

Scientific name

Lablab purpureus (L.) Sweet

Synonyms

Dolichos benghalensis Jacq.

Dolichos lablab L.

Dolichos purpureus L.

Lablab niger Medikus

Lablab purpurea (L.) Sweet

Lablab vulgaris (L.) Savi

Vigna aristata Piper

Family/tribe

Family: *Fabaceae* (alt. *Leguminosae*) subfamily: *Faboideae* tribe: *Phaseoleae* subtribe: *Phaseolinae*. Also placed in: *Papilionaceae*.

Common names

hyacinth bean, lablab bean, field bean, pig-ears, rongai dolichos, lab-lab bean, poor man's bean, Tonga bean (English); dolique lab-lab, dolique d'Egypte, frijol jacinto, quiquaqua, caroata chwata, poroto de Egipto, chicarros, frijol caballo, gallinita, frijol de adorno, carmelita, frijol caballero, pois nourrice (Spanish); faselbohne, helmbohne, schlangenbohne, batao, wal, sem, lubia (the Sudan); fiwi bean (Zambia); antaque, banner bean (Caribbean); wal (India); batao (Philippines); natoba, toba (Fiji); pois Antaque; pois de Senteur, tapirucusu.

Morphological description

Domesticated types are mostly summer growing annuals or occasionally short-lived perennials; a vigorously trailing, twining herbaceous plant. Wild germplasm is strongly perennial. Stems robust, trailing to upright to 3-6 m in length; leaves trifoliate; leaflets broad ovate-rhomboid, 7.5-15 cm long, thin, acute at apex, almost smooth above and short haired underneath. Petioles long and slender. Inflorescence lax, fascicled, of many-flowered racemes on elongated peduncles. Flowers white (in cv. Rongai) or blue or purple (in cv. Highworth), on short pedicels. Pods 4-5 cm long, broadly scimitar shaped, smooth and beaked by the persistent style, containing two to four seeds, or 6-8 in var. *bengalensis*. Seeds in cv. Rongai buff or pale brown coloured, ovoid, laterally compressed, with a linear white conspicuous hilum, 1.0 cm long x 0.7 cm broad, seeds of 'Highworth' black with a linear white hilum. Seed colour of other varieties can range from white or cream through to light and dark brown, red to black. Seeds can have a mottled colouring in some domesticated varieties and in all wild material. Seed weight 2,000-5,000seeds/kg.

Distribution

Native to:

Africa: Angola, Botswana, Cameroon, Chad, Cote D'Ivoire, Ethiopia, Gabon, Ghana, Kenya, Malawi, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa (Cape Province, Natal, Orange Free State, Transvaal), Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Western Indian Ocean: Madagascar.

Now widely cultivated pan-tropically.

Uses/applications

Lablab is a dual-purpose legume. It is traditionally grown as a pulse crop for human consumption in south and southeast Asia and eastern Africa. Flowers and immature pods also used as a vegetable. It is also used as a fodder legume sown for grazing and conservation in broad-acre agricultural systems in tropical environments with a summer rainfall. Also used as green manure, cover crop and in cut-and-carry systems and as a concentrate feed. It can be incorporated into cereal cropping systems as a legume ley to address soil fertility decline and is used as an intercrop species with maize to provide better legume/stover feed quality. As a dual purpose (human food and animal feed) legume, it is sown as a monoculture or in intercrop systems.

Ecology

Soil requirements

Grows in a wide range of soils from deep sands to heavy clays, provided drainage is good, and from pH 4.5-7.5. Low salinity tolerance with symptoms being chlorotic leaves, reduced growth and plant death. Lablab does not always nodulate well with native strains of rhizobia but some virgin soils in sub-tropical Australia appear to have suitable native rhizobia populations, which have resulted in good growth without inoculation of seed. Nevertheless it is recommended to be sown with the appropriate lablab rhizobia strain, which in Australia is Group J.

Moisture

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Adapted to annual rainfall regimes of 650-3,000 mm. Drought tolerant when established, and will grow where rainfall is <500 mm, but loses leaves during prolonged dry periods. Capable of extracting soil water from at least 2 metres depth even in heavy textured soils. Will tolerate short periods of flooding but intolerant of poor drainage and prolonged inundation.

Temperature

Grows best at average daily temperatures of 18-30°C and is tolerant of high temperatures. Able to grow at low temperatures (down to 3°C) for short periods. Frost susceptible, but tolerates very light frosts. More tolerant of cold than either *Mucuna pruriens* or cowpea (*Vigna unguiculata*). Will grow at altitudes from sea level to elevations of up to 2,000 m asl in tropical environments.

Light

Intolerant of moderate to heavy shading.

Reproductive development

Short-day flowering response, with early ('Highworth') and late ('Rongai', 'Endurance') flowering types available. Other varieties are much earlier flowering than 'Highworth' with some landraces flowering as early as 55 days after sowing. Known to have some outcrossing but observations suggest that this is usually minimal. Being an annual or weak perennial, lablab flowers and sets seed in the first season of growth.

Defoliation

Three harvests possible from annual types, but will not stand heavy grazing of stems. For green manure, the crop should be cut before flower initiation. More tolerant of grazing than cowpea, and more harvests possible. As a forage, the crop should be utilised before flowering.

Fire

Intolerant of fire.

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Agronomy

Guidelines for the establishment and management of sown pastures.

Establishment

Percentage of hard seed is very low and no scarification is required. Complete cultivation is used for lablab monocultures with seeding rates of between 12 and 20 kg/ha. Rows should be 80-120 cm apart, with 30-50 cm between plants. Seed can be planted to a depth of 3-10 cm. Will establish readily when sown into subsurface moisture to a depth of at least 7-10 cm. When planted with grasses, seed rates should be 5-8 kg/ha. Will not establish readily into existing pastures without some form of soil disturbance. Provided seed is of good quality, germination should be rapid and uniform as commercial cultivars have soft seed and require no scarification.

Fertiliser

While it is common to grow lablab without fertilizer applications, sowings in sandy soils often require applications of phosphorus and sulphur and benefit from applications of lime in very acid soils.

Compatibility (with other species)

When used for forage in large areas, lablab is often sown with annual grass crops such as annual sorghums and millets. Such mixtures can be strip-grazed through late summer into autumn. Light grazing to remove leaf only will prolong the productive life of lablab pastures. In smallholder systems, lablab can be intercropped with maize. The

lablab should be sown about 28 days after the maize to avoid severe cereal crop yield depression from competition.

Companion species

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Grasses: Annual forage sorghum (*Sorghum* spp.) and millets (*Pennisetum glaucum*), summer cereal crops, maize (*Zea mays*) and sorghum (*S. bicolor*). Oversown into *Panicum maximum* pastures in Brazil.

Pests and diseases

The pod-boring insect *Adisura atkinsoni* can reduce seed yields but has been controlled experimentally by strain HB-III of *Bacterium cereus* var. *thuringensis*. Other insect pests include *Heliothis armigera*, *Exelastis atomosa* and *Maruca testulalis*. Bruchid beetles (*Callosobruchus* spp.) damage seed during growth and storage.

Lablab roots are attacked by several nematodes: *Helicotylenchus dihystera*, *Meloidogyne hapla* and *M. incognita*.

Anthraxnose (caused by *Colletotrichum lindemuthianum*), leaf-spot (caused by *Cercospora dolichi*) and powdery mildew (caused by *Leveillula taurica* var. *macrospora*) have been reported. A stem rot caused by *Sclerotinia sclerotiorum* may attack the plant under wet conditions. In Australia, cultivar Rongai is fairly disease-free and generally lablab is more tolerant to root diseases than cowpeas.

Ability to spread

Will not spread naturally under grazing. May volunteer in subsequent crops but this is usually only for one year because of the low level of hard seed.

Weed potential

None due to its short-lived nature and poor longevity of seed. Reported as a weed in cropped areas in some humid-tropical locations where individual plants may live up to 3 years, but no report as an environmental weed.

Feeding value

Nutritive value

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Leaf has CP content of 21-38%, commonly about 26%. Much lower for stem (7-20%). Grain contains 20-28% CP. Digestibility ranges from 55-76%, commonly >60% (leaves). Grain high in vitamins A, B and C.

Palatability/acceptability

Leaf is highly palatable, but stem has low palatability. Palatability of grain is low to moderate depending on variety.

Toxicity

Leaf does not contain anti-nutritive factors such as tannins. Mixed plantings with forage sorghum prevents the occurrence of bloat. Grain

contains tannins, and phytate and trypsin inhibitors. Concentrations vary among varieties. Soaking or cooking reduces the activity of these compounds.

Production potential

Dry matter

Seasonal yields of 2 t/ha leaf or 4 t/ha stem and leaf are common in sub-humid sub-tropics. Dry matter yield is usually higher than for cowpea, particularly under drought conditions. For human nutrition, 2-7 t/ha green pods. In monoculture, 1-2.5 t/ha DM, depending on cultivar.

Animal production

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In Brazil, Zebu cattle grazing maize stalks, dry grasses and green lablab gained 350 g/head/day over a 3-month period, while cattle without lablab lost weight. In sub-tropical Australia, cattle gains have ranged from 0.09-1.04 kg/head/day depending on the feeding conditions. Trials in Zimbabwe have demonstrated that the use of a lablab hay supplement resulted in milk yield increases slightly less than those obtained through the use of velvet bean (*Mucuna pruriens*). Milk quality was also slightly less than that achieved with velvet bean but still very acceptable. Supplementing the diet of goats with lablab in Zimbabwe has been shown to yield better condition for does, higher kid birth weights and growth rates, and higher milk yields.

Genetics/breeding

The biosystematics of hyacinth bean and its relatives were reviewed and revised. Formerly, *Lablab* was included in the genus *Dolichos* following Linneus, but is now assigned to the monotypic genus *Lablab*. Three subspecies are recognized in *L. purpureus*; ssp. *uncinatus*: the wild ancestral form distributed mainly in East Africa with small, scimitar-shaped pods of about 40 mm x 15 mm; ssp. *purpureus*, cultivated as a pulse crop, has larger, scimitar-shaped pods, 100 mm x 40 mm; includes commercial varieties; and ssp. *bengalensis*, Asiatic origin, has linear-oblong shaped pods, longer than other subspecies, up to 140 mm x 10-25 mm. Although pod shape is a significant morphological difference, it is widely believed that ssp. *bengalensis* and ssp. *purpureus* are genetically very similar. Although most domesticated material is either ssp. *purpureus* or ssp. *bengalensis*, ssp. *uncinatus* has been domesticated in Ethiopia. Studies in lablab have shown that the perennial types have considerable genetic and morphological diversity. Hybrids between perennial and forage types have been produced at CSIRO, Australia and have resulted in new cultivars being released.

Lablab is predominantly self-fertilizing. Chromosome number $2n = 22$.

Seed production

Intermittent flowering and pod production. Grain maturation on the forage cultivars is not uniform but crop landrace types often have more synchronous maturity. High grain yields of 1-2.5 t/ha, depending on cultivar, but when grown on trellises in smallholder systems the grain

cultivar, but when grown on trellises in smallholder systems the grain yields can be far greater. In mixtures with other crops, grain yields 0.5 t/ha. Late seeding varieties may be affected by early frosts.

There is some evidence that lablab accessions with light coloured seeds have poor storage potential, which in turn affects seedling vigour and establishment.

Herbicide effects

Lablab is highly sensitive to 2,4-D, M.C.P.A., 2,4-D-B and dicamba .

Strengths

- A dual purpose legume and can be used with cereals in smallholder systems.
- Can be sown with summer grass crops to provide a mixed forage crop system.
- High forage quality.
- As a green manure crop restores soil fertility .
- Drought tolerant once established.
- High grain yields.
- Better root disease resistance than cowpeas.

Limitations

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- Annual or short-lived perennial .
- Poor frost tolerance .
- Host to pests attacking field beans.
- Indeterminate flowering leading to extended seeding period in current cultivars.

Other comments

Has considerable potential as a multipurpose legume in crop-livestock systems where rotations are possible.

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<http://www.agric.nsw.gov.au/reader/forage-fodder/p4216.htm>

Cultivars

Cultivars	Country/date released	Details
'Rongai'	Australia, 1962	Introduced to Australia as CPI 17883 from Kenya, 'Rongai' is a late-flowering variety with high DM production. 'Rongai' has white flowers and light brown seeds. In the absence of frosts, may flower over several months. Most common forage cultivar. Seed weight 5,000 seeds/kg.
'Highworth'	Australia, 1973	Introduced to Australia as CPI 30212 from southern India. Earlier-flowering variety originally intended for grain production (high seed yield) in areas experiencing early frosts. Also has adequate forage DM production. 'Highworth' has purple flowers and black seeds. Seed weight 4,000 seeds/kg.
'Koala'	Australia, 1995	Early maturing grain type, able to seed set before the onset of frost in northern NSW and southern Queensland, Australia. Produces about 70% of the DM yield of 'Highworth' and 'Rongai'.
'Endurance'	Australia, currently on pre-release	Perennial cultivar, developed from the perennial line CPI 24973 and cv. Rongai, that grows well in the second and even third year. High DM production potential. Seed weight 5,500 seeds/kg.

Promising accessions

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Promising accessions	Country	Details
Selection No. 697	Brazil	Performs well in Brazil.
CPI 67639	Australia	This accession has black seeds and

		appears to have greater resistance to seed borers, possibly through thicker seed testa .
CQ 3632, CQ 3633, P 5305, P 5310 and Q 6879	Australia	These accessions have similar agronomic attributes to cvv. Highworth and Rongai.
CPI 29399, CPI 30701, CPI 52506B and CPI 81364	South Africa	Produced 5-7 t/ha in northern South Africa (See Ayisi et al 2004 for a full list of accessions).



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