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Investigation of climbing species in Dombivli district Thane: A floristic view

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Abstract
The investigation gives a detailed examination of the climbing plant species in the urban area of Dombivli, Maharashtra, from 2021 to 2023. Field surveys in various areas identified a total of 64 species from 36 families and 51 genera. These climbing plants were divided into four types: twiners, climbers, vines, and creepers. The study highlights the ecologic importance of climbing plants in urban areas, highlighting their functions in increasing vertical complexity, providing habitat for animals, and aiding in nutrient cycling. By recording the abundance of climbing plants in Dombivli, this study focuses on the need to include green areas in urban planning initiatives to conserve biodiversity and promote sustainable development.

Keywords: Climbing species, diversity, urban ecology, Dombivli, conservation'

Introduction

Climbers have a significant environmental impact. They improve forest structure by increasing vertical complexity and creating new niches and habitats for numerous creatures. Climbers help in forest regeneration by dispersing seeds and giving structural support to new trees. They also contribute to nitrogen cycling, hence maintaining soil fertility and forest health. Climbers in urban environments can help minimize the urban heat island effect, improve air quality, and increase aesthetic value by covering buildings and other structures with vegetation. Understanding their diversity and biological importance in urban environments may help guide urban planning and biodiversity conservation initiatives, supporting the incorporation of green areas into cityscapes (Schnitzer & Bongers, 2002) [16].

Urban locations such as Dombivli provide a unique chance to study plant biodiversity in urban development. Rapid urbanization frequently causes habitat fragmentation and biodiversity loss, emphasizing the importance of documenting and conserving surviving natural ecosystems. Climbers are especially fascinating in urban ecology because of their capacity to survive in fragmented habitats and play important ecologic roles. Previous studies on climbers have mostly focused on forest habitats, with little information on their prevalence and activities in urban contexts. Gentry (1991) [7] emphasized the importance of climbers in tropical forests, highlighting their contribution to forest structure and species interactions. However, equivalent thorough research in urban environments is few, especially in Indian places such as Dombivli. This study seeks to close this gap by compiling a complete inventory of climbers in Dombivli and evaluating their ecologic roles in an urban environment (Deshmukh & Tambe, 2017) [6].

At the national level, documenting climber diversity is consistent with India's National Biodiversity Action Plan (NBAP), which emphasizes the significance of biological diversity conservation and sustainable resource use. Detailed studies of plant species in urban areas help to further attain this objective by revealing species that may be in threat caused by urbanization and advising conservation initiatives. Understanding the diversity of climbers can also help with urban planning and green space management, encouraging biodiversity conservation in towns (Chaudhary et al., 2015) [2].

On a worldwide level, our study helps improve awareness of urban biodiversity, which is becoming increasingly essential as cities expand worldwide. India is a signatory to the Convention on Biological Diversity, which promotes biodiversity protection across all habitats, including urban areas. Urban biodiversity research, such as this one, contributes essential data to global biodiversity assessments and shapes worldwide conservation strategies. Furthermore, the findings might help to update the International Union for Conservation of Nature Red List by identifying climber species that may be relatively rare or vulnerable in urban areas (International Union for Conservation of Nature and Natural Resources, 2021).

In Maharashtra state, various climatic and topographical conditions support a vast diversity of plant species. However, studies on urban climbers are minimal. Most studies have concentrated on the floristic makeup of forests and rural regions, (Singh and Singh, 2015) [20] N. P., & Karthikeyan, S. (2000) [10]. With their unique characteristics and structures designed for ascent, climbing plants are nature's creators of verticality. These botanical miracles use the physical support of their hosts to reach toward the sun-drenched canopy, where they compete with towering trees and robust shrubs for limited resources such as light and space, as well as essential nutrients. Richards (1952) [15] explained that this competition highlights the evolutionary cunning of climbers, prompting them to evolve specialized adaptations for ascent and resource acquisition.

Dombivli, as part of the Mumbai Metropolitan Region, is under tremendous ecologic impact because of growing urban populations. The primary objective of this research is to describe the climber species found in Dombivli, assess their ecologic importance, and better understand their distribution patterns in an urban area. By doing so, it helps preserve Maharashtra's botanical knowledge while also supporting local conservation efforts.

Dombivli, located in Maharashtra's Thane district, is a rapidly urbanizing and industrializing area. Despite these modifications, it still has sections of natural habitat that support a diverse range of plant species, including climbers. Climbers, also known as lianas, are plants with long, flexible stems that climb upward using external supports like trees, bushes, or even man-made structures. They perform critical functions in forest ecology, adding to structural complexity, providing habitat for wildlife, and assisting in nutrient cycling. This study looks at the diversity of climbers in Dombivli's urban regions, attempting to document their species richness, distribution, and ecologic value.

Materials and Method

Study Area: The study was carried out in Dombivli, Thane district, Maharashtra, India, which is part of the Mumbai Metropolitan Region and is known for its fast development. Geographically, Dombivli is located at 19.2183° N latitude and 73.0860° E longitude, at an elevation of around 14 m above sea level. The region has a tropical monsoon climate with scorching summers (25–38 °C), strong monsoon rains (2,000–2,500 mm/year), and moderate winters (15–28 °C). Despite population growth, this environment supports a diverse range of plant species (Desai & Chitale, 2017 [5]; Kulkarni & Patil, 2019) [11].

Field Survey: The survey was carried out in some of the selected localities for the course of the 2021–2023 season. Field surveys were conducted across five representative sites: urban parks, roadside vegetation, abandoned many, residential areas, and remnant forest patches. Climbing mechanisms were assessed through direct observations in the field, and each species was also assigned to one of five functional climbing modes, twine, Tendril climber, scrambler/Hook climber, root climber, and Adhesive climber. The plants had just been picked, and digital photos of them had been taken. Specimens were identified using standard procedures and Flora of Gujrat) with supporting information for ethno medical uses and recipes (Almeda, 2003 [1]; Cook, 1908 [3], 1965 [4]; Jain & Rao, 1977) [9], and Flora of Gujrat (Naik, 2004 [12]; Shah, 1978) [17].

Results and Discussion

The floristic investigation of the roadside vegetation in the Dombivli Urban area, Thane District, Maharashtra, revealed a rich diversity of climbing plants. The study documented 64 species across 32 families and 50 genera. The climbing plants were categorized into four main plant forms: twiners, climbers, vines, and creepers. The present study's findings highlight a rich diversity of climbing plants in Dombivli, Thane District, with 64 species across 36 families and 51 genera. The members of Fabaceae reported a maximum of 07 species followed by Convolvulaceae 06, Cucurbitaceae 06, Bignoniaceae 03, Asclepiadaceae 03, Verbenaceae 03, Asparagaceae 02 Capparidaceae 02, Menispermaceae 02, Araceae 02 each and the remaining with one each.

Table 1: Climbing Plant Diversity in Dombivli, Thane District"

Sr. No.	Botanical Name	Common Name	Family	Plant form
1.	*Abrus precatorius L.*	Gunj	Fabaceae	Twiner
2.	*Argyreia nervosa* (Burm. f.) Bojer	Elephant Creeper	Convolvulaceae	Twiner
3.	*Aristolochia elegans L.*	Calico Flower	Aristolochiaceae	Vine
4.	*Asparagus racemosus* Willd.	Shatavari	Asparagaceae	Twiner
5.	*Asparagus setaceus* (Kunth) Jessop	Climbing Asparagus Fern	Asparagaceae	Twiner
6.	*Bignonia alliacea* Lam.	Garlic Vine	Bignoniaceae	Vine
7.	*Bignonia magnifica* W.Bull	Purple Funnel Vine	Bignoniaceae	Vine
8.	*Canavalia gladiata* (Jacq.) DC.	Tarvardi	Papilionaceae	Climber
9.	*Capparis sepiaria* L.	Wild Caper Bush	Capparidaceae	Climber
10.	*Capparis zeylanica L.*	Waghati	Capparidaceae	Climber
11.	*Celastrus paniculatus* Willd.	Black Oil Plant	Celastraceae	Climber
12.	*Cissampelos pareira* L.	Velvet Leaf	Menispermaceae	Creeper
13.	*Clematis flammula*	Fragrant clematis	Ranunculaceae	Climber
14.	*Clerodendrum thomsoniae* Balf. f.	Bleeding Heart Vine	Verbenaceae	Creeper
15.	*Clitoria ternatea* L.	Butterfly Pea	Papilionaceae	Climber
16.	*Cajanus scarabaeoides (L.) du-Petit-Th*	Rantur	Fabaceae	Climber
17.	*Lablab purpureus (L.) Sweet.*	Popat	Fabaceae	Climber
18.	*Phaseolus radiatus*	Jangli Moong	Fabaceae	Climber
19.	*Coccinia indica* Wight & Arn.	Ivy Gourd	Cucurbitaceae	Climber
20.	*Combretum indicum* (L.) DeFilipps	Rangoon Creeper	Combretaceae	Climber
21.	*Convolvulus pentaphyllus* L.	Panch-Pan-ni-Fudardi	Convolvulaceae	Climber
22.	*Cryptostegia grandiflora* Roxb. ex R.Br.	Rubber Vine	Apocynaceae	Climber
23.	*Cucurbita maxima* Duchesne.	Red Gourd	Cucurbitaceae	Climber
24.	*Cucurbita maxima* Duchesne.	Red Gourd	Cucurbitaceae	Climber
25.	*Cucumis Melo L*	Muskmelon	Cucurbitaceae	Climber
26.	*Cuscuta reflexa* Roxb.	Amarvel	Convolvulaceae	Climber
27.	*Daemia extensa* R. Br.	Utaran	Asclepiadaceae	Creeper
28.	*Dioscorea bulbifera* L.	Wild Yam	Dioscoreaceae	Climber
29.	*Ficus pumila* L.	Creeping Fig	Moraceae	Creeper
30.	*Gloriosa superba* L.	Kallavi	Liliaceae	Climber
31.	*Gmelina philippensis* Cham.	Parrot's Beak	Verbenaceae	Climber
32.	*Gymnema sylvestre* (Retz.) R.Br. Ex Sm.	Madhunashi	Asclepiadaceae	Climber
33.	*Hemidesmus indicus (L.) R. Br. ex Schult*	Anantvel	Asclepiadaceae	Climber

34.	*Ipomoea aquatica* Forsk.	Jalgamini	Convolvulaceae	Climber
35.	*Ipomoea hederifolia* L.	Scarlet Morning Glory	Convolvulaceae	Climber
36.	*Ipomoea palmata* Forsk	The Railway Creeper	Convolvulaceae	Climber
37.	*Ipomoea purpurea L.*	Morning Glory	Convolvulaceae	Climber
38.	*Ipomoea quamoclit* L.	Ganesh-Pushpa	Convolvulaceae	Climber
39.	*Jacquemontia pentantha* (Jacq.) G. Don	Skyblue Clustervine	Convolvulaceae	Creeper
40.	*Jasminum nitidum* Skan	Angel-Hair Jasmine	Oleaceae	Climber
41.	*Jasminum pubescens* (Retz.) Wild	Star Jasmine	Oleaceae	Creeper
42.	*Lagenaria vulgaris* Ser.	Bottle Gourd	Cucurbitaceae	Climber
43.	*Luffa cylindrica* (L.) M. Roem.	Sponge Gourd	Cucurbitaceae	Climber
44.	*Momordica charantia* L.	Bitter Gourd	Cucurbitaceae	Climber
45.	*Momordica dioica Roxb*	spiny gourd	Cucurbitaceae	Climber
46.	*Mucuna pruriens* (L.) DC.	Cowitch	Papilionaceae	Climber
47.	*Operculina turpethum* (L.) Silva Manso	Indian Jalap	Convolvulaceae	Climber
48.	*Passiflora incarnata* L.	Purple Passion Flower	Passifloraceae	Climber
49.	*Petrea volubilis* Woodr.	Purple Wreath	Verbenaceae	Climber
50.	*Piper betle* L.	Betel Leaf	Piperaceae	Climber
51.	*Piper longum* L.	Indian Long Pepper	Piperaceae	Climber
52.	*Pothos aureus* Linden & Andre	Golden Pothos	Araceae	Creeper
53.	*Pothos pinnatus* L.	Dragon Tail Plant	Araceae	Climber
54.	*Quisqualis indica* L.	Rangoon Creeper	Combretaceae	Creeper
55.	*Smilax zeylanica* L.	Kumarika	Smilacaceae	Climber
56.	*Tecoma brycei* N.E. Br.	Pink Trumpet Vine	Bignoniaceae	Vine
57.	*Thunbergia cordifolia* Nees.	Blue Sky Vine	Acanthaceae	Vine
58.	*Thunbergia fragrans* Roxb.	White Lady	Acanthaceae	Climber
59.	*Tinospora cordifolia* (Willd.) Miers.	Indian Tinospora	Menispermaceae	Climber
60.	*Trichosanthes cucumerina* L.	Jangli Padvel	Cucurbitaceae	Climber
61.	*Vernonia elaeagnifolia* DC.	Curtain Creeper	Asteraceae	Climber
62.	*Vitis vinifera L.*	Angur	Vitaceae	Climber
63.	*Thunbergia grandiflora (RoxRottl.)Roxb.*	Blue Sky Vine	Thunbergiaceae	Climber
64.	*Bignonia unquis-cati L.*	Cat's Claw	Bignonaceae	Climber

The results showed the following distribution of plant forms: twiners: five species, Climbers: 50 species, Vines: 07 species, Creepers: 02 species.

Climbing Mechanisms: The climbing mechanisms observed included twining stems, tendrils, adventitious roots, and hooklike structures. These mechanisms allow the plants to adapt and thrive in various environments, particularly in the urban landscape of Dombivli where they compete for sunlight and space.

This aligns with Reddy and Parthasarathy (2003) [14] in the South coast and Singh and Singh (2015) [20] in Central India, both of whom reported significant climbing plant diversity, particularly within the Convolvulaceae and Cucurbitaceae families. Similarities with studies by Patil and Patil (2016) [13] in the Satpura Range further underscore the widespread occurrence and ecologic importance of climbers in India. These findings, consistent with research by Sharma et al. (2014) [18] in the Himalayan foothills, emphasize the adaptive strategies of climbing plants, such as twining stems and tendrils, highlighting their critical role in maintaining biodiversity and ecosystem stability.

As a result, the diversity of climbing plants found in Dombivli is documented, indicating that this is not an isolated occurrence but rather a part of a larger pattern seen throughout India; the correlation with other studies emphasizes the ecologic significance of climbers and their adaptation strategies, highlighting the necessity of conservation efforts to protect these essential elements of biodiversity in urban and natural ecosystems.

Conclusion

The study undertaken in the urban environment of Dombivli, Maharashtra, shows a diverse range of climbing plants, highlighting their ecologic importance in urban ecosystems. A total of 64 species from 32 families and 50 genera were reported, demonstrating the ecologic resilience and adaptation of climbing plants in urban settings. The findings highlight the necessity of protecting and monitoring urban biodiversity, especially in fast-growing places like Dombivli, to promote long-term urban planning and biodiversity conservation efforts. Understanding the role of climbing species in urban ecology is essential for creating green infrastructure and improving ecosystem services in cities.

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