**Tropical Forages**

**Lablab purpureus**

**Scientific name**

*Lablab purpureus* (L.) Sweet

**Subordinate taxa:**

*Lablab purpureus* (L.) Sweet subsp. *purpureus*

*Lablab purpureus* (L.) Sweet subsp. *uncinatus* Verdc.

*Lablab purpureus* (L.) Sweet subsp. *benghalensis* (Jacq.) Verdc.

**Synonyms**

*Basionym: Dolichos lablab* L.

*Lablab leucocarpos* Savi

*Lablab niger* Medik.

*Lablab vulgaris* Savi

**Family/tribe**


**Common names**

Lablab is widely used as a pulse and vegetable (its use as a forage is fairly restricted) and has numerous common/vernacular names of which the following are just some. The common names almost invariably refer to its use as a crop.

Africa: agni guango ahura, O- cala, amora guaya, gerenga, fiwi bean, kikuyu bean, kashrengieg, lubia

South America: Australian pea, bannabees, chicharos, frijol caballero, caraota chivata, frijol bocpm. frijol chileno

Central America and Caribbean: bounavista pea, seeim bean, bunabís, butter bean, chimbolo verde, Cabellero, frijol de la tierra,

India: Aware, ballar, chapparadavare, chikkadikai chikkuda, mochai numulu, mochakotta sem, pavta, shim, sin bean, val, wal

Indonesia: Kerara

Malaysia: kachang kara, Kara-Kara, Kekara

Philippines: batau, beglau, parda, agaya, itab

Vietnam: dauvan, dall van

English: hyacinth bean, bonavist bean, lablab bean, field bean, pig-ears, rongai dolichos, poor man’s bean, Tonga bean (English)

German: Laselbohne; Helmbohne; Lablabbohne

French: dolique d’Egypte; dolique lab-lab


**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 2,000-5,000 seeds/kg.

**Distribution**

**Native:**

The most recent research points to lablab being a native to eastern and southern Africa where it was domesticated and subsequently dispersed across Africa and Asia (pre 2000BC)

**Cultivated:**

Now widely cultivated as a crop pan-tropically, and especially important in India (especially southern India) and Bangladesh

**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 (CB 1024).

**Moisture**

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 crop 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.

Uses/applications

Forage

An annual forage crop in broad-acre agricultural systems in tropical environments with a summer rainfall and occasionally used for forage in cut and carry systems.

Environment

lablab can be incorporated into cereal cropping systems as a legume ley to address soil fertility decline. It is also used as an intercrop species with maize to enable cereals and pulses to grown simultaneously on the same land, usually in smallholder systems, and to achieve better legume/stover feed quality.

Other

Lablab is a major pulse crop in southern India and an important vegetable elsewhere especially in Bangladesh, where the green pods are widely used like snow peas. Widely used as a minor pulse crop across Asia and Africa especially inm Kenya and Tanzania.

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.

Fertilizer

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

Grasses: Annual forage sorghum (Sorghum spp.) and millets (Cenchrus americanus), summer cereal crops, maize (Zea mays) and sorghum (S. bicolour). Oversown into Megathyrsus maximus 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 Heliotis 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. Anthracnose (caused by Colletotrichum lindemuthianum), leaf-spot (caused by Cercospora dolichii) 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**

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 but yields can often exceed 6-7t/ha. Dry matter yield is usually higher than for cowpea, particularly under drier conditions. For human nutrition, 2-7 t/ha green pods. In monoculture, 1-2.5 t/ha DM (grain) depending on cultivar is achieved.

**Animal production**

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**

*Lablab* was previously included in the genus *Dolichos* following Linneus, but is now assigned to its own monotypic genus. 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*, which 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 now the view 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 (wild) 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 (cv Endurance). Lablab is predominantly self-fertilizing. Chromosome number 2n = 22.

**Seed production**

Intermittent flowering and pod production in the forage types. Grain maturation on the forage cultivars is not uniform but crop landrace types have more synchronous maturity. High grain yields of 1-2.5 t/ha of forage types, depending on 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 (e.g. cv Rongai) may be affected by early frosts. There is some evidence that lablab accessions with light (cream or white) 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
- Poor frost tolerance
- Susceptible to a range of insect pests
- Indeterminate flowering leading to extended seeding period in current cultivars

Selected references


Cultivars

`'Dash'` An moderately early-flowering annual forage cultivar selected from a single plant from within a population of ILRI 14437. Introduced to ILRI from Zimbabwe via the forage collection of the National Agricultural Research Centre, Kitale, Kenya.

`'ELDO-KT Maridadi'` A late-maturity (> 5 months), stay-green cultivar developed by the University of Eldoret, for the Central & North Rift as well as Western regions of Kenya, released in 2015. The spotted seeds have a good flavour and short cooking time; the cultivar has high forage production. Seed is maintained at University of Eldoret, Eldoret, Kenya.

`'Endurance'` A weakly perennial cultivar, developed from the strongly perennial (wild) line CPI 24973 and cv. Rongai and released as a cultivar in 1998. ‘Endurance’ grows well in the second and even into third year after grazing or curtting. High DM production potential. Seed weight 5,500 seeds/kg. ‘Endurance’ seed is no longer commercially available.

`'Highworth'` Introduced to Australia as CPI 30212 from southern India and released as a cultivar in Australia in 1973. 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'` Early maturing grain type and released as a cultivar in Australia in 1995. 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’.

`'Rio Verde'` (Reg. No. CV-280, PI 648441) A vining, herbaceous tropical legume with high nutritive value as a forage or browse for ruminant animals. Qualities include drought tolerance, high palatability, high nutritive value, excellent forage yields and adaptation to diverse environmental conditions; tolerance to defoliation and Texas seed production. Seed weight is 7,000-7,400 seeds/kg. Rio Verde was developed at the Texas A&M AgriLife Research and Extension Center at Overton, Texas and released by Texas A&M AgriLife Research in 2006; it is the first lablab cultivar released in the USA. (URL: https://aggieclover.tamu.edu/rio-verde/; https://dl.sciencesocieties.org/publications/jpr/abstracts/2/1/15/preview/pdf)

`'Rongai'` Introduced to Australia as CPI 17883 from Kenya and released as a cultivar in Australia in 1962. ‘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.

Promising accessions

CPI 67639: This forage type accession and has black seeds. It appears to have greater resistance to seed borers, possibly through thicker seed testa.

CQ 3632, CQ3633, P5305, P5310 and Q6879: These Australian-registered accessions have similar agronomic attributes to cvv. Highworth and Rongai.

CPI 29399, CPI 30701, CPI 52506B and CPI 81364: All of these accessions produced in > 5t/ha biomass in at 87 days after sowing on farmer’s fields near Polokwane, Limpopo, South Africa (see Ayisi et. al. (2004)).

Q6880B: This is the most consistent yielding dual purpose accession under dryland and even drought conditions in northern Tanzania and semi-arid Kenya (short growing seasons). Farmers have been enthusiastic about its agronomic properties because of its early yield and that it remains green for extended periods. It also intercrops relatively well with maize. Unfortunatley the grain appears to be rather bitter and so this accession may be unacceptable in the market.

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