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First report of phyllomorphy on *lagerstroemia parviflora roxb*. from Mogarkasa-Mangarli conservation reserve, Maharashtra, central India

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ABSTRACT

During the monsoon season of 2025 (June-September), symptoms of phyllomorphy were observed affecting *Lagerstroemia parviflora* Roxb. (Lythraceae) within the Mogarkasa-Mangarli Conservation Reserve. Phyllomorphy, a condition leading to the development of leaf-like structures in place of floral organs, can be attributed to a range of biotic, abiotic, and artificial factors. Infected plants exhibited a suite of characteristic symptoms, including excessive branching, a significant reduction in overall plant height and leaf size, and the complete transformation of floral parts into sterile, leafy structures. This pathological condition resulted in several specific floral developmental abnormalities. Detailed examination confirmed the presence of petalody, pistillody, sepalody, staminody, and overall phyllody. A comprehensive review of existing literature indicates that while phyllomorphy is known in other plant species, its occurrence in *Lagerstroemia parviflora* has not been previously documented from various regions of India.Crucially, no such reports exist from the state of Maharashtra, specifically from the Vidarbha region. Therefore, this study serves as the first formal report of phyllomorphy in *Lagerstroemia parviflora*, marking a significant new record of this phytopathological condition for the state and the particular host species. This finding highlights the need for further investigation into the specific causative agent and the potential ecological impact on native plant populations within the conservation reserve.

KEY WORDS

Phyllody; Floral malformation; Phytoplasma; *Lagerstroemia parviflora*; Vidarbha

ARTICLE HISTORY

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Introduction

The Maharashtra State Government declared the establishment of the Mogarkasa-Mangarli Conservation Reserve (MMCR) on October 10, 2022, according to the notification number WLP/06.22/CR-172/F-1, With a total area of 10392.31 Ha (103.92 sq. km), the Mogarkasa-Mangarli Conservation Reserve (MMCR) is located in the Paoni Range (Ramtek Taluka) of the Nagpur Forest Division (Territorial and FDCM) and the Lendezari and Jamkandri ranges of the Bhandra Forest Division of the Nagpur forest circle. The mountainous part of this conservation reserve is mostly Southern Tropical Dry Deciduous Forest, although there are patches of Moist Deciduous Forest. Dendrocalamus strictus is the most common species of bamboo in the vicinity of Mogarkasa Lake. The dense forest around the Mogarkasa's marsh makes it an ideal habitat for both native and migratory birds and flora. The texture of the soil ranges from sandy loam to loamy. The depth of the earth is between 30 and 75 cm. The area is situated within the catchments of the Bawanthadi River, a tributary of the Wainganga River, and has good drainage [1].

The family Lythraceae is a significant component of tropical and subtropical flora, comprising approximately 620 species across 31 genera [2]. The genus Lagerstroemia, commonly known as crape myrtle, is renowned for its vibrant and prolonged flowering displays, holding considerable ornamental, ecological, and economic value. In India, species like Lagerstroemia speciosa and Lagerstroemia indica are widely cultivated in urban landscapes. Lagerstroemia parviflora Roxb., known locally as "Lendia" or "Small-flowered Crape Myrtle," is a native deciduous tree species that plays a vital role in the dry deciduous forests of Central India. It is a source of high-quality timber and provides forage and habitat for various fauna, making it an ecologically important species [3].

Phyllomorphy, also widely referred to as phyllody, is a severe plant disease characterized by the transformation of floral organs including sepals, petals, stamens, and pistils into leaf-like structures (leafy sepals, leafy petals, etc.). This phenomenon is a specific type of virescence, where green, chlorophyllous tissues replace the typical pigmented floral parts [4]. The transformation disrupts the fundamental reproductive architecture of the plant, leading to complete sterility, as the formation of viable pollen and ovules is inhibited. Consequently, the affected plant's reproductive fitness is reduced to zero, which can have cascading effects on population dynamics and genetic diversity, especially in threatened or keystone species [5].

Globally, phyllody has been reported in over 200 plant species, including economically important crops such as sesame, clover, and strawberries [6]. In a forest context, phyllody can diminish the regenerative capacity of tree species, altering forest composition and structure over time. The primary etiological agents associated with phyllody are phytoplasmas. Phytoplasmas are wall-less, phloem-limited bacteria of the class Mollicutes, transmitted in a persistent manner by insect vectors, primarily leafhoppers, planthoppers, and psyllids [7]. However, the condition can also be induced by other biotic factors like viral infections, as well as abiotic stresses such as herbicide exposure, nutrient imbalances, and physical damage [8].

While phyllody has been documented in other members of Lythraceae elsewhere in the world, a thorough review of scientific literature, reveals no prior record of phyllomorphy in Lagerstroemia parviflora from India. Specifically, no such incidence has been reported from the state of Maharashtra, a

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significant gap in the phytopathological records of the region's flora [9].

This communication, therefore, aims to provide a detailed morphological description of the phyllody symptoms observed in L. parviflora within the Mogarkasa-Mangarli Conservation Reserve. This study aims to document the key morphological and floral abnormalities linked to the disease, compare them with healthy specimens to highlight the pathological changes, and formally report its first occurrence in the host species in Maharashtra, providing a baseline for future etiological and epidemiological research.

Materials and Methods

Study area

The study was conducted in the Mogarkasa-Mangarli Conservation Reserve, located in the Nagpur district of the Vidarbha region, Maharashtra, Central India. The Mogarkasa-Mangarli Conservation Reserve is located in the Lendezari and Jamkandri ranges of the Bhandra Forest Division of Nagpur circle, as well as the Paoni Range (Ramtek Taluka) of the Nagpur Forest Division (Territorial and FDCM). It lies between latitudes 20.400 and 21.000 North and longitudes 79.000 and 79.150 East. It has some mountainous terrain and is covered with a lovely forest (Figure 1). This region is characterized by a tropical dry deciduous forest, part of the Deccan Peninsula biogeographic zone [10]. The climate is seasonal, with a hot summer (March-May), a pronounced monsoon (June-September) receiving an average annual rainfall of 1,200-1,400 mm, and a mild winter (November-February). The forest is rich in biodiversity, hosting species such as *Tectona grandis*, *Anogeissus latifolia*, *Terminalia tomentosa*, *and Lagerstroemia parviflora.*

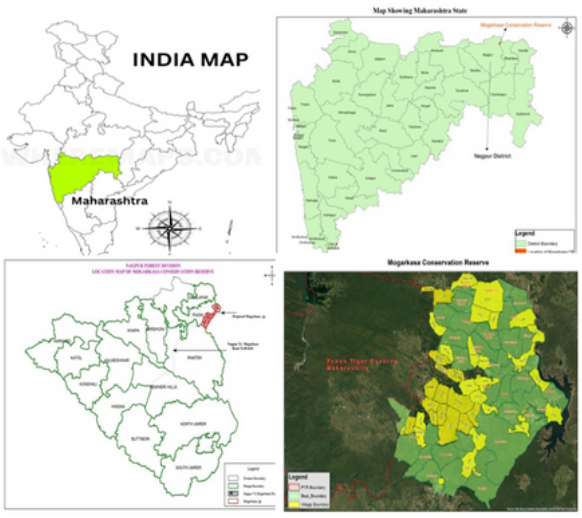

Figure 1. Map showing Mogarkasa-Mangarli conservation reserve (Study area).

Field survey and symptom identification

Repeated field surveys were carried out at monthly intervals during the peak flowering season of L. parviflora, from June to September 2025. The initial observation of abnormal flowering was made in a patch of approximately two hectares within the core zone of the reserve. A total of 35 individual trees of L. parviflora were examined in the affected area. Of these, 12 individuals (approximately 34% of the observed population in the patch) exhibited clear symptoms of phyllomorphy.

Data collection and morphological analysis

For each affected plant, detailed observations were recorded. Voucher specimens of both healthy and diseased inflorescences, leaves, and stems were collected for herbarium preservation and detailed examination. The specimens were processed and deposited at the Institute of Science, Nagpur for future reference.

The following morphological parameters were documented and compared between healthy and infected individuals (Figure 2):

- **Plant Habit:** Overall height, branching pattern.
- **Foliar Characteristics:** Leaf size, shape, and coloration.
- **Floral Morphology:** A detailed dissection of flowers was performed.

Figure 2. A photograph showing (a) Habitat of L. parviflora; (b) Stunted growth of L. parviflora; (c) Phyllomorphy- leaves; (d) Phyllomorphy-a branch of L. parviflora with pronounced witches' broom symptoms, characterized by a dense cluster of small, thin shoots; (e) Phyllomorphy-Floral part; (f) Phyllomorphy- Dry part.

Results

Gross morphological symptoms

Witches' broom and excessive branching

The most striking symptom was the proliferation of numerous, thin, and shortened shoots emerging from axillary buds, creating a dense, broom-like appearance. This "witches' broom" symptom is a classic indicator of phytoplasma infection.

Reduction in plant height and leaf size

Affected trees appeared stunted. The internodes were significantly shortened, and the leaves were notably smaller, chlorotic, and sometimes exhibited mild puckering compared to the broad, healthy green leaves of uninfected trees.

Loss of apical dominance

The normal growth pattern was disrupted, leading to a bushy appearance due to the loss of apical dominance.

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Floral abnormalities (Phyllomorphy)

The most definitive symptoms were observed in the reproductive structures. The entire inflorescence of infected plants was transformed. Instead of producing the characteristic small, white, and crinkled-petal flowers, the floral buds developed into sterile, green, leaf-like structures.

Phyllody: The fundamental transformation where all floral whorls exhibited a homeotic shift towards a leaf-like identity.

Sepalody: The sepals, which are normally small and fused at the base, were enlarged, green, and leaf-like, with increased venation.

Petalody: The petals, which are the most conspicuous part of the healthy flower, were entirely converted into narrow, green, leaf-like structures, losing their white coloration and delicate texture.

Staminody: The stamens, which are numerous in healthy L. parviflora flowers, were transformed into small, green, flattened, leaf-like appendages. No viable pollen was produced.

Pistillody: The central pistil, which normally develops into a woody capsule fruit, was transformed into a cylindrical or flattened green structure resembling a small leaf or shoot, completely aborting any fruit set.

Distribution and incidence

Within the surveyed patch of two hectares (Compartment No. 435RF), the disease incidence was recorded at 34% (12 out of 35 trees). The affected trees were not randomly scattered but appeared in small clusters, suggesting a possible pattern of vector-mediated spread. The severity of symptoms was uniform among the infected individuals.

Confirmation of a new record

The extensive literature review confirmed that there are no previous scientific reports of phyllody or phyllomorphy on Lagerstroemia parviflora from India. While there are anecdotal accounts of phytoplasma diseases in other forest trees, this specific host-pathogen association in the Vidarbha region of Maharashtra is documented here for the first time.

Discussions

This study provides the first confirmed report of phyllomorphy in *Lagerstroemia parviflora* from Central India. The suite of symptoms observed witches' broom, stunting, leaf reduction, and the profound transformation of floral organs into leafy structures is highly consistent with diseases caused by phytoplasmas [4,11]. The clustering of infected trees further supports the hypothesis of a biotic, and likely insect-vectored, pathogen.

The ecological implications of this finding are significant. L. parviflora is a key component of the dry deciduous forests of Vidarbha. A disease that induces complete sterility can severely impact the natural regeneration of this species. Over time, if the disease spreads, it could lead to a decline in the population of L. parviflora, potentially altering the forest composition and affecting the fauna dependent on it for food and habitat [12]. The observed 34% incidence in a localized patch is alarmingly high and warrants immediate attention.

The specific transformations petalody, staminody, and pistillody are a manifestation of homeotic mutations, where the identity of floral organ primordia is switched. Phytoplasmas are known to secrete effector proteins, such as SAP54, that interact with plant MADS-domain transcription factors, key regulators of floral organ identity [13]. This interaction leads to the degradation of these proteins, effectively causing the floral organs to revert to a leaf-like developmental pathway. While this study is morphological and does not identify the causative agent, the symptomology strongly points towards a phytoplasma as the primary suspect.

It is crucial to note that while phytoplasmas are the leading candidate, other causes cannot be entirely ruled out without molecular diagnostics. Herbicide drift from nearby agricultural fields, though less likely in a conservation reserve core area, can sometimes cause similar symptoms [8,14]. However, the presence of witches' broom is a hallmark of phytoplasmas and is rarely induced by abiotic factors alone.

This report aligns with a global increase in reports of phytoplasma diseases in wild ecosystems, possibly linked to changes in climate and vector populations [15,16]. The discovery in a conservation reserve highlights the vulnerability of protected areas to emerging plant diseases.

Conclusion

This paper successfully documents the first occurrence of phyllomorphy in Lagerstroemia parviflora within the Mogarkasa-Mangarli Conservation Reserve, Maharashtra. The detailed description of symptoms, including witches' broom and the complete phyllody of all floral whorls, provides a clear morphological account of this pathological condition. The disease leads to total reproductive failure in affected trees, posing a potential threat to the local population of this ecologically valuable species. This first report serves as a critical alert for forest pathologists and conservation managers in Central India and underscores the need for heightened vigilance regarding emerging plant diseases in natural ecosystems.

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Disclosure of conflict of interest

The authors declare no conflict of interest.

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