

# Tropical Forages

## *Vigna trilobata*

### Scientific name

*Vigna trilobata* (L.) Verdc.



### Synonyms

Basionym: *Dolichos trilobatus* L.; *Phaseolus trilobatus* (L.) Schreb.; *Phaseolus trilobus* auct.

### Family/tribe

Family: *Fabaceae* (alt. *Leguminosae*) subfamily: *Faboideae* tribe: *Phaseoleae* subtribe: *Phaseolinae* subgenus *Ceratotropis*.

### Morphological description

Annual (sometimes perennial) prostrate, trailing (rarely weakly twining) herb, often with reddish, glabrous, rarely pubescent, stems 30–60 cm long. Leaves trifoliolate, petioles 1–11 cm long, with leaflets ovate or rhomboid in outline, 1–5 cm long, 0.6–4 cm wide; glabrous to sub-glabrous, usually shiny; margins entire to deeply 3-lobed (upper lobe of terminal leaflet broadly spatulate, oblong obtuse or subacute); stipules peltate, sometimes spurred, ovate, 4–15 (–19) mm long. Inflorescence 2–6-flowered axillary raceme, with peduncle 2–22.5 cm long; pedicels 1–2.5 mm long; calyx 2.5 mm long, glabrous, teeth minute; corolla yellow, 5–7 mm long, standard cordate; wings obovate, auriculate; keel apex contorted. Pods cylindrical, 1.5–5 cm long, 2.5–4 mm wide, glabrous to sparingly pubescent with short adpressed hairs, black when ripe; 6–12 seeds/pod; seeds orange, mottled brown, black, blue or sometimes whitish, cylindrical, 2.3 × 1.8 × 1.7 mm, truncate at both ends. 80,000–130,000 seeds per kg.



Form with deeply lobed leaflets (CPI 13671)



Form with minimally lobed leaflet margins (CPI 108262)



Form with entire leaflet margins and unusually pronounced leaf marking (CPI 106746)



Inflorescence 2 - 6 flowered axillary raceme; pods black when ripe



Seeds cylindrical, truncate at both ends



Establishment on cropping soils, southern Queensland Australia

### Similar species

*Vigna trilobata* can be distinguished from the morphologically similar *V. aconitifolia* by virtue of large oval stipules, the latter having small, linear-lanceolate stipules, and from *Vigna radiata* var. *sublobata* in having smaller flowers, pods and seeds and a very long peduncle.

### Common names

**Asia:** □□□□□ san lie ye jiang dou (China); kacang kate (Indonesia)

**English:** African gram, three-lobe-leaf cowpea, jungle mat bean, jungli bean, math bean, wild gram

**Indian subcontinent:** arak (ark) moth, banmoong, jangli (jungli) moth, ■■■■■■ mungan, ■■■■■■ mugani, mugam, ■■■■■■ mugvan, mungi, ranmoong, trianguli (Hindi); kaadesaru, kohesaru, mudgaparni, nari hesara, nari hesaru, pilli hesaru, pisaru kaayi, rakhalkalai (Kannada); cheruvidukol, kattupayar, kokkikai (Malayalam); arkamath, jangli-math, ranmath, ranmuga (Marathi); bin-me, munwenna (Sinhala); kocilam, nari payaru, navippayaru, pachapayaru, pani-payir (Tamil); pilli pesalu, phillipesara, pillipersara (Telugu); jangli-math, mukni (Urdu); **medicinal names:** mudgaparni (Ayurvedic); mugwan (Unani)

### Distribution

#### Native:

**Asia:** Bhutan; China (Yunnan); India; Indonesia (Java); Myanmar; Nepal; Pakistan (Punjab, Sind); Sri Lanka; Taiwan (s.) Vietnam

#### Naturalized:

**Africa:** Ghana; Senegal; Sudan

**Australasia:** Australia (Queensland, Western Australia)

**Indian Ocean:** Madagascar; Mauritius

South America: Peru

## Uses/applications

### Forage

*V. trilobata* is sown in as a short-term pasture in drier areas.

### Environment

The plant's ability to thrive under drought conditions and to fix nitrogen make it an excellent green manure crop in semi-arid regions. During the fallow season, it is allowed to grow for 45–50 days before being incorporated into the soil. Sometimes, the green manure is grazed, and allowed to regrow for about a month before being incorporated.

### Other

Seeds and immature seedpods are cooked and consumed by people. Various parts of the *V. trilobata* plant are prized in Ayurvedic and Unani medicine to treat a multitude of conditions.

## Ecology

### Soil requirements

*V. trilobata* is largely found on well-drained, alkaline, dark, cracking clay soils, but also on red lateritic soil, and sandy and loamy soils of similar reaction (pH 6.5–9). However, well-drained sandy-loam soils, rich in humus, are considered most suitable for its growth. It is moderately tolerant of salinity, producing 50% maximum growth in soil with electrical conductivity (saturated extract, EC<sub>e</sub>) of 9.7 dS/m.

### Moisture

Annual rainfall at collection sites ranges from (520–) 700 to 900 (–1,440) mm, with a 5–7 month dry season. It has a well-developed, deep tap root system and is extremely drought tolerant. While *V. trilobata* is sometimes found on poorly drained soils, it is mostly found on well-drained soils, and can suffer from waterlogging.

### Temperature

The species is native to a largely tropical area extending from 2,000 m asl at about 27° N in the Himalayas to near sea level at lower latitudes in India and Indonesia, equating to an average annual temperature range of around 10–27 °C.

### Light

*V. trilobata* grows in open or lightly shaded situations, often being found under thorn-shrubs where it is protected from grazing animals.

### Reproductive development

Under well-watered conditions, flowering and seed set is continuous but sparse. However, under moisture stress, plants respond with more dense flowering, far greater seed production and a reduction in vegetative growth. In Australia, *V. trilobata* usually flowers within 30 days of sowing. It is recorded as flowering September–November in India, and February–March in Sri Lanka.

### Defoliation

Tolerant of regular or constant heavy grazing, but not of infrequent heavy grazing, when a bulk of foliage is rapidly removed.

### Fire

Regenerates from seed.

## Agronomy

Guidelines for establishment and management of sown forages.

### Establishment

Although *V. trilobata* is best sown into a well prepared seedbed, it and other green manures such as *Vigna radiata* and *Tephrosia purpurea* are often relay sown into standing rice crops 7–10 days before harvest.

### Fertilizer

Responds to applications of phosphorus in low P soils.

### Compatibility (with other species)

*V. trilobata* is found in grasslands, scrublands, savannah and rocky areas in dry and moist deciduous forests. It relies on disturbance and open soil for regeneration, so is rarely found in association with dense grass cover.

### Companion species

Grasses: *Panicum coloratum*, *Setaria incrassata*.

Legumes: *Clitoria ternatea*, *Desmanthus* spp., *Bouffordia dichotoma*, *Stylosanthes seabrana*.

## Pests and diseases

Plants are damaged by red hairy caterpillar (*Amsacta albistriga* Lepidoptera: Erebidae), legume pod borer (*Maruca testulalis* Lepidoptera: Pyralidae), pea blue butterfly (*Lampides boeticus* Lepidoptera: Lycaenidae), galerucid beetle (*Madurasia obscurella* Coleoptera: Chrysomelidae), the adzuki bean weevil (*Callosobruchus chinensis* Coleoptera: Chrysomelidae) and aphids. *Cercospora* leaf spot and seed and seedling rot are serious diseases under moist conditions. Yellow mosaic disease (YMD) caused by Mungbean yellow mosaic India virus (MYMIV), a begomovirus, has been isolated from diseased plants of *V. trilobata*. However, resistant varieties have been identified. It is also a host for the pigeon-pea cyst nematode (*Heterodera cajani*).

## Ability to spread

It has become weakly naturalized in areas with similar climate and soils to those found in its native distribution. Populations and yields generally decline following the year of sowing, due largely to competition from weeds and perennial grasses. Soil seed levels under sown stands have been measured at 200 kg/ha in the first year, declining to about 25 kg/ha in subsequent years.

## Weed potential

Not an aggressive species.

## Feeding value

### Nutritive value

Mean CP level across three sites of about 13% and P level of 0.22%.

### Palatability/acceptability

A very palatable species, with palatability > *Clitoria ternatea*, *Lablab purpureus*, *Macroptilium bracteatum*, *Macrotyloma daltonii* and *Stylosanthes seabrana*.

### Toxicity

No suspicion of toxicity.

## Production potential

### Dry matter

Dry matter yields of the order of about 3 t/ha/yr are achievable, but may be considerably less, depending on rainfall and competition from other species.

### Animal production

In the sub-humid subtropics, with a stocking rate of 1.25 ha/steer, *V. trilobata* provided 104–194 animal grazing days/ha/yr, producing average liveweight gains of 0.55–0.79 kg/steer/day.

## Genetics/breeding

*Vigna* is most closely related to *Phaseolus*, with Asian *Vigna* (subgenus *Ceratotropis*) being treated as *Phaseolus* until 1970. When used as the pollen parent, *V. trilobata* can cross with three other Asian *Vigna* spp., *V. aconitifolia*, *V. radiata* and *V. mungo*, all with the same chromosome complement,  $2n = 22$ , and all thought to be derived from *V. trilobata* as progenitor. The F1 plants from a cross between *V. radiata* and *V. trilobata* were sterile, but fertile amphidiploids were obtained through doubling of the chromosomes.

## Seed production

A seed yield of 8.79 quintals/ha (= 830 kg/ha) is cited from work in Gujarat, India.

## Herbicide effects

No specific information found but likely to be similar to tolerances and susceptibilities of closely related, commercial species, moth bean (*V. aconitifolia*), mung bean (*V. radiata*) and black gram (*V. mungo*).

## Strengths

- Very palatable .
- Drought-hardy.
- Grows on cracking clay soils.
- Tolerant of grazing.
- Human food alternative.

## Limitations

- Low yields.
- Best in fertile soils.

- Limited value for cut-and-carry.
- Intolerant of waterlogging.

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## Cultivars

None released.

## Promising accessions

**CPI 13671** Selected in Queensland, Australia. Introduced as *Phaseolus trilobus*. Institutional collection from Agricultural Research Institute, Coimbatore, India. Most vigorous of a limited set of accessions, producing higher vegetative and seed yields than others tested.

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