

Chapter 3

Pollination Ecology of *Tridax procumbens* L.: Diversity and Dynamics of Pollinators

Subhalakshmi Rout and Sanjeet Kumar*

Ambika Prasad Research Foundation, Odisha, India

*Email-Id: sanjeetaprf@gmail.com



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: *Tridax procumbens* L. (Asteraceae) is a widespread perennial herb commonly found in disturbed and open habitats, providing a valuable nectar source for a variety of insect pollinators. The present study investigates the diversity and dynamics of butterfly pollinators visiting *T. procumbens* to understand its role in pollination ecology. Field observations recorded 25 butterfly species belonging to three families, Lycaenidae, Nymphalidae and Pieridae, actively foraging on the flowers. Lycaenid butterflies were the most dominant, exhibiting frequent and prolonged visits, while nymphalid and pierid species contributed through wider-ranging and complementary foraging behaviours. The diversity of visiting butterflies, coupled with their differing foraging strategies, indicates a generalized and resilient pollination system. The findings highlight the ecological significance of *T. procumbens* as a key nectar resource that supports butterfly assemblages, facilitates pollen transfer and enhances reproductive success in human-modified and natural landscapes. The current work emphasizes the importance of conserving common flowering herbs to maintain pollinator diversity and functional pollination networks.

Keywords: Butterfly pollinators, floral visitors, Lycaenidae, nectar resources, Nymphalidae, Pieridae, plant-insect interactions, pollinator diversity

Introduction

Pollination is a fundamental ecological process that ensures sexual reproduction in flowering plants and maintains genetic diversity, population stability and ecosystem resilience (Bareke et al., 2025). Among insect pollinators, butterflies play an important yet often underappreciated role, particularly in tropical and subtropical ecosystems where floral diversity and climatic conditions support year-round activity (Subedi et al., 2021). Butterflies contribute to pollination while foraging for nectar and facilitate pollen transfer across spatially separated plant populations (Young and Montgomery, 2020). Understanding butterfly-plant interactions is

therefore essential for evaluating ecosystem functioning, especially in human-modified landscapes. *Tridax procumbens* L., commonly known as coat buttons, is a perennial, creeping herb belonging to the family Asteraceae, widely distributed across India and other tropical regions (Dattaray, 2022). It commonly occurs along roadsides, agricultural fields, wastelands and urban open spaces (More et al., 2023). Although often regarded as a weed, *T. procumbens* produces bright yellow flower heads with easily accessible nectar, making it highly attractive to a wide range of insect visitors (Varalakshmi et al., 2013). Its prolonged flowering period and adaptability to disturbed habitats allow it to serve as a continuous nectar resource when other floral species are scarce (Devanda and Charan, 2025). Despite its abundance and ecological relevance, the pollination biology of *T. procumbens* has received limited focused attention, particularly with respect to butterfly pollinators (Patil and Gaikwad, 2024). Most studies on pollination ecology have traditionally emphasized bees, while the contribution of butterflies remains comparatively less documented (Barrios et al., 2016). Documenting the diversity and dynamics of butterfly pollinators associated with *T. procumbens* is therefore crucial for understanding its reproductive ecology and its role in sustaining pollinator assemblages. The present study aims to investigate the pollination ecology of *T. procumbens* by documenting the diversity of butterfly species visiting its flowers and analyzing their potential role as pollinators. Through elucidation of butterfly-plant interactions, the current work seeks to emphasize the ecological importance of common flowering weeds in maintaining pollinator diversity and supporting functional pollination networks in natural as well as anthropogenic ecosystems.

Methodology

Field surveys were carried out from June 2025 to November 2025 in Chandaka-Dampara Wildlife Sanctuary, Odisha, India, to document the pollinators on the flowers of *Tridax procumbens*. Butterfly visits to the flowers were recorded through direct visual observations during peak activity hours (morning to early afternoon). The plant species was identified by the authors, and pollinators were identified using available literature (Kumar et al., 2022; Kehimkar, 2016). The collected data were organized family-wise to assess pollinator diversity and dominance patterns.

Results and discussion

The present study revealed a rich diversity of butterfly pollinators associated with the flowers of *Tridax procumbens* L., indicating a generalized pollination system. A total of 25 butterfly species belonging to

three families, Lycaenidae, Nymphalidae, and Pieridae, were recorded actively foraging on the flowers (Table 1). All recorded species were observed making direct contact with the disc florets while feeding on nectar, suggesting their effectiveness in pollen transfer and successful pollination. Among the three families, Lycaenidae emerged as the most dominant group, contributing the highest number of species. Small-sized butterflies such as *Chilades lajus*, *Euchrysops cnejus*, *Leptotes plinius* and *Zizina otis* showed frequent visitation and longer foraging durations. Their repeated movements among inflorescences within and between plants enhance the likelihood of cross-pollination. The structural compatibility between the shallow floral disc of *T. procumbens* and the short proboscis of lycaenid butterflies appears to facilitate efficient nectar extraction and pollen deposition. Nymphalidae constituted the second most represented family, including conspicuous species such as *Acraea terpsicore*, *Junonia* spp., *Danaus chrysippus* and *Euploea core*. These butterflies exhibited relatively fewer visits compared to lycaenids, but compensated through their larger body size and wider foraging range. Their strong flight ability enables pollen transfer over longer distances, potentially contributing to enhanced genetic exchange among plant populations. Species such as *Junonia almana* and *Danaus chrysippus* were particularly regular visitors during peak flowering periods. Pieridae was represented by species such as *Eurema hecabe*, *Catopsilia pomona*, *Catopsilia pyranthe* and *Appias libythea*. These butterflies were observed predominantly during bright sunny conditions and showed moderate visitation frequencies. Their foraging behaviour involved quick but repeated visits to multiple flowers, which may contribute to effective pollen dispersal across plants. The presence of pierid butterflies further supports the role of *T. procumbens* as a broadly attractive nectar source. The high diversity and consistent visitation of butterfly pollinators demonstrate that *T. procumbens* functions as an important floral resource in open and disturbed habitats. The dominance of lycaenid species, coupled with the complementary roles of nymphalid and pierid butterflies, suggests a stable and resilient pollination system. The study highlights the ecological significance of *T. procumbens* in sustaining butterfly assemblages and maintaining pollination processes in landscapes increasingly influenced by anthropogenic activities.

Table 1: Butterflies pollinating flowers of *Tridax procumbens*

Family	Scientific name	Common name
Lycaenidae	<i>Chilades lajus</i>	Lime blue
	<i>Euchrysops cnejus</i>	Gram blue

	<i>Luthrodes pandava</i>	Plains cupid
	<i>Freyeria putli</i>	Oriental grass jewel (Figure 1)
	<i>Tarucus nara</i>	Striped pierrot
	<i>Leptotes plinius</i>	Zebra blue
	<i>Castalius rosimon</i>	Common pierrot
	<i>Jamides celeno</i>	Common cerulean
	<i>Freyeria trochylus</i>	Grass jewel
	<i>Zizina otis</i>	Lesser grass blue
	<i>Cigaritis vulcanus</i>	Common silverline
Nymphalidae	<i>Acraea terpsicore</i>	Tawny coster (Figure 2)
	<i>Junonia almana</i>	Peacock pansy (Figure 3)
	<i>Junonia hierta</i>	Yellow pansy (Figure 4)
	<i>Junonia lemonias</i>	Lemon pansy
	<i>Hypolimnas misippus</i>	Danaid eggfly
	<i>Danaus chrysippus</i>	Plain tiger
	<i>Euploea core</i>	Common crow
	<i>Danaus genutia</i>	Striped tiger
Pieridae	<i>Eurema hecabe</i>	Common grass yellow (Figure 5)
	<i>Catopsilia pomona</i>	Common emigrant
	<i>Catopsilia pyranthe</i>	Mottled emigrant
	<i>Cepora nerissa</i>	Common gull
	<i>Leptosia nina</i>	Psyche
	<i>Appias libythea</i>	Striped albatross (Figure 6)

The occurrence of multiple butterfly families visiting the flowers indicates that the species is not dependent on a single pollinator group, which enhances its reproductive assurance in variable and disturbed environments. Such generalist pollination strategies are particularly advantageous for plants growing in open habitats where pollinator availability may fluctuate seasonally and spatially. The dominance of Lycaenidae observed in the present study can be attributed to the floral architecture and nectar characteristics of *T. procumbens*. The shallow, exposed disc florets and readily accessible nectar are well suited to small-bodied butterflies with short proboscides.



Figure 1: Oriental grass jewel butterflies sucking nectar from the flowers of *Tridax procumbens*

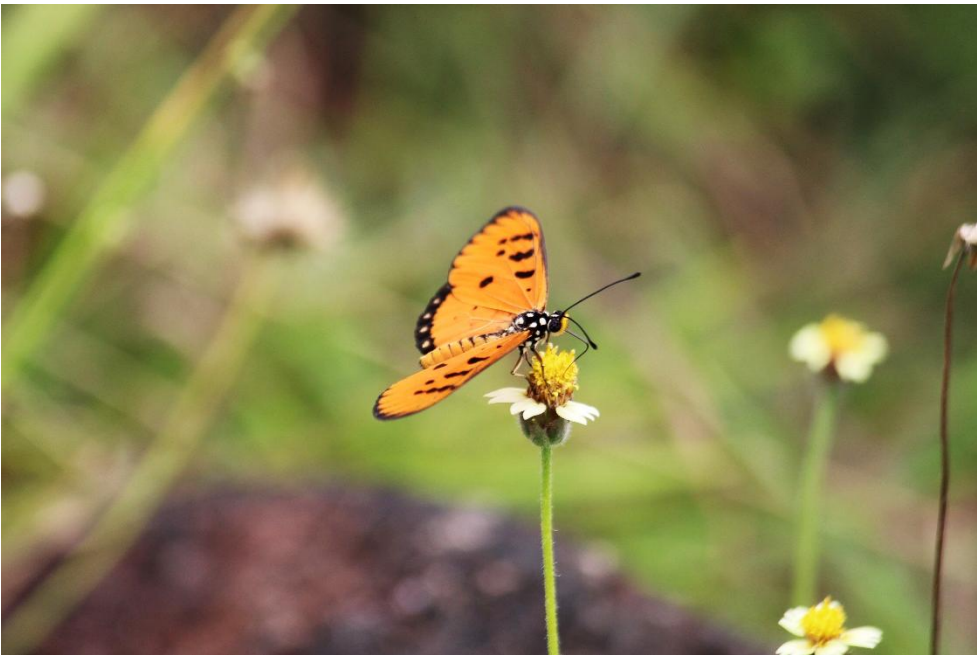


Figure 2: Tawny coster butterfly pollinating the flower of *Tridax procumbens*

Frequent and prolonged visits by lycaenids increase the probability of pollen transfer among capitula, thereby enhancing pollination efficiency. Similar patterns have been reported in other herbaceous Asteraceae, where lycaenid butterflies act as effective pollinators due to their close flower-pollinator morphological compatibility (Budumajji and Solomon Raju, 2018; Das et al., 2024; Saradar et al., 2024). Although nymphalid butterflies were less diverse compared to lycaenids, their ecological role remains significant (Pietrzak and Pabis, 2025). Larger species such as *Danaus chrysippus*, *Euploea core* and *Acraea terpsicore* possess greater mobility and wider foraging ranges, enabling pollen transfer across larger distances. This long-distance pollen dispersal can promote genetic connectivity among fragmented plant populations, particularly in urban and agricultural landscapes. Thus, nymphalids may contribute disproportionately to gene flow despite lower visitation frequency. Pierid butterflies also formed an important component of the pollinator assemblage, especially under favourable climatic conditions. They demonstrated moderate visitation rates during peak sunlight hours, which suggests that environmental factors strongly influence visitation patterns. The rapid and repeated foraging behaviour of pierids facilitates pollen movement among multiple flowers and plants, ensuring consistent pollen transfer across the flowering period. This interplay of frequent small-bodied visitors and less frequent large-bodied species reflects a dynamic pollination network with functional redundancy, enhancing the resilience of *T. procumbens* reproductive success. Ecologically, the results highlight the importance of *T. procumbens* as a keystone nectar resource in degraded, roadside and urban habitats (de Oliveira et al., 2025). Although often regarded as a weed, its extended flowering period and high attractiveness to pollinators make it valuable for sustaining butterfly populations, particularly during periods of floral scarcity (Mallick and Viridi, 2024). Protecting and integrating such flowering herbs into landscape planning can contribute to pollinator conservation and ecological stability, especially in human-dominated environments.

Future perspectives

Further studies focusing on pollination efficiency, pollen transfer rates and seasonal variation in pollinator assemblages would provide deeper insights into the reproductive ecology of *T. procumbens*. Understanding its role in landscape-level pollination dynamics can help integrate pollinator-friendly practices into biodiversity conservation and habitat management plans.



Figure 3: Peacock pansy butterfly feeding on nectar from the flowers of *Tridax procumbens*



Figure 4: Yellow pansy butterfly pollinating the flower of *Tridax procumbens*



Figure 5: Common grass yellow butterfly sucking nectar from the flower of *Tridax procumbens*



Figure 6: Striped albatross butterfly pollinating the flower of *Tridax procumbens*

Conclusion

The present study highlights *Tridax procumbens* L. as an ecologically significant flowering herb that supports a diverse and functionally important assemblage of butterfly pollinators. The documentation of 25 butterfly species belonging to Lycaenidae, Nymphalidae and Pieridae demonstrates that the species operate under a generalized pollination system, ensuring reproductive success across a wide range of environmental conditions. Such diversity reflects the adaptability of *T. procumbens* to disturbed and human-modified habitats. The dominance of lycaenid butterflies, supported by the complementary roles of nymphalid and pierid species, indicates a stable and resilient pollination network. While smaller butterflies contribute through frequent and localized pollen transfer, larger and more mobile species facilitate long-distance gene flow, collectively enhancing the reproductive fitness and genetic diversity of *T. procumbens* populations. Although often categorized as a weed, *T. procumbens* serves as a vital nectar resource, particularly in landscapes where native floral diversity is declining. Its extended flowering period and high attractiveness to butterflies make it an important component of pollinator-friendly habitats. The findings emphasize the need to reconsider the ecological value of such common plants in biodiversity conservation and habitat management strategies. The current work contributes to a better understanding of butterfly-mediated pollination and highlights the role of widely distributed herbaceous plants in sustaining pollinator diversity and ecosystem functioning. Conservation efforts aimed at protecting pollination services should incorporate and value such resilient flowering species within natural, agricultural and urban ecosystems.

Acknowledgements: Authors are thankful to the Principal Chief Conservator of Forests & Head of Forest Force, Forest, Environment and Climate Change Department, Government of Odisha, Odisha and Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife Warden, Forest, Environment and Climate Change Department, Government of Odisha, Odisha. We are also grateful to the Divisional Forest Officer, Chandaka-Dampara Wildlife Sanctuary, Odisha, Range Officer & other forest officials for extending their support during the survey.

References

- Bareke T, Alemu T, Addi A, Yimer O and Mengesha D. (2025). Effects of honeybee pollination and other insect pollinators on increasing the seed yield and germination capacity of carrot (*Daucus Carota* L.) in the central highlands of Ethiopia. BMC Plant Biology. 25(1): 1051. <https://doi.org/10.1186/s12870-025-07142-0>
- Barrios B, Pena SR, Salas A and Koptur S. (2016). Butterflies visit more frequently, but bees are better pollinators: the importance of mouthpart dimensions in

- effective pollen removal and deposition. AoB PLANTS. 8: plw001. <https://doi.org/10.1093/aobpla/plw001>
- Budumajji U and Solomon Raju AJ. (2018). Pollination ecology of *Bidens pilosa* L. (Asteraceae). Taiwan. 63(2): 89-100.
- Das K, Suresh Rao GA, Rout S, Kumar S, Saradar B and Sharma BP. (2024). Pollinators of *Tridax procumbens* L.: a conservation approach. In: Sharma BP, Stalin NA, Dehar PS and Kumar S. Animal-Plant Interaction, Volume V. Ambika Prasad Research Foundation, Odisha, India.
- Dattaray D. (2022). Traditional uses and pharmacology of plant *Tridax procumbens*: a review. Systematic Review Pharmacy. 13(7): 476-482.
- de Oliveira EA, da Silva LC, Battirolo LD and de Andrade RLT. (2025). *Tridax procumbens*: applicable weed in phytoremediation and bioindication of soil contamination by mercury. ACS Omega. 10(25): 27515-27524. <https://doi.org/10.1021/acsomega.5c03362>
- Devanda M and Charan SK. (2025). Diversity of bees and butterflies on *Tridax Procumbens*: a study in Abu Road, Sirohi, Rajasthan. International Journal of Science and Research. 14(4): 1646-1652.
- Kehimkar I. (2016). Butterflies of India. Bombay Natural History Society, Mumbai, India.
- Kumar S, Mishra S, Mishra AK and Kumar SN. (2022). Floral Diversity of Koira and Barsuan Ranges of Bonai Forest Division, Odisha. Bonai Forest Division, Bonai, Sundargarh, Odisha and Ambika Prasad Research Foundation, Odisha, India.
- Mallick MAI and Viridi N. (2024). Feeding butterflies with *Tridax procumbens* (L.), a beneficial plant for maintaining butterfly population. Nova Geodesia. 4(3): 174.
- More VI, Mahale CB, Kendre SJ, Patil MK and Shewale V. (2023). Review on '*Tridax Procumbens*' (Asteraceae) and its pharmacological activity.
- Patil AN and Gaikwad SM. (2024). A study on the association between *Tridax* Daisy *Tridax procumbens* L. and butterflies at Shivaji University Campus, Maharashtra, India. Journal of Threatened Taxa. 16(9): 25920-25930.
- Pietrzak S and Pabis K. (2025). Blooming urban table: flower resources for butterflies in small wastelands of a large European city. Ecology and Evolution. 15(9): e72088. <https://doi.org/10.1002/ece3.72088>
- Saradar B, Rout S, Kumar S and Tripathi G. (2024). Pollinators and medicinal values of *Wedelia chinensis*. In: Sharma BP, Stalin NA, Dehar PS and Kumar S. Animal-Plant Interaction, Volume V. Ambika Prasad Research Foundation, Odisha, India.

- Subedi B, Stewart AB, Neupane B, Ghimire S and Adhikari H. (2021). Butterfly species diversity and their floral preferences in the Rupa Wetland of Nepal. *Ecology and Evolution*. 11(5): 2086-2099. <https://doi.org/10.1002/ece3.7177>
- Varalakshmi P, Solomon Raju AJ and Chandra PH. (2013). Pollination ecology of *Tridax procumbens* L. (Asteraceae). *Journal of Palynology*. 49: 143-158.
- Young FJ and Montgomery SH. (2020). Pollen feeding in *Heliconius* butterflies: the singular evolution of an adaptive suite. *Proceedings of the Royal Society B, Biological Sciences*. 287(1938): 20201304. <https://doi.org/10.1098/rspb.2020.1304>