Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2024; 12(1): 106-111

Received: 17-11-2023
Accepted: 21-12-2023

Dil Mahjoora Majeed
School of Agricultural Science, Glocal University, Saharanpur, Uttar Pradesh, India

Aijaz Majeed
Hubei University of Medicine, Shiyan, Hubei, China

Mohd Majid Jamali
School of Agricultural Science, Glocal University, Saharanpur, Uttar Pradesh, India

Shafkat Jabbar Mir
School of Agricultural Science, Glocal University, Saharanpur, Uttar Pradesh, India

Sajjad Ahmad Khan
School of Agricultural Science, Glocal University, Saharanpur, Uttar Pradesh, India

Corresponding Author:
Dil Mahjoora Majeed
School of Agricultural Science, Glocal University, Saharanpur, Uttar Pradesh, India

Studies on fruit flies (Diptera: Tephritidae: *Bactrocera* spp.) in mango orchards of Saharanpur district of Uttar Pradesh, India

Dil Mahjoora Majeed, Aijaz Majeed, Mohd Majid Jamali, Shafkat Jabbar Mir and Sajjad Ahmad Khan

DOI: https://doi.org/10.22271/j.ento.2024.v12.i1b.9284

Abstract
The extensive damage caused by fruit flies to mango crops worldwide leads to substantial financial losses for farmers. In an effort to address this issue, a recent study utilized advanced morphological techniques to examine the diversity and distribution of fruit flies in mango farms in Saharanpur, Uttar Pradesh. The research identified a total of 10 fruit fly species, with *Bactrocera dorsalis*, *Bactrocera zonata*, and *Bactrocera correcta* emerging as the most prevalent. Notably, the distribution of these pests was uneven, with higher concentrations observed on the orchard peripheries. The study revealed significant spatiotemporal fluctuations in both the quantity and variety of fruit flies, with a notable surge in infestations during the post-monsoon season. These findings hold substantial value for farmers and researchers engaged in fruit fly management, providing crucial insights for devising effective pest control strategies. The identification of prevalent species opens avenues for targeted interventions, potentially curbing financial losses for mango growers.

Keywords: Mango, *Bactrocera*, fruit fly, methyl eugenol, lure

Introduction
Mango (*Mangifera indica*) is a major fruit crop in India and is known for its delicious taste and high nutritional value, as well as its socioeconomic importance in worldwide markets (Kaur, Brahmeet, *et al*.) [1]. It is a member of the Anarcardiaceae family, the genus *magnifera*, and the species *indica*. Uttar Pradesh, in northern India, is the country's second-largest mango grower, accounting for around 23% of total mango (Policy, Draft Revised Import) [2]. The Saharanpur district of Uttar Pradesh has previously been designated as an important fruit belt in the country because to its thick mango plantations, which produce 259460 MT across an area of 259460 hectares (Rajan, Shailendra *et al*. 2016) [3]. Fruit flies are one of the most damaging insect pests to tropical and subtropical mango fruits and vegetables. They are highly polyphagous and are known to infest over 250 plant species from 40 different families. Fruit flies are found in all biogeographic zones except the extreme desert and Polar Regions, where their hosts are few or absent (Foote *et al*., 1993) [4]. There are approximately 44,000 species of fruit flies in the Tephritidae family, and around 200 of these are known to be pest of crops. They are considered major and dangerous pests due to their ability to cause significant damage to horticulture crops (Agarwal and Sueyoshi, 2005 & Satarkar *et al.* 2009) [5, 6]. Their infestations can result in early fruit drop, fruit rot, and diminished fruit size and weight. The economic impact of fruit fly infestations is substantial, with annual losses of 144.4 million pounds of fruits and vegetables (Stone House *et al*., 2002) [7]. Present study aims to identify the different species of *Bactrocera* Fruit Flies found in mango plantations in Saharanpur district and investigates their impact on mango production. The use of methyl eugenol-based parapheramone trapping was employed to record the diversity of fruit fly species in the area. We record 10 species of *Bactrocera* from Saharanpur district as primary pests that damage mangoes, citrus, guavas, and cucurbits. The findings of this study will give significant insights into the diversity of fruit flies in Saharanpur and will help in the development of effective pest control strategies to improve mango production in the region.

Materials and Methods

Study on fruit flies conducted in several places of mango orchards in Saharanpur district of Uttar Pradesh from August 2020 to September 2022. The plastic traps used in the study had a yellow plastic jar closed with clear plastic for rain protection, and the lure included Methyl eugenol and Malathion, which was put on cotton given in the trap. Each trap had four holes in the upper surface of the jar to allow flies to enter. Male flies were attracted to the lures and killed as soon as they touched them. All of the traps were set around 11 a.m. above the level in shaded settings in various orchards and gardens. The flies were preserved in 80% ethanol before identification. The identification of fruit fly species was carried out in the laboratory using a stereo-microscope with a binocular lens and their morphological characteristics.

Results and Discussions

The present study includes the record of 10 species of *Bactrocera* (Tephritidae) from various host plants and fruit trees in the Saharanpur area of Uttar Pradesh. The study also incorporates the diagnostic features of these species and their damage nature. The details of the species are given in Table **1**

Table 1: Fruit fly species in District Saharanpur infesting different host plants

S. No.	Fruit fly species	Locality	Crop species						
			Mango	Guava	Peach	Papaya	Jack fruit	Citrus	Fig
1	*Bactrocera dorsalis* (Hendel)	Sarsawan Dehat, Rampur maniharan Dehat, Khatauli, Fatehpur, Sherpur Shahpur, Mawi Khurd	✓	✓	✓	✓	✓	✓	✓
2	*Bactrocera zonata* (Saunders)	Sarsawan Dehat, Matki Jharoli, Mirzapur, Fatehpur, Sherpur Shahpur, Malhipur	✓	✓	✓	✓	×	✓	✓
3	*Bactrocera correcta* (Bezzi)	Sarsawan Dehat, Behat Dehat, Khurd, Rampur maniharan Dehat, Bilaspur, Mawi khurd	✓	✓	✓	✓	✓	×	✓
4	*Bactrocera tau* (Walker)	Khurd, Sarsawan Dehat, Fatehpur, Mirzapur, Gangdaspur Jutt, Malhipur	✓	✓	×	×	×	×	×
5	*Bactrocera cucurbitae* (Coquillett)	Saroorpur Taga, Khatauli, Rampur maniharan Dehat, Fatehpur, *Gangdaspur* Jutt, Mawi Khurd	✓	✓	✓	×	×	×	✓
6	*Bactrocera diversa* (Coquillett)	Mirzapur Pole, Sarsawan Dehat, Khatauli, Malipur, Sherpur shahpur, Mawi Khurd	✓	✓	×	×	×	×	×
7	*Bactrocera tuberculata* (Bezzi)	Fatehpur, Malakpur, Sherpur shahpur, Mirzapur, Khurd, Malhipur	✓	✓	×	×	×	×	×
8	*Bactrocera versicolor* (Bezzi)	Matki Jharoli, Mirzapur Pole, Gangdaspur Jutt,Mawi Khurd, Malakpur, Rampur maniharan Dehat	✓	✓	✓	×	×	×	×
9	*Bactrocera occipitalis* (Bezzi)	Saroorpur Taga, Khurd, Mirzapur, Fatehpur, Bilaspur, Dudhli Bukhara Must	✓	✓	×	×	×	✓	✓
10	*Bactrocera nigrotibialis* (Perkins)	Saroorpur Taga, Fatehpur, Matki Jharoli, Mawi Khurd, Mirzapur	✓	✓	×	×	×	✓	×

The different species belong to Family: Tephritidae, Genus: *Bactrocera (*Macquart). The fruit flies were trapped at different locations in different mango orchards of Saharanpur district of Uttar Pradesh and were safely carried to laboratory for taxonomic identification. Fig 1 shows labelled picture of different species of genus *Bactrocera*. The detailed description of different fruit flies is given as follows.

Fig 1: Shows taxonomic identification of different species of genus *Bactrocera*.

Bactrocera dorsalis (Hendel)

Diagnosis: Female: The female measures between 6.50 and 7.00 mm in length. Its body color ranges from black to orange brown, and it features a distinctive T-shaped marking on the abdomen. The face has a yellowish hue and noticeable facial spots. The thorax is predominantly dark brown to black in color.

Head: The head of the insect has two spots that resemble antennae and small openings called spiracles. The front spiracle stands out with its enlarged and downward-curving lobe on each side, along with tiny bumps. The rear part of the insect's body is relatively sleek.

Thorax: The scutum is primarily red-brown in color, with variations in shade across different regions. It has lateral

vittae, but no medial vittae. The scutellum has a golden tint and is marked with a black basal line. The wing is narrow and merges with the R2+3 vein, gradually widening towards the wing tip.
Abdomen: This segment of the insect's body displays two horizontal black stripes and a vertical central stripe that extends from the base to the tip. These stripes form a distinctive T-shaped pattern.

Distribution: India: Uttar Pradesh, Assam, Bihar, Delhi, Himachal Pradesh, Jammu & Kashmir, Kerala, Karnataka, Maharashtra, Manipur, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, West Bengal.

Damage: *Bactrocera dorsalis* is a significant threat to guava, mango, peach, and pear crops, resulting in fruit damage rates of 100.0%, 87.0%, 78.0%, and 61% respectively during the rainy season (Sharma *et al*., 2011) [8]. Dil Mahjoora Majeed et al (2024) [9, 10, 11] significantly reported *B. dorsalis* as the most abundant species from Saharanpur, India. Adult females are attracted to ripe fruit for egg-laying purposes. In some cases, a small number of females may even deposit eggs inside immature fruits.

***Bactrocera zonata* (Saunders)**
Diagnosis: Female: The length of the body measures 6 mm. The body is reddish brown and has golden patterns on the thorax. The wings are transparent, with a small brown patch at the tip.

Head: The head is elongated and has fewer chaetotaxy. It possesses two pairs of frontal bristles, one pair of orbital bristles, and reclinate posterior orbital bristles. There are no ocellar or post-ocellar setae present. Additionally, each antennal furrow displays a single dark circular spot.
Thorax**:** Scutum lacks a dark dorsoventral stripe and instead has two pale white to pale yellow lateral postsutural stripes that extend towards the intra-alar bristles. The scutellum is short, decumbent, and has a uniform acuminate shape. The wing exhibits an incomplete or reduced costal band, with no presence of an anal streak or microtrichia. All femora are slender, with the fore femur having normal bristles. There are either1-3 posterodorsal and 1 posteroventral row of bristles alone, or no main bristles at all. Additionally, there are no ventral spines on the femora.

Abdomen: The abdomen is typically oval or has parallel sides. The tergites, except for the first two segments, are clearly defined. Tergite III has a single pair of dark markings. Tergites 3-5 are mostly golden to orange brown in color.

Distribution: India: Uttar Pradesh, Punjab, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttarakhand, West Bengal.

Damage: *Bactrocera zonata*, a species of Tephritidae, poses a significant threat. It is known to target over 40 various fruit crops and wild host plants. In a span of 24 hours, an adult female can lay up to 93 eggs. These eggs are deposited beneath the surface of the host fruit. Once hatched, the larvae penetrate the semi-ripened fruits and consume them from within. This leads to the fruits becoming withered, deformed, rotten, and eventually detaching from the plant. Dil Mahjoora Majeed *et al*. (2024) [12] have reported *B. zonata* as major insect pests of mango from Saharanpur, India.

***Bactrocera correcta* (Bezzi)**
Diagnosis: Female: The length of the body is 6mm, and the color of the body ranges from dark brown to black, with yellow stripes on the sides.

Head: The head is wider than it is long, with a face that has a wavy appearance due to a horizontal groove. There are spots on the groove that extend towards the middle or form a horizontal stripe. The insect has two bristles on its forehead and elongated eyes that are significantly longer than their width. The antennae are noticeably longer than the face.

Thorax: The central section of the mesonotum is predominantly black, while the scutum is black with a dark red-brown color along the lateral and posterior edges. Additionally, the scutum features a pair of parallel lateral postsutural vittae that terminate in a black T-shaped pattern. The scutellum, on the other hand, appears yellowish with a narrow black stripe at the base and two setae on the scutellum. The wings are transparent, with a yellowish subcostal cell and a faint yellow tint along the costal border. Cells bc and c are colorless, and there is no presence of an anal streak. As for the legs, all segments are entirely fulvous except for the hind tibiae, which are pale fuscous.

Abdomen: All segments of the exoskeleton are easily distinguishable; the first segment is wider at the tip compared to the base. The third to fifth segments are a reddish-brown color, displaying a distinctive T-shaped pattern. This pattern includes a short black band positioned horizontally along the front edge of the third segment, as well as a thin vertical black band running through all three segments.

Distribution: India: Uttar Pradesh, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu.

Damage: *B. Correcta* is a prevalent pest that frequently accompanies other notable pests such as *B. zonata* and *B. dorsalis*. The adult flies deposit their eggs on the fruit, resulting in imperfections and changes in color. Once the eggs hatch, the larvae penetrate the fruit, providing a breeding ground for microorganisms like fungi or bacteria. This can cause substantial decay and loss of the fruit. Consequently, the affected fruit becomes unfit for human consumption.

***Bactrocera tau* (Walker)**
Diagnosis: Female: The length of the insect measures between 7.5 to 9 millimeters. The body appears black but has a slight yellowish glow. There is a distinctive black marking on each furrow of the antennae.

Head: The head is taller than it is wide; there are 2-4 or more pairs of bristles on the front; there is one pair of bristles on the orbital area; the face has a wavy appearance, with a convex upper part and a concave lower part, and it has noticeable grooves for the antennae; the front of the head has 2-3 pairs of bristles on the forehead and 1 pair of bristles on the orbital area; the eyes are round and roughly the same height as or slightly taller than they are wide; the antennae are noticeably longer than the face; the scape and pedicel are short, while the basal flagellomere is elongated.

Thorax: The scutum is a dark color with lateral vittae on the postsutural region. The scutellum is densely covered in setae and does not have any distinct dark and pale pattern or black mark. The wings are mostly bare, but there is a complete costal band that may extend below the R2+3 vein. There is also a coral-colored band from the Sc vein to beyond the R4+5 vein. Cells bc and c do not have any coloration. There is an anal streak present. The legs have narrow femora, and the fore femur has 1 to 3 rows of bristles on the posterodorsal side and 1 row on the posteroventral side. The middle and hind femora do not have spine-like bristles.

Abdomen: The abdominal segments on the back of the body are easily identifiable. The third to fifth segments have a predominantly golden to orange brown coloration. These segments also feature a dark stripe running down the middle and dark areas on the front edges. Additionally, the third segment has a transverse dark band.

Distribution: India: Punjab, Haryana, Uttar Pradesh, West Bengal, Bihar, Orissa, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra and Gujarat.

Damage: *Bactrocera tau* is a pest of great economic importance that can be found in many parts of the Indian subcontinent. This destructive insect is known as a polyphagous pest, meaning it attacks a wide variety of food plants. The female *Bactrocera tau* lays her eggs by piercing the delicate and sensitive fruits' outer skin. Once hatched, the maggots burrow into the fruit and feed on the placenta, leading to rotting and premature fruit drop.

***Bactrocera cucurbitae* (Coquillett)**

Diagnosis: Female: Female specimens of this particular species have a body length ranging from 6 to 8 millimeters. The body color is predominantly reddish brown, with distinct pale-yellow markings present on the thorax. Notably, there are two black spots on the face, adding to its unique appearance. Additionally, all of the legs exhibit a yellowish hue.

Head: The stomal sensory organ is relatively small and is enclosed by either 6-7 prominent pre-oral lobes or 17-23 serrated edges resembling oral ridges. The mouth hooks are notably large and heavily hardened, with each hook possessing a small yet clearly defined tooth located before the apex.

Thorax: The scutum of the insect is typically reddish-brown or fuscous, and it usually has only one pair of scutellar setae. Along the middle of its back, there is a yellow stripe that is accompanied by curving lines on both sides. The wings are transparent, with a wide and noticeable band along the leading edge, and well-defined stripes near the anal region. Additionally, there is a thin band that extends from the base of each wing, just inside the trailing edge.

Abdomen: The abdomen displays a reddish yellow color with darker streaks on the second and third terga. It also features a transverse band on the third tergum and a longitudinal stripe running down the center of the third to fifth terga.

Distribution: Uttar Pradesh, Uttarakhand, Himachal Pradesh.

Damage: *Bactrocera cucurbitae*, a notable pest, has been observed on more than 125 plant species according to Islam, M. (2013) [13]. The melon flies lay their eggs in both fruits and soft tissues of vegetative parts. This results in damage to the fruits, causing them to become distorted and eventually fall off. Additionally, the tunnels created by the larvae serve as entry points for bacteria and fungi, leading to fruit rot.

***Bactrocera diversa* (Coquillett)**

Diagnosis

Female: The length of the body ranges from 7.5 to 10 millimeters. The body is slim, elongated, and tapers towards the front. It is predominantly black in color with yellow markings.

Head: The head is taller than it is long, with a concave or undulating shape. It is convex above and concave below, without a transverse groove. The eye is round and slightly taller than it is long. The antenna is noticeably longer than the face, with a short antennal scape and pedicel, while the first flagellomere is long.

Thorax: The scutellum lacks a distinct pattern of dark and pale colors and is covered in dense setae. The scutellum's dorsum is either flat or slightly convex. The wings have a partially exposed brownish pattern, with an anal band that extends to the wing margin. The fore femur possesses bristles, while the mid and hind femurs do not.

Abdomen: The abdomen is shaped like an oval and has noticeable segments. The segments T3-T5 have a dark stripe running down the middle, and T3 also has a dark line that goes across horizontally.

Distribution: Assam, Manipur, Mizoram, Nagaland, Tripura, Uttar Pradesh, Karnataka, Tamil Nadu, and Kerala.

Damage: *Bactrocera diversa* is a notable pest that mainly affects cucurbits and other plants like guava, mango, and orange. Both adult insects and larva infest fruits that are not fully ripe. The adult insects puncture the fruits to lay their eggs, while the larva feed on the pulp, transforming it into a smelly and discolored semi-liquid substance.

***Bactrocera tuberculata* (Bezzi)**

Diagnosis: Female: The length of the body ranges from 7.5 to 9mm. The color of the body is mainly black or dark fuscous, with a pattern that is completely whitish to yellowish.

Head: The head is longer than it is wide, with black orbital setae. The face is a light brown color with two large circular black spots. The antenna is much longer than the face, with a short scape and pedicel. The first segment of the flagellum is elongated, approximately the same length as the face.

Thorax: The scutum is primarily black, featuring reddish-brown bands below the lateral postsutural vittae. The pleural portions are entirely black, devoid of any light markings. The scutellum is densely covered in short setulae that are all the same color. The wings are partially bare, displaying a predominantly yellowish or brownish pattern, with the presence of an anal band. The legs are entirely fulvous, with a black spike located at the apex of the middle tibia.

Abdomen: The shape of the abdomen is oval, with a lateral arch and a domed appearance. It is not very flexible. The tergites are separate from each other. The first tergum is wider at the top than at the bottom. On terga T3-T5, there is a dark stripe running through the middle, as well as a transverse dark line. These terga also have noticeable dark patches on the front sides.

Distribution: Uttar Pradesh, Haryana, Punjab, West Bengal, Bihar, Orissa, Karnataka and Tamil Nadu.

Damage: *Bactrocera tuberculata* (Bezzi) (Diptera: Tephritidae) is an extremely harmful and invasive species of fruit fly. It infests more than 300 different types of fruits and vegetables, causing significant damage. When adult fruit flies lay their eggs on the fruit, it results in blemishes and discoloration. The maggots then burrow into the fruit, where they develop and create openings for secondary invaders such as fungi or bacteria. These secondary invaders lead to extensive rotting and premature fruit dropping.

***Bactrocera versicolor* (Bezzi)**
Diagnosis: Female: Female individuals of this species possess a moderate-sized body that is colored in a reddish-brown hue. Their face is adorned with medium-sized spots set against a fulvous background.

Head: The face is a tawny color with black dots, while the frons is longer than it is wide and has a reddish-brown center and tawny coloring on the sides. The orbital setae are a dark reddish-brown color. The first and second antennal segments are a reddish-brown hue.

Thorax: The thorax has a reddish-brown color with a brief dark line running through the center. The scutellum is yellowish but has a dark fuscous patch at the tip. The wings are mostly transparent, except for a fuscous area in the sub costa cell. The legs are fulvous, with pale fuscous marks located near the ends of the fore and mid femora, as well as on the outer basal areas of the mid tibiae.

Abdomen: The abdomen has an oval shape and is characterized by distinct terga. Tergum I appears pale fuscous, while tergum II is red-brown. Terga III-V also exhibit a red-brown color with a distinctive black 'T' pattern. Additionally, terga IV and V have dark fuscous corners at the front.

Distribution: Maharashtra, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, Kerala, Goa, Gujarat, Madhya Pradesh and Uttar Pradesh.

Damage: This highly adaptable pest invades different hosts, resulting in significant economic damage. Female adults lay eggs by means of an ovipositor, piercing fruits and placing the eggs underneath the skin. Larvae hatched from these eggs consume the pulp of the fruit, causing it to deteriorate rapidly. Infected fruits can be recognized by the resinous secretions coming from the punctures made during egg-laying. The extent of crop loss can range from a few to as high as 90% (Dhillon *et al*., 2005) [14].

***Bactrocera nigrotibialis* (Perkins)**
Diagnosis: Female: Females typically measure between 6.50-7.00mm in length. Their body color is predominantly black, and their face is completely black as well.

Head: The head displays a black coloration, with the exception of thin fulvous lateral margins and a dorsal area below the antennal sockets.

Thorax: The thorax of the perkins has a black scutum. The scutellum, on the other hand, is yellow with a small to medium-sized black band at the base. The wings have colorless cells bc and c, with only microtrichia present in the outer corner of cell c. There is a thin fuscous band along the costal border, which merges with R2+3 and becomes very narrow as it crosses over to the apex of R4+5. Additionally, there is a very narrow fuscous stripe in the cubital region, and the supernumerary lobe is not very prominent.

Leg: Legs with the outer surfaces of the fore femora being shiny black throughout, while the inner surfaces and the basal and apical ends are fulvous in color. The mid femora are entirely shiny black, except for the dark fulvous color on the basal and apical ends. The hind femora are fulvous, except for the shining black color on the apical one-third. The fore tibiae are fuscous, the mid tibiae are dark fulvous with a tendency to pale fuscous at the base, and the hind tibiae are dark fuscous. The tarsal segments are entirely fulvous, with a darker fulvous shade on the apical four segments.

Abdomen: Tergum III is a dark fuscous to black color, except for red-brown markings on each side of a narrow black band in the middle. Tergum IV is fuscous to dark fuscous, also with red-brown markings on each side of a narrow black band in the middle. These red-brown markings extend towards the outer edges. Tergum V is red-brown with dark fuscous anterolateral corners and a narrow black band in the middle. Additionally, there are two oval-shaped shiny spots on tergum V, which are dark fuscous to black in color.

Distribution: Karnataka, Uttar Pradesh, Kerala.

Damage: These flies have a reputation for causing significant damage to various types of fruits such as mangoes, citrus fruits, and guavas. When infested with *B. nigrotibialis*, fruit farmers can experience substantial financial losses, and it also poses a threat to food security in affected regions. The fully developed female *B. nigrotibialis* lays her eggs just below the fruit's surface. When the eggs hatch, the larvae eat on the fruit, inflicting substantial damage. The larvae feed on the flesh of the fruit, frequently leaving a path of decay and discoloration behind them. This not only renders the fruit unfit for ingestion, but also has an impact on its market value. *B. nigrotibialis* infestation can cause secondary infections and fruit degradation, significantly lowering the quality of the infected fruit.

***Bactrocera occipitalis* (the Indian fruit fly) (Bezzi, 1919)**
Diagnosis: Body: Female: The body is primarily black or dark brown in color, with a pattern that has a yellowish hue. The wings display a primarily brownish pattern.

Head: With a face that is longer than it is wide, the head is adorned with two prominent black spots and has a fulvous color. The eyes are elongated more vertically than horizontally. The antenna is approximately the same length as

the face, and the first segment of the flagellum is elongated, surpassing the height of the face.

Thorax: The thorax of this species has a black scutum with patches of reddish brown. The wings are partially bare, specifically the cell dm which is covered in microtrichia. The males have dense microtrichia at the end of vein A1+CuA2 and a colored coral band extending from Sc to beyond R4+5. The crossvein r-m is transparent, and there is a transparent cross vein called Dm-cu. The legs have slender femora, with regular bristles on the fore femur, while the mid and hind femora lack spine-like hairs. The middle leg of the male lacks feathering, and the femora have a consistent coloration throughout.

Abdomen: The abdomen is shaped like an oval, with a dome-like appearance and limited flexibility. It has distinct tergites, with the first tergite being wider at the top than at the bottom. In males, there is a pecten on the third tergite that has black bristles. Tergal glands can be found on the fifth tergite. The fifth abdominal tergite appears normal. In females, the sixth tergite is usually hidden and shorter than the fifth. The setulae on the abdomen are pointed and whitish in color. The third to fifth abdominal tergites are primarily golden to orange-brown.

Distribution: Jammu and Kashmir, Himachal Pradesh, and Uttarakhand, Uttar Pradesh, Andhra Pradesh, Karnataka, Maharashtra, Punjab, Tamil Nadu, and West Bengal**.**

Damage: *Bactrocera occipitalis* is responsible for causing harm to various fruit species such as mangoes, guavas, red mombin, carambola, citrus, and sapodilla. Its presence is predominantly found in South East Asia (Drew and Romig, 2013) [15]. When the fruit is attacked, small punctures from oviposition can be observed, although these indicators of damage may be challenging to identify during the early stages of infection. Substantial harm can occur internally within the fruit before any external symptoms become visible, often presenting as networks of tunnels accompanied by decay.

Conclusion

The current investigation is centered around samples gathered from various areas within Saharanpur district. A total of ten fruit fly species belonging to the Bactrocera genus have been identified. Furthermore, throughout the entire study, *Bactrocera dorsalis*, *Bactrocera zonata*, and *Bactrocera correcta* have emerged as the most dominant pest species. The findings obtained from this research will provide valuable understanding of the fruit fly diversity in the district and aid in devising efficient pest management tactics to enhance mango production in the region.

Acknowledgment

We express our gratitude to Dr. Mohammad Faisal from the Department of Entomology at Himgiri Zee University in Dehradun for his assistance in identifying the specimens. We would also like to extend our appreciation to Dr. Ahmed Faraz from the School of Life Science at Glocal University in Aligarh for his ongoing support.

Referecnes

1. Kaur B. Recent trends in the management of mango by-products. Food Reviews International. 2023;39(7):4159-4179.
2. Policy, Draft Revised Import. Mangoes from India; c2004.
3. Rajan S, Lamers HA, Lal B. A set of interconnected practices which enhance and conserve mango diversity in Malihabad, India. In: Tropical fruit tree diversity: Good practices for in situ and on-farm conservation; c2016. p. 172.
4. Foote M. Discordance and concordance between morphological and taxonomic diversity. Paleobiology. 1993;19(2):185-204.
5. Agarwal ML, Sueyoshi M. Catalogue of Indian Fruit flies (Diptera: Tephritidae). Oriental Insects. 2005;39:371-433.
6. Satarkar VR, Krishnamurthy SV, Faleiro JR, Verghese A. Spatial distribution of major Bactrocera fruit flies attracted to methyl eugenol in different ecological zones of Goa, India. Int J Trop Insect Sci. 2009;29:195-201.
7. Stonehouse J. Farm field assessments of fruit flies (Diptera: Tephritidae) in Pakistan: Distribution, damage and control. Crop protection. 2002;21(8):661-669.
8. Sharma DR, Singh S, Aulakh PS. Management of Fruit Flies in Fruit Crops. Department of Horticulture, Punjab Agricultural University, Ludhiana; c2011.
9. Dil Mahjoora Majeed, Aijaz Majeed, Majid Jamali, Rayees A Mir. Species diversity of fruit flies (Bactrocera spp.) in Guava orchards of Saharanpur District of Uttar Pradesh. J Entomol Zool Stud 2024;12(1):11-16. DOI: 10.22271/j.ento.2024.v12.i1a.9272.
10. Dil Mahjoora Majeed, Aijaz Majeed, Shafkat Jabbar Mir, Sajjad Ahmad Khan, Mohd Majid Jamali. Effect of temperature, humidity and rainfall on the population of Bactrocera spp in mango orchards of Saharanpur district of Uttar Pradesh, India. J Entomol Zool Stud 2024;12(1):44-49. DOI: 10.22271/j.ento.2024.v12.i1a.9278.
11. Dil Mahjoora Majeed, Aijaz Majeed, Majid Jamali and Rayees A Mir. Population, Diversity, and distribution of Fruit Flies (Diptera: Tephritidae: Bactrocera spp.) in Mango Orchards of Lucknow, Saharanpur and Meerut districts of Uttar Pradesh, India. J Pharmacogn Phytochem 2024;13(1):190-195. DOI: 10.22271/phyto.2024.v13.i1c.14825.
12. Majeed D. M., Mir S. J., Khan S. A., Jamali M. M. "Population fluctuations of Bactrocera zonata (Saunders) in connection with different weather parameters in Saharanpur, Uttar Pradesh, India". International Journal of Entomology Research, Volume 9, Issue 2, 2024, Pages 60-65.
13. Islam M. Effect of Different Traps on Incidence and Management of Cucurbit Fruit Fly, *Bactrocera cucurbitae*. Department Of Entomology, Sher-E-Bangla Agricultural University, Dhaka-1207; c2013.
14. Dhillon MK, Singh R, Naresh JS, Sharma HC. The melon fruit fly, *Bactrocera cucurbitae*: A review of its biology and management. Journal of Insect Science. 2005;5(1):40.
15. Drew RAI, Romig MC. Tropical fruit flies (*Tephritidae Dacinae*) of South-East Asia: Indomalaya to North-West Australasia. CABI; c2013.