



BIOLOGY AND MORPHOMETRIS OF CIGARETTE BEETLE, *Lasioderma serricorne* (Fab.) ON FENNEL AND CORIANDER

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ABSTRACT

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Investigations were carried out on “Biology and morphometrics of *Lasioderma serricorne* Fabricius on fennel and coriander” during 2015-2016 at Department of Entomology, S. V. Agricultural College, Tirupati, at prevailing room temperature of $26 \pm 2^\circ\text{C}$ and relative humidity of 60-95 per cent. The durations of 1st, 2nd, 3rd and 4th instars were 8.42, 6.90, 7.60 and 7.73 days when insects were reared on fennel and 6.31, 6.60, 6.90 and 7.93 days when insects were reared on coriander respectively. The total larval duration, pupal duration and adult longevity were shorter (27.83, 12.26 and 12.93) on coriander than that of fennel (28.90, 12.63 and 13.19 days). Morphometric studies revealed that the head capsule width from 1st instar to 4th instar was more when insects were reared on coriander (0.109, 0.153, 0.239 and 0.434 mm) compared to fennel (0.109, 0.157, 0.227 and 0.331 mm). Body length of (1st, 2nd, 3rd, 4th, pupa and adult) were more when insects were reared on coriander (0.592, 0.967, 0.230, 3.430; 1.850 and 1.570 mm) than that of fennel (0.544, 0.934, 2.160, 3.23, 1.820 and 1.510 mm). The oviposition potential of the female insects reared on coriander was 62 eggs and on fennel were 56 eggs per female. Among two food materials tested, coriander provided the higher per cent survival (73.33%) of *L. serricorne*, followed by fennel (66.66%) from first instar to adult. The male to female ratio was worked out to be 1:1.44 on coriander whereas on fennel it was 1:1.33. It can be concluded that coriander was most supportive food material for the growth and development of cigarette beetle with least mean developmental period, higher morphometrics, higher per cent pupal and adult survival as compared to fennel.

KEYWORDS: Biology, coriander, fennel, morphometrics, *Lasioderma serricorne*, Per cent survival.

INTRODUCTION

Lasioderma serricorne (Fabricius) is a small (2-3 mm.) brown beetle of the family Anobiidae, commonly known as the cigarette beetle, cigar beetle, tobacco beetle or herbarium beetle (Jacob, 1998; Lyon, 1991). Its common name refers to the fact that this beetle is the most significant insect pest of all forms of stored tobacco, from cigarette packets to hogs heads and bales. Larvae of the cigarette beetle can feed on dried tobacco (Minor, 1979) either in the stored bundled form or in cigars, cigarettes and chewing tobacco. In addition to tobacco, these beetles also infest a variety of different food products such as ginger, cayenne pepper, dried yeast, chili powder, red pepper, paprika, turmeric, opium and pyrethrum powder (Tenhet and Bare, 1951; Howe, 1957). It also causes damage to a variety of stored products including grain cereal products, ginger, raisins, dates, pepper, dried fish, drugs and seeds. An effort was made in the present investigation to find a suitable host for growth and multiplication of *L. serricorne* along with morphometrics.

MATERIALS AND METHODS

The nucleus culture has been maintained on turmeric in the laboratory, since 2014. Eggs were collected from the nucleus culture with the help of fine camel hair brush and were placed in separate Petri Plates of size (9 cm). Grubs obtained from the eggs collected from nucleus culture were used for further experiments. First instars grubs were transferred to a multi cell well plate with the help of a fine camel brush. The length and breadth of the each plate was 12.5 and 8.5 cm respectively with six cells of 3.3 cm diameter and depth of 2.5 cm. The multi cell well plate had a loose transparent lid helped in taking observations without disturbing the insects. The grubs were provided with broken pieces of fennel and coriander and maintained at room temperatures of $26 \pm 2^\circ\text{C}$ and relative humidity of 60-95 per cent.

A total 30 insects were used for rearing on fennel and coriander separately. Each cell well was examined daily until emergence of adults to record the duration of immature life stages viz., eggs, larvae, pupae and adult.

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After every moulting, the larval duration was recorded and the numbers of instars were also recorded. From durations of larval instars, total larval duration was determined. From the total number of pupae formed, per cent pupal recovery was calculated. Pupae differentiated as male and female on the basis of genital papillae (Halstead, 1963) to determine sex ratio and pupal durations were recorded as date of pupation to date of adult emergence.

Freshly emerged one male and one female adult were released in separate plastic jars size of (6 × 4 cm) and observations were recorded adult longevity. The raw data was subjected to statistical analysis in Completely Randomised Design (CRD) with the help of SPSS statistical package (SPSS, 2013).

RESULTS AND DISCUSSION

The details of duration of various stages of cigarette beetle reared on fennel and coriander and their morphometric measurements are presented in table 1, 2 and 3.

First instar grubs were creamy white in colour and possessed few hairs on each segment. They were observed to be extremely active and immediately after hatching, started feeding voraciously. The developmental period of first instar grub was 6.66 ± 0.60 days when reared on fennel and duration of first instars when reared on coriander was 6.30 ± 0.70 days (Table 1). The second instar grub was also creamy white in colour, with a dense covering of hairs which soon after first moult became erect. Among fennel and coriander the duration of second instar grub was 6.90 ± 0.80 days when reared on fennel and 6.60 ± 0.72 days when reared on coriander (Table 1). The third instar grub was stout bodied, slightly yellowish in colour. They possessed long hairs on abdominal segments. The duration was 6.96 ± 0.61 days when grubs were reared on coriander where as on fennel it was 7.60 ± 0.72 days, were significantly different (Table 1). The fourth instar grub was "Scarabaeiform". The head was darkly sclerotized and body was whitish in colour with long hairs all along the body. The late fourth instar had sparse hairs on body. The developmental period was 7.73 ± 0.583 days when the insects were reared on fennel and on coriander it was 7.97 ± 0.49 days (Table 1) and were significantly different each other. When insects were reared on fennel the total grub developmental period was 28.90 ± 1.27 days and on coriander the total development

period was 27.83 ± 1.48 days, were significantly different (Table 1). The present results are in conformity with Abraham (1975) who reported that the larval periods of *L. serricorne* was 17 - 28 days, on coriander under Kerala conditions. The larval stage lasted for 32-34 days on stored spice of *Carum copticum* as a new host of *Lasioderma serricorne* (Padmavathamma and Rao, 1989).

Pupae were creamy white in colour with black compound eyes. The pupal duration when reared on fennel was 12.63 ± 0.92 days and on coriander it was 12.26 ± 0.98 days (Table 1). The results are in accordance with Abraham (1975) who reported that the pupal periods of *L. serricorne* were 2 - 12 days on coriander in Kerala conditions.

The adults were observed to be dark brown in colour and oval in shape with the first thoracic segment bent downwards. The head was deflexed and obscured from the above, giving the insect a humped appearance. The antennae were serrate. Body was covered with fine hairs. Females were observed to be usually larger than males. When disturbed they often pull in their legs and head and remain motionless. They were active through the night and were found most active at dusk. Mating took place within a day of adult emergence from the cocoon and lasted for 51 – 68.5 minutes. The adult longevity was 13.17 ± 1.09 days on fennel and on coriander it was 12.93 ± 0.94 days (Table 1). The male to female ratio observed on coriander was 1:1.44 whereas on fennel it was 1:1.33. The present results are in conformity with Alaa Saleh (2012) who reported the average longevity of female as 19.80 ± 0.66 , 15.20 ± 0.37 , 14.20 ± 0.37 , 13.80 ± 0.37 and 12.80 ± 0.37 days when reared on dried ficus, grains millo, powdered chicken stock (Maggi), yeast and dried tobacco leaves, respectively.

On coriander the total development period was 53.03 ± 1.97 days and it was 54.70 ± 1.80 days on fennel. Total developmental periods differed significantly with each other. On an average, a female laid 56 eggs on fennel and 62 eggs on coriander. The total egg-to-adult development on fennel and coriander was 54 and 53 days. These observations were in close conformity with the findings of Rolania (2009) they reported the total developmental period of beetles varied from 46.3 to 64.2 days on different fennel varieties.

The female beetle deposited the eggs loosely and singly on the surface of the food material. The eggs of cigarette beetle were observed to be pearly white in colour and oval in shape with a slight swelling in the middle and

Table 1. Duration (days) of various life stages of cigarette beetle, *L. serricorne* on fennel and coriander

Treatments	1 st instar (Mean ± SD)	2 nd instar (Mean ± SD)	3 rd instar (Mean ± SD)	4 th instar (Mean ± SD)	Total larval duration (Mean ± SD)	Pupal duration (Mean ± SD)	Adult longevity (Mean ± SD)	Total developmental period (Mean ± SD)
Fennel	6.66 ± 0.60	6.9 ± 0.803	7.6 ± 0.724	7.73 ± 0.583	28.90 ± 1.269	12.63 ± 0.92	13.17 ± 1.09	54.7 ± 1.803
Coriander	6.30 ± 0.70	6.60 ± 0.72	6.96 ± 0.61	7.97 ± 0.49	27.83 ± 1.48	12.26 ± 0.98	12.93 ± 0.94	53.03 ± 1.97
Significance of F value at	0.035	0.134	0.001	0.099	0.004	0.142	0.362	0.001

Table 2. Head capsule width (mm) of different instars of cigarette beetle, *L. serricorne* on fennel and coriander

Treatments	1 st instar (mm) (Mean ± SD)	2 nd instar (mm) (Mean ± SD)	3 rd instar (mm) (Mean ± SD)	4 th instar (mm) (Mean ± SD)
Fennel	0.109 ± 0.006	0.157 ± 0.010	0.227 ± 0.012	0.331 ± 0.070
Coriander	0.109 ± 0.015	0.153 ± 0.006	0.239 ± 0.013	0.434 ± 0.015
Significance of F value at	1	0.098	0.001	0.01

Table 3. Body length of various life stages of cigarette beetle *L. serricorne* on fennel and coriander

Treatments	Egg length (mm) (Mean ± SD)	Egg width (mm) (Mean ± SD)	1 st instar (mm) (Mean ± SD)	2 nd instar (mm) (Mean ± SD)	3 rd instar (mm) (Mean ± SD)	4 th instar (mm) (Mean ± SD)	Pupal (Mean ± SD)	Adult (Mean ± SD)
Fennel	0.344 ± 0.050	0.168 ± 0.021	0.544 ± 0.053	0.934 ± 0.082	2.160 ± 0.152	3.230 ± 0.220	1.820 ± 0.02	1.510 ± 0.024
Coriander	0.391 ± 0.034	0.182 ± 0.01	0.592 ± 0.070	0.967 ± 0.071	2.230 ± 0.100	3.430 ± 0.154	1.850 ± 0.024	1.570 ± 0.024
Significance of F value at	0.025	0.091	0.004	0.105	0.065	0	0	0

bluntly rounded. There were small papillae like structures projecting at one end from which the grub emerges out. This feature, distinguishes the egg of *L. serricornis* from the egg of other anobiid, *Stegobium paniceum* (Linnaeus, 1758). The eggs when freshly laid were translucent, smooth and shining, which later became pearly white in colour. The length and breadth of eggs obtained from adults of coriander was 0.391 ± 0.034 mm and 0.182 ± 0.01 mm, while on fennel it was 0.344 ± 0.050 mm and 0.168 ± 0.021 mm respectively. The results were similar to that of Chaitanya *et al.* (2016) they reported the average length and breadth of the egg was 0.36 ± 0.004 mm and 0.18 ± 0.004 mm, respectively.

Morphometric studies revealed that the head capsule width from 1st instar to 4th instar was more in coriander (0.109, 0.153, 0.239 and 0.434 mm) compared to fennel (0.109, 0.157, 0.227 and 0.331mm) (Table 2). The head capsule width of 3rd instar grubs were significantly different each other. The results were in accordance with the Rao *et al.* (2003) they reported the head capsule width of four instars were 0.10, 0.15, 0.36 and 0.49 mm, respectively.

Body length of (1st, 2nd, 3rd, 4th, pupa and adult) were more in coriander (0.592, 0.967, 2.23, 3.43; 1.85 and 1.57 mm) than that of fennel (0.544, 0.934, 2.16, 3.23, 1.82 and 1.51 mm), respectively (Table 3). The body length of 1st instar grubs were significantly different each other. The results were in accordance with the Rao *et al.* (2003) they reported the body length were 0.55, 0.77, 1.33, 2.62, 1.73 and 2.39 mm for 1st, 2nd, 3rd, 4th, pupa and adult, respectively.

CONCLUSION

It can be concluded, among the two foods tested, coriander was proved to be more congenial for growth and development of cigarette beetle with least mean developmental period, higher morphometrics, higher pupal and adult per cent survival as compared to fennel.

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