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**RESEARCH ARTICLE**

# SEEDLING MORPHOLOGY OF *LAGERSTROEMIA SPECIOSA* (L.) PERS. (LYTHRACEAE) AND ITS TAXONOMIC SIGNIFICANCE

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**ABSTRACT**

Morphotaxonomic observations on juvenile and seedlings stages of *Lagerstroemia speciosa* were observed upto 6th leaf stages during germination in natural habitat. The features of seedling like collet, hypocotyl, epicotyl, shape and arrangement of paracotyledons, leaf base, colour, phyllotaxy etc. represent high level of constancy within taxon and thus, have been found useful from taxonomic point of view in identification and conservation of this species at juvenile stage itself which facilitate a healthy recruitment.



## INTRODUCTION

The importance of identification of seedlings in forestry operations cannot be overemphasised. There has been a considerable development in the study of seedling morphology in different countries abroad, but little progress has been made in India, in spite of its rich phytodiversity (**Lubbock, 1896; Paria, 2014**). The seedling stage is arguably the busiest phase in a plant's lifetime (**Farnsworth, 2008**) which ensures fitness to survive by overcoming the competitive environment. The comparative seedling morphology in spite of its significance has, however, been of very little interest to botanists. In fossil botany, it has been ignored, possibly due to inadequate preservation of delicate parts of seedlings. Even evolutionists have not appreciated to study this vital stage in the life cycle of flowering plants. The correct identification becomes a prerequisite when natural regeneration is the main stay for restocking felled areas. The seedlings of many commercially important tree species are collected from forests and used for planting degraded or partially disturbed forests where such seedlings are reported to be established fairly well (**Rai, 1979; Rai and Shettigar, 1979**). However, Floras describing seedlings are not many except some notable works from **Burger (1972) and Vogel (1980),** because of seedling heteroblasty, i.e. dissimilarity of seedling organs to that of mature trees. Heteroblasty in general morphology of the leaves (**Vogel, 1980**) such as shape and size, features of leaf margin, internode length, leaf arrangement etc. are very common. Juvenile stages of plants, particularly of trees, are often so strikingly different from the adult stages, that even with good field knowledge of plants, It is difficult to correlate the seedlings with an adult plant of the same species. It is now emphasized that seedling morphology should be thoroughly investigated for a better comprehension of germination, juvenile growth and establishment during the natural regeneration of vegetation (**Troup, 1921; Jackson, 1974**). However, it is unfortunate that, in spite of considerable taxonomic potentiality and prospects of seedling morphology, very little attention has been paid to this field, particularly in the context of Indian flora which has become handicap for field identification of seedlings of important tree species. Against this background, a study has been conducted on the morphology of seedlings of *L. species* in natural populations and compared to that of nursery raised seedlings.

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## MATERIALS AND METHODS

The mature seeds were collected from natural habitat and raised seedlings through germination trials for correct identification. In case of confusion for correct identity of the naturally grown seedlings, it was compared with those of seedlings raised from identified seeds in the experimental garden. The morphology of seedlings was described following

the scheme of description of **Vogel (1980)** and terminology as proposed by **Duke (1965), Burger (1972), Hickey (1973), Dilcher (1974) and Vogel (1980).** Besides, the deeds on seedling morphology of several other authors like **Troup (1921), Sampath (1982), Canne (1983), Augustine (2004), Das and Paria (2008), Singh *et al*. (2008a, b)** etc. have been followed in this study. For minor details in morphology (venation, hairs, etc), the seedlings were observed both in transmitted and incident light by using Leica MZ6 stereomicroscope using different magnifications. All parts of seedlings were described in the sequence of germination type, seedling stature, taproot, hypocotyl, (para) cotyledons, internodes, first two leaves (eophylls) and subsequent leaves. Technical terms, used in conventional seedling floras (**Burger, 1972; Lubbock, 1892; Vogel, 1980**) have been avoided to the extent possible and replaced with descriptive phrases. Of these, the cotyledons alone provide the largest number of characters, much more than the leaves. In general, the following features are recorded for the cotyledons: presence or absence, number, emerging from the seed coat or not, isomorphic or anisomorphic, remaining addressed or separated, stalked or sessile, pendulous or straight, colour, size, general features of shape, surface, indumentum etc. which are used in delimitation at seedling stage itself.

## RESULTS AND DISCUSSION

Seeds from 4 mother plants of each populations from different localities in Kerala portion of Western Ghats (Kulathupuzha: ±37.5 m, 8°52' N, 77°02' E; Perunthenaruvi: ± 17 m, 9°24' N, 76°52' E; Mukkali: ±526 m, 11°03' N, 76°32' E; Chaliarmukku: ±30 m, 11°18' N, 76°14' E) were used to understand the degree of variation. Seedlings started protruding above the soil on 10.5 ± 2.5$^{th}$ day.

The seedlings took another 65 days to reach the 6$^{th}$ true leaf stage. The seedling morphological characters are as important, reliable and conservative as that of floral ones, and can be used in the delimitation of different taxonomic groups. Although, the organs and characters of seedlings for survey and observation are limited in number, yet their diversity in form, shape, size etc. are so large, that a specific combination of such characters serves the purpose of delimitation as well as identification. Parts of the seedling as explained in the descriptions are given in Fig. 1.

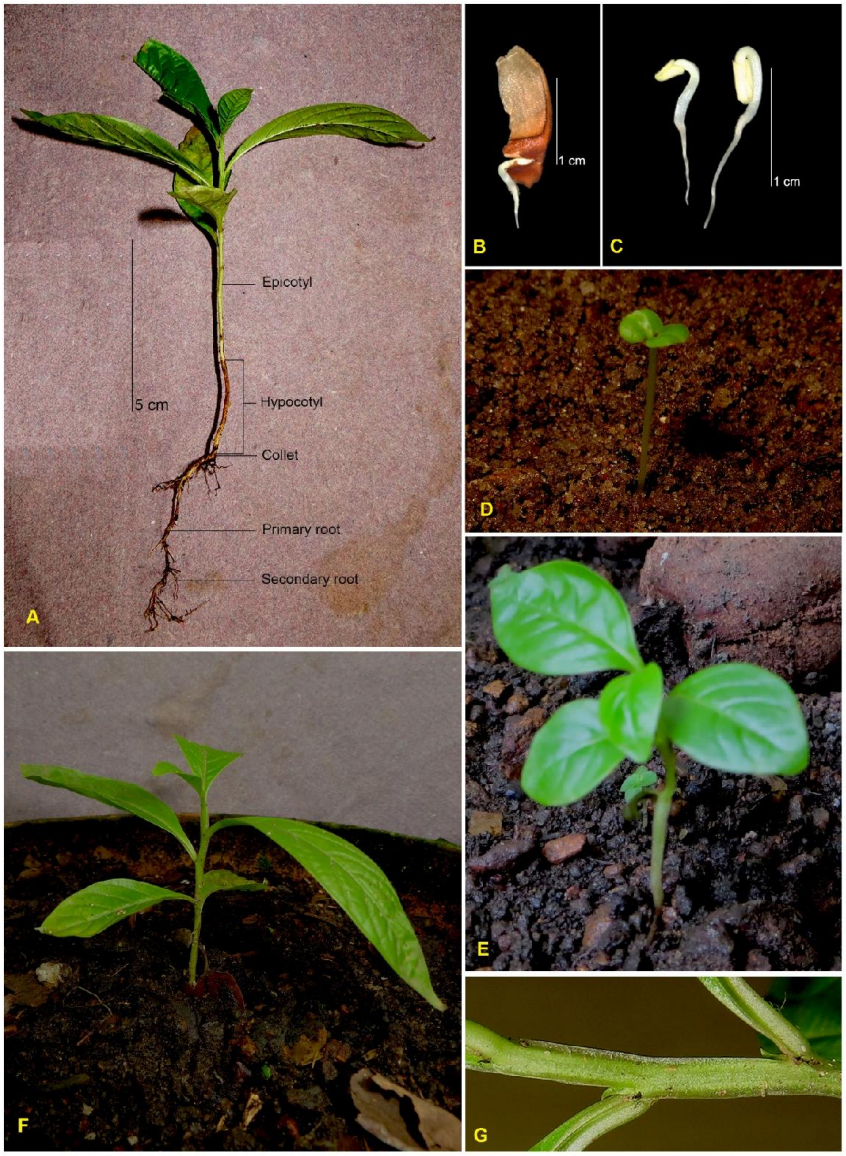


**Fig. 1. *Lagerstroemia speciosa* (L.) Pers. A & F.** 20 week old seedling; **B.** germinating seed; **C.** Seedling with seed coat removed; **D.** 3 week old seedling; **E.** 14 week old seedling; **G.** Seedling stem showing wings.

**Taxonomic treatment**

*Lagerstroemia speciosa* (L.) Pers., Syn. Pl. 2: 72, 1806; *Munchausia speciosa* L., Hausvater 5: 257, 1770; *Adambea glabra* Lam., Encycl. 1: 39, 1783; *Adambea hirsuta* Lam., Encycl. 1: 39, 1783; *Lagerstroemia augusta* Wall., Numer. List 2113, 1829; *Lagerstroemia flos-reginae* Retz., Observ. Bot. 5: 25, 1788; *Lagerstroemia flos-reginae* var. *augusta* Clarke (sphalm augusta) in Hk. F. Brit. India 2: 577, 1879; *Lagerstroemia hirsuta* (Lam.) Willd., Sp. Pl. 2: 1178, 1799; *Lagerstroemia macrocarpa* Wall., Numer. List 2114 A, 1829; *Lagerstroemia major* Retz., Observ. Bot. 1: 20, 1779; *Lagerstroemia munchausia* Willd., Sp. Pl. 2: 1178, 1799; *Lagerstroemia plicifolia* Stokes, Bot. Mat. Med. 3: 105, 1812; *Lagerstroemia reginae* Roxb., Pl. Coromandel 1: 46, 1796; *Munchausia ovata* J. St.-Hil., Expos. Fam. Nat. 2: 176, 1805; *Murtughas hirsuta* (Lam.) Kuntze, Revis. Gen. Pl. 1: 249, 1891; *Sotularia malabarica* Raf., Sylva Tellur. 98, 1838; *Cadali-poea, Adamboe* Rheede, Hort. Mal. 4. (1683) 45t. 22 proparte; *Lagerstroemia intermedia* Koehne, Pflanzenr. 17(IV.216): 260, 1903; *Lagerstroemia speciosa* var. *intermedia* (Koehne) Furtado and Montien Comb. nov. Gard. Bull. Singapore 24: 268, Fig 30B. 1969.

**Seedling morphology**

*Phanerocotylar*. *Epigeal* germination. *Seedlings* erect. Size at 1st leaf stage (1st leaf only) 4–7 cm, 2–4 cm above collet. *Roots*: Primary root at 1st leaf stage non-conspicuous, thicker than laterals, flexuous, white – off-white – yellowish; collet slightly thickened. Lateral roots at 1st stage less in number, very flexuous, moderately or not branched. *Hypocotyl* 1–2 cm long at 1st stage, top 4-angular, faintly winged. *Paracotyledons* 2 equal, isomorphic, opposite, petiolate, ± 2 mm, cordiform – reniform – obovate, green, glabrous, base obtuse, rounded – obtuse apex, mid nerve prominent and thick beneath. *Epycotyl* 2– 4 mm long at 1st stage. In older seedlings obscurely 4-angular. At 2nd stage, stem erect, spiral, upper part 4-winged, green, glabrous. *Phyllotaxy* lowest leaves spirally arranged, upper decussate or so. *Leaves* stipulate, simple, petiole short, apex acute, base acute deccurent, midrib prominent on both surfaces; pinninerve, glabrous; eophylls oblong or obovate; higher leaves obovate-oblong or obovate-lanceolate, acuminate, intramarginally nerved, entire or slightly undulate.

**Conclusion**

Morphological characters of seedlings were observed up to the development of sixth juvenile leaf. The seedlings of *L. speciosa* is of Type I as per the classification of Klebs (1885) as the cotyledons are above the soil and the main root elongate vividly from the first emeregence from the seed onwards, the collet not or relatively little thickened. The developmental type of seedlings belonging to Macranga type (Burger, 1972) as paracotyledons are green persistent and leaf like. They become free and spread in air and have photosynthetic function. The characteristic information provided by the seedling is as important and reliable as that of floral ones. Therefore, the information on seedlings should be taken into consideration in the delimitation of species. The study of seedlings may clarify the nature of some morphological characters or document their changes during their development from early stages to adults (Paria, 2014), which can be practiced in forestry for development of viable populations of commercially important species in long run.

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