



Phenology and floral morphology of *Terminalia catalpa* L.

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The genus *Terminalia* includes about 200 species of trees and shrubs distributed in the tropical and subtropical regions of the world. In India, 20 species belonging to four sections, namely *Catappa*, *Myrobalanus*, *Chuncea* and *Pentaptera* have been reported to be distributed in the tropical and subtropical states (Parkinson 1936, Srivastava 1993). Almost all these species are valued as sources of non-wood forest products such as tannins, gums, oils, wood and fodder. Organic compounds were extracted from their leaves, trunk, bark and fruits and used indigenous drug preparations throughout the Indian sub-continent. These compounds are used also by industries such as pharmaceutical, animal husbandry, leather, dyeing, soap, chemical, resin and gum, paper, railways, match sticks, oil and cosmetics.

Terminalia catalpa L., the Indian almond, Jangali badam, or Andaman badam is a large tropical tree that grows mainly in the tropical regions of Asia, Africa, and Australia (Oudhia and Paull 2008). Despite the economic values, *Terminalia* species have been poorly studied for their reproductive ecology to understand the sexual and breeding systems, and pollinators in the context of their effective conservation and management in their natural areas. Chauhan *et al.* (2008) have studied the reproductive biology of medicinally important species *Terminalia arjuna* while Solamon Raju *et al.* (2012) have made a detailed study on the phenology and reproductive ecology of *Terminalia pallida*. According to them, the flowers of these species of *Terminalia* are bisexual, self-incompatible, and obligately outcrossed and this is enforced by self-incompatibility. Protogyny is a device to promote outcrossing, but it is weak. It is pollinated by several kinds of bees, wasps, bugs and butterflies.

Phenology and floral morphology of five trees of *Terminalia catalpa* trees growing one each at following places of Agra city (28° 11' N to 28° 25' N and 78° 0' E to 78° 2' E) were studied: 1. Sur Udyan, Department of Botany, School of Life Sciences, Dr. B.R. Ambedkar University; 2. Moti Lal Nehru Park; 3. Shastri Nagar; 4. Kabir Nagar, Dayalbagh; and Paliwal Park. Data on the habit of the plant, time of leaf shedding, flushing, flowering and fruiting were periodically recorded.

Habit—The main trunk of the tree is 25±5 m tall and 1±0.5 m in diameter (n=5). Branches are almost horizontals, slightly

ascending, whorls spaced 1±0.5 m, distinctively arranged in tiers on the trunk (Fig.1a). Bark is grey-brown and become rough with age. Leaves are alternate obovate with short petioles, spirally clustered at the branch tips, 15-36 cm long, 8-24 cm wide (n=100), dark green above, paler beneath, leathery and glossy (Fig.1b). Trees are dry-season deciduous; before falling leaf colour turns pinkish-reddish or yellow-brown.

Phenology—It is a semi-evergreen tree and leaf shedding, flushing and flowering occur annually. Leaf shed in the 3rd week of February, and the leaf flushing in the 1st week of March and continues in May (Fig. 1a). Flowering occurs during the 4th week of March and continues up till 3rd week of May at the population level it ceases during late May in most of the trees. Trees flower for about 3-4 weeks only. The flowers remain open the whole day. The flowers are protogynous and stigma becomes receptive in mature buds, while the anthers dehisce by longitudinal slits after anthesis; they remain open the whole day.

Floral morphology—The trees are monoecious, with distinct male and female flowers in axillary or terminal spikes (20±5 cm long; n=50) at the top of axis of leaves on the same tree (Fig.1c). The majority of the flowers are male and borne towards the apex, while a few hermaphrodite ones appear below (Fig.1d). Some spikes have only male flowers. Both male and female flowers are greenish-white, very small (1±0.25cm in diameter), with no petals but 10-12 conspicuous stamens, arranged in two whorls in several slender spikes axils (n=50) inserted inside the distal part of the calyx tube; filaments are 4±1 mm long and incurved in bud but the anthers are exerted from calyx tube after anthesis (Fig. 1d). The anthers are versatile, dithecal, fertile and cream coloured. The ovary is inferior, unilocular with two pendulous anatropous ovules. The style is 4 mm long. The stigma is simple, cream white, 2 mm long, wet and shiny, and stigma protrudes out of the calyx during the mature bud stage; it is receptive since then and continues until the evening of the 3rd day. A nectariferous disc is present on the summit of the ovary and it is enveloped by massive silky hair (Fig. 1d). Fruits are hard, green-red, rounded and flattened, egg-shaped, with 2 ridges without wings, 2.5±0.5 x 4.5±1 cm long (n=50), green first (Fig.1c), then turn yellow or reddish when ripe and contain a single seed. The seeds are cylindrical, contain oil enclosed in a tough, fibrous and fleshy pericarp.

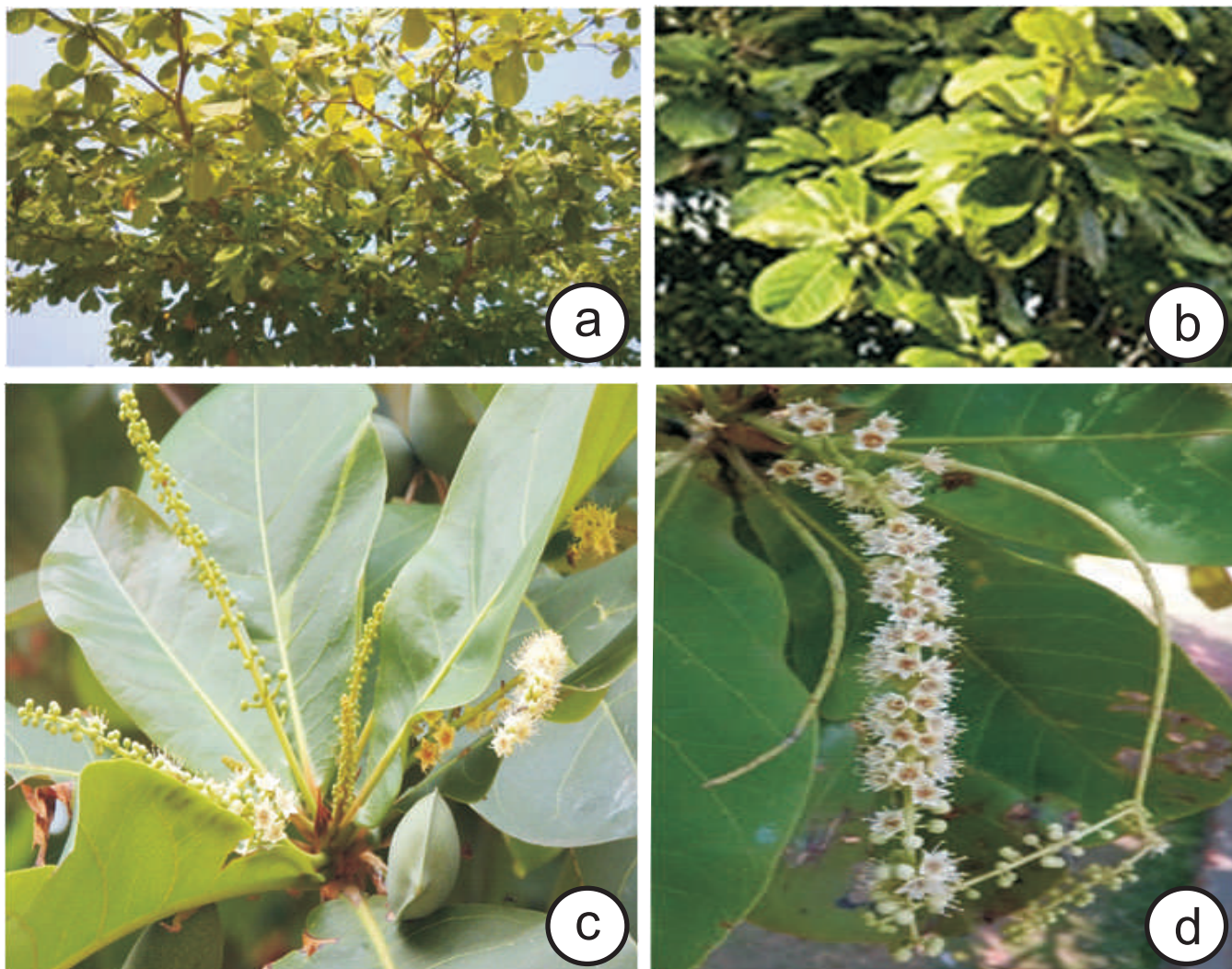


Fig.1 a-d : *Terminalia catalpa*. a. Tree with dense flush of leaves; b. tree with new flush of leaves; c. Several young inflorescences with male and female flowers and a young fruit at the top axis of leaves; d. An inflorescence with male and female flowers.

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