REMOKABLE TREES ON NII CAMPUS

9. Indian Cork Tree

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Common Name: Indian Cork Tree, Tree Jasmine
Botanical Name: Millingtonia hortensis Linn. F. (= Bignonia suberosa Roxb.)
Family: Jacaranda Family (Bignoniaceae)

Where to see: In the quadrangle between the Research Scholars’ Hostel and the auditorium

Illustration of Millingtonia hortensis from William Roxburgh's Plants of the Coast of Coromandel, vol. 3, t. 214, 1819. Image Credit:
http://plantillustrations.org/volume.php?id_volume=1290&lay_out=1&hd=0&compare=1

As you emerge from the rear exit of the Research Scholars Hostel (RSH) towards the auditorium at the western edge of the grassy quadrangle you will find a tall stately tree with a straight trunk and thick yellowish bark with branches that tend to rise almost vertically at the base and droop at the tip, giving it a slender and graceful outline. This is the Indian cork tree, the only specimen of its kind on our campus. How did it get here? Who planted it? Why is there only one such tree in NII? These are questions to which I have not been able to find answers.

1 Unless otherwise acknowledged, the photographs and artwork are mine.
We have only one tree on NII campus, in the quadrangle between the Research Scholars’ Hostel and the auditorium.

<table>
<thead>
<tr>
<th>Vernacular Names of the Indian Cork Tree</th>
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<tr>
<td><strong>Bengali</strong></td>
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<tr>
<td>Ākās Neem, Cork Gach, Mini Chameli, Himjāuri</td>
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<tr>
<td><strong>English</strong></td>
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<tr>
<td>Tree Jasmine, Jasmine Tree</td>
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<tr>
<td><strong>Gujarati</strong></td>
</tr>
<tr>
<td>Ākāsh Limbdo</td>
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<tr>
<td><strong>Hindi</strong></td>
</tr>
<tr>
<td>Ākās Neem, Belayti Neem, Mini Chameli, Neem Chameli</td>
</tr>
<tr>
<td><strong>Kannada</strong></td>
</tr>
<tr>
<td>Ākāsha Mallígé, Beratu, Biraté mara</td>
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<tr>
<td><strong>Malayalam</strong></td>
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<td>Katesam</td>
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This beautiful evergreen tree is believed to be native to Myanmar and the Malay Archipelago and was introduced into India less than 200 years ago. It is now planted all over the country and is naturalized in many places\(^2\). The plant’s generic name *Millingtonia* was coined by Carl Linnaeus the Younger in honour of Sir Thomas Millington (1628-1704), a botanist and Physician at Oxford. The specific epithet *hortensis* is the Latin term for “pertaining to gardens”, and refers to the ornamental value of the tree. The genus *Millingtonia* has only this species.

The foliage of the Indian Cork Tree is attractive - dark green on the ventral surface (above) and duller on the dorsal surface (below). Leaves are pinnately compound, with 3-5 pairs of pinnae on either side of the midrib. Each pinna has 3 pairs of leaflets plus a terminal leaflet. The leaflets are ovate-lanceolate with smooth or slightly wavy margins. Note that at the base the leaf is twice divided.

The tree has a lifespan of ~40 years and attains a height of 25m with a crown spread of 11m. The leaves bear a superficial resemblance to those of the neem. They are arranged in opposite fashion on the stem, 0.6-0.9m long, and pinnately compound (divided feather-like), with odd number of leaflets (imparipinnate). At the base, the leaf is usually twice-or thrice divided (bi- or tripinnate). Each leaflet is ovate/ lanceolate in shape, 5-7cm long with a short stalk and has smooth or slightly wavy margins. Leaves are shed during January to

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Botanists have been intrigued by the fact that although flowering in the Indian cork tree (*Millingtonia hortensis*) is commonly seen all over India, fruit and seed formation are partially or completely suppressed in several regions (e.g., Agra, Delhi, Most of Indo-gangetic plain and Pune). However, normal fruiting and seed-setting takes place routinely in other locations (e.g., Bengaluru, Chennai, Hyderabad, Jammu, Kolkata and Panaji). Location-specific fruiting is also characteristic of certain other members of the family Bignoniaceae to which the cork tree belongs. What could be the reason for this peculiar behaviour in these species? Is pollen production abnormal in certain places, or are pollinators unavailable? Do the pollen grains fail to germinate on the surface of the stigma? Or is there another explanation?

A comparative study of seed-producing and ‘seedless’ samples of the Indian cork tree along with four of its Bignoniaceous cousins viz., Chinese trumpet vine (*Campsis grandiflora*), the orange trumpet (*Pyrostegia venusta*), the calabash tree (*Crescentia cujete*), and the African tulip tree (*Spathodia campanulata*) showed that pollen viability and its germination *in vitro* are not significantly different in the samples. However, it turns out that in seed-producing locations the surface of the stigma at the time when it is most ready to receive pollen is ‘wet’ and consists of tiny projections (or papillae) that are loosely arranged. In contrast, the stigmatic surface from ‘seedless’ locations is dry and is compactly packed with the projections. Chemical analysis has also shown that that in seed-producing locations the phenolic substances are in higher quantities than in locations where the plants remain seedless. The conclusion from the study is that the absence of fruiting in these species is because of the inhibition of pollen germination on the dry stigmatic surface having comparatively large and compact papillae. Members of family Bignoniaceae are, as rule, characterized by wet stigma and low-to-medium papillae.

Obviously, such differences are, in turn, determined by environmental conditions such as temperature and relative humidity of the places where the plants are growing. How exactly these and other factors mediate molecular, physiological and morphological changes in plants needs to be studied in greater detail.


March but never at once so that the tree is never bare. The leaves are reportedly used as a cheap substitute for tobacco in cigarettes.

Flowering starts towards the end of October and continues into December. The inflorescences – large drooping panicles about 10-40 cm long – appear at the tips of branches. Flowers are white and stand out particularly against the dark green foliage. They

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Box 2. Does the Indian Cork Tree Produce Cork?

The last time you opened that bottle of champagne did you wonder about the cork that popped out? Probably not.

For the record, cork is a product of natural origin, extracted from the bark of trees. Among its excellent physical and chemical attributes can be counted resilience and elasticity; impermeability to liquids and gases; heat-, sound- and vibration-insulation; low heat conductivity; and anti-allergic properties. In addition, it is 100% recyclable and reusable. These properties make it ideally suited to various uses especially stoppers, fishing poles, buoys, buildings, military shoes, and automobile parts.

Every tree as it grows produces layers of wood cells towards the centre of the trunk. It also produces layers of bark tissue towards the periphery. The outermost portion of a tree’s bark is a dead tissue known as cork (technically phellem). Just below the cork tissue is a layer of live, actively dividing cells known as phellogen that keep continuously adding newer and newer cork (phellem) cells on the outer side. The phellogen also adds newer cells known as phelloderm on the inner side. Cork cells accumulate hydrophobic chemicals such as wax and suberin as they mature and die soon after. The dead cork tissue gets torn as the tree increases in girth and is usually sloughed off periodically. It is this layer of cork that is commercially exploited. Phellem, phellogen and phelloderm are together known by the term periderm (see photomicrograph above). As the original epidermis (outer skin of the trunk) is torn off, it is the periderm that takes over its function. On the tree, it serves a protective role, insulating it from extremes of temperature, fire, and wind, as well as shielding against attack by microorganisms and herbivores. It is a slice of cork that the English naturalist Robert Hooke (1605-1703) saw under his microscope in 1665 and described what we know as "cells".

The English common name of Millingtonia hortensis is suggestive of the tree's ability to produce cork. Its bark is yellowish, relatively thick and fissured. (Photograph on the right) Many references on the tree state that it produces an “inferior quality” cork. However, it must be noted that while just about every tree produces an outer layer of cork bark, extraction from most is economically unviable. I could not find a reliable source that describes commercial extraction of cork – inferior or otherwise – from the Indian Cork Tree. Indeed, there is no cork extraction industry in India.

Actually, most of the world’s cork comes from the cork oak, Quercus suber (see images on the left). Portugal contributes 50% of global production, followed by Spain (~25%) the balance jointly shared by Italy, France, Morocco, Algeria and Tunisia. What sets this tree apart for cork production? It produces a very thick bark with a continuous layer of cork tissue. Whenever the outer cork bark is removed, its phellogen adds new layers. It is possible to extract cork from the same tree every nine or ten years. Since cork oaks survive for 150 years, it lends itself for cork extraction repeatedly during its lifetime.

So the next time you open that champagne bottle, spare a thought to the humble cork that preserves and protects your champagne!

The flower (far left top) is a larger version of Jasmine, which is why it is named tree jasmine. The cup-like calyx with its margin curved back surrounds the base of the long corolla tube that flares out into four petal lobes. The largest of these lobes is bifurcated (far left top and bottom). The four stamens are anchored at the mouth of corolla tube (far left bottom). The pistil has a long style that holds the stigma well above the petals (left).

open at night and are delightfully scented; by morning, most of them fall to the ground. The tiny cup-shaped calyx has its margin curved back and bears the corolla which, for the greater part of its length, forms an 8-9 cm long, slender tube that usually has a faint green tinge. The tube expands into four petals that are sometimes pink-tinted. The largest petal is deeply cleft. Each petal is oval and pointed at the tip. Four stamens are attached to the corolla tube just where it flares out; the anthers are yellow with one fertile lobe, the other being
reduced to a spur. The pistil has a long style that protrudes beyond the petals, exposing a slightly expanded stigma.

Flowers are believed to be pollinated by moths. The fruit is a slender, compressed capsule about 45cm long. The seed is flat, measuring 2.5 cm across and surrounded by a

Box 3. Indian Cork Tree in Traditional and Folk Medicine

Almost all parts of the Indian cork tree have been used in traditional and folk medicine. A summary of the uses is provided below. For details see the references cited below.

### Therapeutic claims

<table>
<thead>
<tr>
<th>Plant part</th>
<th>Therapeutic uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root</td>
<td>Anti-asthmatic and anti-microbial</td>
</tr>
<tr>
<td>Leaf</td>
<td>Antipyretic, useful against sinusitis, acts as chologogue (a substance that promotes production of bile in the gall bladder) and tonic</td>
</tr>
<tr>
<td>Stem</td>
<td>Cough suppressant, lung tonic</td>
</tr>
<tr>
<td>Bark</td>
<td>Yields a yellow dye</td>
</tr>
<tr>
<td>Flower</td>
<td>Flower buds used in asthma, to treat sinusitis; acts as chologogue, tonic; flowers added to tobacco for smoking as treatment for throat ailments</td>
</tr>
<tr>
<td>Whole plant</td>
<td>Antipyretic, antitubercular, antimicrobial, larvicidal, ant mutagenic, antifungal</td>
</tr>
</tbody>
</table>

### Phytochemical Studies

<table>
<thead>
<tr>
<th>Plant part</th>
<th>Chemical Isolated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root</td>
<td>Lapachol, β-sitosterol and powlonin</td>
</tr>
<tr>
<td>Leaf</td>
<td>Hispidulin, rutinoside, a flavanoid dinitin, β-carotene</td>
</tr>
<tr>
<td>Stem</td>
<td>β-sitosterol from heartwood</td>
</tr>
<tr>
<td>Bark</td>
<td>β-sitosterol, bitter substances and tannin, DL-α- tocopherol, squalene, vitamin E</td>
</tr>
<tr>
<td>Flower</td>
<td>A new glycoside scutellarein-5-galactoside, and scutellarein; from dried flowers a flavanoid hispidulin; from powdered flowers hortesin, 3,4-dihydroxy-6,7-dimethoxyflavone</td>
</tr>
</tbody>
</table>

### Pharmacological Studies

- Antimicrobial - antibacterial, antifungal
- Mutagenicity and antimitagenicity
- Larvicidal
- Induction of apoptosis on RKO colon cancer cell line
- Antioxidant
- Hepatoprotective
- Anti-phlogistic (reducing inflammation and fever)
- Anticonvulsant
- Antiasthmatic and anthelmintic
- Dapsone-resistant leprosy
- Anti-inflammatory

However, the above need to be validated through clinical studies.

String puppetry is a time-honoured tradition in Myanmar. Since ancient times, string puppets or marionettes have been a medium not only to entertain royal courts but also convey news and social messages - even gossip - to lay people. Puppetry in Myanmar arrived on the scene first in the 1400s, and reached its peak about 300 years later, thanks mainly to sustained royal patronage. Sadly, by the 1930s, puppetry could no longer compete with other forms of Burmese entertainment (e.g., movies). These days, the tradition is being kept alive by a small number of troupes who continue to maintain the tradition of their craft by staging shows for tourists.

Burmese marionettes are very different from those of neighbouring countries, and are designed specifically to perform dance movements rather than characteristic stage movements. Puppet making is carried out by men following strict guidelines. A typical Myanmar marionette is 55 cm in height and is guided by up to 17 or 18 strings controlled by a single puppeteer.

The puppets themselves are made of wood. Wood from different types of trees is used to create different types of puppets. For example, the wood of the Indian Cork Tree (*Millingtonia hortensis*) is used to make kings, ministers and hermits, while clog wood (*Salix alba/ Liriodendron tulipifera*) is utilized for other human characters and horses. Mau (*Neolamarckia cadamba*) or bonmeza (*Albizia stipulata*) are usually employed for other characters. Yamane wood (*Gmelina arborea*) is also traditionally used as it is light, pale, durable and considered auspicious. However, the puppets made for the tourist trade employ inferior woods. The log is floated in water and the part above the waterline provides the wood for male figures, while the submerged part is used for female puppets.

All the human figures are carved in proportion to human anatomy. The relative length of each part of the body is faithfully reproduced. Even the ratio between a male and a female figure is carefully followed as traditionally prescribed. Finally, each figure is painted in vivid colours and dressed in beautiful clothing. Traditionally, a minimum of 28 characters are prescribed for a show. These include mythological characters such as Brahma (the Hindu god of creation), dragons and spirits. Human characters include kings, princes, princesses, ministers, and jesters. Animals such as elephants, horses, monkeys and snakes complete the ensemble. All these are skilfully connected together into an enthralling story that comes alive on stage with traditional music.


**Image Credit:** http://www.semesteratsea.org/2014/04/02/field-lab-pulling-strings-in-myanmar
Whereas flowering of the Indian Cork Tree is commonly seen all over India, fruiting and seed set are inhibited in several places including Delhi. The above pictures are from Hyderabad where both fruit- and seed set do occur. The fruit is a long, flat capsule measuring ~45 cm (image on the left). It is packed with numerous, flat winged seeds (right) 2.5 cm long. The wing is membranous, spreading on either side, very narrow at the top and bottom. (Images courtesy: Dr PV Prasanna, Hyderabad).

tender wing that is narrow at the base and top. Fruiting does not occur in many places (e.g. Agra, Delhi, Pune and Indo-gangetic plain) but has been observed in other places (e.g., Bengaluru, Chennai, Hyderabad, Jammu, Kolkata and Panaji). In the absence of fruiting and seed set, propagation is through root suckers.

The Indian Cork Tree is mainly grown in gardens for its ornamental value. It is also cultivated as an avenue tree although it does not produce enough shade and the limbs may break off easily in strong winds. The tree produces creamy white wood with fine grains. More commonly, it is used for making souvenirs and gift items⁴ (e.g., trays and coasters), and occasionally for making furniture⁵. In Myanmar, the wood has been traditionally used for carving string puppets. Several parts (e.g., root, stem, bark, leaf and flower) of the Indian Cork Tree are also used in traditional and folk medicine.

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⁵ [http://www.japaneseartfurniture.com/japanese_woodart.htm](http://www.japaneseartfurniture.com/japanese_woodart.htm)
A poem on the Indian Cork Tree

A Flower to Auroville Mother-95

(Mara Malli, Indian Cork Tree, Tree Jasmine, *Millingtonia hortensis*)

Unusual bells arching
Tolling gentle breezy
Smelling sacred invoking
Gods so aromatic and easy

Who are they? Jasmines
But of a tree Maramalli
Tall and fast in fineness
But barked corked perky

White flower petaled four
Tubular stalk paled green
Pinnae of leaflets lot more
Ever so grand and serene.

- By Indira Renganathan

http://www.poemhunter.com/poem/a-flower-to-auroville-mother-95/

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