



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(11): 1591-1594
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www.thepharmajournal.com
Received: 18-07-2023
Accepted: 22-08-2023

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The Biology of Uzi fly – A dangerous pest of mulberry Silkworm *Bombyx mori* L

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Abstract

Mulberry rearing is done in indoor conditions but is threatened by some pests and diseases from time to time. One of the major problems in mulberry rearing is an insect pest known as uzi fly belonging to the family Tachinidae of order Diptera. The uzi fly infesting mulberry silkworm is known as *Exorista sorbillans* (Wiedemann). In Assam people rear the silkworms mainly in bamboo houses and the doors and the windows are without screens so the uzi flies can easily enter the rearing houses. The female uzi laid their eggs on the intersegmental region of the silkworm body. After hatching, the maggot entered the silkworm body, leaving behind a black scar, the main identification mark of the uzi fly infestation. Only 1 or 2 mated adult female is sufficient to infest 300 to 400 numbers of mulberry silkworms. The total life span of the uzi fly was found to range from 28 to 42 days in the case of males and on average of 34.5 days and 29 to 43 days in the case of females and on average of 35.8 days.

Keywords: Uzi fly, Tachinidae, silkworm, maggot, pupa

1. Introduction

In Assam mainly Muga, Eri and mulberry silkworm rearing are practiced. Because it is suitable for small-scale farmers with minimal resources, mulberry silkworm rearing is a traditional agro-based practice in Assam. Assamese people raise silkworms for the manufacture of silk as well as for human consumption as the larva and pupa of silkworms has high protein content. As Muga rearing is done in outdoor conditions the disease and pest attack is somewhat more but even though mulberry silkworm rearing is done indoors, it occasionally comes under attack from various diseases and pests. Several reasons limit and lower yields during successful silk production, which leads to low yields. One of these factors is the deadly insect pest uzi fly, which belongs to the family Tachinidae of order Diptera. In Japan, the first instance of a tachinid fly parasitizing mulberry silkworm (*Bombyx mori* L.) larvae was documented in 1868. Up until 1980, the only threat to the sericulture sector was from diseases, but in South India, a new threat was discovered in the form of the uzi fly. It was only limited to the North-Eastern region before 1980, but beginning in that year, it extended to South India. According to Cotes (1889a, 1889b)^[1, 2] West Bengal and Assam are the only places where the uzi fly infesting mulberry silkworm has been documented. The uzi fly was initially discovered in West Bengal and was only afterwards discovered to affect mulberry silkworms in Assam and West Bengal. The late instar silkworm larvae are the main target of this endo-larval parasite known as the uzi fly. Depending on the situation, uzi fly can cause crop losses of up to 75% but generally causes 10-15% crop loss. The percentage of infestation varies from season to season and is observed to be highest during the rainy season. The primary distinguishing features of an infestation with uzi flies are a black scar on the larval body and an emerging hole on the cocoons. (Source: CSB). Assam has a year-round uzi infestation since mulberry silkworms are raised there more or less year-round. Due to the close synchronization of the multivoltine mulberry silkworm's life cycle with the uzi flies, it is nearly impossible to conduct multivoltine mulberry silkworm rearing without uzi fly infestation. The windows and ventilators are left unscreened, making it easy for the uzi fly to enter the rearing room and infest the silkworms. Silkworms are reared by farmers in pakka or thatched homes. The uzi fly is frequently referred to as "bor makhi" or "kuji makhi" by farmers in Assam. The uzi fly can be controlled in a variety of biological and botanical ways, but Assamese marginal farmers do not use those methods since they are unpopular. The farmers lack in-depth knowledge of biology, the nature of damage, infestation severity and the control measures of the uzi fly. The present study was conducted to know the nature of damage and biology of the uzi fly infesting mulberry silkworm in Assam.

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2. Materials and Methods

The uzi fly's life cycle was studied in a laboratory at room temperature with temperature and humidity levels varying from 24 °C to 33 °C and 79% to 86% throughout the study period. To accurately obtain information on the entire biology and life cycle, a thorough record of every data starting from oviposition to adult longevity was maintained. Total 10 numbers of transparent plastic containers (15×30 cm) were taken and 10 numbers of healthy late-age silkworm larvae were taken in each container to conduct the study. After that 1 mated adult female was introduced to each container. Data from every 10 containers were taken for further study. As feeding, 70% honey solution and 10% glucose solution were given to the adult uzi flies. A binocular stereoscopic (10x) microscope (Make: Zeiss, Model: AxioCam ERc 5s) was used to measure the dimensions of the egg, maggot, pupa, adult, and adult wing span.

3. Results

The adult females of *Exorista sorbillans* were seen to lay their eggs on any area of the silkworm's body, but they tended to do so more frequently on the dorsal and dorso-lateral sides of the body of the larvae. The eggs were glued to the intersegmental portion of the body mostly. The adult female was observed to lay 1–8 eggs per silkworm when kept in an enclosed condition. The mated female preferred fourth and fifth instars silkworm larvae over second and third instar larvae for egg laying. The incubation period was found to be ranges from 1 to 3 days. The hatching of the egg took place on the anterior portion of the egg on the upper side and the maggot directly entered the silkworm body leaving a scar which was first seen to be lighter in color and gradually turns to black. The hatching percentage was found to be 47.08%.

3.1 Egg stage of *E. sorbillans*

The eggs were glossy white, oval and macro type. The dorsal aspect of the egg was convex and the ventral aspect of the egg was concave. The Chorion was almost transparent.

3.2 Larval stages of *E. sorbillans*

The maggots were fusiform, apodous and acephalous and it was represented by a pair of down-curved mouth hooks. They had 12 numbers of distinct body segments. The posterior portion was somewhat round in shape and the anterior portion was somewhat pointed. The larva of the uzi fly had three instars the first and second instar maggots were present inside the host body and the third instar maggot after maturation came out of the host body.

First instar maggot: They were glossy white with one pair of spiracle present in the posterior portion of the body and the spiracle was represented by two small dots or slits.

Second instar maggot: Maggots were creamy white and a pair of spiracles was present on the posterior body part and the peretreme was sclerotized and light brownish. 1st and 2nd instar maggots were sedentary and were present near the penetration slit inside the body of the host.

Third instar maggot: They were yellowish white and had a pair of prominent spiracles at the posterior portion, peretreme was highly sclerotized and was blackish brown, also had 3 well-developed slits. In the early period the third instar maggots were present near the penetration site but in the later period they started freely moving inside the whole body and feeding on the fat bodies. After maturation, they came out of the body of the host by puncturing the integument by pushing the posterior end of the body from any point of the larval body. The maggot after emergence from the silkworm larval body searches for a perfect place for pupation and the pre-pupal period ranged from 4 to 5 hours.

3.3 Pupal stage of *E. sorbillans*

The pupae were coarctate and reddish brown which gradually turns to dark brown. Uzi flies generally pupate in the cracks and crevices inside the rearing room, in the soil surrounding the rearing rooms and sometimes in the corner of the rearing tray. The pupae had 11 segments and the posterior portion of the pupa was somewhat round in shape. The adults emerged by breaking through a circular line of weakness in the anterior portion of the puparium by pushing through its head mostly during the morning hours when the temperature was optimum and low emergence percentage was observed when the temperature was very low. The adult emergence percentage was found to be 86.34% in laboratory conditions. The female-male sex ratio was found to be 2.23:1.

3.4 Adult Characteristics

The adult flies were blackish grey and has four numbers of longitudinal lines on the thorax of the fly, as well as they, had long bristles on the lateral sides of the abdomen.

The mating of the uzi flies was observed during the daytime and the mating period lasted from 20 minutes to 1 hour and 15 minutes. Mating mostly occurs on the day of emergence or within 1-2 days of the emergence of the female.

3.5 Nature of damage of *E. sorbillans*

A black scar on the silkworm body is the main characteristic symptom of the uzi infestation. Sometimes more than one black scar can be seen on the silkworm body which indicates more than one uzi maggots were present inside the host. The silkworms which were infested in the fourth instar or third instar, the maggots became matured inside the larvae before the silkworm larva starts spinning a cocoon. As a result of this, the silkworm larvae became sluggish, liquid started oozing out of the body and the larva gradually turns blackish color which ultimately leads to the death of the larva. There was 100 per cent mortality seen in the case of the silkworm larvae before spinning cocoon when the larvae were infested in IIIrd instar or IVth instar. The larva infested in the Vth instar managed to spin the cocoon but the maggot comes out by piercing a hole in the cocoon resulting in pierced cocoons. This makes the cocoon unreelable and causes economic loss to the farmers. Sometimes some maggot pupates inside the silkworm cocoon also.

Table 1: Developmental parameters of uzi fly, *Exorista sorbillans* (Wiedemann) in mulberry silkworm

Sl. No.	Parameter	Mean (±) SEM	Range
1	Larval period(days)	7.10±0.33	5-9
2	Pupal period(days)	15.55±0.41	14-18
3	Adult emergence (%)	86.34±2.4	74-94
4	Sex ratio	2.23:1	-
5	Adult longevity (days)		
	Male	9.40±0.46	8-12
	Female	11.15±0.48	9-14

*Based on 10 numbers of observations

Table 2: Reproductive parameters of uzi fly, *E. sorbillans* in mulberry silkworm

Sl. No.	Parameter	Mean (\pm)SEM	Range
1	Pre-oviposition period (hours)	5.61 \pm 0.29	4-7
2	Oviposition period (days)	4.50 \pm 0.36	3-6
3	Rate of oviposition (no.of eggs/female/day)	40.10 \pm 2.40	28-55
4	Fecundity	250.70 \pm 16.97	172-325
5	Post-oviposition period (days)	5.75 \pm 0.20	5-7

*Based on 10 number of observation

Table 3: Measurements of different life stages of *E. sorbillans*

Sl. No.	Life stage	Length(mm) Mean (\pm)SEM	Range	Width(mm) Mean (\pm)SEM	Range
1	Egg	0.590 \pm 0.050	0.4-0.7	0.310 \pm 0.045	0.2-0.4
	Maggot				
2	First instar	0.959 \pm 0.116	0.6-1	0.548 \pm 0.052	0.3-0.6
	Second instar	5.584 \pm 0.660	4-7	2.078 \pm 0.201	1-3
	Third instar	14.372 \pm 0.533	12-15	4.564 \pm 0.103	4-5
3	Pupa	11.467 \pm 0.471	10-13	5.104 \pm 0.173	4-6
	Adult				
4	Male	11.299 \pm 0.253	10-12	3.436 \pm 0.173	2-4
	Female	10.281 \pm 0.173	9-11	3.490 \pm 0.116	2-4
	Wing span				
5	Male	8.584 \pm 0.161	8-9	3.360 \pm 0.131	2-4
	Female	7.611 \pm 0.090	7-8	2.942 \pm 0.216	2-3

*Based on 10 numbers of observation

4. Conclusions

The uzi flies were found to be laid their eggs on the intersegmental region of the silkworm body. On average an adult female laid about 40.10 numbers of eggs per day and the fecundity of the uzi fly was found to be 250.70 numbers of eggs per female laid in 4.55 days of the oviposition period on average. The incubation period was seen 2.55 days in case of uzi fly eggs and the hatching percentage was found to be 47.08% in laboratory condition. The egg was glossy white in color, dorsal aspect of the egg was convex and the ventral aspect was concave in nature. The maggots were fusiform in shape, apodous and acephalous and were found to be represented by a pair of mouth hooks. The maggot had 12 numbers of body segments. The total larval period was found to be an average of 7.10 days and the pre-pupal period ranges from 4 to 5 hours. The pupae of the uzi fly were coarctate type and reddish brown which gradually turns to dark brown and had 11 numbers of segments. The pupal period was the longest period of life cycle and was found to be an average of 15.55 days. The adult emergence percentage was found to be 86.34% in laboratory condition. The adult uzi flies were medium-sized and blackish-grey and has four numbers of longitudinal lines on the thorax of the fly as well as long bristles on the lateral sides of the abdomen. The life span of the adult on average was found to be 9.40 days in the case of males and 11.15 days in the case of females. The total life span of the uzi fly was found to range from 28 to 42 days in the case of males and an average of 34.5 days and 29 to 43 days in case of females and an average of 35.8 days. A black scar on the silkworm body and pierced cocoon are the two main characteristic symptoms of the uzi infestation.

5. Discussions

There are a few pieces of information regarding the biology of the uzi fly are present which includes in 1962 Das Gupta found that the fecundity of the uzi fly was 300 and eggs were mostly laid in the dorso-ventral region of silkworm larvae and

the adult emerged by employing the growing membrane of the anterior portion of the head and breaking through the front region of the puparium. Sriharan *et al.* (1971) [3] stated that the female started laying their eggs the second day after emerging and fecundity was reported in 380 numbers of eggs. Between 4 and 7 days after emergence, the highest numbers of eggs were deposited. It is also claimed that for oviposition, IVth and Vth instar worms were usually chosen over IIIrd instar worms, incubation period varied from 2 days in the summer to 3 days in the winter. It was also noted that a black scar had formed on the entry place of the maggot and the pre-pupal stage ranged between 0.27 to 0.33 days and during this time the maggots searched very far distances for crevices and dark areas to pupate. In addition, they claimed that the maggot had entered slightly into the earth to pupate. Dutta and Mukherjee (1978) [4] stated that depending on the season, female uzi lay between 21 and 70 numbers of eggs per day, first instar maggots were fusiform in shape, with a transparent cuticle and evident body segmentation, one solid downward-curving oral hook serves as the solitary cephalic appendage. The second instar maggots were fusiform in shape, yellowish-white, evident body segmentation, very sharp, non-serrate mouth hooks, two slits in the posterior spiracles, and a heavily sclerotized peritreme. The maggots of the third instar have three radial, straight breathing apertures. Each of their posterior spiracles was situated in a heavily sclerotized peritreme, creamy white color, and clear body segmentation, pupae were oblong with a slightly pointed front and rounded posterior, reddish brown at first, then gradually darkens to a dark reddish-brown color. Pupa size varied from 0.40 cm to 0.60 cm in width and 0.90 cm to 1.20 cm in length, with 11 body segments. The pupal stage lasted 10 days in the summer and 14 days in the winter, adult uzi flies were grey and coated with dark grey hairs on their wings. In addition, they noted that the thorax had four longitudinal lines and that the male was slightly larger than the female in size. Reddy *et al.* (2015) [6] reported that the uzi fly prefers to lay its eggs on silkworm larvae in their fourth and fifth instars and typically lays 1-2

eggs on the intersegmental parts of the silkworm and it can lay up to 1000 eggs at a time.



Black scar



Pierced Mulberry cocoon



Uzi fly Egg



1st instar



2nd instar



3rd instar



Uzi fly Pupa



Adult

References

1. Cotes EC. Further notes on insects. Indian Museum Notes. 1889a;1(1):63-64
2. Cotes EC. Entomology notes. 1. *Tricholyga bombycis*. Indian Museum Notes. 1889b;1(2):77- 80 & 83-88.
3. Sriharan TP, Samson MV, Krishnaswami S, Dutta RK. Laboratory investigation on Uzi fly *T. bombycis* Beck. A tachinid parasite of silkworms (*Bombyx mori* L.). Indian Journal of Sericulture. 1971;10(1):14-22.
4. Dutta RK, Mukherjee PK. Life history of *Tricholyga bombycis* (Diptera: Tachinidae), a parasite of *Bombyx mori* (Lepidoptera: Bombycidae). Annals of Entomological society of America. 1978;71:767-770.
5. Kumar P, Jolly MS. Studies on the ovipositional preference of uzi fly, *Tricholyga bombycis* Beck. (Diptera: Tachinidae). Indian Journal of Sericulture. 1986;25(2):64-68.
6. Reddy BV, Lakshminarayana Reddy P, Shanthan Babu MA, Sujatha B, Naik S. Egg laying patterns of the uzi fly, *Exorista sorbillans* (Wiedemann) on the larvae of the silkworm, *Bombyx mori* L. Global Journal of Bio-science and Bitechology. 2015;4(1):175-180.

Acknowledgments

The author is grateful to his Major advisor and Chairman Dr. Roshmi Borah Dutta, all the members of her advisory committee, Dr. Surajit Kalita, Dr. Popy Bora, Dr. Hemanta Saikia, the official staff of the Department of Sericulture and Department of Entomology, AAU, Jorhat, Director of Post Graduate Studies Dr. Anup Kumar Das, the staff of the DPGS office, all the staff of Govt. Sericulture Farm, Titabar, her parents and friends for their help and support in completing her research work. She apologizes for any errors or omissions.