Biological Forum – An International Journal **15(10): 1152-1157(2023)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

A Study on the extent of Uzi Fly infestation on Muga Cocoons in the Districts of Lakhimpur and Dhemaji of Assam

Dipankar Brahma[1*], Rushali Chakraborty[2], Roshmi Borah Dutta[3], Vasanth V.[1] and Nilav Ranjan Bora[1]

[1]Ph.D. Scholar, Department of Sericulture,
Forest College and Research Institute, TNAU, Mettupalayam (Tamil Nadu), India.
[2]Department of Entomology, AAU (Assam), India.
[3]Assistant Professor, Department of Entomology, AAU (Assam), India.

(Corresponding author: Dipankar Brahma)*
(Received: 25 August 2023; Revised: 19 September 2023; Accepted: 05 October 2023; Published: 15 October 2023)
(Published by Research Trend)

ABSTRACT: Since muga silkworms are reared outdoors, a variety of pests and diseases attacks the silkworm frequently. The Uzi fly, or *Exorista sorbillans*, is a parasitic dipteran fly that lays its eggs mostly on late intar muga silkworm larvae. The Uzi fly's maggots enter the larval body after hatching from the eggs and consume the silkworm's tissue and fat bodies. After emerging from the cocoons, the mature maggots pupate in the grainage hall. The study aims to investigate the prevalence of Uzi fly infestation on Muga cocoons in Lakhimpur and Dhemaji districts of Assam and analyse the factors contributing to the infestation. A total of 500 cocoons were collected during all the four crop seasons from different muga rearing areas of both the districts and the percentage of infestation was recorded. The study found that the infestation rate varied among seasons, with the highest infestation recorded during Chotua crop (March-April) at 46.8% and the lowest during Kotia crop (Oct.-Nov.) at 20.4%. Meteorological data, such as maximum and minimum temperature, relative humidity, rainfall, and number of rainy days, were also recorded and analyzed to identify the factors contributing to Uzi fly infestation. Correlation coefficient analysis showed that temperature and rainfall significantly influenced the Uzi fly infestation. With the increase in temperature and rainfall the infestation of Uzi fly increases drastically. Because silkworm harvests are available year-round, the uzi fly can persist and establish itself in Muga rearing areas. Difficulties and lack of control measures also play a major role in the infestation of Uzi fly.

Keywords: Muga, Uzi fly, Chotua crop, Kotia crop, temperature, rainfall, Assam.

INTRODUCTION

Assam is known for its rich biodiversity and unique sericulture practices. Among the various types of silk produced in Assam, Muga silk holds a significant place in the sericulture industry. The Muga silkworm is polyphagous, semi-domesticated, and multivoltine in nature with five generations in a year (Thangavelu *et al*., 1988). The demand for Muga silk has been rapidly expanding in recent years because of its distinctive natural golden colour, durability and exquisite texture, indicating its enormous market potential (Tikader *et al*., 2013). Assam produces 240.46 MT of muga silk in 2020-21 (Statistical hand book Assam, 2021). However, the production of Muga silk is often hindered by various pest and diseases. One such pest is the Uzi fly, which infests the Muga cocoons and causes significant damage.

The Uzi fly (*Exorista sorbillans*) is a dipteran parasitic fly that lays eggs mostly on the late instar silkworm larva, later making the muga cocoons unfit for reeling. The Japanese uzi fly, *Crossocosmia sericaria* (Rodani), Hime uzi fly, *Ctenophora pavida* (Meigen); the Tasar uzi fly, *Blepharipa zebina* (Walker); the Indian uzi fly, *Exorista sorbillans* (Wiedemann) are the four species of uzi flies that have been identified so far (Williams *et al.,* 2016). *Exorista sorbillans* and *Blepharipa zebina,* both species of Tachinid flies, are responsible for causing significant damage to the Muga silk industry in Assam during winter and post-winter months.It has been observed that the infestation of uzi flies in upper Assam is more widespread than in lower Assam, and that it is most noticeable during the winter months when the jarua and chotua crops are harvested (Goswami *et al.,* 2013). They can cause 20-40% and 80-90% losses in seed-growing regions in upper and lower Assam, respectively (Choudhury *et al.,* 2014). This infestation results in the loss of valuable silk and affects the livelihood of the farmers who rely on the Muga silk production.

The districts of Lakhimpur and Dhemaji lie in upper Assam and are known for their high Muga silk production. A study was conducted between August 2012 and September 2013 across 110 farmers in 11 major Muga rearing areas in Assam revealed that the traditional way of controlling uzi flies is still being used, with little acceptance of improved package of practices (Goswami *et al.,* 2015). Due to which the

incidence of Uzi fly hampers the production of muga silk production. Moreover, due to the high incidence of diseases, pests, and variations in climatic conditions, the production of muga silk has recently declined dramatically (Baruah and Kalita 2020). Therefore, studying the extent of Uzi fly infestation on Muga cocoons in these districts is crucial to understand the severity of the problem and develop effective strategies to control it.

This study aims to assess the prevalence of Uzi fly infestation on Muga cocoons in Lakhimpur and Dhemaji districts of Assam and analyse the factors contributing to the infestation.

MATERIAL AND METHODS

Study Area: The study was conducted in the Lakhimpur and Dhemaji districts of Assam, known for their high Muga silk production. Two villages each were chosen from Lakhimpur and Dhemaji districts. In each of these villages, five Muga silkworm rearers were selected, and a total of 25 muga cocoons were randomly collected from the overall harvest of each rearers.

Sample Collection: A total of 250 Muga cocoons were collected from each district using a random sampling method during four crop seasons: Kotia (Oct.-Nov.) 2021, Jarua (Dec.-Feb.) 2021-22, Chotua (March-April) 2022, and Jethua (May-June) 2022. The cocoons were collected from both districts and brought to the laboratory of the Department of Sericulture at Assam Agricultural University for analysis.

Identification of Uzi fly Infestation: The cocoons were stored in plastic containers to allow Uzi fly to emerge, and the percentage of infestation was recorded through 10 replications. Each cocoon was carefully examined for Uzi fly infestation. The presence of holes or punctures on the surface of the cocoon indicated Uzi fly infestation. Infested cocoons were separated and counted.

Data Analysis: The data collected from the study were analyzed using descriptive statistics. The prevalence of Uzi fly infestation was calculated as the percentage of infested cocoons out of the total number of cocoons collected.

$$\text{Percentage of infestation} = \frac{\text{Number of Infested cocoon}}{\text{Total number of cocoon collected}}$$

Factors Contributing to Uzi fly infestation: During the entire study period, information about infestation by instar during four crop seasons was collected. Meteorological data, such as the maximum and minimum temperature, morning and evening relative humidity, total rainfall, and number of rainy days, were also recorded from RARS (Regional Agricultural Research Station), North-Lakhimpur and Skymet Weather Service in Dhemaji.

Statistical Analysis: Correlation coefficient analysis, as described by Panse and Sukhatme (1985), was conducted to investigate the statistical relationship between the meteorological factors and the population densities of Uzi fly.

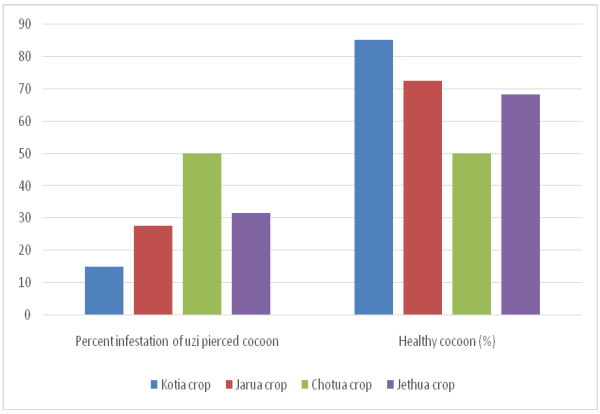

Fig. 1. Uzi fly infestation level of different seasons at different villages of Lakhimpur district.

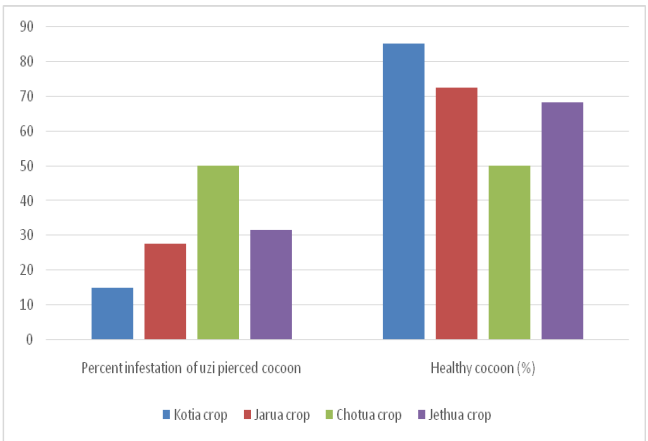

Fig. 2. Uzi fly infestation level of different seasons at different villages of Dhemaji district

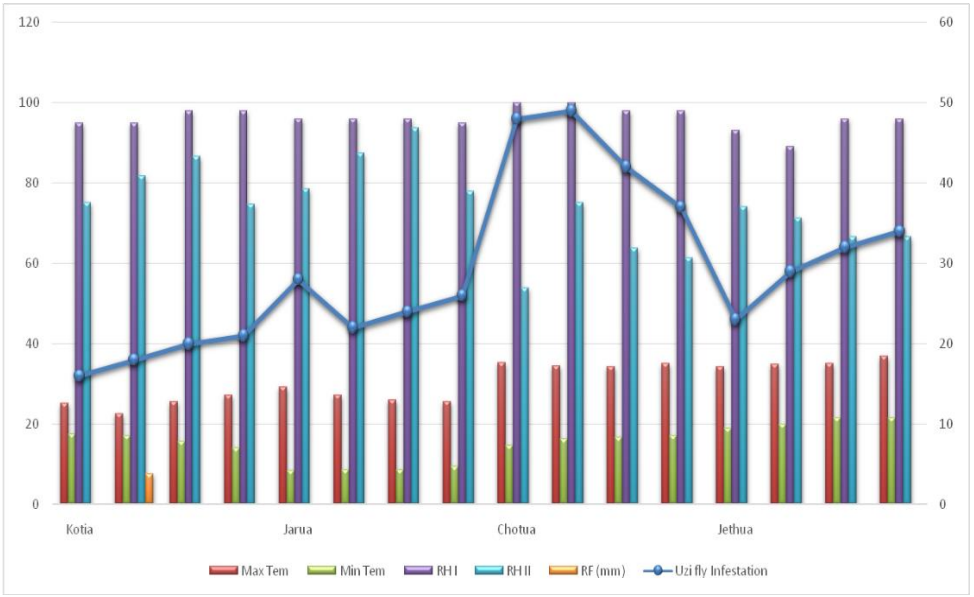

Fig. 3. Uzi fly infestation trend with meteorological factor of Lakhimpur district.

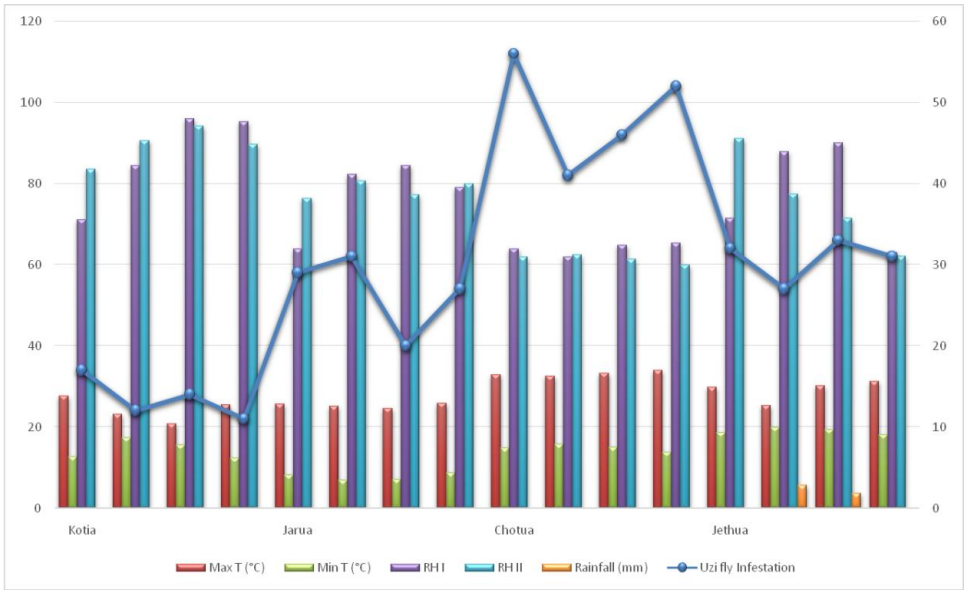

Fig. 4. Uzi fly infestation trend with meteorological factor of Dhemaji district.

RESULTS AND DISCUSSION

The study recorded the percentage of Uzi fly infestation of Muga cocoons in Lakhimpur district during four crop seasons: Kotia (Oct.-Nov.) 2021, Jarua (Dec.-Feb.) 2021-22, Chotua (March-April) 2022, and Jethua (May-June) 2022. The data revealed that the infestation rate varied among seasons, with the highest infestation recorded during Chotua crop at 46.8% and the lowest during Kotia crop at 20.4%. The healthy cocoon percentage also varied accordingly, with the highest healthy cocoon percentage during Kotia crop at 79.6% and the lowest during Chotua crop 53.2%. The data for each crop season and a summary of the infestation rate for all four seasons are presented in Table 1.

The percentage of Uzi fly infestation recorded from Dhemaji district showed that the infestation was highest during Chotua crop (50%) and lowest during Kotia crop (14.8%). The percentage of healthy cocoons was highest during the kotia crop (85.2%) and lowest during the Chotua crop (50%). Overall, the data showed that the Uzi fly infestation in Muga silkworm cocoon was a significant problem during the four crop seasons.

Table 3, 4 and Fig. 3 show the percentage of infestation of uzi fly, *Exorista sorbillans* with meteorological factors, and the results of the correlation studies from the Lakhimpur district. The maximum temperature and morning relative humidity had a significant positive effect on Uzi fly infestation during all four rearing seasons, while no significant correlation was found with minimum temperature and rainfall. There was a significant negative correlation with evening relative humidity. Rainfall was found to be non-significant at a 1% level. Multiple regression analysis showed that all meteorological factors combined accounted for 85% of the variation in Uzi fly infestation.

Table 5, 6 presents the percentage of Uzi fly infestation related to meteorological factors, while Fig. 4 displays the results of correlation studies between Uzi fly infestation and weather parameters in the Dhemaji district. The maximum temperature has a significant positive influence on Uzi fly infestation across all four

rearing seasons, while there is no significant relationship with the minimum temperature. The study finds significant negative correlations between relative humidity in the morning and evening, but there is no significant correlation with rainfall at a 1% level. Multiple regression analyses determined how meteorological factors interact with Uzi fly infestation. The results show that the combined effect of all meteorological factors accounts for 79% of the variation in Uzi fly infestation.

Table 1: Infestation of muga cocoon by Uzi fly in Lakhimpur district during all four-crop season.

Season	Percent infestation of Uzi pierced cocoon (%)	Healthy cocoon (%)
Kotia crop	20.4	79.6
Jarua crop	26.8	73.2
Chotua crop	46.8	53.2
Jethua crop	30.8	69.2

Table 2: Infestation of muga cocoon by Uzi fly in Dhemaji district during all four-crop season.

Season	Percent infestation of Uzi pierced cocoon	Healthy cocoon (%)
Kotia crop	14.8	85.2
Jarua crop	27.6	72.4
Chotua crop	50.0	50.0
Jethua crop	31.6	68.4

Table 3: Determination of correlation coefficient (r) and its significance between meteorological factors and Uzi fly, *Exorista sorbillans* infestation.

Meteorological factors	correlation coefficient (r)	P-value
Max T (°C)	0.759**	0.001
Min T (°C)	0.190 NS	0.481
RH (morning)	0.502*	0.047
RH (evening)	-0.679**	0.004
Rainfall (mm)	-0.294 NS	0.269

NS = non-significant; ** Significant at P = 0.01 * Significant at P = 0.05

Table 4: Relationship of Uzi fly, *Exorista sorbillans* infestation with meteorological factors during 2021-22.

Meteorological observation	Coefficient	P value	R square
Intercept	-150.208**	0.038	0.85
T max (°C)	2.005**	0.002	
T min (°C)	-0.822***	0.067	
RH (morning)	1.449**	0.017	
RH (evening)	-0.121	0.558	
Rainfall (mm)	1.212	0.170	

Table 5: Determination of correlation co-efficient (r) and its significance between meteorological factors and uzi fly, *Exorista sorbillans* infestation.

Meteorological factors	Correlation co-efficient (r)	p-value
Max T (°C)	0.857**	0.001
Min T (°C)	0.121 NS	0.655
RH (morning)	-0.700**	0.003
RH (evening)	-0.837**	0.001
Rainfall (mm)	-0.017 NS	0.951

NS = non-significant; ** Significant at P = 0.01

Table 6: Relationship of uzi fly, *Exorista sorbillans* infestation with meteorological factors during 2021-22.

Meteorological observation	Coefficient	P value	R square
Intercept	7.237	0.901	0.79
T max (°C)	2.120	0.098	
T min (°C)	-0.482	0.464	
RH (morning)	-0.108	0.720	
RH (evening)	-0.291	0.433	
Rainfall (mm)	1.106	0.547	

The present investigation was studied in the Lakhimpur and Dhemaji districts of Assam. The survey was conducted during four muga crop *viz*., Kotia (October-November), Jarua (December-February), Chotua (March-April) and Jethua (May-June) 2021-22. At the cocoon stage of muga silkworm, the maximum infestation of uzi fly was found during Chotua crop (50.0%) and the minimum infestation was found during Kotia crop (14.8%) in the Dhemaji district. Similarly, in the Lakhimpur district, the maximum infestation of uzi fly was found during Chotua crop (46.8%) and the minimum infestation was found during Kotia crop (20.4%). The findings of the current study are consistent with those of Goswami *et al.* (2013), who reported that the Chotua crop (March-April) in upper Assam was when the Uzi fly infestation was at its peak (Lakhimpur and Sonitpur district). Reddy and Rajan (2011) also found a similar trend in harvested muga cocoons during Chotua crop of about 35.0%. The present investigation was limited to only two districts of Assam *i.e*., Dhemaji and Lakhimpur districts. As the farmers of both districts harvested four crops in a year without any gap and with overlapping muga silkworm rearings throughout the year. There is also very less appropriate measures taken for the control of Uzi fly at the farmers field. Thus, the uzi fly, *Exorista sorbillans* on emergence finds a host at suitable stages for oviposition causing a higher rate of infestation in both the districts.

Muga Silkworm rearing field.

Black Scar

Uzi fly infested Muga cocoons

Uzi fly maggots and pupa

Adult Uzi fly

CONCLUSIONS

In conclusion, Muga silk holds a significant place in the Sericulture industry of Assam, and the demand for it has been rapidly expanding in recent years. However, the production of Muga silk is often hindered by various pests and diseases, such as the Uzi fly, which infests the Muga cocoons and causes significant damage. This infestation results in the loss of valuable silk and affects the livelihood of the farmers who rely on the Muga silk production. Therefore, the study of the prevalence of Uzi fly infestation on Muga cocoons in Lakhimpur and Dhemaji districts of Assam and the anlaysis of the factors contributing to the infestation are crucial to understand the severity of the problem and develop effective strategies to control it. The findings of this study can be used to formulate policies and interventions to mitigate the damage caused by Uzi fly infestation and ensure sustainable Muga silk production in Assam.

FUTURE SCOPE

The findings of this study can be used to develop effective strategies to control Uzi fly infestation and ensure sustainable Muga silk production in Assam. Future research can focus on the biology of Uzi fly and its biocontrol to ensure their effective management.

Acknowledgement. The author is grateful to his Major advisor Dr. Roshmi Borah Dutta, the members of advisory committee, the official staff of the Department of Sericulture, AAU, Jorhat, all the staff of Assistant Directorate of Sericulture, Lakhimpur, Dhemaji and the muga rearers of Lakhimpur and Dhemaji District, his parents, friends for their help and support in completing his research work. He apologizes for any errors or omissions.

Conflict of Interest. None.

REFERENCES

Anonymous (2020-21). Statistical handbook Assam. pp. 159-163.

Baruah, J. P. and Kalita, C. (2020). Integrated pest management of uzi fly (*Exorista sorbillans*) in Muga silkworm *Antheraea assamensis* Helfer (Lepidoptera: saturniidae): *A Journal of entomology and zoology studies*, *8*(4), 341-3.

Choudhury, B., Kumar, R., Chutia, P. and Rajkhowa, G. (2014). Host infestation Potentiality of N. thymus to Control the Uzifly of muga silkworm, *Antheraea assamensis* (Helfer)-A Bio-control Tool for Controlling Uzifly. *Biological Forum – An International Journal*, *6*(1), 1-4.

Goswami, N. K., Nath, P. and Saharia, D. (2013). Uzi fly infestation in Muga seed cocoons. *Antheraea assamensis* Helfer and crop loss during Chotua crop in Assam. *Indian Journal of Applied Research*, *3*(10), 2249-5559.

Goswami, N. K., Nath, D. and Saharia, P. (2015). A study on socio-economic assessment and adoption of scientific technologies by the muga rarers of Assam. *International Journal of Scientific Research*, *4*(2), 349-353.

Panse, V. G., Sukhatme, P. V. (1985). Statistical methods for agricultural research. ICAR, New Delhi, *8*, 308-318.

Reddy, S. E. and Rajan, R. K. (2011) Present Status of Uzi Fly, *Exorista Bombycis* (Louis) (Diptera: Tachinidae) Incidence on Muga Silkworm, *Antheraea Assamensis* Helfer (Lepidoptera: Saturniidae) In Upper Assam. In Abstract In: The National seminar on Seri-Biodiversity of North East India and its Conservation and Prospects held at Dhing College, Nagaon, Assam during, (p. 69).

Thangavelu, K., Chakraborty, A. K., Bhagowati, A. K., Isa Md (1988). Handbook of Muga Culture. Central Silk Board, Bangalore. p. 75.

Tikader, A., Vijayan, K. and Saratchandra, B. (2013). Muga silkworm, *Antheraea assamensis* (Lepidoptera: Saturniidae)-an overview of distribution, biology and breeding. *European Journal of Entomology*, *110*(2).

Williams, K. A., Lamb, J. and Villet, M. H. (2016). Phylogenetic radiation of the greenbottle flies (Diptera, Calliphoridae, Luciliinae). *Zookeys*, *568*, 59.

How to cite this article: Dipankar Brahma, Rushali Chakraborty, Roshmi Borah Dutta, Vasanth V. and Nilav Ranjan Bora (2023). A Study on the extent of Uzi Fly infestation on Muga Cocoons in the Districts of Lakhimpur and Dhemaji of Assam. *Biological Forum – An International Journal*, *15*(10): 1152-1157.