

First record of Mango blossom midge *Procystiphora mangiferae* (Felt, 1927) from Satna, Madhya Pradesh

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Abstract

Entomological survey was carried out in Satna district of Madhya Pradesh between January 2018 and April, 2019. The result of present investigation reveals the occurrence of a new Mango blossom midge in study area. *Procystiphora mangiferae* (Felt), member of Cecidomyiidae family belongs to order Diptera, are frequent blossom feeders of Mango. This species widely distributed in South India and the larvae pupate in the buds. Mode of pupation play a key role in species identification. This year *P. mangiferae* were found operating in Satna rather simultaneously.

Keywords: cecidomyiidae, *Procystiphora mangiferae*, gall midge, mango

1. Introduction

Mango (*Mangifera indica* L.) a tree belonging to the dicot family Anacardiaceae (Singh, 1968) [1]. Mango is decidedly one of the most popular fruits among millions of people of the Orient, particularly India. Mango is the national fruit of India, Philippines, and Pakistan. The fruit is very popular with the masses due to its high nutritive value, richness in variety, delicious taste and excellent flavor. It is said that Mango cultivation is nearly as old as Indian civilization. In Madhya Pradesh, Satna region is one of the growing and potential belt of mango (National Horticulture Board, 2011) [2]. The flowering of mango is governed by local weather conditions. In Madhya Pradesh, Uttar Pradesh and Bihar, the main growing tracts in Northern India, Mangoes flower in February to March, the period of bloom usually falls in the third week of March.

The mango blossom midge, *Procystiphora mangiferae* (Felt) (Diptera: Cecidomyiidae), is one of the blossom gall midge species feeding on mango tree (*Mangifera indica* L.) (Grover, 1988) [3]. This blossom midge is widely distributed within the mango production areas in South India. It is one of the most destructive to mango inflorescence causing severe flower damage. They feed on the vital internal organs of the blossom with the result that the growth of the bud is arrested.

A detailed biological study is required to control the population and distribution through integrated pest management. Realizing the importance of problem, detailed study of biology was taken to consideration.

2. Material and Methods

The study areas are characterized by dry season (summer) and wet season with average annual temperature 26.2°C and the average annual rain fall 990 mm. The study area is well flourish with the Dashehari, Bombay Green, Neelum, Langra, and Fasli varieties of mango. Study on the identification and biology of *Procystiphora mangiferae* were

conducted in Satna region for two successive flowering seasons of 2018 and 2019. In the orchard of Chitrakoot University Agriculture farm we collected midges taking them to be *Dasineura amaramanjarae*, but on examining them closely they were found to be a mixed population of both *D.amaramanjarae*, and *P. mangiferae*, the last of which we recorded for the first time in the region.

The method employed to assess the infestation is very simple. Taking advantage of the fact that an infested bud assumes a conical gall-like form, the infested buds were easily separated. (Prasad, 1971) [4]. Mostly larvae were collected during mid flowering season along with their infested parts of plants. The infested inflorescence of *Mangifera indica* having larvae of gall midges, were collected in the wider plastic bags from different orchards of the region. The infested buds were opened to collect the minute eggs and early instar larvae for further study. Adult midge is obtained by rearing of fourth instar larvae.

3. Result and discussions

The result of present investigation confirmed the occurrence of *Procystiphora mangiferae* belongs to the family Cecidomyiidae. The Midge was identified by its typical structure of larval sternal spatula (Grover, 1984) [5] and ovipositor strongly sclerotized at the end forming a blade like structure.

3.1. Life cycle

Gall midges have a general life pattern with four separate stages in their life cycle: the egg, larva, pupa and adult. The adults are short lived, they only to mate and lay eggs on flower bud. The larval period is longest and economically important stage because of its destructive feeding.

3.2. Mating and Oviposition.

Mating take rest of about 30 minutes after emergence and then fly in search of mates. Nuptial are not very long ones as

mating usually take place on the undergrowth. The females usually keep sitting on the under-growth and it is the male that indulges in the searching. In the laboratory copulation took place at about 9.00 am and onwards.

The copulation time varies from 30 seconds to two minutes. Mating infuses the female with vigour, it becomes active and hovers over the mango inflorescence in search of a suitable bud for egg-laying. As soon as suitable spot on the bud is available, egg is laid. Usually one to two, rarely three eggs are laid by a female in one sitting. Eggs are laid in the fold between sepals and petals and on hatching the larvae enter blossom. The egg-laying begins at about 8.30 am and continues up to 10.30 in morning, after that flies are visible only here and there. After egg laying the females usually perish while the males die soon after mating.

3.3 Egg

The eggs of *P.mangiferae* are minute cylindrical structure (0.28 x 0.11 mm) round at one end while the other end is drawn out to form a delicate stalk. The outer shell or chorion is thin and membranous, and responsible for its characteristic shape. The freshly laid egg is soft and sticky and is creamy white in color. The eggs develop rather quickly with the result that 24 hours after oviposition a fully formed larva is visible inside shell. The time taken by the egg from oviposition to hatching varies from 30 to 36 hours.

3.4 First instar larva

At the time of hatching the first instar larva (0.4 x 0.11 mm.) is fully transparent and develops a white color as it grows old. Larval feeding inside the bud prevents the bud from opening. The larval body comprises a head, a head capsule, a supernumerary segment, three thoracic and nine abdominal segments. A pair of crescent-shaped eye spot lies, back to back, on the supernumerary segment. Cuticle is scaled and the anus is terminal. The anal segment bears 8 complex papillae. Ventrally each segment carries four rows of creeping welts.

3.5 Second instar larva

The second instar larva moults when the first instar has migrated to a suitable place. It begins feeding actively. It not only grows larger (1.43 x 0.37) but develops heavier sclerotization of different parts of the body. Naturally the head capsule, the antennae becomes more elaborate and the eye spot become darker. It is remarkable that in this instar two collar papillae are visible on the supernumerary segment and two sternal papillae on the prothorax.

3.6 Third instar larva

This larva is larger still, measuring on an average of 2.13 mm. long and .57 mm. wide. It has a yellowish color. Crown of sternal spatula makes its appearance in this stage. The pseudopods are well formed with distinct podal papillae, one on each pseudopod.

3.7 Fourth instar larva

The fourth instar larva is the largest of all (2.59 x 0.73) previous instars. The head capsule is larger and, the mouth

parts are elaborate, antennae are stout with the basal segment short and broad and second segment long and narrowing distally. The sternal spatula is fully formed and sclerotized being brown in colour. The crown is bi-dentate, but the groove separating the two dents is very shallow. The shaft is fully formed and is lodge in a pocket-shaped fold of the body wall. Prothoracic spiracles are cylindrical, while the metathoracic spiracle are more or less hemispherical. Anus is vertically situated on the venter of the ninth abdominal segment. The meso- and meta-thorax and the abdominal segment 1-7 have locomotory pads called pseudopods.

The fully fed fourth instar larva is robust but sluggish. When taken out it shows quick body movements.

3.8 Pupa

Pupa spins a cocoon of silken fibres and pupates inside the bud. The head bears contiguous eyes, imaginal antennae, pupal antennae and fully formed mouth parts. In color this pupa is brownish orange being darker dorsally and lighter ventrally. The thorax bears wings dorsally and legs ventrally.

3.9 The Adult Midge

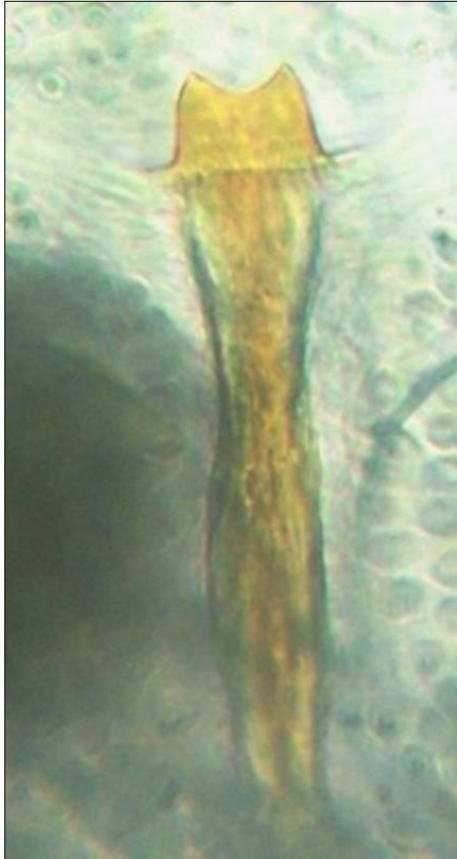
Procystiphora mangiferae is a minute orange colored midge in which the male is smaller than the female. While hovering over the inflorescence for egg laying, they are mistaken for *Dasineura amaramangarae* Grover. This year the same thing happened when the midges were seen in the field. They were taken for *D. amaramangarae* till they were examined in the laboratory. The ovipositor of the female differs markedly from that of and it is because of this that suspicion regarding their systematic status arose. Eyes are confluent above, trophy normal, palpus quadriarticulate, thickly hair, antennae dark brown with 2+13 segments in the males, while 2+12 segments in the female. The length of antennae in the male is less than 1/3 the length of the body while in the female it is 1/4 the body. Thorax and wings are similar in both sexes. Genitalia in male is dark brown but not very different from that of the male of other species. The ovipositor, being long retractile and strongly sclerotized at the end forming a blade like structure (generic character). The midge is host-specific and has not been found associated with any other plant so far in study area.

3.10 Damage

Procystiphora mangiferae is an important destructive midge pest of mango. The sepals of heavily infested buds wither, while the petals turn yellowish-red and project out. The projecting petals constitute a good character for the identification of the infected bud. The infected buds fails to open and drop ultimately. Sometime the larvae also dropped on the soil with bud, shall pupate there. The survey work done in 2018 showed that the destruction of flowers by *P. mangiferae* infection was complete at least in one orchard of Chitrukoot. On the basis of above investigation, the author recorded, *Procystiphora mangiferae* is an important minor pest of mango in Satna region, Madhya Pradesh.

Table 1: morphometric measurements and duration of different stages in the life cycle of *Procystiphora mangiferae*.

Developmental stage	Duration		Morphometric Measurements	
	Minimum	Maximum	Length(mm)	Width(mm)
Egg	30 hours	36 hours	0.28	0.11
First Instar	12 hours	48 hours	0.41	0.11
Second Instar	14 hours	20 hours	1.43	0.37
Third Instar	50 hours	60 hours	2.13	0.57
Fourth Instar	35 hours	45 hours	2.59	0.72
Pupa	4 days	6 days	2.60	0.74
Adult Male	2 hours	6 hours	2.62	0.81
Adult Female	10 hours	18 hours	2.89	1.2

**Fig 1:** Sternal Spatula of Forth instar larva of *Procystiphora mangiferae*.

- Jadhav KM. Biology of gall fly, *Procontarina matteiana* (Kieffer & Cecconi) on mango. *AGRES*. 2013; 2(3):358-362.
- Kalleshwaraswamy CM, Patel RK, Patel SA. New report of fruit infesting gall midge on mango. *Pest Management in Horticulture Ecosystem*. 2016; 22(1):84-87.

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5. References

- Singh LB. The mango: botany, cultivation and utilization. World Crop Books, Leonard Hill, Landon, 1968, 437.
- National horticulture Board. <http://www.nhb.gov>. 22 January, 2020.
- Grover P. Newer trends in gall midge studies. *Cecid. Internationale*, 1988; 10(1):1-10.
- Prasad SN. The Mango Midge Pest. *Cecidological society of india*. Allahabad, India, 1961, 49.
- Grover P, Kashyap V. On the Study of Bio-Ecology of Certain Gall-midges- A Discussion. *Cecid. Internationale*. 1984; 5(3):79-85.