Blossom Midge Felt (Diptera: Cecidomyiidae) Infestation in Floriculture: Impact on Tuberose, Jasmine and Orchids

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ABSTRACT

The blossom midge, *Contarinia maculipennis* Felt (Diptera: Cecidomyiidae), is an emerging threat to high-value floricultural crops like jasmine, orchids, and tuberose across India. Its wide adaptability to diverse environmental conditions and ability to overcome climatic barriers have contributed to its emergence as a major threat in commercial floriculture. The larval stage develops hidden within flower buds, making detection and management particularly challenging. Moist soil conditions support successful pupation, while nocturnally active adults oviposit on the upper surfaces of young flower buds, which provide ideal nutrition and moisture for larval development. Understanding the pest's biology, behavior, and damage potential is essential for identifying vulnerable points in its life cycle. Accurate identification through integrative taxonomic approaches and timely intervention during the

early bud stage are critical for effective control. Integrated management strategies involving soil raking to disturb pupae, incorporation of granular insecticides, mulching, installation of yellow sticky traps, application of botanicals, and judicious use of chemical insecticides on both soil and foliage while avoiding irrigation during pesticide application are recommended. Coordinated, zone-wise implementation of these practices by farmers can significantly reduce midge populations and mitigate crop losses.

INTRODUCTION

The blossom midge, *Contarinia maculipennis* Felt (Diptera: Cecidomyiidae), has recently emerged as a serious pest in both floriculture and vegetable cultivation, infesting a wide array of economically important crops such as orchids, jasmine, hibiscus, plumeria, and tuberose. In India, the presence of *C. maculipennis* was first recorded in jasmine plantations in the states of Andhra Pradesh and Tamil Nadu (Thirumala Rao *et al*. 1954; David,1958). Originating in Southeast Asia, the pest was initially reported on hibiscus in Hawaii (Felt 1933), with subsequent documentation linking its introduction to orchid imports from Thailand (Gagné *et al*. 1995). Today, it is recognized globally as a highly invasive gall midge with established infestations across multiple ornamental and vegetable crops, including *Jasminum sambac*, *Dendrobium phalaenopsis*, *Momordica charantia*, *Solanum melongena*, and *Hibiscus rosa-sinensis* (Uechi *et al*. 2011; Tokuda *et al*. 2002; Uechi *et al*. 2003; Kamala and Kennedy 2018).

One of the key challenges in managing *C. maculipennis* is its cryptic larval stage, which remains hidden within the floral structures. This characteristic not only makes early detection difficult but also allows the pest to evade phytosanitary checks, facilitating its silent and widespread distribution through international trade (Uechi *et al*. 2007; Dias *et al*. 2017). As a result, its establishment in new regions often goes unnoticed until significant damage has occurred. Given its wide host range, climatic adaptability, and potential for rapid spread, it emerged as a significant threat to high-value ornamental crops in India, causing substantial economic losses, particularly in orchids, jasmine, and more recently, tuberose (Keerthi *et al*., 2015). Its rapid expansion in host range and aggressive spread have led to its classification as a serious quarantine pest. Therefore, gaining detailed insights into its biology and population trends is critical for developing timely and effective interventions. Addressing this challenge requires urgent implementation of robust monitoring protocols, early warning systems, and integrated pest management (IPM) approaches. Emphasis must be placed on cultural practices, biological control and regulatory measures to contain its spread and safeguard the productivity and quality of vulnerable crops. This article provides insights on Blossom midge identification, life cycle and behaviour and integrated management strategies.

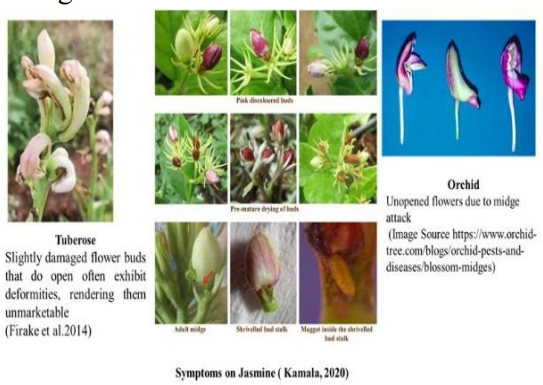

Figure 1. Blossom midge (*Contarinia maculipennis*) damage symptoms on tuberose, jasmine, and orchid. (Source: Firake *et al*. 2024; Kamala 2020; Orchid Tree, https://www.orchid-tree.com/blogs/orchid-pests-and-diseases/blossom-midges)

Identification:

Diagnostic taxonomic characters of *C. maculipennis* (Firake *et al*. 2024)

Blossom midge (*Contarinia maculipennis*) PC: Dr. D. M. Firake, Senior Scientist, ICAR DFR Pune **(https://insectenvironment.com/f/midge-infestation-rising-in-tuberose-jasmine-spp-in-south-india)**

1. The spiracles of the maggots are situated on the posteriorly oriented lobes of the eighth abdominal segment.

2. In the female, the first antennal flagellomere is approximately 1.8 to 1.9 times longer than the second flagellomere.

3. The male aedeagus is elongated and projects beyond the hypoproct.

Life Cycle and Behaviour:

The midge undergoes four stages: egg, larva (maggot), pupa, and adult. Eggs are typically laid at night in clusters within the flower buds. These eggs hatch within a day, releasing maggots that feed on the delicate tissues inside the bud. After 4–5 days of feeding, the maggots pupate in the soil, emerging as adults within a week (Kamala, 2020) All developmental stages of the blossom midge (*C. maculipennis*), except the adult, remain concealed either within jasmine flower buds or in the soil. The larvae inhabit and feed on the internal tissues of young, unopened buds, while pupation occurs in the soil. Adults typically emerge from the soil during the early evening hours, likely to take advantage of cooler temperatures that favor mating and dispersal.

Female midges lack the ability to pierce plant tissues and instead deposit their eggs through the natural floral opening at the tip of immature buds. Preference is given to young buds due to their higher moisture content and nutritional value, which are essential for optimal larval development. In contrast, older buds are generally unsuitable and are avoided. If a bud dries prematurely or dies before larval development is complete, the larvae may exit and drop to the soil for pupation. However, such early exit often results in delayed development and reduced adult size, as compared to individuals that complete their development within healthy floral tissues.

Symptoms:

1. Although adult females initiate damage by oviposition, it is the newly hatched larvae that feed on the flower tissues, causing deformation and economic loss (Tokuda *et al*. 2002). In India, *C. maculipennis* infestations have led to up to a 33% reduction in flower yield in *Jasminum* spp (Dueñas-López, 2022)

2. Symptoms and signs can be seen in both plant part and inflorescence characterized by distortion/fall or shedding/ internal feeding (CABI International 2022)

Eco-Friendly Management strategies (ICAR-Directorate of Floricultural Research):

Effective management of the blossom midge (*C. maculipennis*) begins with precise field sanitation. Since the eggs and maggots remain concealed within unopened flower buds, conventional insecticides often fail to reach the pest, rendering chemical applications largely ineffective. Hence, it is strongly recommended

to routinely collect and destroy both fallen and infested buds still present on the plant, as these serve as key sources of infestation.

To prevent larval escape, infested flower buds should be sealed in containers before disposal. This practice ensures complete elimination of maggots and prevents their spread to nearby crops. Successful suppression of the midge population requires coordinated action. Thus, management interventions should be implemented uniformly across villages or localities in a zonal manner. Such collective efforts significantly reduce reinfestation risks from untreated neighbouring areas.

Chemical pesticides offer limited benefit against the blossom midge because most life stages develop inside buds or soil, hidden from direct exposure. Additionally, reliance on such chemicals leads to environmental degradation. Therefore, sustainable alternatives with minimal ecological impact are highly recommended.

Adult midges are free-living and tend to visit flower buds during the evening to lay eggs, which offers a strategic window for intervention. Eco-friendly approaches such as mass trapping using yellow sticky traps installed at a density of 100 traps per hectare can help substantially reduce adult populations. Furthermore, spraying a 5% neem seed kernel extract (NSKE) acts as an oviposition deterrent, discouraging females from laying eggs in flower buds. Together, these measures provide effective midge suppression without harming beneficial organisms.

The mature maggots exit buds and drop to the soil, where they construct earthen cocoons for pupation. However, successful pupation occurs only under moist soil conditions. Therefore, maintaining dry soil between crop rows is a practical strategy to disrupt the midge's lifecycle. Although soil insecticides can target maggots before cocoon formation, regularly harrowing or raking the inter-row soil proves more effective. This mechanical disruption not only destroys existing cocoons but also hinders adult emergence, providing robust control of midge populations.

Integrated Management strategies for Blossom midge (*Contarinia maculipennis)*

Table adopted from Babu *et al*. 2014

Category	Practice / Agent	Details / Dosage
Cultural and Sanitation	Destruction of infested plant parts	Burn or remove infested portions
	Sanitation and drainage	Regular maintenance to prevent breeding grounds
	Collection and destruction of buds	Remove discolored and fallen buds
	Avoid early blooming yellow cultivars	Prevents attraction of pests
	Removal of infected buds	Prevents spread of infestation
Soil Management	Soil raking	Exposes and kills pupae
	Winter pruning	Reduces overwintering populations
	Soil application of *Metarhizium* spp.	Biological control of soil-borne stages
	Carbofuran 3G	30 kg/ha
	Chlorpyrifos 20 EC (soil drenching)	5 mL/L around plant base
Botanical Insecticides	Neem oil	2% – effective against *C. maculipennis*
	Pungam oil	2% – high field efficacy
	Neem Seed Kernel Extract (NSKE)	5% – effective in reducing infestation
Biological Control	*Amblymerus* sp.	Hymenopterous parasitoid (Essig, 1916)
	Beauveria bassiana, Metarhizium anisopliae, Paecilomyces lilacinus, Lecanicillium lecanii	Entomopathogenic fungi
	Trichogramma chilonis (Ishnii)	Egg parasitoid
	Web-spinning spiders, ants	Pupal predators
	Brumoides suturalis, Cheilomenes sexmaculata, Chrysoperla zastrowi, Coccinella septempunctata	Predatory beetles and lacewings
	Coccinella transversalis, Illeis cincta, Mallada	Generalist predators

	desjardinsi, Scymnus spp., Systasis dasyneurae (Mani)	
Chemical Control	Chlorpyrifos 25 EC	0.05%
	Thiacloprid 240 SC	0.6 mL/L
	Flubendiamide 39.35 SC	0.75 mL/L and 0.40 g/L
	Chlorantraniliprole 18.5 SC	0.05%

CONCLUSION:

The blossom midge, *C. maculipennis*, is an emerging threat to high-value floricultural crops like jasmine, orchid, and tuberose across India. Its cryptic larval stage within flower buds and soil-based pupation make detection and control challenging, particularly under moist soil conditions that favor development. Adults oviposit on young buds during evening hours. Integrated management involving field sanitation, botanicals, soil raking, moisture control, and eco-friendly interventions has proven effective. Coordinated, zone-wise implementation of these practices is essential for sustainable suppression of midge populations.

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