

A Brief Review on Botanical Description, Medicinal Uses and Pharmacological Actions of *Lablab purpureus*

Pratheeksha¹, Karunakar Hegde²

^{1,2}Department of Pharmacology, Srinivas College of Pharmacy, Valachil, Mangalore, Karnataka, India, 574143

Corresponding Author: Pratheeksha

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ABSTRACT

Lablab purpureus is a species of the beans, which is commonly known as a Dolichos bean belongs to the family Fabaceae. The crop is believed to be cultivated in south Asia and introduced into Africa. It is a multipurpose leguminous plant and holds a unique position as a vegetable among legumes because of its high level of nutritional value. The different varieties of the plant show the different composition. It is a rich source of proteins which possess a variety of health benefits, including reducing susceptibility to heart and kidney disease, and lowering blood sugar levels in diabetics. The field crop is an herbaceous, climbing, short-lived plant with a vigorous taproot and cultivated in a large extent in Karnataka and adjoining districts of Kerala, Tamil Nadu, Andhra Pradesh, Uttar Pradesh and Maharashtra. The phytochemical analysis of the plant shows the presence of various components such as sugar, alcohols, phenols, steroids, essential oils, alkaloids, tannins, flavonoids, saponins, coumarins, terpenoids, pigments, glycosides, and anthranoids. The pharmacological study of the plant showed that it possesses antioxidant, antimicrobial, cytotoxic, insecticidal, anti-obesity, immunomodulatory, hypolipidemic, antiviral, anti-cancer, analgesic, anti-fungal, hepatoprotective, anticholesterolemic, antidote and carminative activity. The plant was also used as anti-inflammatory, aphrodisiac, antispasmodic, antidiabetic, febrifuge, flatulent and for phlegmatic disorders.

Keywords: Botanical description, Dolichos bean, *Lablab purpureus*, Nutritional value, Protein, Pharmacological actions.

INTRODUCTION

Most medicines used in health care come from plants, and in developing countries nearly 80% of primary health care is provided by traditional plant-based medicines, but only a tiny fraction of medicinal plants have been tested.^[1] Worldwide, attention is being paid to the medicinal plants to solve healthcare problems. Plants are the source of 25% of prescribed drugs in the world.^[2] There are approximately 3.6 lakh species of medicinal plants on earth, of which 1.4 lakh are native to India.^[3] In traditional health systems, herbal medicines have played an essential role in treating acute and chronic conditions with or without minimal toxic effects. Many plant species have been used as sources for developing therapeutic agents for nearly 1000 years, and most of the drugs in use today are naturally derived from plants. There are more than 2500 plants used by traditional herbal practitioners for treating basic illnesses, which has been regarded as one of the best methods in Indian medical practice.^[4]

Lablab purpureus, commonly known as Dolichos bean in India, is one of the ancient multipurpose crops that belong to the family Fabaceae.^[5] The crops are originated from India or South-East Asia

and it was introduced into Africa during the eighteenth century. The immature green pods of the Dolichos bean are leguminous vegetables that are a good source of protein. In many parts of Africa and other underdeveloped countries, human nutrition lacks sufficient protein. This has led to research on improving the quality of conventional protein sources and the development of new unconventional sources. [6] It holds a unique position as a vegetable among legumes because of its high level of nutritional value. Legumes have been found to possess a variety of health benefits, including reducing susceptibility to heart and kidney disease, and lowering blood sugar levels in diabetics. [7]

It is cultivated in many tropical and subtropical countries as a grain, vegetable,

and fodder crop. The crop is either cultivated as a pure crop or intercropped with groundnut, castor or sorghum in Karnataka, Kerala, Madhya Pradesh, Andhra Pradesh, Maharashtra and Tamilnadu. [8] As a crop, field beans are rich in rare pharmaceuticals used in the treatment of human and animal diseases. [9]

TAXONOMIC CLASSIFICATION: [10]

Table 1: Taxonomical classification of *Lablab purpureus*.

Kingdom	Plantae
Division	Tracheophyta
Subdivision	Spermatophytina
Class	Magnoliopsida
Order	Fabales
Superorder	Rosanae
Family	Fabaceae
Subfamily	Faboideae
Genus	<i>Lablab</i>
Species	<i>L.purpureus</i>

VERNACULAR NAMES: [10]

Table 2: Vernacular name of *Lablab purpureus*.

English	Dolichos bean, Hyacinth bean, Bonavist bean, Lablab bean, Egyptian kidney bean, Indian bean, Common bean, Field bean
Hindi	Sem, Bhatvas
Kannada	Capparada-avare, Avare, Avare bele
Malayalam	Amara, Avara
Marathi	Anvare, Kadavebaala, Pandhre pavate
Sanskrit	Nispavah
Tamil	Avarai, Motchai
Telugu	Chikkudu, Adavichikkudu, Alsanda
Bengali	Rajashimbi
Arabic	Lablab

HABITAT: [11, 12]

Lablab purpureus is a species of bean in the family Fabaceae. The wild form is believed to have originated in India or South-East Asia. It is remarkably adaptable to wide areas under diverse climatic conditions such as arid, semi-arid, subtropical and humid regions where temperatures vary between 22°C–35°C. Within India, *Lablab purpureus* is a field crop mostly confined to the peninsular region and cultivated in a large extent in Karnataka and adjoining states of Kerala, Tamil Nadu, Andhra Pradesh, Uttar Pradesh and Maharashtra. Outside India, the crop is distributed in Malaysia, Indonesia, Egypt, Bangladesh, East and West Africa and Central and South America.

DESCRIPTION: [13]

An herbaceous, climbing plant with a vigorous taproot, *Lablab purpureus* is a warm-season or short-lived plant. It has a thick, herbaceous stem that can reach a height of 3 feet, and the vines can reach a height of 25 feet from the plant. The leaves are trifoliolate and long-staminate. Leaflets are egg-shaped and 3 to 6 inches (7.5 to 15 cm) long, widening in the middle. Over the leaflet's surface, the hairs are short and smooth. Clusters of flowers grow at an angle between the leaf and the main stem on an un-branched inflorescence. Depending on the variety, the flowers may be white, blue, or purple. Two to four seeds are contained in seedpods that are 2 inches (4–5 cm) to 4 inches (10 cm) long, smooth, flat, and pointed. The colour of seeds can be

white, cream, dark brown, red, black, or mottled.

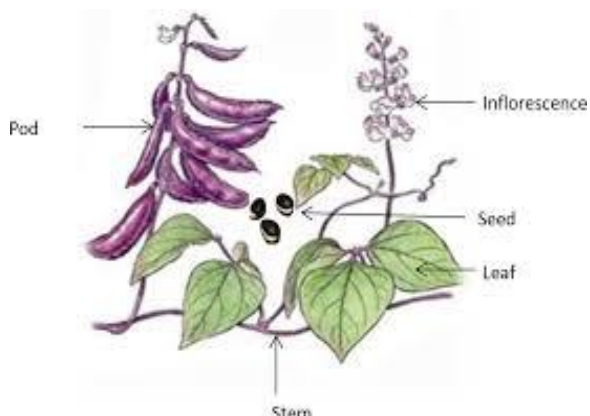


Figure 1: *Lablab purpureus* plant

CULTIVATION: [14]

A wide range of rainfall, temperatures and altitudes are ideal for Lablab, making it a suitable choice for most tropical environments. Adaptable to a variety of soil types ranging from deep sand to heavy clay, with good drainage and a pH range of 4.5 to 7.5. Plant will grow where it receives 650-3000 mm of annual rainfall, and is drought tolerant once established, but loses leaves during prolonged dry periods. Best grown at average daily temperatures of 18 to 30 °C, and is tolerant to high temperatures. Plants can also grow at low temperature (down to 3°C) for a short time. Plants in tropical environments can grow from sea level up to 2,000 meters above sea level.

NUTRITIVE VALUES: [15]

The dried seeds contain 33% carbohydrate as the main component, 25% protein, 0.8% fat, and 7.2% dietary fibre, according to nutritional analyses. It also contains oligosaccharides such as 3.5% raffinose and stachyose, phytic acid 82.0 mg/g, phosphorus 430 mg/g, and phytates phosphorus 243 mg/g. The leaves were high in protein (up to 28%), and it also contains iron (155 mg), and zinc (30 mg) per 100 g dry weight of leaves. The grain had 34 mg of zinc per kg and 57 mg of iron per kg. On a dry matter basis, crude protein ranged from 22.4 to 31.3%, crude fibre from 7.62 to

9.63%, and total carbohydrate from 54.2 to 63.3%. Calcium, phosphorus, phytate phosphorus, and iron concentrations were 36.0 to 53.5 mg/100 g, 388 to 483 mg/100 g, 282 to 380 mg/100 g, and 5.95 to 6.90 mg/100 g, respectively. Dolichos lablab seeds were harvested for the purification of Arcelin and Dolichin proteins.

CHEMICAL CONSTITUENTS: [10]

The phytochemical examination of Dolichos lablab fresh leaf extracts contains sugar, alcohols, phenols, steroids, essential oils, alkaloids, tannins, flavonoids, saponins, coumarins, terpenoids, pigments, glycosides, and anthranoids. The seeds contained trypsin inhibitors, Hemagglutinin content, cyanogenic glycosides, oxalates, phytates, tannins, and saponins, according to a phytochemical analysis of the raw and aqueous crude extracts of the three varieties of Lablab purpureus seeds.

MEDICINAL USES: [10, 16]

The entire plant parts used as antioxidant, antimicrobial, cytotoxic, insecticidal, anti-obesity, immune modulatory, hypolipidemic, antiviral, anticancer, analgesic, anti-fungal, hepatoprotective, anticholesterolemic, antidote and carminative. The plant was also used as anti-inflammatory, aphrodisiac, antispasmodic, antidiabetic, febrifuge, flatulents and for phlegmatic disorders. The leaves have been used for treating eczema, gonorrhoea, and tumours.

PHARMACOLOGICAL ACTIONS:

Antibacterial activity: [17]

The ethanolic, methanolic and aqueous extract of Dolichos lablab reported to have antibacterial activity against four strains of bacterium (*Escherichia coli*, *P. aeruginosa*, *B. subtilis* & *Staphylococcus*). Among the 3 extracts, methanolic extract shows potential bactericide activity with maximum inhibition zone. The methanolic extract of leaf and flower is also evaluated

for antibacterial activity against *S. aureus* by using Agar well diffusion method.

Antifungal activity: [18]

The ethanolic, methanolic and aqueous extract of *Dolichos lablab* reported to have antifungal activity against three strains of fungi (*T. rubrum*, *T. mentagrophytes*, *C. albicans*) by well diffusion method. Among the three, methanolic extract shows maximum antifungal activity against *T. mentagrophytes* (30 mm) at a range, 15-19mm.

Anti-inflammatory Activity: [19]

The methanolic extraction of two varieties of *dolichos lablab* reported to have an anti-inflammatory activity. It shows that with the concentration, the absorbance decreases, it means that % inhibition increases with concentration and there is a marked anti-inflammatory effect.

Antioxidant Activity: [20]

A molecule that ends any chain reaction by removing free radical intermediates in order to prevent further sort of oxidation reactions, is called an antioxidant. For studying the antioxidant activity of *Dolichos lablab*, Linoleic acid emulsion system is used and the peroxidation of linoleic acid is being investigated. *Dolichos lablab* inhibits 98.58% peroxidation of linoleic acid after incubated for 54hours at 1mg concentration in the final solution. Antioxidants like phenolic compounds which are present in the seed coat play a significant role in protecting from oxidative damage. A different variety of polyphenolics present in *Dolichos lablab* showed to have antioxidant activity.

Antidiabetic Activity: [21]

Methanolic extract of *Dolichos lablab* (MEDL) seeds shows glucose lowering activity in streptozotocin-Nicotinamide induced diabetic rat. The experimental rat treated with MEDL

showed decrease in total cholesterol, triglycerides, SGPT, and SGOT levels as compared with diabetic rats which were untreated. 400mg/kg MEDL found to have more effective antidiabetic activity than 200 mg/kg.

Antinociceptive Activity: [22]

Antinociceptive activity is established through abdominal writhing test using acetic acid. Inter peritoneal administration of acetic acid leads to abdominal constrictions which were highly reduced by the plant extract in a dose-dependent fashion. The percentage reduction in abdominal constrictions on administering the drug at a dose of 50mg, 100mg, 200mg and 400mg/kg body weight, were 32.3, 45.2, 54.8, and 58.1 respectively.

Gastroprotective Activity: [23]

Peptic ulcer is a chronic and recurrent disease that affects millions of people. Ulcerations can result from insufficient dietetic habits, increased acid secretion, or *Helicobacter pylori* infection. Methanolic extracts of the leaves of *Dolichos lablab* were tested against ethanol and aspirin-induced ulceration in mice models. There was a significant reduction in ulceration rates in both ulcer models when plant extracts were used.

Cytotoxic Effect: [24]

L. purpureus extracts and vincristine sulphate, a positive control, were incubated for 24 hours to determine their lethality to brine shrimp. The percent mortality increased as the concentration increased. In comparison to vincristine sulphate, whose LC₅₀ value is 7.55 g/ml, the crude n-hexane, chloroform, and ethyl acetate extracts showed better cytotoxicity.

Hypolipidemic Effect: [25]

The Hypolipidemic effect of *Dolichos lablab* was studied in rats with high levels of fats (lipids), such as cholesterol, in the blood. If the diet was supplemented with the powder made from

soaked beans of the corresponding variety, plasma cholesterol levels were reduced. However, the liver cholesterol levels were still three times higher than in controls.

Treatment of Iron deficiency Anemia: [26]

Anemia was induced by tail clipping procedure to the point that the haemoglobin and haematocrit reached low levels. The aqueous extract of the Dolichos bean was used for the study of iron deficiency Anemia in rats at the dose of 100 mg/kg body weight orally for 14 days of treatment. The study result shown that in the experimental group, haemoglobin level increased from 11.33 to 14.33, and haematocrit level increased from 34.00 to 43.00.

Hepatoprotective effect: [27]

Using a non-alcoholic fatty liver disease (NAFLD) model in which excessive fatty acid influx into the liver cells was simulated in an in vitro cellular model, Dolichos lablab aqueous extract (DLL-Ex) was evaluated for hepatoprotective effects and mechanisms. DLL-Ex inhibited CD36 expression in HepG2 cells, which controls fatty acid uptake, as well as BODIPY-labelled fatty acid uptake in cells treated with DLL-Ex and FFAs for 24 hour. In addition, DLL-Ex significantly decreased FFA-mediated cellular energy depletion and mitochondrial membrane depolarization. A significant increase in AMPK phosphorylation was also observed with DLL-Ex, indicating that AMPK was a key regulator of DLL-Ex mediated inhibition of liver lipid accumulation.

Anticoagulant, fibrinolytic and anti-platelet aggregation effect: [28]

Lablab purpureus (L.) sweet seed radicle extract (LPRE) reported to have an Anticoagulant, fibrinolytic and anti-platelet aggregation effect. SDS-PAGE analysis of LPRE showed the protein bands distributed in medium molecular weight region and the concentration of the protein is found to 1.5 mg/ml. By using casein and

gelatine as a substrate, zymogram study has been performed, it shows a translucent activity bands which confirms a protease. The study demonstrates LPRE has proteolytic activity associated with fibrinogenolytic activity which exhibit anticoagulant and anti-platelet aggregation effect.

Traditional Uses: [10]

Traditional system of medicine extensively used decoctions of the plant as diuretics, to treat cholera, diarrhoea, globefish poisoning, gonorrhoea, and nausea. In ancient times, seeds were used to treat cholera, diarrhoea, colic, rheumatism and sunstroke, treat poisoning and spasms. Juices of the fruit pods were used as astringents, digestion aids, stomachics, worm expulsion medicines and to treat swollen ears and throats. The flowers were used to reduce uterine irritation and improve menstrual flow. The herb was also used as flatulent, stomachic, and for phlegmatic illnesses. It was also eaten as a vegetable (green bean, pod, and leaf).

CONCLUSION

Dolichos bean is a prominent bean commonly found in South Asia and Africa. It is known in many countries and it has a capability of being a good resource for agricultural systems in the tropical and sub-tropical regions. The available literature reports that *Lablab purpureus* contains a large amount of protein and other nutrients. With its enhanced nutritive value, it can be used as supplements on poor quality diets and possesses wide variety of health benefits. The preliminary phytochemical analysis of the plant indicates the presence of various constituents, which is responsible for the various pharmacological actions. Each part of the plant contains a different medicinal uses.

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