
PROSEA

Plant Resources of South-East Asia 12

(3) Medicinal and
poisonous plants 3



Indigofera L.

Sp. pl. 2: 751 (1753); Gen. pl. ed. 5: 333 (1754).

LEGUMINOSAE

$x = 8$; *I. linnaei*, *I. tinctoria*: $2n = 16$

Origin and geographic distribution *Indigofera* consists of about 700 species, and is widely distributed in the tropics and subtropics of Africa, the Americas, Asia and Australia. Africa is richest in species, but the southern Himalaya region is also comparatively rich. Approximately 35 species occur naturally in South-East Asia, 16 of which are found in the Malesian region. Additionally, several species have been introduced in South-East Asia.

Uses *Indigofera* is used in traditional medicine in South-East Asia for various complaints, externally, e.g. to treat sores, ulcers and aphthae, as well as internally, e.g. to treat epilepsy and as a diuretic. Some *Indigofera* species are well-known dye plants throughout the world, especially *I. arrecta* Hochst. ex A. Rich. and *I. tinctoria* L., the leaves of which are also used in traditional medicine to treat epilepsy and nervous disorders, and to heal sores and ulcers. Several *Indigofera* species are used as a cover crop, green manure or fodder, e.g. *I. hirsuta* L. and *I. suffruticosa* Miller, both of which have medicinal applications: the leaves of the first are used to treat stomach complaints in the Philippines and Thailand, the roots of the second to treat stomach-ache and diarrhoea, the leaves against fever and the juice against diarrhoea in Malaysia. Seeds are used occasionally as a famine food, including those of *I. linifolia* and *I. linnaei*.

In Taiwan the roots of *I. zollingeriana* Miq. are used to treat stomach-ache and snakebites. In Burma (Myanmar) the roots of *I. cassioides* Rottler ex DC. (synonym: *I. pulchella* Roxb.) are applied to treat cough.

Properties An ethanol extract from the leaves of *I. oblongifolia* showed in-vitro antibacterial activity against *Enterococcus faecalis*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. Small proteins or peptides in the leaves of *I. oblongifolia* show considerable in-vitro antibacterial and antifungal activity. These compounds probably play a role in the defence mechanism of the plant.

An extract of the above ground parts of *I. tinctoria* shows hypoglycaemic and central nervous system-depressant effects in rats, and potentiates pentobarbital sodium-induced sleep in mice. An ethanol extract possesses protective effects against carbon

tetrachloride-induced liver damage in rabbits, rats and mice, as confirmed by histopathological studies.

Pharmacological research on *I. arrecta* supports its traditional use in Ghana, where an aqueous extract of leaves from immature shoots is administered orally to patients with diabetes mellitus. This extract prevented the development of hyperglycaemia in genetically obese diabetic mice. In tests with rats, an intraperitoneal administration of a hot water extract of dried leaves decreased the plasma glucose levels of fasting normoglycaemic rats, but did not prevent the rise in plasma glucose after an oral glucose load. It was suggested that the extract is insulinotropic and may require functional β -cells to be active. The extract was devoid of acute and subchronic toxic effects in tests with mice. Clinical test data suggest that the plant may not have overt toxic reactions in humans but could affect the immune status of users. A medicine based on *I. arrecta* for the management of peptic ulcer has been patented.

Many *Indigofera* species contain toxic compounds. The toxic effects of *I. linnaei* may well be attributed to the presence of nitropropanoyl esters that upon hydrolysis yield 3-nitropropanoic acid. This compound inhibits succinate dehydrogenase and other essential respiratory enzymes. Several flavonoids have been isolated from *Indigofera*, including *I. linifolia*.

Botany Annual or perennial herbs or shrubs, with a taproot; branches spreading or ascending; indumentum consisting of 2-branched hairs. Leaves alternate, imparipinnate, sometimes trifoliate or unifoliate; stipules usually persistent. Inflorescence an axillary raceme, bracteate. Flowers bisexual, pedicellate; calyx campanulate, 5-toothed; corolla papilionaceous, standard without appendages, usually pubescent outside, wings usually with an auricle at base, keel with auricles at base and with lateral pockets; stamens 10, 9 connate and 1 free, all fertile, alternately shorter and longer; ovary superior, sessile, 1-celled, style curved upwards. Fruit a linear to globose pod, 1–20-seeded, dehiscent or not. Seeds globose to ellipsoid, cylindrical or quadrangular. Seedling with epigeal germination; cotyledons thick, short-lasting.

In Java flowering and fruiting of *I. linifolia* is limited to March–June, whereas *I. linnaei* and *I. oblongifolia* can be found flowering and fruiting throughout the year. *I. linifolia* and *I. linnaei* both have nodulating ability.

The large number of species makes a worldwide

taxonomical study of *Indigofera* a daunting task. In many regions the genus has been incompletely studied, and in regions where a taxonomic revision has been accomplished, comparisons with other regions have usually not been done.

Ecology Most *Indigofera* species occur in open locations, such as grassland, roadsides and open deciduous forest, in the lowland. In South-East Asia several species are bound to monsoon areas. *I. linifolia* prefers an extremely dry monsoon climate.

Management Propagation of the *Indigofera* species treated here is by seed. Soaking for 5 minutes in concentrated H_2SO_4 increased the germination rate of *I. oblongifolia* seeds from 10% to 90%, whereas gibberellic acid was ineffective. In *I. linifolia* pretreatment with KNO_3 , 1-naphthalene acetic acid (NAA) and 3-indole acetic acid (IAA) proved to be effective in breaking seed dormancy, whereas for *I. linnaei* this did not work. Thiourea proved to be effective in both species.

Genetic resources In view of their wide distribution and presence in dry open habitats, the *Indigofera* species treated here do not appear to be threatened by genetic erosion.

Prospects Several fractions of *Indigofera* showed various interesting pharmacological effects, both in vitro and in vivo. Further research is needed to fully evaluate these preliminary results for future applications.

Literature 198, 239, 542, 688, 731, 870.

Selection of species

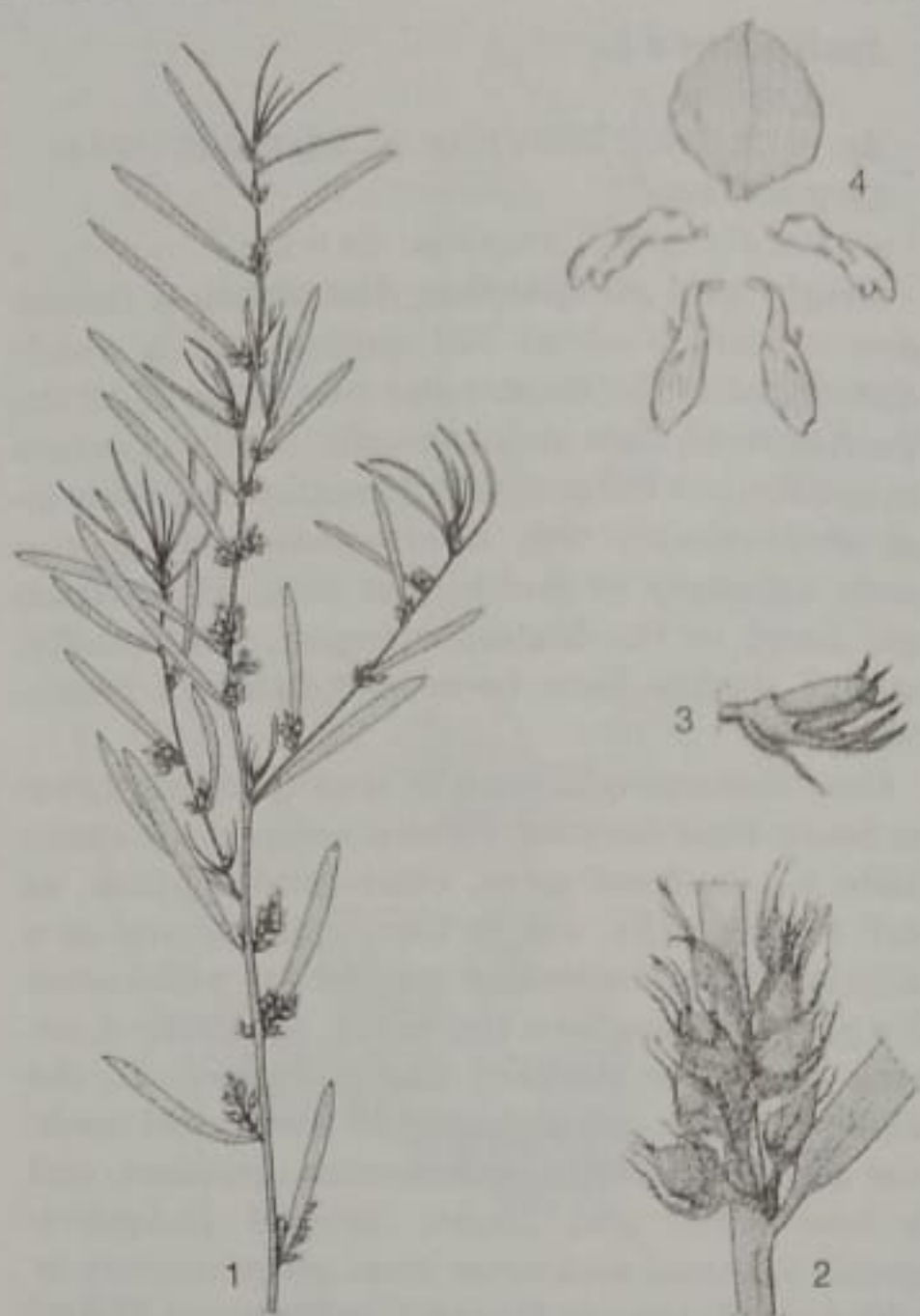
Indigofera linifolia (L.f.) Retz.

Obs. 4: 29 (1786).

Vernacular names Indonesia: rumba mutong (Sumba), rhema mon-hoi (Flores). Vietnam: ch[af]m l[as] lanh.

Distribution From Sudan and Ethiopia eastward to Indo-China, China, the Ryukyu Islands, Taiwan and Thailand, and throughout the drier parts of South-East Asia (in Malesia in eastern Java, the Lesser Sunda Islands, the Philippines (Luzon) and New Guinea), southward to northern Australia.

Uses In India the whole plant is given as a febrifuge. In combination with *Euphorbia thymifolia* L. it is used to treat amenorrhoea. It is further credited with vermifuge properties. The leaves are used to treat cuts and wounds. *I. linifolia* is recommended as a fodder for goats in very dry areas.



Indigofera linifolia (L.f.) Retz. - 1, flowering and fruiting twig; 2, old inflorescence; 3, flower bud; 4, corolla.

Observations An annual or perennial, prostrate or erect herb or shrublet up to 100 cm tall; leaves unifoliate, elliptical to linear, 0.5–4 cm × 0.2–0.4 cm, base cuneate, apex acuminate; inflorescence up to 15 mm long; calyx 3–4 mm long, standard elliptical, up to 5 mm long, pale with a red base, wings and keel slightly shorter, bright red; fruit globose, beaked, 2–3 mm × 1.5 mm, densely appressed grey-hairy, 1-seeded, endocarp not blotched; seed rounded, laterally flattened, 1.2 mm × 1 mm. *I. linifolia* is found on very arid localities on grassland, cropped land, roadsides, beaches and grassy deciduous forest from sea-level up to 750 m altitude.

Selected sources 35, 62, 121, 181, 198, 250, 334, 965.

Indigofera linnaei Ali

Bot. Notis. 3: 549 (1958).

Synonyms *Hedysarum prostratum* Burm.f. (1768), *Indigofera enneaphylla* L. (1771), *Indigofera prostrata* (L.) Domin (1926).

Vernacular names Indonesia: dedekan, trus-