



# *Oroxylum indicum* (L.) Kurz

## BIGNONIACEAE

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### Synonyms

*Oroxylum indicum* (L.) Kurz: *Arthrophyllum ceylanicum* Miq.; *Arthrophyllum reticulatum* Blume Miq.; *Bignonia indica* L.; *Bignonia lugubris* Salisb.; *Bignonia pentrandra* Lour.; *Bignonia quadripinnata* Balnco; *Bignonia tripinnata* Noronha; *Bignonia tuberculata* Roxb. ex DC.; *Calosanthus indica* (L.) Blume; *Hippoxylon indica* (L.) Raf.; *Oroxylum flavum* Rehder; and *Spathodea indica* (L.) Pers.

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## Local Names

***Oroxylum indicum*:** **Ayurvedic:** Shayonakkul; **Assamese:** Toguna; **Chinese:** Hanyu pinyin, Mu hudie; **English:** Midnight Horror, Tree of Damocles, Trumpet Flowers, Indian Caper, Broken Bone Tree, *Oroxylum*, *Calosanthes*, Butterfly Tree, Pharra; Duddha Tree; **Hindi:** Patrorna, Putiveriksha, Shallaka, Shuran, Son, Vatuk, Arlu, Urnu, Sauna; **Malaysia:** Bonglai; **Nepali:** Tatelo, Sanna; **Sri Lanka:** Totila, Thotila; **Thai:** Phe kaa; **Vietnam:** Nu'c Na'c, So' do; **Karnataka:** Ane-mungu; **Malayalam:** Palakappayyani, Vella, Pathiri; **Sanskrit:** Aralu, Shyonaka; **Tamil:** Cai-kinnai, Kalai-y-utacikki, Puta-puspam, Achi, Pana, Pei-maram, Venga maram, Peruvaagai; **Telegu:** Manduka-paramu, Pampena, Suka-nasamu, Dundi lamu, Pampini, Newati, Chettu; **Others:** Kompong, Sonapatta, Sonnapaathaa, Tatpalengu, Kinnauri phool, Shoshana, Tuntuka, Kutunata, Mandukparna, Bhalluka, Prthushimba, Katvan (Chauhan 1999; Khare 2004; Harminder et al. 2011); **Bengali:** Kanaidingi, Totola, Surimala (Raj et al. 2018); **Kailsah:** Tata, Faltate; naga: Ochamiliau; **Rajsthani:** Shivnath; **Jammu:** Tantu

## Botany and Ecology

*Oroxylum indicum* is a monotypic genus of family Bignoniaceae (Jacaranda Family) generally found in the subtropical regions up to 1200 m, mostly in Asian countries. It is a small deciduous tree occasionally reaching about 10–15 m high with branchless cylindrical stem below (Fig. 1). It has shoe-like fruits tapering both sides. In some countries, it has grown as a garden and roadside tree for its ornamental value.

***Oroxylum indicum*:** Trees 6–10 m tall. Trunk 15–20 cm in diameter; bark gray-brown. Leaves 2(–4)-pinnately compound, borne nearly at stem apex, 60–130 cm; leaflets triangular-ovate, 5–13 × 3–10 cm, glabrous, becoming blue after drying, base subrounded or cordate, oblique, margin entire, apex short acuminate; lateral veins 5 or 6 on each side of midrib. Inflorescences 40–150 cm. Flowers usually open at night, with foul smell. Pedicel 3–7 cm. Calyx purple, campanulate, 2.2–4.5 × 2–3 cm, glabrous, membranous, becoming subwoody in fruit, apex truncate. Corolla purple-red; tube fleshy, 3–9 × 1–1.5 cm; mouth 5.5–8 cm in diameter; upper lip 2-lobed, lower lip 3-lobed, lobes slightly reflexed. Stamens inserted at middle of corolla tube; filaments about 4 cm, slightly exserted from corolla tube, tomentose basally; anthers ellipsoid, 8–10 mm, slightly divergent. Disc large, fleshy, 5-lobed, 4–5 mm thick, about 1.5 cm in diameter. Style 5–7 cm; stigma 2-parted, about 7 × 5 mm. Capsule woody, 40–120 × 5–9 cm, about 1 cm thick; valves with midrib, margin convex. Seeds rounded, including papery wing 6–7 × 3.5–4 cm. Flowering September–December (Wu et al. 1994–2013) (Fig. 2). Seeds very numerous, 2–2.5 in across, including the papery wing all round the seeds. The fruit remains on the tree till the next year without leaves. When the pods bursts, the seeds flutter to the ground often travelling to some distance looking like butterflies. The fresh root bark is soft and juicy; it is sweet becoming bitter later. On drying, the bark shrinks, adhere closely to the wood and becomes faintly fissured (Warrier et al. 1995; Daniel 2006).



**Fig. 1** *Oroxylum indicum* (Bignoniaceae), plant. (Photo Ripu Kunwar)

**Fig. 2** *Oroxylum indicum* (Bignoniaceae), fruits. (Photo Kedar Baral)



It is found in many parts of India, Nepal, Myanmar, Sri Lanka, in the Andaman, southern China, Bhutan, Thailand, Cambodia, Laos, Vietnam, Malaysia, Indonesia, and the Philippines. In the outer sub-Himalayan tracts, it ascends up to 1200 m, along the river valley and foothills. In Nepal, this tree is found from Panchkhal (East Nepal) to Dadeldhura (Farwest Nepal). It is usually found in the plain and hillock area in the subtropical tracts in the moist riverine deciduous forest area, e.g., on the river valley in Arun, Rapti, Babai, Seti, Mahakali, and others (Kunwar et al. 2019).

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## Phytochemistry

The root and stem contain three flavones, oroxylin – A (5,7-diOH, 6-OMe flavone), baicalein (5,6,7-triOH flavone) and chrysin (5,7-diOH flavone), sitosterol, and tannin. Seeds yield a fatty acid (of oleic acid 80% and rest saturated acids), baicalein and its glucoside tetuin. Root bark contains chrysin, scutellarin-7-rutino-side, traces of alkaloids, sitosterol, galactose, baicalein, biochanin-A, ellagic acid, oroxylin – A and a yellow chrySTALLINE, coloring matter 5,7-dihydroxy-6-methoxy flavone. Heartwood contains prunetin and sitosterol. Fruit pods contain oroxylin A, chrysin, baicalein, a triterpene carboxylic acid, and ursolic acid. Seeds contain oils and flavonoids such as chrysin, oroxylin A, baicalein, baicalein-7-o-diglucoside (Oroxylin B), baicalein – 7-O-glucoside, apigenin, terpenes, alkaloids, saponnins, tetuin, the 6-glucoside of baicolein, benzoic acid, and fatty acids. A new flavone glucuronide-oroxylin and chrysin-7-o-diglucoside were also isolated. The seed oil contains caprylic, lauric, myristic, palmitic, palmotoleic, stearic, oleic, and linoleic acids (Subramanian and Nair 1972a, b; Nakahara et al. 2001; Khandar et al. 2006; Upaganlawar and Tende 2007; Upaganlawar et al. 2009; Dinda et al. 2014).

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## Local Medicinal Uses

***Oroxylum indicum*:** The species is used in the case of diarrhea and dysentery, rheumatism, headache, cough, piles, ulcers, skin diseases, edema, tonic. The root bark is used in diarrhea and dysentery. Small part of root bark is crushed into paste and mixed with a cup of water to drink. Piled bark and leaves is made a paste to be used in the joints to cure rheumatism. The bark and fruit are also used as a mordant in tanning and dyeing (Dey et al. 1978; Chauhan 1999; Daniel 2006; Harminder et al. 2011). Researches showed that the plant exhibit anti-inflammatory, antimicrobial, antioxidant, anticancer, antimutagenic, photocytotoxic, antiarthritic, immunostimulant, hepatoprotective, and antiproliferative activities. Flavonoids obtained from the plant have various biological activities such as apoptosis induction, cell cycle arrest, anti-proliferative, anti-angiogenesis, and antioxidation. Flavonoids are known for their anti-inflammatory and antiallergic effect. Chrysin is a flavone which have biological activities such as antibacterial, antioxidant, anti-inflammatory, antiallergic, anticancer,

antiestrogenic, and anxiolytic activity. Oroxylin-A exhibits many biological activities such as COX-2 inhibition, cytotoxic, and antimicrobial. It also demonstrated anti-HIV and lipid peroxidation inhibition activities (Dey et al. 1978; O'Neill et al. 2017; Tomimori et al. 1988; Nakahara et al. 2002a, b). It is used for dysentery and rheumatism. A seed paste is applied to treat boils and wounds. The root is astringent, anti-inflammatory, aphrodisiac, expectorant, anthelmintic, and tonic. The bark is diuretic and stomachic and useful in diarrhea and dysentery, carminative, tonic, diaphoretic, and astringent. Root bark is also used to treat bile problems and cough. The fruit is spasmolytic. The plant extract is considered as a source of anticancer compounds (Kunwar and Bussmann 2009; Kunwar et al. 2009). It is also used as purgative and to treat headache (Kala 2005). In Rajasthan, it is used as an antidote, abortifacient; for diarrhea and dysentery. Some antimutagenic activity has been shown (Ahmad et al. 2006). Employed in Jammu for cough, cardiac ailments, piles, stomachache, and scabies (Gairola et al. 2014).

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## Local Food Uses

***Oroxylum indicum***: In Thailand, leaves are eaten and are sold in market. Young leaves, pods, flowers, and seeds are used as vegetable. It is also an ingredient in Chyawanprash as food tonic (Nakahara et al. 2001). Flowers, fruits, and pods are eaten (Dangol et al. 2017).

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## Local Handicraft and Other Uses

***Oroxylum indicum***: Lama, Tamang, Sherpa, Kirantis, and Buddhist Newar use its seed for holy purposes and offer to their deities. In this way, it is a religious plant in Nepal. Garland prepared from the seeds is offered for deities and in Buddhist monasteries (Fig. 3), and used in marriage and funeral time as well. In Kimdol Swayambhu (Nepal), the seeds are sold. Its use in the monasteries is very frequent (Hongmao et al. 2002; McCann Charles 1959). The seeds are found to be used in lining umbrella and hat. The hard-curved part of the fruit is used in removing dung in cattle hut (Goth) in villages. Fuel, pulp, matchboxes are other uses of this tree (Dinda et al. 2014). It is reported that in Philippines and Singapore, the plant is grown as a roadside ornamental tree. In Nepal, it is grown as a garden plant and in front of the house. But recently the trend has been decreasing attributed to overcrowding of concrete buildings and may also be due to its short survival rate. Its growth rate is 50% when soaked in water for 3–4 weeks. It is fast growing and also dies early (McCann Charles 1959). In Dadeldhura and Dhankuta, it is used as fodder.



**Fig. 3** *Oroxylum indicum* (Bignoniaceae), garland prepared from the seeds of *O. indicum* are offered in Buddhist monasteries, Nepal. (Photo Keshab Shrestha)

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