

Tropical Forages

Flemingia macrophylla

Scientific name



Flemingia macrophylla (Willd.) Merr.

Synonyms

Basionym: *Crotalaria macrophylla* Willd.; *Flemingia congesta* Roxb. ex W.T. Aiton; *Moghania macrophylla* (Willd.) Kuntze

Family/tribe

Family: *Fabaceae* (alt. *Leguminosae*) subfamily: *Faboideae* tribe: *Phaseoleae* subtribe: *Cajaninae*.

Morphological description

Perennial, deep-rooting, leafy shrub, 0.5–2.5 (–3) m high. Prostrate to erect growth habit, numerous stems arising from the base. Leaves trifoliolate, leaflets elliptic-lanceolate, 5–15 cm long, 2–8 cm wide, silky or hairless, papery when old. Inflorescences mostly dense, axillary racemes, 5–30 cm long, with 15–40 flowers; calyx 7–13 mm long; corolla 14 mm long, white to pink or yellowish, densely silky, standard greenish with distinct red blotches or stripes and purple apex, wings rose-pink. Pods oblong, 11–15 mm long, 5–7 mm wide, dark brown and slightly silky, dehiscent, 2-seeded. Seeds globular, mottled brown or shiny black, 2–3 mm in diameter. 45,000–97,000 seeds per kg.

Common names

English: large leaf flemingia, warrus (waras) tree

Asia: barasalpan, charchara, dalia (Bangladesh); □□□ □□ da ye qian jin ba (China); basa-salpan, bhalia, bisbut, samnaskahat (India); apa apa, hahapaan, pok kepokan (Indonesia); enoki-mame (Japan); thwàx h'èè h'üäd, hom sam muang, ko dok kam, thoua huat (Laos); serengan jantan, beringan (Malaysia); batwasi, kamatteri (Nepal); wal-undu (Pakistan); laclay-guinan, gewawini, malabalatong (Philippines); mahae-nok, khamin naang, khamin ling (Thailand); tóp mo'láto, cây dau ma, cai duoi chon (Vietnam)

Distribution

Native:

Asia: Bhutan, Cambodia, China (s.?), India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan (n.), Sri Lanka, Taiwan, Thailand, Vietnam

Cultivated/naturalized:

Africa: sub-Saharan

Asia: widely through humid tropics.

Americas: humid tropical areas

Uses/applications



Leaves trifoliolate, leaflets elliptic-lanceolate



Perennial, deep-rooting, leafy shrub to about 2.5m high, Vietnam



Inflorescence an axillary raceme



Flower standard greenish with distinct red blotches or stripes.



Immature pods (P 4435)



Maturing pods



Dehiscent pods



Seeds



Flemingia macrophylla (Willd.) Merr. – 1, flowering branch; 2, fruiting branch.

Line illustration



Browsing shrubs

Forage

It is considered a poor forage since it has high fibre and condensed tannin concentrations and is not readily eaten by stock. More suitable for small ruminants than for cattle.

Environment

Most commonly used in contour hedgerows for erosion control, often in association with *Desmodium cinereum* (formerly known as *D. rensonii*). Prunings are used for mulch (slow breakdown of leaf due to high concentration of condensed tannins) and green manure in alley cropping systems. It is also used to shade young coffee and cocoa plants, for weed suppression and soil enrichment in orchards, and to provide fuel wood and stakes for climbing crop species.

Other

Pods provide a brilliant orange dye for silk. *F. macrophylla* is a host plant for Lac insects (*Kerria lacca* Hemiptera: Kerriidae) cultivation in India.

Ecology

Soil requirements

Will grow on most soils, with very low to moderate (and even high) fertility, with a pH range from 4 to 8, and high soluble aluminium (up to 80% saturation).

Moisture

Requires a minimum annual rainfall of about 1,100 mm, and grows up to 3,500 mm. tolerating up to 6 months dry season. Capable of surviving on poorly drained and occasionally waterlogged soils.

Temperature

Best growth between 22 and 28 °C, producing minimal growth above 36 °C and below 12 °C. Found from sea level to 2,000 m asl.

Light

Moderately shade tolerant.

Reproductive development

Short day flowering response.

Defoliation

Plants grow vigorously once established, if adapted. Excellent coppicing and regrowth capacity after cutting, producing numerous shoots from buds near the base of the stem. Cut at intervals of 6–14 weeks at 35–100 cm above the ground. Cutting interval depends on climatic conditions.

Fire

Well established plants tolerate fire.

Agronomy

Guidelines for establishment and management of sown forages.

Establishment

To improve germination, seeds should be soaked in boiled water for 2–3 minutes, stirring the whole time, followed by soaking in cool water for 12 hours. Reasonable results being obtained from cool water soaking alone. Seedlings emerge in 7–14 days. Scarification with



Effect of age on palatability: left side of plot mature, right side 6 week regrowth browsed selectively.



Different palatability (CPI 53911 grazed, CPI 52605 not grazed)



Vigorous regrowth from the basis of old stems.



Hedgerows in *Urochloa humidicola* pasture, Colombia.



Leaf drying for forage conservation, Vietnam.



With *Desmodium cinerea* in hedgerows, Mindanao, Philippines



Erosion-controlling and terrace-forming contour hedge, Sumatra, Indonesia.



Dense stand in a lychee orchard, Vietnam.



Persistent soil cover and slow nutrient release by slowly-decomposing litter.

concentrated sulphuric acid for 15 minutes is more effective than the hot water treatment, but is more hazardous to the operator. Planting density varies according to the use. For large areas, it can be planted in rows 90 cm apart with a seed planted every 10–20 cm. For hedgerows, it is important to have minimal space between plants within the row if erosion control is to be effective. Weed control is necessary for 3–6 months after emergence, since early growth is slow and young plants are sensitive to competition. Although somewhat promiscuous, best to inoculate seed with strains of *Bradyrhizobium* such as CB 756, CIAT 4203, or CIAT 4215.

Fertilizer

Although adapted to infertile soils, limited fertilizer is beneficial. In Brazil, about 75 kg/ha/yr of biologically fixed nitrogen have been measured.

Compatibility (with other species)

Seedlings are slow to develop and cannot compete with other species. Once established, plants are strongly perennial and can tolerate competition from companion species. Beneficial effect on trees is reported when *Flemingia* is used as mulch-providing plant such as in orchards. Can act as a trellis for twining legumes.

Companion species

Grasses: Any grass once *F. macrophylla* becomes established.

Legumes: Twining, trellis-seeking species such as [Centrosema spp.](#)

Pests and diseases

Not susceptible to any major diseases. Can be used to reduce nematode populations of *Pratylenchus* spp., *Helicotylenchus* spp. and *Rotylenchus* spp., but not of *Meloidogyne* spp. *Flemingia* is an off-season host for the pigeonpea pod fly, *Melanagromyza obtusa*, which can reduce seed yields.

Ability to spread

Spreads by seed only.

Weed potential

Considered to be low.

Feeding value

Nutritive value

Lower leaf nutrient levels (especially K, Ca, and Mg) than [Leucaena leucocephala](#) and [Gliricidia sepium](#) (11.3–24.4% CP; 0.15–0.3% P; 1.0–1.4% K; 0.13–0.94% Ca; 0.2–0.3% Mg). IVDMD values for foliage range from 11 to 60%, most values tending to be in the lower part of the range; in sheep, an apparent DM digestibility of 54% has been reported. Low IVDMD values result from high tannin and lignin levels in the leaves; depending on accession, concentrations of 0–27% extractable condensed tannins and 17–39% lignin have been reported.

Palatability/acceptability

Palatability is adversely affected by high tannin content of the leaves, immature leaves being considerably more palatable than mature herbage. Can be 'disguised' by mixing with grasses and other legumes. Under grazing and in mixture with other species, low palatability can lead to dominance of *F. macrophylla*. Palatability is very low in the wet season but reasonable in the dry season.

Toxicity

Detection of saponin has been reported.

Feedipedia link

April 2020: Page under construction

Production potential

Dry matter

Yields depends on growing conditions, and range from 3 to 12 t leaf DM/ha/yr, more commonly <8 t/ha.

Animal production

Has been fed to lactating dairy goats for 120 days without harmful effects, although another report showed growth and milk production of goats decreased when *Flemingia* foliage supplied more than 15% of the dietary DM. Other studies report upper limits in the range of 7.5–75% *F. macrophylla* in the diet of lactating goats.

Genetics/breeding

2n = 22. There is a large germplasm collection available with considerable variation regarding important features.

Seed production

Produces flowers and seed within 6–7 months from planting, although first year seed yields are low. Pods are dehiscent, so need to be harvested regularly (twice per week handpicking of ripe pods) before the discharge of seeds. Cumulative yields of up to 200 kg/ha seed can be obtained. Pigeonpea pod fly (*Melanagromyza obtusa*) can reduce seed yields if active.

Herbicide effects

No information available.

Strengths

- Strongly perennial, multipurpose shrub.
- Adapted to acid, infertile soils with high Al.
- Some tolerance of waterlogging.
- Suited to low-input smallholder production systems.
- Drought and shade tolerant.
- Vigorous, leafy growth after cutting.
- Slow breakdown/nutrient release of leaf when used as mulch.
- Dry season forage for (mainly small) ruminants.

Limitations

- Very poor quality forage for ruminants.
- Low digestibility because of high tannin and fibre content.
- Low palatability to cattle, particularly in the wet season.
- Slow establishment.

Internet links

http://apps.worldagroforestry.org/treedb/AFTPDFS/Flemingia_macrophylla.PDF

<https://www.cabi.org/isc/datasheet/24227>

Selected references

Andersson, M.S., Lascano, C.E., Schultze-Kraft, R. and Peters, M. (2006) Forage quality and tannin concentration and composition of a collection of the tropical shrub legume *Flemingia macrophylla*. *Journal of the Science of Food and Agriculture* 86:1023–1031. doi.org/10.1002/jsfa.2433

Andersson, M.S., Schultze-Kraft, R., Peters, M., Hincapié, B. and Lascano, C.E. (2006) Morphological, agronomic and forage quality diversity of the *Flemingia macrophylla* world collection. *Field Crops Research* 96:387–406. doi.org/10.1016/j.fcr.2005.09.002

Asare, E.O., Shehu, Y. and Agishi, E.A. (1984) Preliminary studies on indigenous species for dry season grazing in the northern Guinea savanna zone of Nigeria. *Tropical Grasslands* 18:148–152. bit.ly/2QT0Rnk

Aviz, M.A.B. de, Lourenço Jr., J.B., Camarão, A.P., Garcia, A.R., Araújo, C.V., Monteiro, E.M.M. and Santos, N.F.A. dos (2009) Valor nutritivo da leguminosa *Flemingia macrophylla* (Willd.) Merrill para suplementação alimentar de ruminantes na Amazônia Oriental. *Amazônia: Ciência & Desenvolvimento* 4:253–272. bit.ly/39pBvUz

Budelman, A. and Siregar, M.E. (1992) *Flemingia macrophylla* (Willd.) Merr. In: Mannerje, L't. and Jones, R.M. (eds) *Plant Resources of South-East Asia No. 4. Forages*. Pudoc Scientific Publishers, Wageningen, the Netherlands. p. 131–133. edepot.wur.nl/327785

Mui, N.T., Ledin, I., Udén, P. and Binh, D.V. (2002) The foliage of *Flemingia* (*Flemingia macrophylla*) or Jackfruit (*Artocarpus heterophyllus*) as a substitute for a rice bran - soya bean concentrate in the diet of lactating goats. *Asian-Australasian Journal of Animal Sciences* 15:45–54. doi.org/10.5713/ajas.2002.45

Oiticica, I.N., Fonseca, C.E.M. da, Souza, V.C. de, Silva, A.B. da, Lopes, F.C.F. and Morenz, M.J.F. (2015). *Flemingia macrophylla* in goat feeding. *Revista Brasileira de Zootecnia* 44:335–341. doi.org/10.1590/S1806-92902015000900005

Salmi A.P., Risso, I.A.M., Guerra, J.G.M., Urquiaga, S., Araújo, A.P. de, Abboud, A.C.S. 2013. Crescimento, acúmulo de nutrientes e fixação biológica de nitrogênio de *Flemingia macrophylla*. *Revista Ceres* 60:79–85. doi.org/10.1590/S0034-737X2013000100012

Skerman, P.J., (1977) *Tropical forage legumes*. FAO Plant Production and Protection Series No. 2. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy. p. 243–255. doc1.bibliothek.li/aay/FLMA174882.pdf

Cultivars

'Chumphon' (CIAT 17403) An unofficial release (~1990) in South-east Asia. Leafy and productive variety collected from Chumphon, Thailand.

Promising accessions

CIAT 18437, CIAT 18438, CIAT 21083, CIAT 21090 and CIAT 22082: These 5 accessions from Sumatra, Indonesia (CIAT 18437) and from Thailand have been selected from studies in Colombia based on higher digestibility and dry matter yield and lower tannin and fibre than 'Chumpon' (CIAT 17403). However all of these selections had poor seed production in Colombia.

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