

Occurrence of Dipteran Shoot Flies, on Bamboo in West Bengal, India

Rakesh Pashi, N. U Visakh and Shantanu Jha*

Department of Agril. Entomology, Bidhan Chandra Krishi Viswavidyalaya,
West Bengal, India

*Corresponding author

ABSTRACT

Keywords

Bambusa tulda,
Acroceratitis
parastriata,
Rioxoptilona
dunlopi, *Neosilba*
sp. and *Bambusa*
balcooa (Roxb)

Article Info

Accepted:
25 August 2019
Available Online:
10 September 2019

A survey had been conducted in districts of South 24 parganas, Nadia, Bardhaman and Jalpaiguri of West Bengal, India on shoot fly infestation of bamboo. *Acroceratitis parastriata* David & Hancock, *Rioxoptilona dunlopi* (Wulp) (Diptera: Tephritidae) and *Neosilba* sp. (Diptera: Lonchaeidae) a saprophytic species could be recorded on young shoots of bamboo. Amongst the infesting species, *Acroceratitis parastriata* David & Hancock had been found to be predominant. Infestation of the pests caused severe damage of newly emerged shoots of the crop, resulting in oozing, stunted growth with hollow internode and drying up of the entire shoots. The activity of the flies could be recorded during day. Maximum pest attack took place when bamboo shoots were of 15-20 cm height. The extent of damage ranged from 35.27 - 55.42 %. All the species could be recorded from the infested samples of *Bambusa tulda* collected from districts of South 24 pgs, Bardhaman and Nadia; only *Acroceratitis parastriata* was recorded from infested samples of *Bambusa balcooa* (Roxb) collected from district of Jalpaiguri. This is the first report of dipteran shoot fly infestation on bamboo from West Bengal.

Introduction

Bamboo (Gramineae: Bamboosoideae) which is commonly known as “poor man's timber” is the fastest growing perennial evergreen arborescent woody plant (Loushambam *et al.*, 2017; Yeasmin *et al.*, 2015). As per the FAO report on world forest resources, India is considered as second richest country of the world after China in terms of bamboos genetic resources (Lobovikov *et al.*, 2007;

Bystriakova *et al.*, 2003). About 115 species in 20 genera have been found to grow naturally or in cultivated condition from India (Naithani, 2008). *Arundinaria*, *Bambusa*, *Ochlandra*, *Sarocalamus*, *Pseudostachyum*, *Stapletonia*, *Chimonobambusa*, *Dendrocalamus*, *Gigantochloa*, *Ampelocalamus*, *Melocanna* etc are the major bamboo genera commonly grown in India (Tripathi *et al.*, 2015; Sharma *et al.*, 2015; Ahmed, 1996). Abundant of more than 50 percent bamboo

species are found only in north-eastern India *i.e.*, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura and West Bengal (Rishi *et al.*, 2014). Good numbers of insect pests are known to attack bamboos in the field from the early stage to maturity (Haojie *et al.*, 1998; Koshy *et al.*, 2001; Paduvil, 2008). One of the major limiting factors the production of bamboo is heavy infestation of dipterans' flies on young shoots (Permkam, 2005). They cause significant damage in bamboo cultivation. West Bengal, an eastern province of India is also a traditional growing area of bamboo. The present study was carried out to find out different species of dipterans' flies attacking bamboo, their distribution and extent of damage caused by those in West Bengal, India.

Materials and Methods

A reconnaissance survey was carried out at different locations in four districts of West Bengal from July 2017- October 2018. The districts covered in this survey were Khidderpore at Nadia, Gazipur at South 24 PGS, Chakdighi at Bardhaman and Kharimati at Jalpaiguri to record the incidence of bamboo shoot flies (Table 1). Young shoots were randomly collected from the bamboo orchards. Amongst those, infested shoots were counted, collected and stored in properly tagged plastic bags tied with rubber bands. Collected samples from the fields were cut carefully from the base of the plant with a sharp knife and were kept in glass containers provided with sterilised fine sand for pupation. The glass containers were covered with muslin cloth tied with rubber bands to prevent the pest from escaping. The moisture content of the sand was maintained by adding distilled water as and when required. The pupae were recovered from the sand and kept in another glass container for the emergence of adult flies with sterilised fine sand. The geographic

coordinates of the sampling sites were recorded with a GPS device. The flies emerged from the infested shoots were identified based on morphological characteristics. Specimens were observed under compound light microscope (zeiss-Axioskop-40) at varying range of magnification for identification and confirmation of the species. The species were identified using keys developed by Hancock and Drew for Gastrozonini (Hancock *et al.*, 1999). Samples of bamboo-shoot flies were also sent to NBAIR, Bengaluru for confirmation of identity.

Results and Discussion

Altogether, three dipterans were recorded, from infested bamboo shoots during the time of study. Among these two species *Acroceratitis parastriata* David & Hancock, *Rioxoptilona dunlopi* (Wulp) belonged to the tribe Gastrozonini of subfamily Dacinae, family Tephritidae and *Neosilba sp.* under family Lonchaeidae. The fly infestation rates were maximum when the number of young shoots in the bushes was high. Infestations of these pests were first observed at 2nd week of July, 2017. Maximum infestations were seen from August to September. Adult flies were active during day time throughout the bamboo growing period and mating was found to take place on host plants. Pest attack started when bamboo shoots were of 15-20 cm in height or about two weeks after the emergence of shoots. Adult female flies lay their eggs under culm sheath with the help of needle-like ovipositor. Upon emerging, maggots continue to feed on soft part of the bamboo tissue. Bacterial infection initiated rotting of bamboo tissues and made those edible for the dipteran maggots. The rotten mass of such tissues created foul smell. The infested plant produced hollow internode with hindered development, oozing could also be found from infested area and later infested shoots dried

up. Fly infestations were found in all bamboo growing areas causing extensive damage to emerging shoots. The number of maggots could be recorded to the tune of 26-34 in a single shoot. The level of bamboo shoot damage ranged from 35.27 -55.42 %. *Acroceratitis parastriata*, *Rioxoptilona dunlopi* and *Neosilba sp.* could be found in the infested samples of *Bambusa tulda* (Roxb) from the districts of south 24 parganas, Bardhaman and Nadia all from southern part of west Bengal. Whereas only *Acroceratitis parastriata* could be recorded from the infested samples of *Bambusa balcooa* (Roxb) collected from Jalpaiguri, a district located at

northern part of West Bengal. However *Rioxoptilona dunlopi* and *Neosilba sp* could not be found in the samples collected from Jalpaiguri district. In case of *Acroceratitis parastriata*, the body of the fully developed maggot was creamy white, measures $8.07 \pm 0.09 \text{ mm} \times 1.43 \pm 0.05 \text{ mm}$. The Pupae barrel-shaped having brown capsule, measures $4.99 \pm 0.04 \text{ mm} \times 1.96 \pm 0.14 \text{ mm}$. Adult females of *Acroceratitis parastriata* were $4.65 \pm 0.02 \text{ mm} \times 1.55 \pm 0.01 \text{ mm}$ and males were $4.51 \pm 0.06 \text{ mm} \times 1.53 \pm 0.04 \text{ mm}$. Whereas the fully developed maggot and pupa of *Rioxoptilona dunlopi* were $7.67 \pm 0.07 \text{ mm} \times 1.39 \pm 0.08 \text{ mm}$ and $5.02 \pm 0.10 \text{ mm} \times 1.88 \pm 0.08 \text{ mm}$.

Table.1 Occurrence of dipteran flies in bamboo in West Bengal.

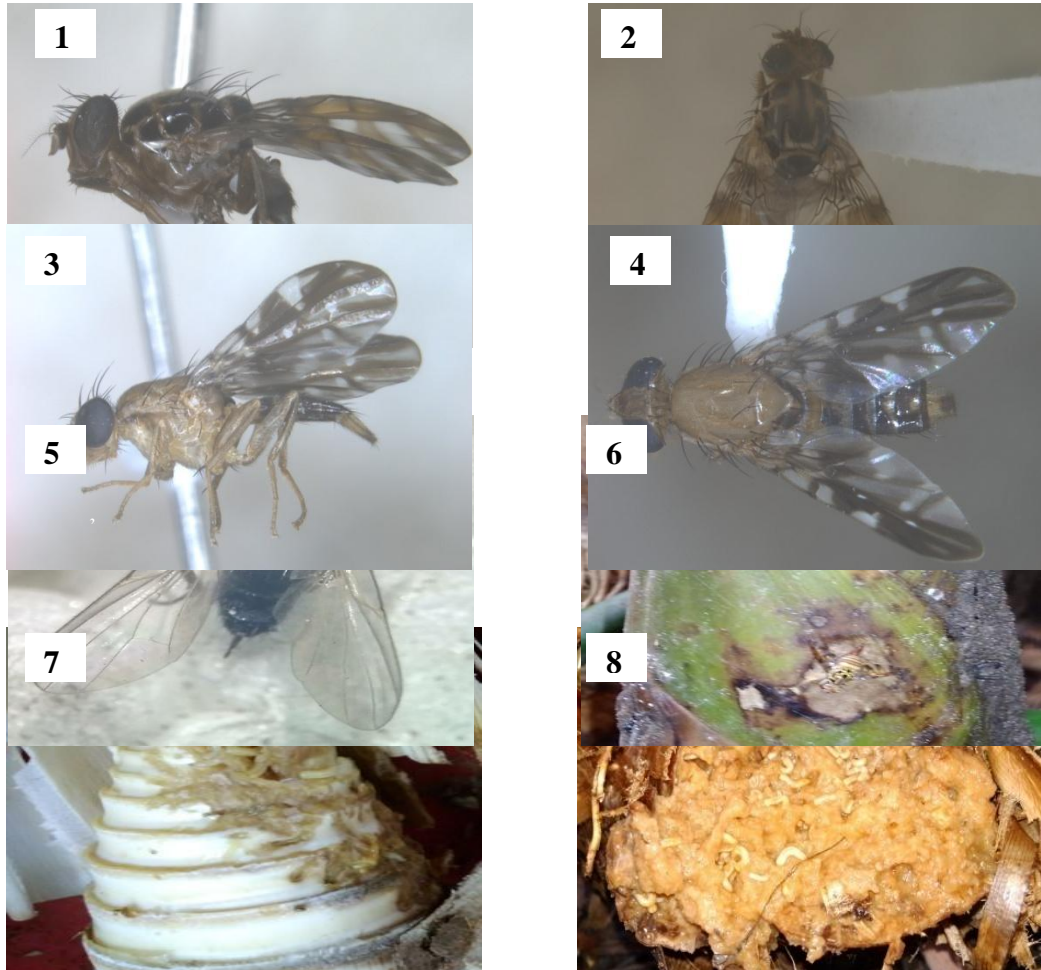
District	area	Latitude and Longitude	Percentage of infestation	spp
Nadia	Khidderpore	N23.60475 E88.41267	35.27	<i>Acroceratitis parastriata</i> , <i>Rioxoptilona dunlopi</i> , <i>Neosilba sp</i>
South 24 PGS	Gazipur	N 22.28104 E 88.22220	55.42	<i>Acroceratitis parastriata</i> , <i>Rioxoptilona dunlopi</i> , <i>Neosilba sp</i>
Barddhaman	Chakdighi	N 22.97923 E 88.01761	37.25	<i>Acroceratitis parastriata</i> , <i>Rioxoptilona dunlopi</i> , <i>Neosilba sp</i>
Jalpaiguri	Kharimati	N 26.46361 E 88.83870	41.30	<i>Acroceratitis parastriata</i>

Table.2 The morphometric characteristics of different life stages of *Acroceratitis parastriata*, *Rioxoptilona dunlopi* and *Neosilba sp.*

Flies	Life stages	Length (mean)	Breadth (mean)
<i>Acroceratitis parastriata</i>	Fully developed maggot	8.07 ± 0.09	1.43 ± 0.05
	Pupa	4.99 ± 0.04	1.96 ± 0.14
	Female ♀	4.65 ± 0.02	1.55 ± 0.01
	Male ♂	4.51 ± 0.06	1.53 ± 0.04
<i>Rioxoptilona dunlopi</i>	Fully developed maggot	7.67 ± 0.07	1.39 ± 0.08
	Pupa	5.02 ± 0.10	1.88 ± 0.08
	Female ♀	6.06 ± 0.15	1.52 ± 0.02
	Male ♂	5.82 ± 0.11	1.49 ± 0.09
<i>Neosilba sp</i>	Pupa	2.95 ± 0.05	1.02 ± 0.04
	Female ♀	3.01 ± 0.09	1.08 ± 0.07
	Male ♂	2.93 ± 0.14	1.07 ± 0.12

Measurement (mm) (n = 10)

Fig.1-8 (1) *Acroceratitis parastriata* (lateral view); (2) *Acroceratitis parastriata* (Ventral view); (3) *Rioxoptilona dunlopi* (Lateral view); (4) *Rioxoptilona dunlopi* (Ventral view); (5) *Neosilba sp* (Ventral view); (6) both *Acroceratitis parastriata* and *Rioxoptilona dunlopi* on same host; (7) infested young bamboo shoot of *Bambusa tulda*; (8) infested young bamboo shoot of *Bambusa balcooa* (Roxb).



However, Adult females of *Rioxoptilona dunlopi* were $6.06 \pm 0.15 \text{ mm} \times 1.52 \pm 0.02 \text{ mm}$ and males were $5.82 \pm 0.11 \text{ mm} \times 1.49 \pm 0.09 \text{ mm}$. The pupal length of *Neosilba sp.* was recorded to be $2.95 \pm 0.05 \text{ mm} \times 1.02 \pm 0.04 \text{ mm}$. The sizes of adult females were $3.01 \pm 0.09 \text{ mm} \times 1.08 \pm 0.07 \text{ mm}$ whereas; adult males were $2.93 \pm 0.14 \text{ mm} \times 1.07 \pm 0.12 \text{ mm}$.

Acroceratitis parastriata and *Rioxoptilona dunlopi* were the predominant and the most damaging bamboo shoot fly species found in different regions of West Bengal. Bamboo

species *Bambusa tulda* (Roxb.) was found to be the host of *Acroceratitis parastriata*, *Rioxoptilona dunlopi* and *Neosilba sp* in Southern part of West Bengal. Whereas *Bambusa balcooa* (Roxb) was found to be the host of *Acroceratitis parastriata* in Northern part of West Bengal. Earlier David *et al.*, (2014) described *Acroceratitis. parastriata* David & Hancock from India. Agarwal *et al.*, (2005) also reported six different *Acroceratitis spp* infesting bamboo in India. Khan *et al.*, (2017) revealed a wide distribution and predominance of *Rioxoptilona dunlopi* (van

der Wulp) and several other *Acroceratitis spp* under tribe Gastrozonini (Tephritidae: Dacinae) prevailing in bamboo from Bangladesh. From West Bengal incidence of *Acroceratitis parastriata* and *Rioxoptilona dunlopi* (van der Wulp) in bamboo is being reported for the first time. Regarding period of prevalence of the pests Dohm *et al.*, (2014) also reported that both the species could be found in rainy season when bamboo shoots were widely available.

During the present study presence of *Neosilba sp* (Diptera: lonchaeidae) in rotten bamboo shoots from West Bengal were also recorded. But the species was actually a saprophytic one. Macgowan *et al.*, (2008); Uchoa & Nicacio, (2010) reported that the lonchaeids were considered as polyphagous pest generally found in flowers or fruits of different plant taxa feeding on organic matters, especially of decaying plants.

The study revealed the incidences of bamboo shoot flies with highest of its population in rainy season in West Bengal. The present study showed that the level of infestation by the pest group ranged from 35.27 to 55.42 %. and thus the population of bamboo get drastically reduced by the infestation of the pests. The information generated from this study will be immensely useful for determining pest risk analysis required for better production of good quality of bamboo.

Acknowledgements

The authors are grateful to the Department of Agricultural Entomology of BCKV, West Bengal for infrastructural support and KJ David, Principal scientist, NBAIR for his help with pests' identification.

References

Agarwal, M.L. and Sueyoshi, M. (2005).

Catalogue of Indian fruit flies (Diptera: Tephritidae). *Oriental Insects*. 39:371-433.

Ahmed, M.F. (1996). In: Keynote address: proceedings of the National seminar on bamboo, Bangalore. 28–29 Nov, pp 6–8.

Bystriakova, N., Kapos, V., Lysenko, I. and Stapleton, C. (2003). Distribution and conservation status of forest bamboo biodiversity in the Asia-Pacific region. *Biodiversity and Conservation*. 12:1833–1841.

David, K.J., Hancock, D.L. and Ramani, S. (2014). Two new species of *Acroceratitis* Hendel (Diptera: Tephritidae) and an updated key for the species from India. *Zootaxa*, 3895(3): 411-418.

Dohm, P., Kovac, D., Freidberg, A., Rull, J. and Aluja, M. (2014). Basic Biology and Host Use Patterns of Tephritid Flies (Phytalmiinae: Acanthonevrini, Dacinae: Gastrozonini) Breeding in Bamboo (Poaceae: Bambusoidea). *Ann. Entomol. Soc. Am.* 107(1): 184-203.

Hancock, D.L. and R.A.I. Drew. (1999). Bamboo-shoot fruit flies of Asia (Diptera: Tephritidae: Ceratitidinae). *Journal of Natural History*. 33: 633-775.

Haojie, W., Varma, R.V. and Tiansen, X. (1998). Insect pests of bamboos in Asia: An illustrated manual. New Delhi, INBAR. 200p.

Khan, M., Bari, M.A., Hossain, M., Kovac, D., Freidberg, A., Royer, J. and David, L. (2017). Hancock A Preliminary Survey of Bamboo-Shoot Fruit Flies (Diptera: Tephritidae: Acanthonevrini, Gastrozonini), With Four New Records from Bangladesh. *Academic Journal of Entomology*. 10 (1): 01-04.

Koshy, K.C., Harikumar, D. and Narendran, T.C. (2001). Insect visits to some bamboos of the Western Ghats, India. *Current Science*. 81(7): 833-838.

- Lobovikov, M., Paudel, S., Piazza, M., Ren, H. and Wu, J. (2007). World bamboo resources: A thematic study prepared in the framework of global forest resources assessment 2005. Rome, FAO.
- Loushambam, RS., Singh, NR., Taloh, A. and Mayanglambam, S. (2017). Bamboo in North East India. *Indian Journal of Hill Farming*. 30 (2), 181-185.
- Macgowan, I. and Freidberg, A. (2008). The Lonchaeidae (Diptera) of Israel, with descriptions of three new species. *Israel Journal of Entomology*. 38 (1): 61-92.
- Naithani, HB. (2008). Diversity of Indian bamboos with special reference to North East India. *Indian Forester*. 134(6): 765-783.
- Paduvil, R. (2008). Post-harvest damage by *Dinoderus* beetles in bamboos and its management. Ph.D. thesis. FRI University, Dehradun. 105p.
- Permkam, S. (2005). Bamboo-shoot fruit flies (Diptera : Tephritidae) of southern Thailand. *Songklanakarin J. Sci. Technol*. 27(2): 223-237.
- Rishi, R. R., Barthakur, N.D., Borah, R.K., Kumar, R. and Pandey, S. (2014). Pest problems of some commercially important bamboo species in Assam, India. *International Journal for Life Sciences and Educational Research*. 2(4), 113 – 120.
- Sharma M.L. and Nirmala, C. (2015). Bamboo Diversity of India: An update. 10th World Bamboo Congress, Korea.
- Tripathi, H. K., P, Somasundaram., Kumar, R. and Lakchaura, Prakash. 2015. "Assessment of Bamboo Resources of India."
- Uchoa, M.A. and Nicacio, J.N. (2010). New records of Neotropical fruit flies (Tephritidae), lance flies (Lonchaeidae) (Diptera: Tephritoidea), and their host plants in the South Pantanal and adjacent areas, Brazil. *Annals of the Entomological Society of America*. 103 (5): 723-733.
- Yeasmin, L., Ali, N., Gantait, S. and Chakraborty, S. (2015). Bamboo: an overview on its genetic diversity and characterization. *3 Biotech*. 5:1–11.

How to cite this article:

Rakesh Pashi, N. U Visakh and Shantanu Jha 2019. Occurrence of Dipteran Shoot Flies, on Bamboo in West Bengal, India. *Int.J.Curr.Microbiol.App.Sci*. 8(09): 2964-2969.
doi: <https://doi.org/10.20546/ijcmas.2019.809.340>