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Lablab purpureus (L.) Sweet

Leguminosae

Synonyms

Dolichos lab-lab.

Common names

Rongai dolichos, lab-lab bean (Australia) poor man's bean, Tonga bean (England), lubia (the Sudan), batao (Philippines), hyacinth bean (Brazil), frijol jacinto (Colombia), quiquaqua, caroata chwata (Venezuela), poroto de Egipto (Argentina), dolique lab-lab, dolique d'Egypte (France), fiwi bean (Zambia), chicarros, frijol caballo (Puerto Rico), gallinita (Mexico), frijol de adorno (El Salvador), wal (India).w

Description

Summer-growing, rampant and vigorously twining herbaceous annual or short-lived perennial. Stems robust, 3 to 6 m, leaves trifoliolate; leaflets broad ovate-rhomboid, 7.5 to 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 'Rongai') or blue or purple, on short pedicels. Pod 4 to 5 cm long, broadly scimitar shaped, smooth and beaked by the persistent style, containing two to four seeds. Seeds in 'Rongai' buff or pale brown coloured, ovoid, laterally compressed, with a linear white conspicuous hilum, 1.0 cm long x 0.7 cm broad (Barnard, 1967). □A

Distribution

Widespread throughout the tropics, especially in Africa as a food crop.

Season of growth

A summer-growing annual, biennial, or short-term perennial.

Altitude range

Sea level up to 2 000 m (Crowder, 1960), but it prefers the lower elevations.

Rainfall requirements

Used for a food crop in rainfall as low as 400 mm with summer incidence and where deep soils are available. Prefers a rainfall in excess of 750 mm but not above 2 500 mm.

Drought tolerance

It is quite drought-tolerant when established (Luck, 1965b) .

Tolerance of flooding

Very poor; it will not grow in wet soils (Luck 1965b; Wilson and Murtagh, 1962).

Soil requirements

Extremely tolerant of soil texture, growing in deep sands to heavy clays, provided drainage is good. It will grow in a wide range of pH, from 5.0 to 7.5. Salinity reduces the plant population and produces chlorotic leaves (Wilson, personal communication).

Rhizobium relationships

Lablab does not easily nodulate with native strains of rhizobia, and although it is often not inoculated it is preferable to treat the seed with the cowpea strain CB 756 (Norris, 1967). Diatloff (1967) recorded poor growth on poor sandy soils in south-east coastal

Queensland, where uninoculated plants yielded 203 kg./ha of dry matter compared with 1 611 kg./ ha inoculated. Only three out of 25 virgin soils gave good growth without inoculation of seed. Cloonan (1963) found that crown nodules on lablab were pink at four weeks, dark pink at six weeks, and black at 12 weeks and still active. He suggested that this feature might be used as a diagnostic check on successful strain inoculation.

Ability to spread naturally

Will not spread naturally.

Land preparation for establishment

Lablab performs best when drilled into a well-prepared seed bed, but it can establish by broadcasting into roughly ploughed or cultivated land if the seed is covered to some extent.

Sowing methods

It is drilled in 1-m rows into a prepared seed bed, or broadcast onto rough seed beds. In Brazil, it is commonly drilled in with maize at planting or when the maize is 15 cm high, using 20 percent by weight of lablab seed and 80 percent maize, in alternate rows 80 cm apart (Schaaffhausen, 1966).

It does not establish well in natural pastures unless they are cultivated. It can be sod-seeded into pastures (McAdam and Swain, 1969) with adequate fertilizer and preferably inoculated. In Brazil, it is sometimes broadcast from horseback into P. maximum pastures where the deep red latosolic surface is loose (Horrell, personal communication). Drilled rows allow interrow cultivation for early weed control. It is often sown with maize and sorghum in alternate rows for silage.

Sowing depth and cover

The seed germinates from sowing as deep as 10 cm, but it is usually sown at 2.5 to 5 cm and harrowed. Hand planting by dibbling in the seed or using a one-row hand machine is also practised.

Sowing time and rate

Five to 7 kg./ha drilled, with a heavier rate of 8 to 10 kg./ ha broadcast. Sown in early summer, it will yield up to three grazings; later summer planting yields only one grazing.

Number of seeds per kg.

3 300 to 4 290. Percentage of hard seed is very low.

Seed treatment before planting

Not necessary to break dormancy. Inoculation with a cowpea type is advisable. Pelleting is not necessary unless to protect rhizobia, in which case rock phosphate should be used. Seeding with a neutral fertilizer will also protect the rhizobia. For insect and disease control, treat seed with dieldrin or endrin prior to sowing (to protect from bean fly).

Nutrient requirements

Generally in fertile soils, no fertilizer is necessary. In poor sandy soils, use 250 to 500 kg./ha molybdenized superphosphate and some potash if needed.

Compatibility with grasses and other legumes

It is usually sown alone or in widely spaced maize or sorghum rows because of its slow early growth and short life.

Tolerance to herbicides

No reference in the literature to this effect. Being a plant with broad-leaved, tender foliage, it is probably highly susceptible to herbicide damage.

Nitrogen-fixing ability

In relation to yield. Besides nodulation from nitrogen fixation, it also supplies large amounts of nitrogen by leaf decay. At São Paulo, Brazil, it is estimated that it provides 220 kg./ha of nitrogen (Lambert, personal communication). Parbery (1967b) obtained dry matter yields up to 44 832 kg./ ha in 287 days at the Kimberley Research Station,

Australia, which contained 6 279 kg./ha of protein, unfertilized with nitrogen, indicating its extensive nitrogen-accumulating ability.

Response to defoliation

Will not stand heavy grazing of stems, but if only the leaf is taken it will provide two to three grazings in a season. Neme (1970, unpublished) advises that the plant should not be below 25 cm and recovery will take four to five months to give a second cut in Brazil.

Grazing management

Graze first in about ten weeks from sowing to remove the leaf only and then remove the animals to allow further leaf to develop (Hamilton, 1969). Do not turn hungry animals onto a sole diet of lablab or bloat may occur, especially with young regrowth. Use a mixed grass/legume diet if possible or spray the material before grazing with an antilloat agent.

Response to fire

It will not tolerate fire.

Breeding system

The flowers are mainly cross-pollinated. Chromosome number $2n = 22$. Patil (1958) has dealt with anthesis and pollination in the field.

Dry-matter and green-matter yields

Crowder (1960) reported 25 tonnes/ha of green material after four to six months growth in Colombia. In Brazil, 40 tonnes/ha were obtained, and 35 tonnes of mixed maize and dolichos. Van Rensburg (1967) obtained 5 438 kg. DM/ha at Mount Makulu, Zambia, of 23.38 and 11.5 percent crude protein for the first and second cut, giving 870 kg. of crude protein per hectare. In another experiment, 35.64 percent of the dry matter of a crop yielding 3 374 kg. DM/ha was consumed at grazing. The dry matter of the whole crop consisted of 69 percent stem of 8.25 percent protein, and the leaf DM per hectare was 1 031 kg./ha, containing 17.63 percent crude protein. Murtagh and Dougherty (1968) averaged a yield of 4 035 kg. DM/ha from three sites on the north coast of New South Wales (lat. 28°50'S), leaf yield averaging 2 094 kg./ ha. They felt that a ceiling leaf yield of 2 200 kg./ha can be expected in that environment. Neme (personal communication) calculated that 1 ha of lablab could furnish 1 500 kg. protein/ha.

Suitability for hay and silage

Lablab makes excellent hay if the leaf is preserved. The stem is difficult to dry and must be conditioned mechanically to hasten curing. Thurbon, Byford and Winks (1970) made hay of lablab in north Queensland. The material was mown, crushed (conditioned), windrowed and, when dry enough, baled with a pick-up baler.

Ryley (1966) recorded good silage made from lablab alone in trench silos in Queensland. Skerman (1958b) made excellent silage with a mixture of lablab and sorghum, lifting the protein of the sorghum from 4.5 percent alone to 8.1 percent with a 1:2 lablab/sorghum mixture and to 11 percent with a 2:1 mixture. It is often grown with maize for ensiling. Morris and Levitt (1968) recorded the intake and digestibility of lablab silage. The material was ensiled immediately after harvesting, after wilting for two days with and without 3 percent molasses, and after wilting for three days. All silages were satisfactory and readily eaten by sheep.

Value as a standover or deferred feed

Excellent if there are no frosts. It flowers late and carries a large body of feed into the winter. Even if frosted, if it has set seed the pods do not dehisce and so there is good feeding value in them alone. In Brazil, the lablab crop planted with maize is fed off with the old maize residues after the maize harvest.

Feeding value

It is excellent for bridging the gap between summer and winter grazing crops and pastures (Luck, 1965b).

• Chemical analysis:

French (1937) reported 11.74 percent crude protein, 37.67 percent crude fibre and 39.47 percent carbohydrates with 2 percent CaO, 0.42 percent P₂O₅, 0.36 percent

Na₂O, 1.69 percent K₂O and 0.13 percent Cl in lablab hay at Mpwapwa, Tanzania. Some of the leaf had been lost in making the hay. Luck. (1965b) reported 25 to 26 percent crude protein in the leaf of lablab cv. Rongai compared with 18 to 23 percent for velvet bean, and the stem crude protein was 9 to 11 percent. Neme (1970, unpublished) recorded 22.17 percent crude protein and 27.44 percent crude fibre on a dryweight basis. Thurbon, Byford and Winks (1970) found lablab hay to have a protein content of 11 to 14 percent. For weaner calves, it can be cut within ten weeks to give a higher protein; for mature animals it can be cut later. Digestibility of the dry matter of the young plants (77 days) was 61.3 percent and for old plants (140 days) 48.6 percent, and for crude protein 66.4 and 61.7 percent respectively. Morris and Levitt (1968) reported 24.9 percent dry matter, 2.3 percent nitrogen, 30.1 percent crude fibre, 42.6 percent carbohydrates, 1.5 percent Ca, 0.3 percent P and 4.6 percent sugar in green lablab before ensiling. In the resulting silage made from non wilted and wilted material plus molasses, there was no significant difference in composition. The average dry matter was 38.2 percent, nitrogen 2.4 percent, crude fibre 30.9 percent, carbohydrates 37.9 percent, Ca 1.8 percent, P 0.3 percent and sugar 1.0 percent with final pH ranging from 4.2 to 4.6.

- **Digestibility:**

Of the organic matter in the silage, digestibility was 49.1 percent (nitrogen 58.4 percent, crude fibre 55.3 percent and nitrogen-free extract 9.2 percent) for cattle. With sheep, digestibility figures were higher. The voluntary intake of sorghum/lablab silage was directly related to the proportion of lablab in the silage.

- **Palatability:**

Green lablab is not usually eaten for up to four days (Murtagh and Dougherty, 1968), after which the cattle become used to it and then eat it readily. The palatability of the hay (French, 1937) and silage (Ryley, 1966) for sheep has been recorded. Sheep ate the silage readily at approximately 1 kg./head/day.

Toxicity

A sole ration of lablab caused a "feedy" flavour in milk, similar to that from clovers and lucerne. Pasteurization and/or homogenization rendered milk acceptable (Hamilton, Fraser and Armitt, 1969). A case of bloat in cattle eating a sole diet of lablab was reported by Hamilton and Ruth (1968).

Seed harvesting methods

Often hand-picked in the tropics. It can be directly headed when the seed is ripe and standing or twining fine-stemmed crops, or it can be mown, cured in the field and subsequently threshed.

Seed yield

Up to 1 000 kg./ha in Brazil and Bolivia. Davies and Hutton (1970) give an average figure of 500 kg./ha. Its seed yield is best at elevations of 1 200 to 1 800 m in Colombia. It does not seed very well in Venezuela.

Cultivars

Cultivar Rongai originally came from Kenya as CPI 16883. A much earlier-flowering cultivar, cv. Highworth, was introduced to Australia as CPI 20212 from southern India. It has high seed yield coupled with adequate foliage DM production. It has purple flowers and black seeds (those of 'Rongai' are white and light brown). There are numerous cultivars in the tropics. Selection No. 697 performs well in Brazil.

Diseases

The plant is attacked by numerous diseases throughout the world. In Australia, cultivar Rongai is fairly disease-free. A stem rot caused by *Sclerotinia sclerotiorum* may attack the plant under wet conditions (Wilson and Murtagh, 1962).

Main attributes

Its late maturing habit allows it to grow well into the autumn to provide feed between the normal summer species and winter species (e.g. Oats). Its large seed allows easy establishment. It provides a high yield of dry matter and is drought tolerant. It is a good pioneer crop to prepare land previously infested with *Axonopus* and *Cynodon* grasses for sowing grass/legume mixtures (Cassidy, 1968).

Main deficiencies

Its short life, low palatability of the stems and its susceptibility to frost.

Performance

At Fazenda El Prata, São Paulo, Brazil (Lambert, personal communication), lablab raised the milk yield by 1.5 kg./day after two days. French (1937) successfully fed lablab hay to sheep at Mpwapwa, Tanzania. In Brazil, on rotation pastures with lablab, pigeon pea and grasses, 47 bulls gained an average of 40 kilograms per head in 63 days (Schaaffhausen, 1966). Hamilton (1969) obtained 9 to 13 litres milk/head/day from cows grazing pure dolichos.

Main references

Luck (1965b); Morris and Levitt (1968).

Latitudinal limits

It extends south to beyond latitude 30°S. It is cultivated in Buenos Aires, Argentina (Burkart, 1952).

Ability to compete with weeds

Excellent when once established, but its early growth is slow and so it should not be subject to weed competition at this stage.

Pests

Colbran (1963) found that the roots of Lablab purpureus were attacked by the nematodes *Helicotylenchus dihystrera*, *Meloidogyne hapla* and *M. incognita*. It is also attacked by leaf-eating insects.

Toxicity levels and symptoms

There is evidence of an adverse effect of salinity on lablab (Wilson, personal communication).

Temperature for growth

Requires warm temperatures for good growth. Does not grow rapidly till December in south-east Queensland, Australia, when temperatures exceed 29°C. It shoots rapidly in the spring from old plants. Minimum temperature for growth is about 3°C (Murtagh and Dougherty, 1968). It is more tolerant of cold than velvet bean (*Mucuna pruriens*). Its frost tolerance is low. It usually seeds late and so early frosts affect it. In Georgia, United States, and Queensland, (Downes, 1966), a breeding programme for earliness of flowering and seed production is in progress.

Vigour of seedling, growth and growth rhythm

Its seedling is vigorous, a little slower growing than cowpeas early in the season. It is easy to establish because of the large seeds. Murtagh and Dougherty (1968) showed leaf yield increasing rapidly in midsummer and continuing up to the first frost (mid-June), whereas stem growth continued into the spring despite the frosted leaves. With a dense growth, the lower leaves are shed. These are lost to grazing, but form an excellent mulch and provide nitrogen on decomposition. In indicating growth rhythm of dolichos, cowpea and velvet bean in northern New South Wales, Wilson and Murtagh (1962) clearly show that the lablab retains its foliage, and therefore its feed value, much later into the winter than the other two.

Response to photoperiod and light

It is a short-day plant. In south-east Queensland, flowering commences in May; but if unfrosted, flowering may continue through the winter into the spring. Cv. Rongai is later flowering than other types. It is sensitive to day length and flowers best with less than 11 hours of daylight, but it requires ample sunlight. In New South Wales, Australia, Murtagh and Dougherty (1968) got full light interception with a canopy of pure lablab. If grown with tall grasses or crops, it can climb to the light.

Minimum germination and quality for commercial sale

Minimum germination of 75 percent, with a maximum of 10 percent hard seed and purity of at least 97.5 percent in Queensland. The seed is germinated under cover at 25°C (Prodonoff, 1968).