Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2021; 9(3): 318-322

Received: 01-03-2021
Accepted: 03-04-2021

Pawan Kumar
Forest Protection Division
Tropical Forest Research
Institute, Jabalpur,
Madhya Pradesh, India

Sakshi Dwivedi
Forest Protection Division
Tropical Forest Research
Institute, Jabalpur,
Madhya Pradesh, India

Anjana Jain
Forest Protection Division
Tropical Forest Research
Institute, Jabalpur,
Madhya Pradesh, India

Corresponding Author:
Pawan Kumar
Forest Protection Division
Tropical Forest Research
Institute, Jabalpur,
Madhya Pradesh, India

A new report of fruit fly infestation on fruits of *Madhuca indica* in central India

Pawan Kumar, Sakshi Dwivedi and Anjana Jain

DOI: https://doi.org/10.22271/j.ento.2021.v9.i3e.8716

Abstract
This paper focuses on the identification of fruit fly insect infesting the fruit of *Madhuca indica*. The different site under Jabalpur region was selected and collection of fruit was made. Rearing of collected larva from fruit of mahua was conducted. Data and photographs of different stages of insect larva of mahua was noted and captured respectively. It was found that the large incidence was caused by *M. indica* fruit fly i.e. *Bactrocera zonata* and it was recorded as a new pest in Jabalpur region of central India in 2020 at Tropical Forest Research Institute Jabalpur, District Jabalpur.

Keywords: fruit fly, *Madhuca indica*, *Bactrocera zonata*

Introduction
The peach fruit fly, *Bactrocera zonata* (Saunders) is one of the most harmful species of Tephritidae. It is a polyphagous species attacking more than 40 species of fruit crops and has also been recorded from wild host plants. *Bactrocera zonata* is well adapted to hot climates.
The genus *Bactrocera* includes about 500 species, mostly in Asia, the Pacific and Australasian Regions. These genera belong to the family Tephritidae (Trypetidae or Trupaneidae in some older literature), a group of about 4000 known species, an estimated 80% of which have larvae that develop in the seed bearing organs (flowers or fruit) of higher plants, and are therefore known as fruit flies. The genus Bactrocera is considered a serious threat of fruit crops because of the wide host range of its species and the invasive power of some species within the genus. The *Bactrocera zonata* was a serious pest of fruits causing severe losses to the fruit production and their quality (Khan *et al.* 2017) [8]. The fruit fly incidence was positively correlated with maximum and minimum temperature, and when the temperatures fall within the optimum range, the population was at its peak (Stanley *et al.* 2015) [6]. The temperature has significant role in determining the climatic suitability for *B. zonata* in reproduction (Choudhary *et al.* 2019) [5]. During faunistic surveys in Chhattisgarh conducted by the Zoological Survey of India, 7 species of fruit flies were collected out of which 3 species were reported for the first time from the state while dealing with the collection of 7 fruit flies (Halder *et al.*, 2015) [12]. Choudhary *et al.* (2019) [5] conducted an experiment on *Bactrocera zonata* (Saunders) and studied the temperature based growth potential at ecologically relevant constant temperatures (15, 20, 25, 30 and 35 °C; relative humidity of 60 ± 10% and a photoperiod of 12:12 h L:D) and simulated growth potential parameters that were validated with fluctuating temperatures life cycle data under laboratory conditions on artificial diet. Satarkar *et al.* (2009) [13] studied the spatial distribution of *Bactrocera* fruit flies in the Goa region (west coast of India) using several dispersion parameters between April 2006 and March 2008 in three ecological zones, *viz*. coastal, midland and upland. He concluded that the population of all the fruit fly species attracted to methyl eugenol-baited traps, *viz*. *Bactrocera dorsalis*, *Bactrocera caryeae*, *Bactrocera zonata*, *Bactrocera affinis* and *Bactrocera correcta*, was following the negative binomial distribution pattern and was highly aggregated or clumped. *Bactrocera zonata* was recorded as a new pest in central India in 2020 At Tropical Forest Research Institute Jabalpur, District Jabalpur. The attack of *B. zonata* was first time reported on the fruit of *Madhuca indica* in Jabalpur region of Central India.

Detection and identification symptoms
The collection of fruits of *Madhuca indica* was carried out randomly in sunny days.

Identification and Observation of fruit-fly larva and adult was carried out as per Kumar *et al*. (2020) with some modification. Attacked fruits usually show signs of oviposition punctures. Fruits with high sugar content, such as peaches, exude a sugary liquid, which usually solidifies adjacent to the oviposition site.

Host and damages known to attack
Mahua, guava, mango, banana, apple, pineapple, peach, jamun, grapes, custard apple included some vegetables etc. larvae infest inside the fruit pulp of inset making it unfit for the consumption.

Distribution
Occurs in China, India, Myanmar, Nepal, Pakistan, Sri Lanka, Egypt and Thailand.

Classification
Kingdom: Animalia
Phylum: Arthropoda
Class: Insecta
Order: Diptera
Family: Tephritidae
Genus: Bactrocera
Species: Zonata

Synonymy
B. cucurbitae, B. dorsalis, B. zonata, B. correcta, B. tryoni, B. oleae

Methods and Materials
Collection site
Collection of Mahua fruit was started from mid-May to June end. The present study was performed in accordance to Kumar and Bhowate *et al*. (2020) [9-11] at Tropical Forest Research Institute Jabalpur campus & nearby places.

Table 1: Distribution of *Madhuca indica* fruit-fly larva in different location under Jabalpur region

S. No.	Date of collection	Site details	GPS coordinates	Habitat type	Percentage of infestation
1.	13.06.2020	BOTANICAL GARDEN TFRI	N23◦05'57.02 E079◦58'59.49 Elevation-1371 ft.	Forest area	20%
2	14.06.2020.	BARHA, BARGI NAGAR, JABALPUR	N 23◦01'35.4 E 079◦59'31.1 Elevation-1401ft.	Forest area	40%
3	16.06.2020	NEAR SCIENTIST HOSTEL, TFRI	N 23◦05'45.83 E 079◦59'14.71 Elevation-1404 ft.	Grass area	70%
4	17.06.2020	NEAR SCHOLAR HOSTEL, TFRI	N 23◦05'45.83 E 079◦59'14.71 Elevation-1404 ft.	Grass area	65%
5	18.06.2020	SILVICULTURE NURSERY, TFRI	N 23◦05'57.02 E 079◦58'59.49 Elevation-1371 ft.	Forest area	32.5%

Formula of incidence

Percentage incidence of *M. indica* fruitfly larva = (No. of infested fruit)/(Total no. of observed fruits) × 100

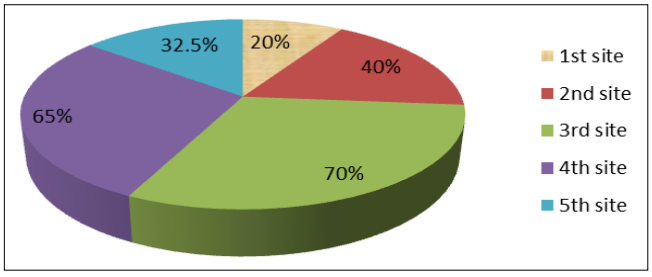

Fig 1: Percentage infestation in different sites *by B. zonata*

Rearing of Mahua fruit-fly-*B. zonata* (Saunders)
Larvae collection
Larvae of *B. zonata* were obtained from infested *Madhuca indica* fruits that were collected from different location under tropical forest research institute, Jabalpur (M.P) of central India. Emerged larvae were reared for two generations on Mahua fruits in the laboratory for adaptation.

Larval rearing
Rearing of larvae of *B. zonata* was carried out in Insect chamber in the Department of entomology forest protection division (TFRI, JABALPUR). The room was provided with heat and fluorescent light systems. Rearing conditions was adjusted to 25 ± 2 ºC, 65 – 75% RH and a photoperiod of 14:10 (L: D).

Handling pupae
Collecting pupae was done for 4 days after pupation. Pupae were held in the adult rearing jar until emergence. Number of pupae recovered and percentage of pupal recovery was noted based in the initial numbers of eggs put on the diet.

Adult rearing
Collected pupae from infested Mahua fruits were placed inside plastic jar. Jars were covered with muslin cloth for ventilation. Emerged adult flies were provided with a 1:10(volume: volume) solution of honey and water thrice in a week. Fresh Mahua fruits were put inside the jar to stimulate flies to lay eggs. Deposited eggs were collected by using Camel hair brush. Eggs were collected until adults reach up to 30 days from the beginning of egg laying.

Fig 2: Mahua fruit

Fig 3: Fruit infestation by *B. zonata*

Fig 4: Laraval feeding inside fruit

Fig 5: Measurement of larva of *B. zonata*

Fig 6: Size of larva

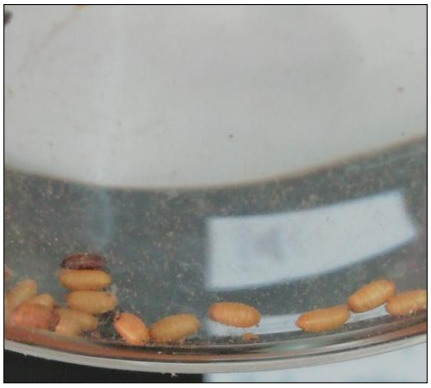

Fig 7: Pupation stage of *B. zonata*

Fig 8: Adult rearing vessel of *B. zonata*

Results and Discussion

Nature of infestation

It was observed that the fruit of *Madhuca indica* was infected by the larvae of *Bactrocera zonata*. The adult female fruit fly of B. *zonata* lays there eggs on the surface of the fruit through their ovipositor. After hatching off eggs the larva penetrate inside the fruit and start feeding on the fruit pulp.

Taxonomic description

Bactrocera zonata is a brightly colored little fly, predominately black with lateral yellow stripes, approximately 5.8 mm in length. It has two black transverse bands on its face and predominately black scutum with two yellow lateral stripes (vittae). Yellow costal band on the wing is interrupted and expanded at apex into a brown spot. Abdomen yellowto orange-yellow with a black “T” mark on dorsal surface. Larvae (maggots) are white to creamy white, legless with cylindrical bodies narrowed at the anterior end.

Due to large infestation seen on the fruits of many species of Mahua, *B. zonata* (Dipteran- tephritidis) is also known as Mahua fruit fly.

Life cycle

Eggs

Elongated, elliptical, whitish, 1.0-1.2mm long, somewhat round at posterior end, slightly pointed anteriorly.

Larvae

Cylindrical, whitish yellow color 1.0-7mm long anteriorly pointed and posteriorly round in shape.

Pupae

Barrel-shaped, 11 segments, yellowish or yellowish brown, 4.2-5.8 mm long, 2.3-2.5 mm wide, anterior end with two anterior spiracles, posterior end rounded, posterior spiracles occupy the same position as in larva.

Adult

It is a yellowish brown colored little fly, having yellow colored triangle band at the posterior end of thorax, wings transparent marked with brown spot at the apex, male is slightly smaller than female.

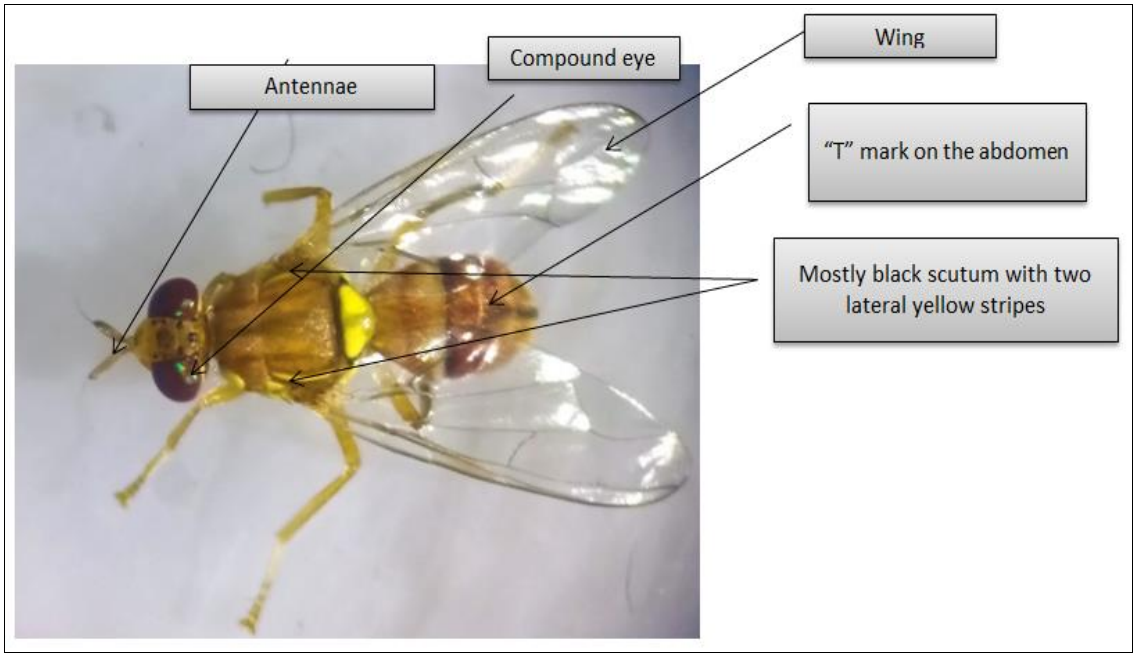

Fig 9: Adult of *Bactrocera zonata*

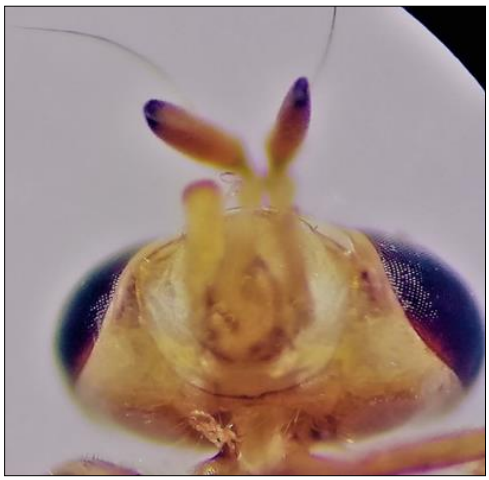

Fig 10: Mouth part of *B. zonata*

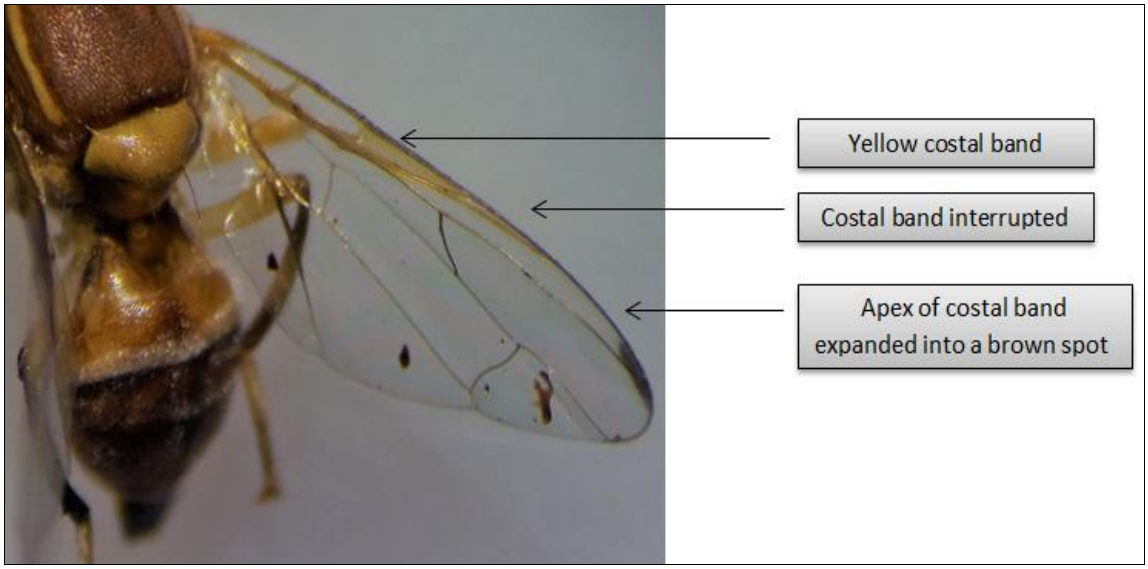

Fig 11: Overview of wings of *B. zonata*

Conclusion

The present study is the first effort in exploring the identity of *Madhuca indica* fruit fly in Jabalpur region of central India in 2020 at tropical forest research institute Jabalpur, district Jabalpur, Madhya Pradesh. During the study different sites were selected and fruits were collected. The data showed that large infestation of fruit fly was seen in the area of silviculture nursery at Jabalpur. The species identified is *Bactrocera zonata* a fruit fly causing severe damage to fruits of *Madhuca indica* the condition can be normalized by adopting the good agronomic and pest management practices.

Acknowledgement

The authors are thankful to Dr. Rajeshwar Rao, Director, Tropical Forest Research Institute Jabalpur for providing the facilities for carrying out this research work. Thanks are also due to Dr. Pawan Kumar scientist 'E' zoological Survey of India Jabalpur for authentic identification of fruit fly of *Madhuca indica.*

References

1. Essays UK. Studying the Peach Fruit Fly: *Bactrocera Zonata* 2018.
2. Gadagkar R, Chandrashekara K, Padmini Nair. Insect species diversity in the Tropics: Sampling method and Case study, Journal of the Bombay Natural History Society 1932;87(3):337-353.
3. Howard Weems V Jr. (Retired). Florida Department of Agriculture and Consumer Services, Division of Plant Industry; and T.R. Fasulo (retired), University of Florida. Published as DPI Entomology circular 291. Updated for this publication 2001. Latest revision: 2012. Reviewed 2018.
4. Jaipal Choudhary S, Naiyar Naaz, Moanaro Lemtur, Bikash Das, Arun Kumar Singh, Bhagwati Bhatt P, Chandra S. Prabhakar Genetic analysis of *Bactrocera zonata* (Diptera: Tephritidae) populations from India based on *cox1* and *nad1* gene sequences Received 2017, Accepted 2017, Published online 2017.
5. Jaipal Singh Choudhary, Santosh S. Mali, Naiyar Naaz, Debu Mukherjee, Moanaro L, Bikash Das, Singh AK, Srinivasa Rao M, Bhatt BP. Predicting the population growth potential of *Bactrocera zonata* (Saunders) (Diptera: Tephritidae) using temperature development growth models and their validation in fluctuating temperature condition, Published 2019.
6. Johnson Stanley, Gupta JP, Deepak Rai. Population dynamics of fruit flies, *Bactrocera* spp. In north western Himalayan Indian journal of entomology 2015;77(3):214-220.
7. Pawan Kumar, Romilla Devi, Mattu VK. Diversity and abundance of butterfly fauna (Insecta: Lepidoptera) of Subalpine area of Chanshal Valley of District Shimla (Himachal Pradesh) Journal of Entomology and Zoology Studies 2016;4(4):243-247.
8. Rashid Ahmed Khan, Muhammed Naveed. Occurrence and Seasonal Abundance of Fruit Fly, *Bactrocera zonata* Saunders (Diptera: Tephritidae) in Relation to Meteorological Factors 2017.
9. Shalini Bhowate, Pawan Kumar. Ethno entomological practices by tribes and rurals of Satpura plateau of Madhya Pradesh, India, Journal of Entomology and Zoology Studies 2020;8(2):833-837.
10. Shalini Bhowate, Pawan Kumar. Species diversity, relative abundance and status of butterflies of Betul district, Madhya Pradesh, Journal of Entomology and Zoology Studies 2020;8(3):1054-1057.
11. Shalini Bhowate, Pawan Kumar. Diversity and abundance of butterfly fauna of Chhindwara district, Madhya Pradesh. International Journal of Entomology Research 2020;5(6):121-124.
12. Sumana Halder, Kaushik Bhattacharya Kr., Parui P, Kailash Chandra, Dhriti Banerjee. Zoological Fruit-Flies (Insecta: Diptera: Tephritidae) of Chhattisgarh: Rec. zool. Survey. India 2015;115(4):385-389.
13. Satarkar VR, Krishnamurthy SV, Falerio JR, Verghese A. Spatial distribution of major Bactrocera fruit flies attracted to methyl eugenol in different ecological zones of Goa, India International Journal of Tropical Insect Science 2009;29.
14. ZSI. Manual of Collection, Preservation and Identification for Insects. ZSI, Calcutta India 1990, 114.