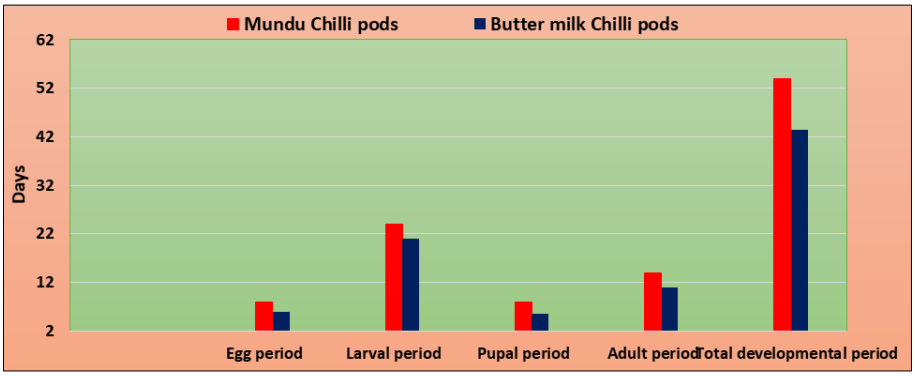

Fig 1: Developmental period of Lasioderma serricorne in Mundu and Buttermilk chilli pods

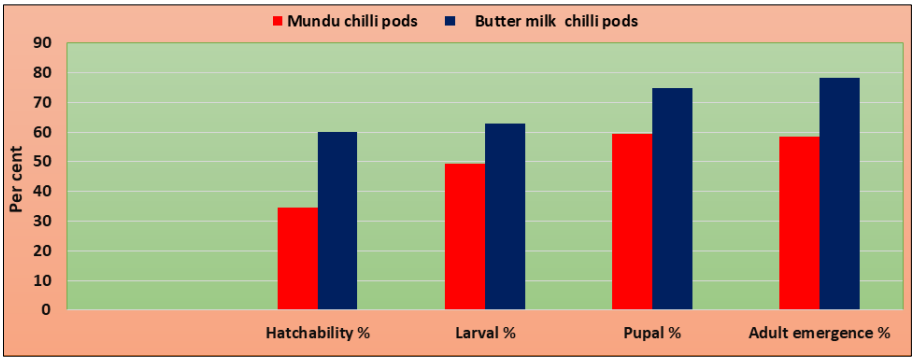

Fig 2: Survival per cent of Lasioderma serricorne in Mundu and Buttermilk chilli pods

Conclusion

The present study concludes that the multiplication of *L. serricorne* was more in Buttermilk chilli pods than Mundu chilli pods. The developmental period was longer in Munduchilli pods (69.00 ± 0.05 days) as compared to the Buttermilk pods (43.50 ± 0.08 days).The highest level of survival per cent of larvae was recorded in Buttermilk chilli pods (62.87 ± 2.32%) while the lowest level of survival

observed in Mundu chilli pods (49.41 ± 1.89%).

References

1. Arifa SA. Bionomics, damage potential, and management of cigarette beetle, *Lasioderma serricorne* (Coleoptera: Anobiidae) in the storage of coriander. M.Sc. unpublished thesis, Madurai, 2015.
2. Ashworth Jeremy R. The biology of *Lasioderma serricorne*. Journal of stored products research. 1993;29(4):291-303.
3. Azmiera N, Singh S, Heo CC. The first report of cigarette beetle infestation on dried fish crackers in Malaysia. Jurnal Sains Kesihatan Malaysia (Malaysian Journal of Health Sciences). 2020;18(1):25-28.
4. Basheer A, Bilal H, Saleh A. Life table of the cigarette beetle, *Lasioderma serricorne* (F.) reared on dried tobacco leaves. Arabian Journal of Plant Protection. 2013;31(3):216-221.
5. Chaitanya N, Swamy SVS, Gopala, Madhumathi T, Lakshmipathy R. Biology of Tobacco beetle, *Lasioderma serricorne* (Fab.) on turmeric. Annals of Plant Protection Science. 2016;24(1):42-48.
6. Cabrera BJ. Cigarette Beetle, *Lasioderma serricorne* (F.) (Insecta: Coleoptera: Anobiidae). University of Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences Electronic Data Information Source (EDIS), Document EENY-227. 2001.
7. Dowd PF, Shen SK. The contribution of symbiotic yeast to toxin resistance of the cigarette beetle (*Lasioderma serricorne*). Entomologia Experimentalis et Applicata. 1990;56(3):241-248.
8. Kavin Raj S. Bionomics, damage potential and management of cigarette beetle, *Lasioderma serricorne* (Fabricius) (Coleoptera: Anobiidae) in stored cumin. M.Sc., (Ag.) Thesis, Department of Agricultural Entomology, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Madurai, 2017.
9. Mahroof RM, Phillips TW. Orientation of the cigarette beetle, *Lasioderma serricorne* (F.) (Coleoptera: Anobiidae) to plant-derived volatiles. Journal of Insect Behaviour, 2007, 20 (1).
10. Marimuthu S. Bioecology and management of Cigarette beetle (*Lasioderma serricorne* Fabricius) (Anobiidae: Coleoptera) on senna (*Cassia angustifolia* Vabl.). M.Sc. unpublished thesis, Killikulam, Vallanadu, 2003.
11. Moura ES, Zanuncio JC, Faroni LRD, Heleno FF, Wilcken FC, Plata-Rueda A, *et al*. *Lasioderma serricorne* (Coleoptera: Anobiidae): First Report on Black Sesame (*Sesamum indicum*). Journal of Food Protection. 2017;80(11):1941-1943.
12. Narasimha Rao, CHV, Narasimha Rao B, Ramesh Babu T. Biology of the cigarette beetle, *Lasioderma serricorne* Fabricus (Coleoptera: Anobiidae). Entomon. 2003;28(1):39-44.
13. Naveena K. Bio-ecology and management of cigarette beetle, *Lasioderma serricorne* F. (Coleoptera: Anobiidae) infesting stored turmeric, *Curcuma longa* L. M.Sc., (Ag.) Thesis, Department of Plant Protection, Anbil Dharmalingam Agricultural College and Research Institute, Tamil Nadu Agricultural University, Tiruchirappalli. 2018. Onion seeds. International Journal of Farm Sciences. 2018;1(1):59-60.
14. Retief E, Nicholas A. The cigarette beetle *Lasioderma serricorne* (F.) (Coleoptera: Anobiidae): A serious herbarium pest. Bothalia. 1988;18(1):97-99.
15. Saeed M, Khan SM, Shahid M. Food preferences of *Lasioderma serricorne* (F.) (Coleoptera: Anobiidae) on four types of tobacco. Sarhad Journal of Agriculture. 2008;24(2):279-284.
16. Sivik P, Tenhet N, Delamar D. An ecological study of the cigarette beetle in tobacco storage warehouses. Journal of Economic Entomology. 1957;50(3):310-306.
17. Tamang S. Biology and management of Cigarette beetle, *Lasioderma serricorne* (F.) on turmeric powder. M.Sc. (Ag.) Thesis, N. M. College of Agriculture, Navsari Agricultural University, Gujarat, 2015.
18. Verma SC. Record of cigarette beetle L*asioderma serricorne*. (Coleoptera: Anobiidae) on onion seeds. International Journal of Farm Sciences. 2011;1(1):59-60.