Neonotonia wightii

Scientific name

Neonotonia wightii (Wight & Arn.) J.A. Lackey

Subordinate taxa:

Neonotonia wightii (Wight & Arn.) J.A. Lackey subsp. *wightii*

Neonotonia wightii (Wight & Arn.) J.A. Lackey subsp. *wightii* var. *wightii*

Neonotonia wightii (Wight & Arn.) J.A. Lackey subsp. *wightii* var. *longicauda* (Schweinf.) J.A. Lackey

Neonotonia wightii (Wight & Arn.) J.A. Lackey subsp. *petitiana* (A. Rich.) J.A. Lackey

Neonotonia wightii (Wight & Arn.) J.A. Lackey subsp. *petitiana* (A. Rich.) J.A. Lackey var. *mearnsii* (De Wild.) J.A. Lackey

Neonotonia wightii (Wight & Arn.) J.A. Lackey subsp. *petitiana* (A. Rich.) J.A. Lackey var. *petitiana* (A. Rich.) J.A. Lackey

Neonotonia wightii (Wight & Arn.) J.A. Lackey subsp. *pseudojavanica* (Taub.) J.A. Lackey

Synonyms

***Neonotonia wightii*:** *Glycine javanica* auct.; *Glycine javanica* var. *paniculata* Hauman

var. *wightii*: Basionym: *Johnia wightii* Wight & Arn.; *Glycine wightii* (Wight & Arn.) Verdc.

var. *longicauda*: Basionym: *Glycine longicauda* Schweinf.; *Glycine claessensii* De Wild.; *Glycine javanica* subsp. *micrantha* (Hochst. ex A. Rich.) F.J. Herm.; *Glycine javanica* var. *claessensii* (De Wild.) Hauman; *Glycine javanica* var. *moniliformis* (Hochst. ex A. Rich.) F.J. Herm.; *Glycine micrantha* Hochst. ex A. Rich.; *Glycine moniliformis* Hochst. ex A. Rich.; *Glycine wightii* var. *longicauda* (Schweinf.) Verdc.

var. *mearnsii*: Basionym: *Glycine mearnsii* De Wild.; *Glycine javanica* var. *mearnsii* (De Wild.) Hauman; *Glycine wightii* var. *mearnsii* (De Wild.) Verdc.

var. *petitiana*: Basionym: *Johnia petitiana* A. Rich.; *Glycine wightii* subsp. *petitiana* (A. Rich.) Verdc.

subsp. *pseudojavanica*: Basionym: *Glycine pseudojavanica* Taub.; *Glycine wightii* subsp. *pseudojavanica* (Taub.) Verdc.

Family/tribe

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

Morphological description


Trailing, climbing, or twining perennial


Leaves pinnately trifoliolate


Inflorescence a dense or lax (open) axillary raceme


cv. Clarence


cv. Malawi


Immature pods


Mature pods brown often densely pubescent with grey to reddish brown hairs

Seeds usually brown in colour


Seeds with white aril


Line illustration

Trailing, climbing, or twining perennial with strong taproot, and woody base to 25 mm diameter in advanced plants, climbing to 10 m on appropriate framework (*e.g.* trees). Herbaceous stems slender (mostly 2–3 mm diameter), glabrous to densely pubescent (hairs whitish to reddish brown, semi-erect, retrorse), well branched, redeveloping from underground crown if main stem severed; ability for prostrate stems to develop nodal roots varies with ecotype. Leaves pinnately trifoliolate; leaflets elliptic, ovate, or rhombic-ovate, acute to obtuse, 1.5–15 cm long, long and 1.3–12.5 cm wide, glabrous to densely velvety pubescent; stipules lanceolate, 46 mm long, deciduous; petiole 2.5–13 cm long. Inflorescence axillary, dense or lax racemes, 2–35 cm long on peduncles 3–12.5 cm long, comprising 20–50 flowers; flowers 4.5–11 mm long, standard white to mauve-blue, sometimes with obscure small violet streaks on lower part, yellow to orange on senescence. Pod brown, linear-oblong, straight or slightly curved at the apex, transversely grooved and weakly septate between the seeds, glabrous to densely pubescent with grey to reddish brown hairs, 1.5–4.0 cm long and 2.5–5 mm wide, containing 3–8 seeds, shattering at maturity. Seeds oblong with rounded corners, laterally compressed, olive-green to light- to dark- and reddish-brown, occasionally mottled, aril white, 2–4 mm long, 1.5–3 mm wide and 1–1.5 mm thick; 50,000–170,000 (–330,000) seeds per kg.


Baling windrowed glycine hay


With Kazungula setaria under grazing, north Queensland Australia (cv. Cooper)


With Narok setaria under grazing north Queensland Australia (cv. Tinaroo)


Callide Rhodes grass-glycine pasture, north Queensland, Australia (cv. Tinaroo)


Guinea grass-glycine pasture under grazing north Queensland Australia

Search GeneSys for cv Tinaroo

ssp. *wightii*: small flowers 4.5–7.5 mm long; hairy pods.

var. *longicauda*: lax inflorescences.

var. *wightii*: congested inflorescences.

ssp. *pseudojavanica*: small flowers; glabrous pods.

ssp. *petitiana*: flowers 7.5–11 mm long; pods densely covered with brown hairs.

var. *petitiana*: flowers 8–11 mm long, corolla blue to mauve.

var. *mearnsii*: flowers 7.5–8.5 mm long, corolla white or tinged with blue or mauve, standard with blue or mauve blot.

Common names

Africa: olieboontjie, sooiboontjie, soyaboontjie (Afrikaans); yardiyan awaki (Hausa,*Nigeria*); akpaka ngwele oji (Igbo, *Nigeria*); mikundekunde (Swahili); fundo-fundo (Tanzania); dinawá tsá nága (Tswana), ebikamba (Runyankole/Rukiga, Uganda)

Asia: □□□□ zhao wa da dou (China); □□□□□□ jawa daizu (Japan); thua peelenian soibean (Thailand)

English: glycine (Australia, Kenya); rhodesian kudzu (Taiwan); perennial soybean, wild soybean

Europe: soja pérenne (French); ausdauernde Soja (German)

India: kattavarakkavalli, adutheenikai (Malayalam); ■■■■■■■■■■■■■ kaadu avareballi, ■■■■■■■■■■■■■■■■ kaadu togariballi (Kannada)

Latin America: soja perene (Brazil); soya perenne forrajera, soya forrajera, soya perenne (Colombia, Mexico); glicine (Spanish)

Distribution

subsp. wightii var. wightii

Native:

Asia: India (s.); Indonesia; (Java); Malaysia (Malaya); Sri Lanka

subsp. wightii var. longicauda

Native:

Africa: Angola; Botswana; Burundi; Cameroon; Chad; Democratic Republic of Congo; Ethiopia; Gabon; Ghana; Guinea; Kenya; Malawi; Mozambique; Nigeria; Rwanda; Sudan; Tanzania; Togo; Uganda; Zambia; Zimbabwe

Asia: Saudi Arabia; Yemen (n.)

Cultivated/naturalized:

World subtropics and upland tropics

subsp. *petitiana*

Native:

Africa: Ethiopia; Kenya; Malawi; Tanzania; Zambia

subsp. *pseudojavanica*

Native:

Africa: Cameroon; Democratic Republic of the Congo; Ghana; Kenya; Liberia; Nigeria; Rwanda; Sierra Leone; Sudan; Tanzania; Togo; Uganda

Uses/applications

Forage

N. wightii cultivars have formed the legume base for warm season pastures in the subtropics and upland tropics for a number of decades. Pasture for grazing, cut-and-carry, and standover; makes good hay and silage. Suitable for open pasture or agroforestry, although the twining habit can lead to distorted growth in coppice and young trees.

Environment

It can be used in small areas as a fallow crop in old cultivation and as a cover crop for weed control in overgrazed pastures and orchards. Care should be exercised to prevent the vigorous vine spreading into tree canopies.

Ecology

Soil requirements

Occurs on wide range of soils from red sands to heavy black clays, mostly, but not always, well drained, and with pH from 6 to 8.9. In cultivation, grows best on deep, fertile, well-drained, near neutral clays and clay loams, usually of alluvial origin or derived from basic igneous rocks (basalt, andesite). Performance is less reliable on soils with pH much less than 6 unless heavily limed, or those with a hard-setting A horizon. More demanding than most tropical legumes for molybdenum. Very sensitive to manganese (more so than *Trifolium repens*) and aluminium toxicity (similar to *Trifolium repens*), both of which are alleviated by additions of lime. Symptoms of Mn toxicity include interveinal chlorosis and leaf puckering. Moderately tolerant of salinity, some genotypes more so than others. Of the twining legumes, *N. wightii* is best adapted to neutral fertile soils, *Centrosema molle* (*pubescens*) to acid fertile soils, and *Macrotyloma axillare* and *Macroptilium atropurpureum* to acid, only moderately fertile soils.

Moisture

Originates from areas with average annual rainfall from 550 to 1,650 mm, mostly 750–1,000 mm. Cultivars are usually grown in areas with a summer dominant rainfall, with annual averages between 800 and 1,500 mm. It is not successful in areas of much higher rainfall. *N. wightii* is generally quite drought tolerant, although this varies among ecotypes. Grows best in well-drained soils, but tolerates a degree of waterlogging, some accessions being collected in depressions and on swamp margins. Tolerates short periods of flooding although not normally grown on flood-prone land.

Temperature

Most evaluated material originates from tropical east Africa, where it occurs mostly at >1,000 (and up to 2,450) m asl, and from southern Africa to 33º S, largely at lower elevations (but sometimes to 1,750 m asl). Average annual temperatures vary from as low as 15 ºC to about 25 ºC, sometimes with a lowest average monthly minimum of 5 or 6 ºC, and subject to frosts. Foliage and finer stems are killed by frost causing leaf shedding, but plants recover from buds on the older, less affected stems, and from the low crown. Up to 50% of plants may be killed if temperatures fall below -10 ºC. Optimum day/night temperature regime for growth 30/25 ºC, with growth slowing at 16 °C and ceasing at 13°C.

Light

Found in grassland, and shaded situations in bushland, thicket and woodland. Moderately shade tolerant, and can be grown successfully under trees in open forest and woodland. Twines towards the light when growing among taller grasses.

Reproductive development

A short-day plant. Cultivars have been selected partly on the basis of flowering time.

Defoliation

N. wightii is relatively slow to establish, and should not be grazed too soon after emergence. Under normal conditions, mixed grass/legume pastures can be grazed 7–8 weeks after sowing, but then only with sufficient grazing pressure to reduce the grass competition for the young legume plants. In the following season once the legume is fully established, the pasture can be rotationally grazed, leaving at least a 20 cm stubble after each grazing. It is intolerant of continuous intensive grazing. Even if not being used as standover feed, it is advisable to exclude stock towards the end of the growing season every few years to facilitate legume build-up accompanied by flowering and seeding to assist legume persistence. Longer periods of de-stocking may be necessary for shrubby weed suppression.

Fire

Overcomes the damaging effects of fire by virtue of low or buried crown, and setting large amounts of hard seed that germinate following fire.

Agronomy

Guidelines for establishment and management of sown forages.

Establishment

Hard seed levels in manually harvested seed are frequently of the order of 80–90%. Larger samples can be mechanically scarified, and smaller samples treated with concentrated sulphuric acid for 25 minutes or hot water at 70 ºC for 10 minutes. Commercial seed has usually been sufficiently scarified during the harvesting and threshing process. *N. wightii* is fairly promiscuous in its rhizobial relationships, but is best inoculated with CB 756 (Australia), SFS 288 or SFS 404 (Brazil), or MG 5013 (Malawi). Seed can be broadcast onto the surface of a well-prepared seedbed, or drilled to to a depth of 1–2 cm at seeding rates of 1–5 kg/ha, and rolled with a heavy roller. Germination is best at moderate temperatures, and declines markedly above 37 °C. Seedlings are initially slow, but vigour improves with the development of effective nodulation. With good conditions, ground cover can be achieved by about 2 months from sowing.

Fertilizer

N. wightii requires fertile soil, and deficiencies or toxicities must be corrected for a productive stand. Main nutrients to consider are calcium, phosphorus, sulphur and molybdenum. On very fertile soils, no fertilizer may be required, but as a guide, a suitable establishment dressing is 40 kg/ha P together with 200 g Mo (= 600 g Mo trioxide or 300 g of Na molybdate). Follow-up dressings of 20 kg/ha P every 1 or 2 years, and 100 g/ha Mo every 3 years may be necessary. Need for copper should be monitored in areas of known Cu deficiency, since Mo and Cu are antagonistic. Work has shown that the presence of VAM fungi (*Acaulospora longula* + *A. morrowae*) can improve P uptake in low P soils.

Compatibility (with other species)

The slow seedlings can be smothered by initial grass or weed growth if steps are not taken to reduce this competition. Cutting or grazing to about 15 cm every 9 weeks helps to minimise competition.

Companion species

Grasses: *Chloris gayana*, *Digitaria eriantha* (pangola grass), *Megathyrsus maximus*, *Cenchrus clandestinus*, *C. purpureus*, *Setaria sphacelata*, *Urochloa decumbens*.

Legumes: *Macroptilium atropurpureum, Macrotyloma axillare, Leucaena leucocephala*.

Pests and diseases

Generally few problems with pests and diseases. Under very wet conditions, leaf blight caused by *Rhizoctonia solani* can cause severe leaf damage. A leaf spot (*Cercospora* sp.), sclerotinia rot (*Sclerotinia sclerotiorum*) and another disease caused by *Synchytrium dolici* producing small yellow rust spots on the leaves and stems have also been recorded. Rust (*Phakopsora pachyrhizi*) is sometimes found on mature leaves but is not a problem in grazed stands where there is a regular turnover of leaves. *N. wightii* is an alternative host for halo blight caused by *Pseudomonas syringae* pv. *phaseolicola*, a serious disease of french beans (*Phaseolus vulgaris*), but is not seriously affected itself. Alfalfa mosaic virus has been isolated.
During moist and mild, temperature conditions, webworms (*Oncopera* spp. Lepidoptera: Hepialidae) can severely defoliate plants. Amnemus weevil (*Amnemus quadrituberculatus*) and rough brown weevil (*Baryopadus corrugatus*) (both Coleoptera: Curculionidae) attack the roots of young plants, causing loss of stand. Seed yields have been reduced due to activity of a bruchid weevil (*Bruchus* sp. Coleoptera: Bruchidae).

Ability to spread

N. wightii is a prolific seeder, and with sufficient space and the appropriate environment, seedlings establish readily. Some varieties can also spread vegetatively by rooting down at the nodes.

Weed potential

Has becomes a serious weed of rainforest margins, growing over surrounding weedy shrubs such as *Lantana camara* and *Solanum mauritianum*, and into the lower tree canopy.

Feeding value

Nutritive value

Crude protein values in the leaf dry matter range to about 26%, and to 20% in the whole plant. Dry matter digestibility varies from about 55 to 62%, which is generally higher than that of *Centrosema molle* and *Lablab purpureus*. Digestibility varies widely with the age of regrowth and the moisture regime under which the pastures are grown, and is about 10 units lower than that of a temperate legume at an equivalent stage of growth.

Palatability/acceptability

As with many warm season legumes, it is not always well grazed early in the season, but if not properly managed, may be selectively grazed towards the end of the season when grasses are more mature.

Toxicity

Low levels of oestrogenic substances found in the tissues have not been associated with any problems. Can cause meat taint initially, which diminishes with continued exposure.

Feedipedia link

https://www.feedipedia.org/node/293

Production potential

Dry matter

Dry matter yields vary according to soil and environmental conditions, and with variety and defoliation management. They generally range from about 3 to 8 t/ha/yr DM, and rarely to 12 t/ha.

Animal production

Experimental data provide unrealistically low estimates of the value of *N. wightii* or compare different systems. Commercial dairy and beef producers have judged it favourably and continue to plant it.

Genetics/breeding

2*n* = 22 (diploid), 40, 44 (tetraploid). Essentially cleistogamous and self-pollinated, with a low percentage of outcrossing. Plant improvement activity to date has involved selection from wild collections.

Seed production

For late flowering types such as 'Tinaroo' and 'Malawi', seed crops must be grown in areas where seed can mature before onset of frost. A day/night temperature regime of 27/22 to 16 °C is most suitable for seed production and growth; seed formation is reduced at high temperatures. Seed may be harvested by hand or machine harvested. Crops are ready when pods become dark and hard and commence shattering. They can be direct headed, or mowed and windrowed prior to threshing. Peg drum threshers are favoured to minimise the difficulties encountered with tangling vines. While yields of up to 1 t/ha seed have been recorded, commercial producers consider 300 kg/ha satisfactory.

Herbicide effects

N. wightii is tolerant of pre-emergence applications of trifluralin and benfluralin. Seedlings are susceptible to acifluorfen, bentazone, 2,4-D and 2,4-DB. Tolerance to 2,4-D and 2,4-DB improves with age. The former should only be used at 0.8 kg/ha a.e. or less once the stand is three to four months old, but still checks growth of the legume. 2,4-DB can be used at five weeks of age at 1.1 kg/ha a.e., and at 2.2 kg/ha a.e. at three to four months. Tolerant of diquat at 140 g/ha cation from 5 to 8 weeks as long as seedlings are healthy, and at 280 g/ha once established. It appears to be highly tolerant of glyphosate, with an ED50 value of 363 g a.e./ha. It also appears to be tolerant to tebuthiuron in apple-of-Sodom (*Solanum linnaeanum*) control trials and following large-scale aerial treatment of pastures. *N. wightii* can be controlled with foliar application of 2% solution of triclopyr amine in water with surfactant.

Strengths

- Productive.
- Moderately drought tolerant.
- Good seed production.
- Palatable.
- Persistent under suitable management.

Limitations

- Restricted to near neutral, fertile soils.
- Slow nodulation and establishment.
- Frost-tender.
- Susceptible to amnemus weevil attack.
- Environmental weed potential.

Selected references

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Cultivars

'Clarence' (P 1402, PI 322608, PI 339670, PI 379645) Released in NSW, Australia (1962). Originating from the Nigel district, Gauteng, South Africa (26.4º S, 28.5º E, 1,550 m asl, rainfall 850 mm). A tetraploid (2*n* = 44). Originally classified as var. *claessensii* (De Wild) Haumann. Stems coarser, less branched and less stoloniferous than 'Cooper' or 'Tinaroo'; pronounced brown hairs over the whole plant; large leaves, with hairs on both surfaces; veins of the lower surface prominent, rust-coloured. Flowers with pink-violet streaks on the standard. Slightly earlier flowering than 'Cooper', seeds maturing before frosts in marginal areas (early April at 27º S). Commences post-winter growth earlier than other cultivars.

'Cooper' (CPI 25702, K 115, P 5873, PI 339687, PI 379644) Released in Queensland, Australia (1962). Institutional collection from Kongwa, Tanzania. A diploid (2*n* = 22). Originally classified as var. *moniliformis* (Hochst. ex A. Rich.) F.J. Herm. Stems branched, slender and stoloniferous; leaves and stems covered in white hairs. Lateral leaflets more symmetrical than other cultivars. Flowers white, with pink-violet streaks on the standard. Marked constrictions in pods. Flowers in late April at 27º S, maturing 4–6 weeks before 'Tinaroo'. Continues growth later into the autumn than 'Clarence'. Establishes faster and is more tolerant of drought and waterlogging than other cultivars.

'Kenya violet glycine' (K51393, CPI 37920) Released in Kenya. Originating from near Eldoret, Kenya (0.5ºN, 35.2ºE, 2,100 m asl, rainfall 1,220 mm). Diploid (2*n* = 22). A very uniform variety, originally classified as subspecies *micrantha* (Hochst ex A. Rich.) F.J. Herm. Leaflets small, acute, the terminal ones mostly 3-4 cm long. Stems fine. Racemes 5-10 cm long. Flowers small, violet in colour, not turning yellow after flowering. Pods slightly curved, hairy, hairs directed toward the base of the pod. Although small, in mixed swards it is only slightly less vigorous than K51394.

'Kenya white glycine' (K51394, CPI 39165) Released in Kenya. Originating from near Eldoret, Kenya (0.5º N, 35.2º E, 2,100 m asl, rainfall 1,220 mm). Tetraploid (2*n* = 44). Leaflets medium to large. Flowers, white, often with a greyish-violet spot on the standard (occasionally slightly bluish) turning yellowish orange on senescence. Pods are straight, hairy, with the hairs directed toward the apex. Cross-pollination frequent. A vigorous variety, with numerous leaves. Recommended over other types in Kenya.

'Malawi' (CPI 28279) Released in Queensland, Australia (1976). Institutional collection from Zimbabwe, originally collected in Malawi. Tetraploid (2*n* = 44). Usually less branched and with less stolon development than 'Tinaroo' and 'Cooper'. Leaves generally larger and darker green than 'Tinaroo' or 'Cooper', and with more glabrous appearance than 'Clarence'. Leaf hairs semi-erect, brown on the leaf margins and veins. Pods brown, retrorsely hirsute. Flowers white with violet-purple markings on standard. Distinguished from 'Tinaroo'

by longer racemes, more appressed hairs on the stem and young leaflets, and darker green leaves; from 'Cooper' by time of flowering and hair colour; and from 'Clarence' by time of flowering and hair prominence; distinguished from other cultivars by retrorsely hirsute pods. Establishment and early growth slower than 'Clarence' and 'Cooper' but similar to 'Tinaroo'. Seasonal growth pattern, time of flowering and seeding are also similar to 'Tinaroo'. Selected for performance on soils of pH below 6, which are less suitable for other cultivars. Released elsewhere as **'Nyasaland'.**

'Moshi' (PI 319479) Released in Tanzania. Adapted to lower rainfall environment. Grows naturally at Itigi, Central Tanzania (5.7º S, 34.5º E, 1,300 m asl, rainfall 600 mm).

'Tinaroo' (Q 2056, PI 355918, PI 379646) Released in Queensland, Australia (1962). Institutional collection from Kenya. Diploid (2*n* = 22). Stems moderately hairy, hairs brownish, semi-erect to appressed. Leaflets almost glabrous. Flowers creamy white with obscure small violet streaks on the lower part of the standard . Seedling development slower than 'Clarence' and 'Cooper'. Grows longer into the cool season than these two cultivars. Commences flowering early to mid-June, with seed maturing in September at 27º S.

'Tropic Verde' (PI 224980, HA 1129) Released in Hawaii, USA (1992). Originating from Zimbabwe. Morphologically similar to 'Tinaroo', but with finer stems, also somewhat earlier flowering. Less hairy than 'Cooper' and 'Clarence'. Drought tolerant, high yielding, palatable and excellent for erosion control. Comparable yields to 'Tinaroo', 'Cooper' and 'Clarence', with and without supplemental irrigation. Although well considered by farmers, 'Tropic Verde' is no longer recommended due to concerns about difficulty of management and weediness potential.

The following varieties have been sufficiently impressive to warrant a varietal name, but specific information is not available:

'Choma' (CPI 18419, CPI 30367, PI 275762, PI 379639): From Choma, Zambia.

'Citrus' (CPI 25421, CPI 30528, CPI 30535, PI 379642): from Mazowe, Zimbabwe (17.5º S, 31º E, 1,230 m asl, rainfall 850 mm).

'Domasi' (CPI 25700): from near Zomba, Malawi (15.4º S, 35.3º E, 900 m asl, rainfall 1,400 mm).

'Grasslands' (CPI 30360, CPI 30495).

'Gunson' (CPI 30529).

'Melsetter' (CPI 30641, PI 379643): from Skyline Junction, Chimanimani, Zimbabwe (19.5º S, 32.5º E, 750 m asl, rainfall 1,130 mm).

'Nelspruit' (CPI 28277).

'Norval's Special' (CPI 28278, CPI 30498, CPI 30362).

Promising accessions

IRI No. 1 (SP1) Selected in Brazil. More tolerant of high soil manganese than 'Tinaroo', but less productive than 'Tinaroo' where manganese is not excessive.

M218 Selected in Tanzania. Successful in lower rainfall climate at Kilosa (700–800 mm).