REMARKABLE TREES ON NII CAMPUS

5. Arjuna

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Common name: Arjuna

Botanical Name: Terminalia arjuna (Roxb.) Wight & Arn.

Family: Combretaceae (Terminalia Family/Arjuna Family)

Where to Find: Near Block-G, Research Scholars' Hostel (RSH), edge of the sports ground between the Guest House and the Primate facility

Most people walking in the blazing heat of June under the shade of the Arjuna tree near the Research Scholars' Hostel (RSH) do not look up at all. If they do, they will doubtless see the branches full of off-white flowers. At any rate, they cannot miss their sweet fragrance wafting in the air. The Arjuna tree is not pompously showy. However, it certainly has a quiet but enduring – and even majestic – presence.

A native of the Indian subcontinent, the Arjuna is also found eastwards in Myanmar and southwards in Sri Lanka. It occurs along the river banks and streams in north and south India. The generic name Terminalia is derived from the Latin ‘terminus’ or ‘terminalis’ (ending), referring to the habit of its leaves being crowded at the tips of the shoots. The name ‘Arjuna’ for the tree occurs in the Rig Veda and Atharva Veda and means “white” or “bright”, probably denoting its creamy-white flowers or the shining quality of its bark. One of the tree’s Sanskrit names is ‘Kakubha’ which, inter alia, means “beauty” or “fascination”; it also means “several flowers held together in a cluster”. The Kakubha tree is mentioned in the Bāla Kānda of the Ramayana as growing in Malada² and Karusha³ (http://en.wikipedia.org/wiki/Flora_of_the_Indian_epic_period). Hindu mythology and astrology have

¹ Unless otherwise acknowledged, the photographs are mine.
² Present geographical location uncertain.
³ Karusha is today’s Datia district of Madhya Pradesh. It was one of the Yadava kingdoms of the Mahabharata epic, placed to the south of Chedi. Dantavakra, the Karusha king supported Sishupāla, neighbouring king of Chedi, and was killed by Vāsudeva Krishna.
This Arjuna tree near the RSH, is one of the nine on the NII campus. The tree equals the five-storied RSH building in height. Note the buttresses (arrows).
### Vernacular Names of Arjuna tree

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<tr>
<th>Language</th>
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<tbody>
<tr>
<td>Assamese</td>
<td>Arjun</td>
<td>Marathi</td>
<td>Arjun, Anjan, Sadura</td>
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<tr>
<td>Bengali</td>
<td>Arjun, Arjhan</td>
<td>Oriya</td>
<td>Hanjal</td>
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<tr>
<td>English</td>
<td>Arjun, White Marudah</td>
<td>Punjabi</td>
<td>Arjon</td>
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<td>Gujarati</td>
<td>Sadada, Salado</td>
<td>Sanskrit</td>
<td>Kakubha, Pārtha, Indrādru, Dhavala, Devasāla, Nādisarja, Veervriksha</td>
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<tr>
<td>Hindi</td>
<td>Anjan, Anjani, Arjun, Arjun, Kahua, Kowa</td>
<td>Tamil</td>
<td>Vella marda, Vella maruthu, Vella matti</td>
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<tr>
<td>Kannada</td>
<td>Holé matti, Maddi, Matti</td>
<td>Telugu</td>
<td>Vella marda, Vella matti, Yer maddi, Erra maddi, Tella madu</td>
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One of the Arjuna trees on the edge of the sports ground near the Primate House. *T. arjuna* is among the largest trees lining New Delhi’s avenues (e.g., Jan path and Teen Murti Marg).
The bark is thin, smooth, shiny, and greenish-grey from outside and peels off in large flat pieces regularly (left). It is also of considerable importance in Ayurveda (right: Picture source - http://www.kisalayaherbals.net/terminalia-arjuna-bark-1561916.html).

several references to the Arjuna tree (see Box 2). It is large, deciduous/evergreen, up to 6-15 (-25) m tall, often having a buttressed trunk, and a broad, oval crown with drooping branches. The bark is thin, smooth, shiny, and greenish-grey and peels off regularly.

Box 1. The Many Uses of Arjuna

- **Timber:** Sapwood (peripheral wood in which living cells are active, and the sap still flows) is pinkish white; heartwood (core part which has no living cells, and in which the sap has stopped flowing) is dark brown, very hard, lustrous and coarse-textured. Timber is mainly used locally for carts, agricultural implements, water troughs, boats, tool handles etc.

- **Fuel:** Wood makes excellent firewood and charcoal, with calorific value of 5030 kcals/Kg (sapwood) and 5128 kcal/kg (heartwood).

- **Tannin:** The bark (22-24%) and fruit (7-20%) are sources of tanning and dyeing material.

- **Sericulture:** Arjuna leaves constitute one of the major feeds for the tropical tasar silkworm (see Box 3).

- **Medicine:** The bark is highly valued in Ayurveda as a cure for a range of ailments including heart-associated problems (see Box 4).

The leaves are simple (undivided), oblong-elliptic, 7-18 (-25) cm long with short petioles, arranged opposite (sub-opposite) on the stem and often coriaceous (leathery) at
Box 2. Arjuna Tree in Hindu Mythology and Astrology

Is Arjuna tree named after Arjuna, the hero of the Mahabharata?

Unlike. The name Arjuna for this tree is mentioned in the Rig Veda and Atharva Veda both of which predate the Mahabharata. Atharva Veda has five references to the tree.

Lord Krishna and Arjuna Trees - Story from the Bhagavatam

The following story from the Bhagavatam illustrates how infant Krishna delivered two gods from a curse through which they had been born as Arjuna trees on earth.

It was a particularly hectic day at Gokul. Everyone was busy preparing for some forthcoming festival. Peeved that no one was paying him attention, little Krishna was especially mischievous that day. Exasperated with his incessant naughtiness, and to prevent him from getting into serious trouble, mother Yashoda tied him up with a rope to a large wooden mortar in which butter milk is churned and returned to finish her work. This, of course, further displeased the infant. Moreover, mischief being Krishna's second name he could not sit quietly in one place even if he was tied. So he jerked at the rope and started to crawl out of the room, in the process bringing down the mortar on its side and dragging it behind him. Now on all fours, he soon moved outdoors. Spying two Arjuna trees standing next to each other, he decided to pass through them, mortar and all. Now the mortar was large and got stuck between the trees. With a powerful heave little Krishna tugged at the rope and the force of the pull uprooted the trees. With a mighty sound the trees crashed to the ground. In an instant two heavenly beings in resplendent clothing materialized from their trunks and fell at Krishna's feet bowing and offering prayers.

They were Nalakuvara and Manigriva, the sons of Kubera, the treasurer of the gods. Rich and idle as they were, they had grown accustomed to wine and women. Once, when they were so occupied, the great Sage Nārada happened to pass by. Having consumed too much alcohol, and engrossed in the company of pretty women, they failed to show proper respect and welcome to the sage. Enraged and insulted at this unbecoming conduct, Sage Nārada cursed that they shall forever remain as two Arjuna trees in Gokul.

Hearing this, the wives of Nalakuvara and Manigriva rushed in to beg forgiveness for the conduct of their husbands, beseeching the sage to take back the curse. At last Sage Nārada relented and said "A curse once given cannot be retracted. It can only be modified or its effect lessened. Your husbands will be released by Lord Vishnu himself when he takes the incarnation of Krishna".

Now, that prophesy was fulfilled. Delivered from their curse, Nalakuvara and Manigriva thanked Lord Krishna profusely and, seeking his permission, left for their heavenly abode.

Hearing a loud crash, Yashoda and other people in the village came rushing in to find the infant playing happily by the fallen trees. It was a matter of wonder and speculation as to how two strong and ancient trees could be suddenly uprooted in perfectly calm weather. Everyone was particularly relieved to find little Krishna unharmed!

Importance of Arjuna tree in Vedic Astrology

Those having faith in Vedic astrology believe that stars (Nakshatras) exercise influence on people throughout their life. There are 27 Nakshatras present in a year and every individual has a Nakshatra assigned to her or him depending on the date and time of birth. Every Nakshatra has a specific symbolic tree associated with it. Hindu scriptures enjoin persons to plant and care for their particular Nakshatra-associated tree to attain peace and prosperity and ward off evil influences. The Arjuna tree is associated with the 15th star Swāti (=Arcturus in Western astrology). Thus it is believed that those born under Swāti Nakshatra should plant and look after Arjuna trees.
maturity. Each leaf has a pair of knob-like glands on the dorsal (lower) side at the junction between the petiole and the lamina. The dorsal surface has downy hair but the ventral surface is smooth.

The leaf is simple (undivided), oblong-elliptic, arranged in opposite (sometimes sub-opposite) manner on the stem. The ventral (upper) surface is dark green and the dorsal surface is paler. About 10-15 secondary veins can be seen. A unique feature is a pair of glands at the junction between the petiole and lamina.

The flowers are greenish white or creamy and have a sweet scent. They are borne at the ends of shoots or in the axils of leaves in inflorescences. Lacking pedicels (and hence sessile), they are directly attached to the inflorescence axis. The
Petals are absent in Arjuna flowers and they are borne in short axillary spikes or terminal panicles (upper photograph). However, the calyx lobes make up for this loss by being greenish-white or off-white in colour. The ten stamens attached to the calyx tube stand out. The ovary is surrounded by a disc (arrow in lower photograph).
Box 3. Wild About Silk - Arjuna in Sericulture

Natural commercial silk is a fibre produced by certain Saturnid silk moths. During their larval stage, they spin a thread - in some breeds as long as 1.6 km - around themselves to form a cocoon. The fibre is unwound from the cocoon during a process known as reeling and used for textile-, carded- or spun silk. India produces four kinds of silk: mulberry, tasar (both tropical and temperate), muga and eri. Each of these is produced by a distinct species of silkworm feeding on specific host plants. India is the second largest silk producer after China. In 2013-14 India produced 26,481 MT of raw silk.

Mulberry silkworm (Bombyx mori) is completely domesticated and silk production can be carried out entirely indoors under controlled conditions. By far, moriculture is commercially most valuable, accounting for more than 73.5% (19,476 MT) of the national production. The three non-mulberry silks together account for the balance 26.5% (7004 MT) production. These silkworms are not fully domesticated and spend at least part of their life cycle in the wild. For this reason, these ‘wild’ silks are known as Vanya silks (Sanskrit vana = forest). Thus, non-mulberry sericulture cannot be carried out indoors and is subject to the vagaries of nature. Cocoons reared in the wild are collected by local people from forests and production fluctuates from year to year. Muga silk production is endemic to Assam. At present production of muga (148 MT) and eri (4237 MT) silks in India are in small quantities, mostly for domestic consumption.

Tasar silk is produced both under temperate and tropical conditions. Tropical tasar (or Kosi) culture is exclusive to India. Although its origins are not clearly traced, its practice must be very ancient since there is a reference to it in the Ramayana: Rama’s nuptial gifts to Seeta included tasar silk! Kosi is traditionally common in the humid and dense jungles of Bihar, Jharkhand, Madhya Pradesh, Chhattisgarh and Orissa. It is also practised in Maharashtra, West Bengal, Andhra Pradesh and Uttar Pradesh. The leaves of Arjuna tree constitute the primary food for the kosi silkworm Antheraea mylitta along with those of Asan (T. tomentosii) and Sal (Shorea robusta). Secondary food plants include other species of Terminalia, Kachnar (Bauhinia variegata), Shisham (Dalbergia sissoo), Anjan (Hardwickia binata), as well as Khumai (Careya arborea), Mahua (Madhuca latifolia), Ber (Zizyphus mauritiana), and Pipal (Ficus religiosa). Temperate tasar (or Oak tasar) is produced by Antheraea poyei silk moths that feed on the leaves of certain species of oak (Quercus spp.), and is practised largely in the sub-Himalayan forests of Jammu & Kashmir in the west to Manipur in the east. China leads the world production in oak tasar. Today the tasar sector provides gainful employment to thousands of people, mainly tribal people and women across the country. Typically two cocoon crops are raised per year, the first (seed crop) during July-August and the second (commercial crop) during October-November. The total tasar silk production during 2013-14 was 2619 MT.

Tasar silk is mainly used for furnishing, dress materials and sarees. Bomkai, Paithani, Ikkat and Katki are some of the popular fabrics using tasar silks. It is ideal for both traditional costumes such as salwar-kurta and trendy new items such as dresses, stoles and scarves. Additionally, the fabric can be printed, hand painted or even embroidered into traditional sarees and dress materials. Such being the case, how can a bride’s trousseau be complete without a saree made of tasar silk!

Anti-clockwise from top left: Tasar silk worm Antheraea mylitta fifth instar larvae feeding on leaves; cocoons have stalks and are ready for reeling; mature silk moth; and fabrics from tasar silk.

Box 4. The Protecting Bark - Medicinal Importance of Arjuna

The dried stem bark of *Terminalia arjuna* has been used widely as a drug in Ayurvedic medicine as a cardiotonic (*hridya*), for injury or wound (*kshata*), emaciated condition (*kshaya*), poison (*visha*), blood disorders (*rakta vikāra*), obesity (*meda roga*), urinary disorders (*prameha*) and ulcer or wound (*vrana*). The use of Arjuna bark powder as an astringent and diuretic finds mention in *Charaka Sambita*. Vagbhata, a disciple of Charaka, was the first to recognize the cardioprotective property of the bark in his treatise *Ashtānga Hridayam* some 1200 years ago. Traditionally, the drug has been administered as an alcoholic decoction of the stem bark (*asava*), or taken with clarified butter (*ghrita*) or boiled in milk (*ksheerpaka*).

The use of Arjuna bark in cardiovascular diseases has attracted considerable attention in recent years. A range of cardiovascular properties has been extensively studied in animal models.

Several chemical compounds have been isolated from the stem bark. These include triterpenoids (e.g., arjunolic acid, arjunic acid, arjungenin, arjunglycoside, arjunolitin, arjunoside, and arjunetoside), tannins (e.g., pentagalloyl glucose, hexadroxdiphenyl galloyl glucose, tetragalloyl glucose, and ellagic acid), flavonoids (e.g., leucocyanidin and luteolin) as well as minerals (e.g., magnesium, calcium, zinc and copper).

A number of clinical studies have also reported beneficial effects in patients of chronic stable angina (chest pain or discomfort that usually occurs with activity or stress. Angina is chest discomfort due to poor blood flow through the blood vessels in the heart), endothelial dysfunction (a condition in which the endothelium or inner lining of blood vessels does not function normally) and heart failure.

However, the major lacunae in the studies conducted so far include insufficient information on (a) quality standards of the ‘drug’ preparations used, (b) safety data of the preparations, (c) reports on pharmacological interactions with other drugs, and (d) large randomized placebo-controlled clinical trials.


calyx is cuplike, 5-lobed and constitutes the most prominent component of the flower. There are no petals. The 10 stamens are attached to the calyx cup. The ovary is encased in a disc with yellowish or reddish hairs. Flowers have a sweet scent.

**The fruit** is ovoid, up to 6 cm long, and at maturity, hard and woody. It has five wings in which the veins curve upwards from the axis.

*Arjuna fruit* is botanically described as a drupe. A drupe is a fruit that never splits open to release seed. The fruit wall (pericarp) has three layers: the outermost epicarp, the middle fleshy mesocarp and the innermost stony endocarp that encloses the seed. The most familiar example of a fleshy drupe is mango fruit. In Arjuna, the drupe has five wings. The photograph above shows stages of fruit development. At maturity, the fruit becomes hard and woody (inset).

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