



Further Investigation on the species of Diptera from the host plant *Zizyphus mauritiana* Lamk. (Rhamnaceae) from W.B, India

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Abstract

The study was carried out at New Town, near Salt Lake (North 24 parganas, West Bengal, India) during January 2017-February 2017, to document the insect diversity, their activities, roles and abundance in Indian plum (*Zizyphus mauritiana* L.) flower. 12 insect species belonging to 7 families under order Diptera were found at day time. Numbers of species of the family Syrphidae were high. Present communication reveals that non syrphid flies also play an important role in the pollination activities. Peak activities of the insect visitors were mainly observed from 9 am to 12 noon. Present work is the baseline data of dipteran diversity of *Zizyphus mauritiana* L. at New Town in Kolkata, W.B.

INTRODUCTION

New Town lies between latitude 22.5894°N and 88.4748°E. New Town is a neighbourhood to the north of Kolkata, West Bengal, India. The mean annual total rainfall of this region is 1,582 mm, with maximum and minimum average temperatures being 35.4°C and 13.8°C respectively.

Zizyphus mauritiana Lamk. (Rhamnaceae) commonly known as Indian jujube or Indian plum is a spiny, evergreen shrub, grows commonly within villages of central India. This species produces disciflorous flowers, where the disc on the thalamus serves as a nectar producing organ. The nectar smeared disc in open sunlight gives an impression of exposed sugar drop, which serves to attract a great variety of pollinators, creating a polyphilic system (Mishra *et al.*, 2004).

Pollinators play a crucial role in ecosystems by facilitating plant reproduction (Vazquez *et al.*, 2005). They provide an essential ecosystem service, being responsible for 35% of global crop-based food production (Klein *et al.*, 2007). Diptera is one of the

largest insect group in the world next to Hymenoptera and are important flower visitors and pollinators for many plant species and in a variety of habitats. Syrphid and non syrphid both flies play an important role in the pollination activities. Nectar is one of the most important foods for majority of dipterans with respect to adult energetic requirements for flight in dispersing, finding mates, mating, and searching sites for oviposition (Larson *et al.*, 2001).

In a recent study in Madhya Pradesh, Mishra *et al.* (2004) reported 30 species of flies of various families from the flowers of *Zizyphus mauritiana*. Some other notable works on dipteran Insect were made by Brunetti (1920,1923), Ghosh and Dasgupta (1962), Sen and Dasgupta (1964), Joseph and Parui (1980), Dutta *et al.* (1997), Mitra *et al.* (2004 & 2005), Mitra *et al.* (2005), Mitra and Banerjee (2007), Roy *et al.* (2014), Brintha *et al.* (2015), Maity *et al.* (2016), Kushwaha *et al.* (2017) that enriched the dipteran faunal studies of Kolkata.

MATERIALS AND METHODS

This study was conducted in the New Town. Intensive field visits were carried out during 9am to 12 noon. The insects were collected with the help of insect net throughout the day of February 2017 once in a week for eight continuous weeks of flowering period. Samples were brought in polythene bags to avoid their drying before study. Insect visitors were identified by us.

RESULTS AND DISCUSSION

A total of 12 species of insects were recorded on the blossom of *Z. mauritiana* during 60 days period. These 12-insect species belonging to 7 families under order Diptera. Altogether, 12 species were listed below with their distribution in India and abroad.

Systematic position:

Order: Diptera

1. Family: Sciaridae

Genus: *Sciara* Meigen

1803. *Sciara* Meigen, *Magazin Inse*, 2:263

1. Species: *Sciara longipennis* Brunetti

1912. *Sciara longipennis* Brunetti, *Fauna Br. India, Dipt.* Nematocera:143.

Materials examined: 1 female, 1 male, West Bengal, 24 Pgs. (N), Newtown, 15.II.2017, Coll. P. Parui, A. K. Gayen.

Distribution: India: Himachal Pradesh and West Bengal.

Remark: The species is being recorded here as the first flower visitor on *Zizyphus mauritiana* L. (Rhamnaceae) in India.

2. Family: Sepsidae

Genus: *Australosepsis* Malloch

1925. *Australsepsis* Malloch, *Prac. Linn. Soc. N.S.W.*, 50: 314.

2. Species: *Australosepsis niveipennis* (Becker)

1903. *Sepsis niveipennis*, Becker, *Mitt. Zool. Mus. Berl.* 2(3):143.

Material examined: 1 female, W.B, 24 Pgs. (N), Newtown, 12.I.2017, Coll. A. K. Gayen, P. Parui.

Distribution: India: Andhra Pradesh, Odissa, Tamil Nadu, Uttar Pradesh and West Bengal.

Elsewhere: Java, Lesser Sunda Islands, Myanmar, Pakistan, Philippines; Ethiopian, Mediterranean, Australasian.

Remarks: This fly is Scavenger in habit but here it is being recorded as a flower visiting insect on *Zizyphus mauritiana* L. (Rhamnaceae). Mitra

(2010), recorded it on *Cosmostigma racemosum* (Asclepiadaceae).

3. Family: Syrphidae

Genus: *Eristalini* Rondoni

1845. *Eristalinus* Rondoni, *Nuovi Ann. Sci. Nat. Bologna.* 2(2): 453.

3. Species: *Eristalinus (Eristalinus) arvorum* (Fabricius)

1787. *Syrphus arvorum* Fabricius, *Mant.Ins.*, :335.

Material examined: 2 female, 1 male, W.B, 24 Pgs. (N), Newtown, 22.I.2017, Coll. P. Parui, A. K. Gayen, S.P.Agarwala.

Distribution: India: Arunachal Pradesh, Jammu and Kashmir, Meghalaya, Odissa, Sikkim, Tripura and West Bengal.

Elsewhere: China and other parts of S E Asia; Australia, Hawaii, Japan and Micronesia.

Remarks: From many flowers this species has been recorded. Mitra (2010), recorded it from various flowering plants including *Zizyphus mauritiana* L. (Rhamnaceae).

4. Species: *Eristalinus (Eristalinus) quinquestriatus* (Fabricius)

1794. *Syrphus quinquestriatus* Fabricius, *Ent. Syst.*, 4:289.

Material examined: 1 female, W.B, 24 Pgs. (N), Newtown, India, 29.I.2017, Coll. P. Parui, A. K. Gayen.

Distribution: India: Assam, Bihar, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Nagaland, Odissa, Tripura, Uttar Pradesh and West Bengal.

Elsewhere: China and other parts of Oriental Region; Japan.

Remarks: This is common flower visiting fly in India. Mitra (2010), recorded it on *Tagetes patula* (Asteraceae).

5. Species: *Eristalis (Eristalis) tenax* (Linnaeus)

1758. *Musca tenax* Linnaeus, *Syst. Nat.* 10:591.

Material examined: 2 female, W.B, 24 Pgs. (N), Newtown, India, 27.II.2017, Coll. A. K. Gayen, P. Parui.

Distribution: India: Cosmopolitan distribution including West Bengal.

Elsewhere: Australia

Remarks: This is very common flower visiting fly. Mitra (2010), recorded it from various flowering plants other than *Zizyphus mauritiana* L.

Family 4: Ulididae

Genus: *Physiphora* Fallen

1810. *Physiphora* Fallen, *Sp. Ent.nov.Dit.*:11.

6. Species: *Physiphora aenea* (Fabricius)

1794. *Musca aenea* Fabricius, *Ent. Syst.* 4:335.

Material examined: 1 female, W.B, 24 Pgs. (N), Newtown, India, 15.II.2017, Coll. A. K. Gayen, P. Parui.

Distribution: India: Himachal Pradesh and West Bengal.

Elsewhere: South Asia, Mauritius and Pacific Island.

Remarks: This species are encountered in varied situation: on rotten fruits, garbage, rotten vegetation, carrion, on feces including human excrement. But here the family is being recorded as the flower visitor from *Zizyphus mauritiana* L. (Rhamnaceae). Mitra (2010), also recorded it from *Zizyphus mauritiana* L. (Rhamnaceae).

Family 5: Muscidae

Genus: *Musca* Linnaeus

1758. *Musca* Linnaeus, *Syst. Nat.*, 10:589.

7. Species: *Musca (Musca) domestica* (Linnaeus)

1758. *Musca domestica* Linnaeus, *Syst. Nat.* 10:596.

Material examined: 2 female and 1 male, W.B, 24 Pgs. (N), Newtown, India, 05.II.2017, Coll. A. K. Gayen, P. Parui, S. P. Agarwala.

Distribution: India: Andaman Island, Andhra Pradesh, Assam, Bihar, Goa, Himachal Pradesh, Karnataka, Kashmir, Maharashtra, Punjab, Sikkim, Tripura and West Bengal.

Elsewhere: Cosmopolitan.

Remarks: This is the second record of this species from the host plant *Zizyphus mauritiana*. Mitra (2010), recorded it from various flowering plants including *Zizyphus mauritiana* L. (Rhamnaceae).

8. Species: *Musca (Byomya) sorbens* (Wiedemann)

1830. *Musca sorbens* Wied., *Aussereurop. Zweife. Ins.*, 2:418.

Material examined: 2 female, W.B, 24 Pgs. (N), Newtown, India, 20.II.2017, Coll. A. K. Gayen, P. Parui.

Distribution: India: Andhra Pradesh, Assam, Bihar, Goa, Tamil Nadu, Uttar Pradesh and West Bengal.

Elsewhere: China, Christmas Islands, Cocos Islands, Flores Islands, Java, Lombox, Malaya, Maldive Islands, Myanmar, Nepal, Pakistan, Pelea Endeh, Philippines, Ryukyu Islands, Simeulue Islands, Sumatra, Sumbawa, Sri Lanka, Taiwan, Talaud Islands, Thailand; Ethiopian; Hawaii, Micronesia, South Palaeartic.

Remarks: This species is being recorded here also as the flower visitor on *Zizyphus mauritiana* L. (Rhamnaceae). Mitra (2010), recorded it on *Cosmostigma racemosum* (Asclepiadaceae) and *Zizyphus mauritiana* L. (Rhamnaceae).

9. Species: *Musca (Byomya) pattoni* (Austen)

1910. *Musca pattoni* Austen, *Ann. Mag. N. Hist.*, (8)5:114.

Material examined: 2 female flies, W.B, 24 Pgs. (N), Newtown, India, 20.II.2017, Coll. P. Parui, A. K. Gayen.

Distribution: India: Andhra Pradesh, Assam, Bihar, Tamil Nadu, Uttar Pradesh and West Bengal.

Remarks: This species is recorded here as the first flower visitor on *Zizyphus mauritiana* in India. Mitra (2010), recorded it on *Cosmostigma racemosum* (Asclepiadaceae).

Genus: *Morellia* Robineau-Desvoidy

1830. *Morellia* Robineau-Desvoidy, *Myod.*: 405.

10. Species: *Morellia hortensia* (Wiedemann)

1824. *Musca hortensia* Wiedemann, *Anal. Ent.*, 49;

1830. *Aussereurop. Zweife. Ins.*, 2:413.

Material examined: 1 Female and 1 male, W.B, 24 Pgs. (N), Newtown, India, 22.I.2017, Coll. P. Parui, A. K. Gayen.

Distribution: India: Andhra Pradesh, Assam, Himachal Pradesh, Kerala Madhya Pradesh, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal.

Elsewhere: China, Java, Malaya, Myanmar, Philippines, Sri Lanka, Sumatra, Ryukyn Islands, Taiwan; Papuan subregion.

Remarks: This species is being recorded here for the first time as flower visitor in India.

Family 6: Calliphoridae

Genus: *Stomorhina* Rondani

1861. *Stomorhina* Rondani, *Dipt. Ital. Prodr.*, 4:9.

11. Species: *Stomorhina discolor* (Fabricius)

1794. *Musca discolor* Fabricius, *Ent. Syst.*, 4:320.

Material examined: 1 male and 1 female, W.B, 24 Pgs. (N), Newtown, India, 05.II.2017, Coll. A. K. Gayen, P. Parui.

Distribution: India: Himachal Pradesh and West Bengal.

Elsewhere: Entire Oriental region; Moluccus.

Remarks: This species is a common flower visitor. Mitra (2010), recorded it from various flowering plants including *Zizyphus mauritiana* L. (Rhamnaceae).

Family 7: Sarcophagidae

Genus: *Parasarcophaga* Tohnston and Tiegs

1921. *Parasarcophaga* Tohnston and Tiegs, *Proc. R. Soc. Qd.* 33:86.

12. Species: *Parasarcophaga (Pandelleisca) bainbriggei* (Senior White)

1925. *Sarcophaga bainbriggei* Senior White, *Spol. Zeyl.* 13:212.

Material examined: 1 male, W.B, 24 Pgs. (N), Newtown, India, 05.II.2017, Coll. P. Parui.

Distribution: India: Bihar and West Bengal.

Remarks: This species is being recorded here as flower visitor for the first time in India.

Table-1: Recorded dipteran species from *Zizyphus mauritiana* L. by the present authors.

Host Plant	Order	Family	Species
<i>Zizyphus mauritiana</i> .	Diptera	Sciaridae	<i>Sciara longipennis Brunetti</i>
		Sepsidae	<i>Australosepsis niveipennis</i> (Becker)
		Syrphidae	<i>Eristalinus (Eristalinus) arvorum</i> (Fabricius)
			<i>Eristalinus (Eristalinus) quinquestriatus</i> (Fabricius)
			<i>Eristalis (Eristalis) tenax</i> (Linnaeus)
		Ulidiidae	<i>Physiphora aenea</i> (Fabricius)
		Muscidae	<i>Musca (Musca) domestica</i> (Linnaeus)
			<i>Musca (Byomya) sorbens</i> (Wiedemann)
			<i>Musca (Byomya) pattoni</i> (Austen)
			<i>Morellia hortensia</i> (Wiedemann)
		Calliphoridae	<i>Stomorhina discolor</i> (Fabricius)
Sarcophagidae	<i>Parasarcophaga (Pandelleisca) bainbriggei</i> (Senior White)		

Out of 86 insects species recorded by Mishra *et al.* (2004) from the host plant *Zizyphus mauritiana* L. (Rhamnaceae), 30 species belongs to dipteran flies and among the mentioned species (*Syrirta pipiens*, *Antherogona nudiseta*, *Musca conducens*, *Daucus cucurbitae*, *Antherogona oreintalis*, *Musca sorbens*, *Physiphora aenaea*, *Ischiodon scutellaris*, *Myospila lenticeps* and *Paragus serratus*.) only *Musca sorbens* and *Physiphora aenaea* are common in this present study. The other remaining 10 species belonging to 7 families are being considered as new record from the host as earlier authors didn't mention the name of the other insect species.

Mitra. B, 2010 recorded 14 dipteran species, out of which these 5 species i.e *S. discolor*, *M. domestica*, *P. aenea*, *M. sorbens* and *E. arvorum* are common as flower visitor from this host plant. So, we are recording here *S. rufipennis* (Sciaridae), *A. neveipennis* (Sepsidae), *E. quinquestriatus* (Syrphidae), *E. tenax* (Syrphidae), *M. pattoni* (Muscidae), *M. hortensia* (Muscidae) and *P. bainbridgei* (Sarcophagidae) as first record from this host plant from India.

It is known that pollination service by bees may be meagre or absent under certain condition. But this lacuna may be partly or completely replaced by flies. Though we are knowledgeable about dipteran taxonomy but the knowledge on functional system of pollination need to get more attention to support agriculture and maintain biodiversity and to be able to fight with the change of climate (Ssymank *et al.*, 2008)

Mitra and Banerjee (2007) recorded several species of Syrphidae flies as pollinator from agriculture, horticulture and medicinal plants. Present authors recorded here 3 species of Syrphidae from only one horticulture plant species - *Zizyphus mauritiana* L.

It is proven that Syrphidae plays the most important role in pollination but other non-syrphid dipterans being diverse, common and ubiquitous both in natural and managed habitat and therefore to be considered significant pollinator. The present study reveals that non syrphid flies also play an important role in the pollination activities as the authors recorded 9 non-syrphid flies species along with 3 species of Syrphidae from the same host plant.

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