Univ. j. zool. Rajshahi Univ. Vol. 26, 2007. pp. 99-102 ISSN 1023-6104
http://journals.sfu.ca/bd/index.php/UJZRU

A pest of stuffed museum specimen *Anthrenus scrophulariae* (L.) (Coleoptera: Dermistidae)

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Abstract: A pest of stuffed museum specimen, *Anthrenus scrophulariae* is known as carpet beetle. It is a serious and destructive coleopteran insect to stuffed and preserved museum bird and mammal specimens. The larvae devoured the feather, hair and skin of stuffed animals. The stuffed animals became feather or hairless and ultimately destroyed. Food and feeding habits and development of larvae were evaluated. The life history also observed in room temperature. Mean length of mature larvae was 3.16±072; 3.11±054; 2.75±077; 2.92±046 and 2.81±059 mm for feather, leather of goat and cow, dried cocoon of silkworm, dried insects and hair of mammal respectively. Number of eggs varied from 41-54 with a mean of 47.80 in the case of females which supplied food. No food supplied female laid 28-33 eggs. The mean length and breadth of eggs was 0.43±.112 and 0.212±0.54 respectively. Incubation period varied from 12-18 days. Larval period was varied from 140-148 days. Larvae passed 6 instar larvae is brownish in colour and very hairy. Pupal period varied 18-20 days. Mean length of pupae was 3.75±0.30 and breadth 1.87±0.05 mm. The duration to the life cycle (egg to the death of adult) of the carpet beetle, *A. scrophulariae* was ranged 182-199 days.

Key words: museum specimen *A. scrophulariae*

Introduction

Stuffed museum specimen, *Anthrenus scrophulariae* (Linnaeus) is a pest of commonly known as the varied carpet beetle (Blake, 1959), or Buffalo beetle (Metcalf and Flint, 1973) called the carpet beetle. There are three species such as *Anthrenus scrophulariae* (Linnaeus), *Anthrenus flavipes* (Vorax) and *Anthrenus verbasci* (Linnaeus). Beside these *Ataginus piceus* (Oliver) is also included among the carpet beetle, (Ayappa *et al*., 1958; Metcalf and Flint, 1973). The carpet beetles generally live in the dry and warm places. The beetles are found in clothing, rugs, the upholstery covers and interior padding furniture, curtains, especially those containing wool, fur, feathers or hair and brushes made of animal bristles (Metcalf and Flint, 1973). The black carpet beetle *A. scrophulariae* is also found in nature, is a serious pest of preserved museum animal specimens, and is distributed throughout the world (Annon, 2003).

A. flavipes was first reported to occur in India by Cotes (1890) who found it on dried mammalian skin in the Indian Museum, Calcutta. Back (1931) reported this species in the United States and also in Algeria, Spain, Greece, Southern Russia, Mesopotamia and the East Indies. It has also been reported from Sudan (Annon, 1918). The adult beetles feed at normal conditions only on pollen and nectar of flowers in nature (Ayappa *et al.*, 1958; Blake, 1959; Woodroffe and Southgate, 1955).

Theÿÿarÿÿe are generallÿÿfound to feeÿÿ0 on wool, hair, feathers, bristles, fur, horn and tortoise-shell (Hinton, 1945). Back & Cotton (1937), found that the larvae occasionally gnaw holes in cardboard wrapping and damage cotton, linen, rayon, silk, jute, leather, soft wood and other materials, preferably if these are stained or impregnated with animal exertions or other suitable matter. They authors also found that the larvae skeletonise dead mice and eat dead insects, cheese, old grain, casein, dried blood and the glue in book bindings. The larvae have been recorded as feeding on the exuviae in the nests of the moths (Hinton, 1945). *A. scrophulariae* feed on insect collections, dried plants, flour and wheat adult feed on pollen and nectar during mating season (Annon, 2003). *A. scrophulariae* was found to feed on the skin of museum specimen of birds and mammals (Rahman and Delowar Hossain, personal communication).

There is very little detailed information about *A. scrophulariae* is a serious and destructive pest of museum stuffed bird and mammal specimens. The present work has been under taken to determine the food and feeding habit and development of *A. scrophulariae* different stuffed specimens under laboratory condition.

Materials and Methods

The larvae were collected from the infested stuffed specimens of bird and mammal, from the professor Mustafizure Rahman Memorial Museum, Department of Zoology, Rajshahi University, in the month of August 2003.

Five experiments *A. scrophulariae* were set with feather of stuffed bird, hair of stuffed mammals (small piece of goat and that of cow), dried cocoons of silkworm and dried insects. Birds feathers were kept in 500 ml beaker, and other materials in glass petridishes (9 cm diameter). Larvae *A. scrophulariae* were collected and released (in different numbers) in food materials and kept of seven months. Larvae of *A. scrophulariae* were carefully observed daily. The life stages of the beetle were detailed and the developmental times were determined on different food.

Results and Discussion

Larval development of A. scrophulariae on different food materials: The rate of development of the larvae of the carpet beetle was found to be varied on different stuffed materials (Table 1). The larval stage was found to pass six instars and took longer time to metamorphose into pupae (Fig. 1). Developmental rate of *A. scrophulariae* are known to vary with the summer and winter seasons. The full grown larvae appeared to be brownish in color with dense hairs over the body.

Table 1: Development of carpet beetle *A. scrophulariae* larvae reared on different stuff materials.

No. of Obs.	Stuffed materials	Larval length Mean±SD (mm)	
10	Bird feather	1.62±0.13	3.16±0.07
10	Leather (goad & cow)	1.45±0.11	3.11±0.05
10	Silk worm	1.50±0.11	2.75±0.77
10	Dried insect	1.60±0.11	2.92±0.05
10	Mammal hair	1.70±0.08	2.81±0.05

Larval growth on the basis of their length was observed to be maximum at last larval stage, as 3.16±0.07 mm on birds feather, and the minimum growth was recorded as 2.75±0.77 mm on silkworm cocoon (Table 1). Though the larvae did not prefer cocoon but they liked to feed on scales of the dried butterfly (dried insect), destroying the whole insect. However, a number of larvae were found to die living on mammals hair, due to nutrient deficiency.

The larval period was found to vary from 140-148 days on different food materials. The mean length and breadth of the pupae on different food materials, were ranged from 3.0-4.5 mm 1.50-2.0 mm respectively. After 18-20 days the adults were emerged from the pupae. The egg to adult development of *A. scrophulariae* was found to completed in 182-199 days.

Characters of adult A. scrophulariae: Adults are oval in shape, head is more or less hidden from above. Compressed eyes are notched around inner margin. Antenna short, with compact 3-segments, one segment distinctly shorter than the other two, and clubbed. Underside of addomen with black patehes of scales on each side.

Females were black, but head, thorax, ethylra and abdomen contained white patches; and they were small then males. The males are orange colored with white patches are percent on head, thorax and abdomen, black patches are found and thorax and edgtra, variable pattern of whitish, orange and black oval scales are also noticed on the body.

Body size: The range and mean body length and breadth on 15 male and female beetles collected from different sets are shown in table 2, the males were larger in size than the females.

Table 2. Body length and breadth, and longevity of adult male and female *A. scrophulariae* (N=15).

Sex	Body length (mean±SE) mm	Body breadth (mean±SE) mm	Longevity (mean±SE) day
Male	3.00-3.50 (3.22±1.02)	2.00-2.50 (2.20±0.69)	10-13 (11.6±0.21)
Female	2.25-3.00 (2.80±0.88)	1.00-1.50 (1.40±0.62)	13-16 (14.61±0.71)

Pre-mating and mating period: When two females were kept with a male beetle, the pre-mating period was found to range form 5-6 hours, and mating was started at sunset. Mating was continued for 20-40 minutes with an average of 31.42 minutes. During the adult life the beetles mated for 3-4 times.

Ovipositon period: There was on significant difference in oviposition period of *A. scrophulariae* among the fed and unfed females. The females having food (pollen of sweet ground flower) laid eggs for four days, and those under starvation laid eggs for three days (Fig. 2).

Fecundity and incubation period: The number of eggs laid varied from 41-54 with an average of 47.80 by the female provided with food. The starved females laid eggs 28-33 with an average of 30.20 (Fig. 2). On average 70.90±22.09% of the laid eggs were hatched (range 60-70%) after an incubation period of 12-18 days (mean 13.71±4.32 days). The mean length and breadth of the eggs were 0.43±0.11 mm and 0.21±0.54 respectively.

Longevity of adults: Longevity of the adults under experimental condition was observed. The females lived longer than the males (Table 2).

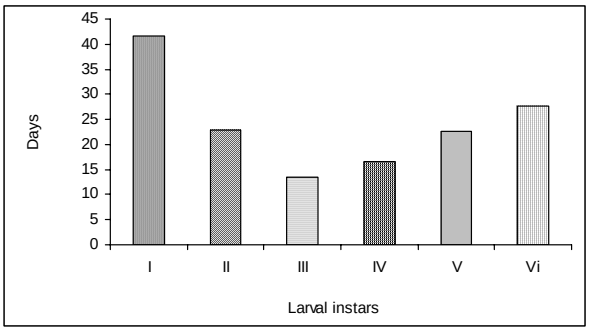

Fig. 1. Duration of larval inster in *A. scrophulariae*.

The present work was just an primitive observation and describes the life characters of the carpet beetle *A. scrophulariae*. The observed data were not statistically to compare the differences between the data obtained from different food materials, those between the two sexes.

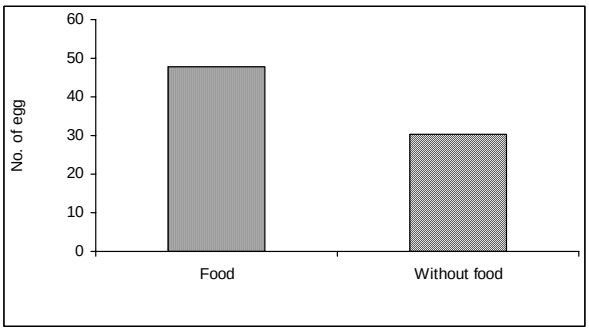

Fig. 2. Effect of food on the oviposition in *A. scrophulariae*.

In the present study a full grown larva differed according to the rearing food materials, stowing the minimum as 1.45±0.11 mm and maximum as 1.70±0.08 mm. Blake (1959) reported that a full grown larva measured from 3.40-4.40 mm and Metcalf & Flint (1973) measured them as a little bit more then ¼ inch. Sengupta et al. (1990) and Annon (2003) found the larvae to attain length as 3-4 and 4-5 mm respectively.

Anthrenus beetles are reported to pass the winter in grub stage (Sengupta et al., 1990) and require longer times to complete the life cycle, 77-100 days up to 2 years (Annon, 2003).

Anthrenus flavipes larval development varied with temperature and season, temperature range between 25-31°C *A. flavipes* larvae took 222.60±4.51 days to pupal (Ayappa et al., 1958). Blake (1959) reported that *Anthrenus verbasci* during the summer passed an active developmental period, and passed slow development during the winter. In the present study the larvae of *A. scrophulariae* took longer time to develop during the winter (upto the end of February).

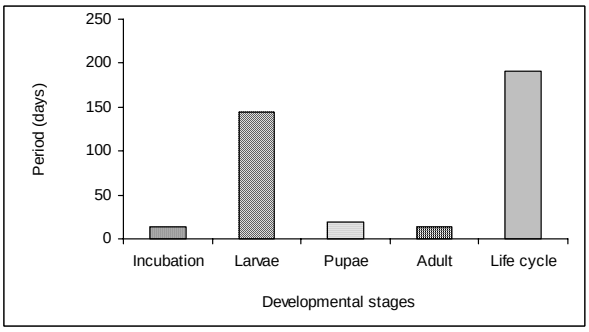

Fig. 3. Showing the developmental periods *A. scrophulariae*.

Published reports on life cycle of *A. scrophulariae* are negligible. Female *A. flavipes* have been found to ovipositor for 3-12 days (Ayppa, 1958), whereas, in the present work they oviposited for only 4 days, Annon (2003) found 30-60 eggs were laid by *Anthrenus vorax*, whereas, *A. scrophulariae* laid 41-54 eggs when the females were fed on sweet ground flower pollen. The embryogenesis is completed during different periods, depending on the species, temperature and food materials (Annon, 2003; Ayappa, 1958; Metcalf & Flint, 1973), and all these authors found decreased incubation periods compared to the present experiment. The present work reports on the life cycle and developmental time of the life stages of *A. scrophulariae*, a notorious pest of the stuffed museum specimen. The research needs detailed works, of the management of this beetle.

Acknowledgement

We are grateful to Professor Dr. M.A. Mannan, Chairman, and Professor Dr. Selina Parween, Department o Zoology, Rajshahi University, for their full cooperation and critical reviews on the manuscript.

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Manuscript received on 27.07.07,accepted on 20.11.07