

Chapter 7

Buzzing Allies of Lemongrass: Pollinators Supporting Ecosystem Services and Plant Conservation

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Abstract: Pollinators play a fundamental role in maintaining ecosystem services, biodiversity and agricultural sustainability. *Cymbopogon citratus* (DC.) Stapf (lemongrass) is an economically and medicinally important aromatic grass widely cultivated in tropical and subtropical regions. Although lemongrass is primarily known for its essential oil and vegetative propagation, the role of insect visitors in supporting its reproductive ecology and associated ecosystem services remains poorly documented. The present study records and analyzes the diversity of pollinators visiting *C. citratus*, highlighting their taxonomic composition and ecological significance. The documented assemblage includes representatives from Diptera, Hymenoptera and Coleoptera, emphasizing the contribution of both managed and wild insects to plant-pollinator networks and conservation strategies.

Keywords: *Cymbopogon citratus*, ecosystem services, honey bees, hoverflies, plant conservation

Introduction

Pollinators are indispensable components of natural and managed ecosystems, playing a vital role in plant reproduction, genetic diversity and overall ecosystem stability (Katumo et al., 2022). Through the transfer of pollen, insects such as bees, flies, beetles and butterflies facilitate sexual reproduction in flowering plants, thereby supporting food webs, sustaining biodiversity and enhancing agricultural productivity (Bareke et al., 2025). However, global declines in pollinator populations caused by habitat fragmentation, intensive agriculture, pesticide use and climate change have raised serious ecological concerns, emphasizing the need for detailed studies on plant-pollinator interactions, especially in economically important plant species (Daza et al., 2024). *Cymbopogon citratus* (DC.) Stapf, commonly known as lemongrass, is a perennial aromatic grass belonging to

the family Poaceae and is widely cultivated across tropical and subtropical regions (Shah et al., 2011; Figure 1). The plant is valued for its essential oil rich in citral, which has extensive applications in pharmaceuticals, cosmetics, food industries and traditional medicine (Mukarram et al., 2021). While lemongrass is predominantly propagated vegetatively for commercial purposes, its flowering phase produces inflorescences that offer pollen and nectar resources to a variety of insect visitors (Ashaq et al., 2024). These floral resources make *C. citratus* an important component of agroecosystems, particularly in landscapes where floral diversity is otherwise limited (Shamsheer et al., 2022). Despite its economic and medicinal importance, the ecological interactions of *C. citratus* with insect pollinators remain inadequately explored. Most studies on lemongrass focus on its phytochemistry, cultivation practices and essential oil yield, with little attention given to its role in supporting pollinator communities. Documenting pollinators associated with *C. citratus* is therefore crucial not only for understanding its reproductive ecology but also for recognizing its contribution to ecosystem services such as pollination and biodiversity conservation. The present study aims to investigate the diversity of pollinators visiting *C. citratus* and to highlight their ecological significance. From examining the taxonomic composition and functional roles of these insect visitors, the study aims to highlight the importance of lemongrass as a pollinator-supporting plant and to elucidate its potential role in sustainable agriculture and plant conservation strategies.

Methodology

Field observations were conducted during the flowering period of *Cymbopogon citratus* from October 2025 to December 2025 in Dasapur, Cuttack, Odisha, India. Grass species were identified by the authors with references (Saxena and Brahmam, 1996; Behera et al., 2025). Insect visitors were recorded through direct visual observations during peak activity hours. Pollinators were identified up to the species level using standard taxonomic keys and available literature (<https://en.wikipedia.org/>). The observed species were categorized based on their order and family to assess taxonomic diversity and functional roles within the pollination system.

Results and discussion

The pollinator assemblage recorded on *Cymbopogon citratus* comprised six insect species representing three orders, which include Diptera, Hymenoptera and Coleoptera, and four families. Diptera was the most dominant order, accounting for half of the total species recorded, all

belonging to the family Syrphidae. The hoverflies *Allograpta obliqua*, *Episyrphus balteatus* and *Helophilus pendulus* were frequently observed visiting the inflorescences, exhibiting active hovering and foraging behavior. Their repeated visitation suggests a strong attraction to the floral resources offered by *C. citratus*. Hymenoptera was represented by two species of honey bees, *Apis cerana* and *Apis mellifera*, both belonging to the family Apidae. These species showed regular and purposeful foraging activity, collecting pollen and nectar from the flowers. The presence of both native (*A. cerana*) and managed (*A. mellifera*) pollinators indicates that *C. citratus* serves as a valuable forage plant across different pollination guilds. Coleoptera was represented by a single species, *Chrysolina staphylaea* (family Chrysomelidae). Although its visitation frequency was comparatively low, the beetle was observed feeding on floral parts, contributing to incidental pollination. The study reveals that *C. citratus* supports a diverse and functionally varied group of insect pollinators, dominated by flies and bees.

Table 1: Pollinators visiting *Cymbopogon citratus*

Scientific name	Common name	Order	Family
<i>Allograpta obliqua</i>	Oblique streaktail hoverfly	Diptera	Syrphidae
<i>Apis cerana</i> (Figure 2)	Eastern honey bee	Hymenoptera	Apidae
<i>Apis mellifera</i>	European honey bee	Hymenoptera	Apidae
<i>Chrysolina staphylaea</i> (Figure 3)	Brown leaf beetle	Coleoptera	Chrysomelidae
<i>Episyrphus balteatus</i>	Marmalade hoverfly	Diptera	Syrphidae
<i>Helophilus pendulus</i>	Common tiger hoverfly	Diptera	Syrphidae

The dominance of syrphid flies among the recorded pollinators highlights the importance of Diptera in the pollination ecology of *C. citratus*. Hoverflies are known to be effective pollinators, particularly in open and small-flowered plant species such as grasses and aromatic herbs. Their ability to forage efficiently under a wide range of environmental conditions may explain their frequent presence on *C. citratus* inflorescences.



Figure 1: *Cymbopogon citratus* in the wild



Figure 2: *Apis cerana* pollinating *Cymbopogon citratus* flowers



Figure 3: Brown leaf beetle feeding on nectar from *Cymbopogon citratus* flowers

Additionally, the larval stages of many syrphid species act as natural enemies of agricultural pests, suggesting that their association with lemongrass contributes to both pollination and biological control services within agroecosystems. The consistent visitation by *Apis cerana* and *Apis mellifera* highlights the role of bees as reliable pollinators of *C. citratus*. Honey bees are generalist foragers and are attracted to mass-flowering crops that provide abundant and accessible resources. The presence of *A. cerana* reflects the importance of native pollinators in sustaining local ecosystems, while *A. mellifera* indicates the compatibility of lemongrass cultivation with managed pollination systems. Such coexistence enhances pollination stability and reduces reliance on a single pollinator species. The relatively low representation of Coleoptera suggests that beetles play a minor but complementary role in the pollination of *C. citratus*. Beetle pollination is often incidental, occurring during feeding or movement across flowers, yet it contributes to the overall resilience of pollination networks. The involvement of multiple insect orders indicates a generalized pollination system, which is advantageous for plant reproduction under fluctuating environmental conditions. The observed pollinator diversity demonstrates that *C. citratus* functions as an important floral resource supporting a range of insect pollinators. This interaction enhances ecosystem services such as pollination, pest regulation and biodiversity maintenance. From a conservation perspective, the inclusion of lemongrass in agricultural landscapes can promote pollinator-friendly habitats, reinforcing the ecological value of aromatic and medicinal plants in sustainable farming systems.

Conclusion

The present study demonstrates that *Cymbopogon citratus* supports a diverse assemblage of insect pollinators belonging to Diptera, Hymenoptera and Coleoptera, with hoverflies and honey bees playing a dominant role. The prevalence of syrphid flies highlights the importance of non-bee pollinators in sustaining pollination services, while the regular visitation by both native and managed honey bees highlights the ecological and agricultural relevance of lemongrass. The involvement of multiple pollinator groups suggests a generalized and resilient pollination system that enhances ecosystem stability. Beyond its economic and medicinal value, *C. citratus* functions as a valuable floral resource within agroecosystems, contributing to pollinator conservation, biodiversity maintenance and sustainable agricultural practices.

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