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Wrightia tinctoria R. Br.

Taxonomy and Nomenclature
Species name: *Wrightia tinctoria* R. Br.
Family name: Apocynaceae
Synonyms: *Alstonia oleandrifolia* Lodd. ex Loudon, *Nerium jaspideum* Span., *Nerium tinctorium* Roxb., *Nerium tinctorium* hort. ex Sweet
Vernacular (common name): Pala indigo plant, dyer's oleander, dudhi, indrajav.

Distribution and habitat
The tree is native to Southeast Asia including India, Nepal, Myanmar, Vietnam, and Australia in an elevation up to 1500m. The mean annual rainfall of its natural habitat is within the range of 400 - 2,500mm and the mean temperature range is 17-35^{o}C. In India, it is found in moist and dry deciduous forests of the peninsular and central India and rare in the northern and northeastern states. It grows in a wide range of soil types ranging from arid, semi-arid, gravely, or rocky soils and moist regions, especially on dry sandy sites or hillsides and valleys. Well-drained, laterite loamy soil is best for its growth. It tolerates moderate shading and is often found as undergrowth in deciduous forests. It is drought and frost tolerant.

Use
The wood is uniformly white when first exposed, turning ivory-colored with age; heartwood is not distinct. The wood is lustrous, smooth, straight, or somewhat wavy or curly-grained in the radial plain, very fine and even-textured, extremely close-grained, moderately hard, and light. It is easy to season and saw. This high-quality wood is extensively used in all classes of turnery and carving. It is used to make furniture, utensils, stained wood inlay work, lacquerware articles, and 'Channapatna' toys in India. The plant yields cream-colored latex that is used in code-wire insulations, floor furnishings, adhesives, etc. The flowers, leaves, pods, and seeds are edible. The leaves are also used as fodder and green manure. An indigo-colored dye is produced from leaves, flowers, roots, and seeds. It can also be used as an ornamental or agroforestry species. All parts of the plant are used as medicine by local people. The bark is used in the treatment of dysentery, skin infections, and dropsy. The seeds are anthelmintic, aphrodisiac, astringent, and febrifuge and are also used in the treatment of fevers, diarrhea, and intestinal worms. The leaves are used to relieve toothache and jaundice. The leaves are used to treat psoriasis, stomach pains, toothache, and dysentery. The milky juice is used to stop bleeding.

Botanical description
It is a deciduous tree; 6-18 m tall, girth up to 20cm in diameter; bark 8-10 mm thick, grey, smooth; outer layer thin, inner layer thick, brittle, creamy; blaze greenish-yellow; latex milky white. Leaves simple, opposite, distichous, estipulate; petiole 2-5 mm long, stout, glabrous; lamina 3.5-11 x 2-4 cm, oblong-lanceolate or elliptic-ovate; base acute; apex acuminate or caudate acuminate; margin entire, glabrous, sometimes pubescent beneath; lateral nerves 5-10 pairs, slender, arched, pinnate, prominent, intercostae reticulate.

Flowers bisexual, creamy white, scented, actinomorphic, and hypogynous, in terminal cymes appearing along with new leaves; pedicel 1.5 mm long, bracts 2, minute; calyx lobes 5, with membranous margin, 2 mm, ovate, obtuse, ciliate, glandular inside; corolla has a short cup-shaped tube at the base around the ovary and is divided into five elaborate petals. Hairy appendages arise from the inner side of the throat of the short corolla tube and are arranged in 2–3 series. Stamens 5, inserted on the mouth of the tube; anthers sagittate, spurred at the base, adhering to the

stigma; they are arranged in a whorl forming a cone-shaped structure enclosing the style and stigma. The filaments are not fused and there is a wide gap at the base, and this gap is gradually narrowed towards the tip. Carpels two, free, with many ovules. Style simple, filiform; stigma ovoid, highly viscid and massively thickened with a ring below. The ring has tiny grooves that run parallel to and intersect with the narrow gap between the filaments. Such carpel has one free ovary; but both ovaries have a common style and stigma which are situated slightly below the level of the anthers and completely concealed by the conical filaments.

Fruit and seed description

Fruit of 2 follicular schizocarp, pendulous, 15-45cm long, slender, smooth, green, cylindric, cohering at the tip; seeds are light, linear, pointed at the end, 1.2-1.8 mm long, light greyish brown, crowned with a tuft of white silky hairs. About 45,000-60,000 seeds weigh 1 Kg, i.e., 1000 pure seed weight (psw) is 17-22 grams.

Flowering and fruiting habit.

The tree starts flowering when they are 5-8 years old. The flowers appear (in India) from March to May, peaking from April to June. It shows sparse flowering occasionally during the rainy season from the second week of July to the second week of August. The plant is obligatory entomophilous; bees, wasps, butterflies, and ants are the main pollinators. In a research, the natural fruit set was found as 3.7% only and but the seed set was 72.8%. The fruits become brown when they mature in the dry season and dehisce longitudinally, liberating the seeds into the air. Seed dispersal is done by wind.

Seed collection

The pods can be collected when the color of the pod and seed is still green, and the moisture content of pods and seeds reaches 50-55% and 30-35% respectively. Collection of pods can be done by lopping the branches or plucking. A tarpaulin sheet may be spread under the tree. Pods are dried in the shade with proper aeration by spreading in one layer on a cement floor or tabletop till the pods dry and split.

Processing and handling

Seeds are extracted from the split pods and hairs are removed manually. Seeds are dried in the shade with proper aeration.

Dormancy and pretreatment

Seeds are not dormant. The germination percentage of fresh seeds is 80-100%.

Storage and viability

Seeds are orthodox. Seed viability does not decrease if dried to 3-4% moisture content and seeds are also tolerant to freezing temperatures. At ambient temperature (15-35º C) seeds can maintain their initial viability for up to 1 and 2 years if stored at 6-10% and 3-4% moisture contents respectively. Long-term storage can be done by storing seeds at low temperatures (0°C to -20°C) and 3-4% moisture content.

Sowing and germination

Germination starts in 18 days. Seeds are sown in the nursery and transplanted when they are in the four-leaf stage. The tree responds well to coppicing and also produces root suckers.

Pest and Diseases

The tree is prone to many fungal diseases and pests. *Cercospora wrightiae* attacks the leaves and causes leaf spot disease. *Hemileia wrightiae* infects the whole tree. *Xylorhiza adusta*, a beetle produces rings on the stem and the branches. *Coccus viridis*, the green bug of coffee, feed on the plant. *Lygropia obrinusalis* defoliate the tree. *Dendrophthoe falcata*, *Viscum monoicum*, and *V.orientale* are reported to parasitize the plant.

Selected readings

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