

# Tropical Forages

## *Macroptilium lathyroides*

### Scientific name

*Macroptilium lathyroides* (L.) Urb.



### Synonyms

Basionym: *Phaseolus lathyroides* L.; *Macroptilium lathyroides* var. *lathyroides* (L.) Urb.; *Macroptilium lathyroides* var. *semierectum* (L.) Urb.; *Phaseolus crotalarioides* Mart. ex Benth.; *Phaseolus semierectus* L.; *Phaseolus semierectus* var. *angustifolius* Benth.

### Family/tribe

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

### Morphological description

Herbaceous annual or short-lived perennial, erectly branching, 0.6–1 m tall, sometimes trailing, or twining to 1.5 m (especially in shade), becoming somewhat woody with age towards the base. Stems sparsely to densely appressed pubescent. Leaves trifoliolate; leaflets mostly entire, ovate to lanceolate, or narrowly elliptic, 3–8 cm long; 1–3.5 cm wide, upper surface glabrous, lower surface adpressed hairy, petioles 1–5 cm long, stipules lanceolate, 5–6 mm long lateral leaflets sometimes slightly lobed towards the base. Inflorescence a semi-erect, spicate raceme, about 15 cm long borne on axillary peduncles to about 30 cm long. Flowers papilionate on very short pedicels; calyx campanulate, 4–6 mm long; standard red to red-purple (rarely white or pink), roundish 13 mm, wing and keel petals tinged green, red, or white; keel spirally twisted. Pods linear, sub-cylindrical, 5.5–12 cm long, 2.5–3 mm wide, straight or slightly curved, glabrous or pubescent, the valves becoming strongly twisted on dehiscence (pods shatter readily on maturity), each pod containing up to 20 (–30) seeds. Seeds obliquely oblong, slightly compressed, about 3 mm long, mottled light and dark grey-brown or black. 88,000–154,000 seeds per kg.

### Common names

*Asia*: 豆豉 da yi dou (China); kacang batang (Indonesia); fajibiin, 豆豉豆 (Japan); nanban-akabana-azuki (Japan); ถั่วผี thua-phi (Thailand)

*English*: phasey bean, phasemy-bean, quail bean, wild bean, one-leaf clover; wild dolly (Cayman Islands); quail bean (Florida); cow pea, cowpea, wild bush bean, wild pea bean, (Hawaii)

*French*: macroptilium à fleur rouge; pois-poison, pois-zombi(e) (Lesser Antilles)

*German*: Phasemybohne



Accession with hairy stems and slightly lobed leaflets (CPI 49771)



Spontaneous stand, Paraguayan Chaco



Erectly branching, herbaceous annual or short-lived perennial, 0.6–1 m tall (cv. Murray)



Variation among accessions



Ecotype with narrowly elliptic leaflets



Some ecotypes exhibit twining ability (CPI 49771)



Inflorescence a semi-erect, spicate raceme; ecotype with ovate-lanceolate leaflets



Pods linear, straight or slightly curved, the valves becoming strongly twisted on dehiscence



Inflorescence and immature pods



Leaves, inflorescences and immature pods (cv. Murray)

*Latin America:* feijão-de-rola, feijão-de-rolinha, feijão-de-pombinha, feijão-dos-arrozais (Brazil); habichuela parada, látiros de pasto (Puerto Rico); porotillo, porotillo del campo, frijol de monte (Venezuela); frijol de los arrozales (Colombia); frijolito de los arrozales, pico de aura

*Pacific:* pini, piinivao (Tonga)

## Distribution

### Native:

*Northern America:* Mexico

*Caribbean:* Antigua and Barbuda (Antigua); Bahamas; Barbados; Cayman Islands; Cuba; Dominica; Grenada; Guadeloupe; Jamaica; Martinique; Puerto Rico; St. Kitts and Nevis (St Kitts); St. Lucia; St. Vincent and The Grenadines

*Central America:* Belize; Costa Rica; Guatemala; Nicaragua; Panama

*South America:* Argentina; Bolivia; Brazil; Colombia; Ecuador; French Guiana; Guyana; Paraguay; Peru; Suriname; Venezuela

### Naturalized:

Throughout the tropics and subtropics.

## Uses/applications

### Forage

Mainly used as a pioneer forage, but can also be conserved as hay or as silage when mixed with a grass. Care must be taken to minimise leaf drop during hay making and handling.

### Environment

It fixes nitrogen very effectively, and can be used as a green manure or cover crop in rotations.

### Other

Often used as indicator plant in pot and field trials.

## Ecology

### Soil requirements

Adapted to a wide range of well to poorly drained soils, from deep sands to heavy clays, and with a pH range of (5.0–) 6.0–7.0 (–8.0). It can tolerate moderate salinity, but is susceptible to higher levels of available soil manganese and aluminium, responding to lime to reduce available levels.

### Moisture

Found in areas with a rainfall range of (400–) 750–2,000 (–3,500) mm, usually in drainage lines and other wet places in lower rainfall environments. Although moderately drought tolerant, it avoids the effects of severe drought through its free-seeding annual habit. It grows on seasonally flooded soils, but not in permanent water.

### Temperature

Natural distribution extends from 25° N in Mexico to 30° S in Argentina, and from the low altitude subtropics to low (0 m asl, Panama) and high (2,000 m asl, Ecuador) altitude tropics. It can survive light frost, and although killed by heavy frost, has usually set seed before they occur.

### Light

Tolerant of light to moderate shade, although seedlings may suffer from shading. Its twining ability, once mature, enables it to compete for light with tall grasses.

### Reproductive development



Seeds



*Macroptilium lathyroides* (L.) Urban - 1, flowering and fruiting branch; 2, flower.

Line illustration



Seed crop



Seed crop (P15301)

[Search GeneSys for P15289](#)

It is day-neutral, flowering through most of the growing season. However, undefoliated plants generally do not flower until they reach about 30 cm tall. It can flower throughout the wet season but under shaded and humid conditions flowering and seed production are depressed and the plant assumes a twining growth habit.

### Defoliation

*M. lathyroides* only persists for one or two years under continuous grazing. It should be lightly (at least 10–15 cm of legume growth in the pasture) or rotationally grazed, and/or rested for 6–8 weeks later in the growing season to facilitate seed set and encourage persistence. A light cultivation helps annual regeneration.

### Fire

Plants do not survive fire, but soil seed germinates when conditions are suitable.

## Agronomy

Guidelines for establishment and management of sown forages.

### Establishment

Percentage of hard seed is generally fairly low, but to break dormancy in small samples, seed can be manually scarified or treated with concentrated sulphuric acid (sg. gr. 1.8) for 20 minutes. Acid-treated seed should be washed and dried thoroughly after treatment. *M. lathyroides* is fairly promiscuous in its rhizobial relationships, mostly nodulating freely with strains already in the soil. If in doubt, seed can be inoculated with cowpea strain *Bradyrhizobium*, such as CB 756 (Australia) and C 5 or C 95 (Argentina). For best establishment, seed should drilled (1–1.5 cm) or broadcast onto a well-prepared seedbed and lightly covered. It can be sown at any time during spring and summer when moisture is adequate, using (1–) 3 (–10) kg/ha seed. It has a vigorous seedling, emerging and developing more quickly than *Grona heterocarpa* cv. Florida or *Aeschynomene americana*, and can be co-planted with these legumes to provide early summer grazing.

### Fertilizer

*M. lathyroides* grows best on fertile alluvial soils or heavy clays, where it rarely requires fertilizer. On less fertile (usually more acid) soils, it may require addition of 250 kg/ha molybdenised superphosphate and possibly other nutrients if indicated by soil analysis. If required, Mo is normally reapplied at 100 g/ha Mo every 3 or 4 years. If plant tissue analysis is <0.20% P, additional P may be required. Lime is sometimes necessary to reduce levels of available Al and Mn in more acid soils.

### Compatibility (with other species)

Once established, it combines well with more open grasses, particularly under fertile, moist conditions. Although free-seeding, seedling regeneration in pastures only occurs under favourable conditions, and is usually poor after the second year.

### Companion species

Grasses: *Chloris gayana*, *Dichanthium aristatum*, *Megathyrsus maximus* (cv. Petrie), *Paspalum atratum*, *P. dilatatum*, *P. plicatum*, *Setaria sphacelata*, *Urochloa mutica*.

Legumes: *Aeschynomene americana*, *Grona heterocarpa* subsp. *heterocarpa*, *Trifolium repens*.

### Pests and diseases

Late-sown seedlings in particular are severely attacked by bean fly (*Ophiomyia* (*Melanagromyza*) *phaseoli* Diptera: Agromyzidae). Coating seed with carbofuran or carbosulfan before sowing protects plants against attack for two to three weeks, as can banding systemic insecticides, such as phorate and carbofuran along the seeds at sowing. Weekly spraying of monocrotophos, dimethoate or omethoate during the first four weeks gives effective control. Adults of rough brown weevil (*Baryopadus corrugatus* Coleoptera: Curculionidae) feed on the foliage, while larvae can severely damage roots. *M. lathyroides* is an alternative host for silverleaf whitefly (*Bemisia argentifolii* Homoptera: Aleyrodidae), a serious pest of a number of crop plants.

Nematodes attack the roots in lighter textured soils, the main species being *Meloidogyne incognita* and *M. javanica*. It shows field resistance to little-leaf phytoplasma, but is susceptible to a multitude of viruses, few of which are of any consequence in the field.

### Ability to spread

It spreads readily from seed under moist conditions, providing competition is not too severe. Seed can be ejected several metres by virtue of the violent shattering mechanism on ripening.

### Weed potential

*Macroptilium lathyroides* is widely naturalized and considered a minor weed of rice, but rarely a serious weed. However, it is regarded as an environmental weed in Queensland and the Northern Territory in Australia. There is also concern in some countries that it may be an alternative host for diseases of adjacent crops.

## Feeding value

### Nutritive value

CP values range from about 7% in old stemmy material to 25% in young vegetative growth, and IVDMD from 40 to 70%. NDF has been measured at 52 and 62%, compared with ADF of 40 and 46%, and IVDMD of 71 and 76% in different accessions. Leaf:stem ratio averages about 0.3 compared with 0.6 for *Aeschynomene americana*.

### Palatability/acceptability

*M. lathyroides* is claimed to be less palatable to stock when young and more palatable after seed set, although this may largely reflect a change in relative palatability of associated grasses.

### Toxicity

No record of problems with ruminants, and although suspected of causing poisoning with horses, other evidence suggests to the contrary. It does not produce milk taint.

### Feedipedia link

<https://www.feedipedia.org/node/627>

## Production potential

### Dry matter

DM yields depend on grass competition and growing conditions, and range from 500 kg/ha when grown with grass in the subhumid subtropics, up to 13 t/ha in pure sward under ideal conditions.

### Animal production

Published performance results are largely confounded by the presence of other species.

## Genetics/breeding

Closely self-pollinated;  $2n = 22$ . No breeding programs have been undertaken, any plant improvement coming from wild selections.

## Seed production

As with some other *Macroptilium* spp., flowering appears to be at least partly induced by a drying environment, although vigorous pollen germination and pollen tube growth are favoured by humidity. Pods mature throughout the growing season, with high levels of seed being produced. The absence of a synchronous crop and the shattering habit of the pods make machine harvest difficult and only a proportion of the crop produced is harvested. It can be direct-headed when a fair percentage of the pods are ripe to ripening and the material subsequently dried where seed from dehiscent pods will not be lost. Seed can then be threshed in a follow-up operation. Machine harvest can yield 30–150 kg/ha seed, and hand harvest about 250 kg/ha.

## Herbicide effects

Susceptible to pre-emergence application of azafenidin. Moderate tolerance of 2,4-D amine. Decent control by mixture of glyphosate and 2,4-D.

## Strengths

- Widely adapted (including heavy clay soils).
- Tolerant of poor drainage.
- Rapid early growth (good pioneer species).
- Good nitrogen fixation.
- Seeds heavily.

## Limitations

- Poor persistence in pastures.
- Susceptible to bean-fly.
- Susceptible to root-knot nematode.
- Difficult to harvest seed.
- Only moderate palatability.
- Has some weed potential.

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## Cultivars

**'Murray'** Released in Queensland, Australia (1966). Selected from naturalized ecotypes in coastal Queensland, and possibly CPI 5676 from the botanical gardens in Bogor, Indonesia. Less productive than CPI 49771 in Australia, or the naturalized ecotype in Florida, USA. Commercial seed rarely available.

**'Mancebo'** Released by La Universidad Nacional del Litoral, Santa Fe, Argentina (2016). No information available.

## Promising accessions

**CPI 49771** Selected in Queensland, Australia. Sourced from the Instituto de Pesquisas IRI, Matão, São Paulo state, Brazil. Origin Bahia, Brazil. A tall-growing, vigorous, productive genotype with slightly lobed terminal and lateral leaflets and densely pubescent stems. Well adapted to acid and alkaline soils in the humid and subhumid subtropics.

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