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PHASEOLUS TRILOBUS- A PLANT OF VERSATILE THERAPEUTIC APPLICATIONS

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ABSTRACT

Phaseolus trilobus is one of the well known medicinal plants and is native to Asian countries like Bhutan, India, Indonesia, Myanmar, Pakistan, Sri Lanka, Taiwan and Vietnam but also cultivated in Africa, Western Australia, and South America. In India, Pakistan and Sudan it is grown as a short-term pasture and green manure crop. Different parts of this plant are used in Indian system of medicine for various pharmacological actions. *Phaseolus trilobus* is extensively used by tribal people of Nandurbar district of Maharashtra, India in the treatment of jaundice and other liver disorders aphrodisiac, antibilious and mild sedative. The plant constitutes an important ingredient of *Chyavanprash*, a well known Ayurvedic health-promotive and disease preventive product. . It's claimed traditional uses have been proved on scientific basis using *in-vitro* and *in-vivo* experiments. The plant has been pharmacologically assessed for its hepatoprotective and antioxidant activity. The plant has been chemically investigated and is found to contain flavonoids and isoflavonoids. The present study will give comprehensive information on the chemical constituents and mainly pharmacological activities of this plant.

INTRODUCTION

Herbal medicine is still the mainstay of about 75–80% of the world's population, mainly in developing countries, for primary health care because of better cultural acceptability, better compatibility with the human body and lesser side effect¹. In addition, they are renewable and raw material base for the elaboration of more complex semi-synthetic chemical compounds and taxonomic markers for the discovery of new compounds. Herbal products are used worldwide, however, Indian subcontinent is a vast repository of medicinal plants² and around 20,000 medicinal plants have been reported³ but traditional communities are using only 7,000 - 7,500 plants for curing different diseases⁴⁻⁶. The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed⁷ and even the developed countries are also turning to encourage the usage of plant-based natural medicinal product in their healthcare systems⁸. Furthermore, an increasing reliance on the use of medicinal plants in the industrialised societies has been traced to the extraction and development of several drugs and chemotherapeutics from these plants as well as from traditionally used rural herbal remedies⁹. This review highlights the traditional and pharmacological account of an important and interesting plant *Phaseolus trilobus*, Ait. syn *Vigna trilobata* (L) Verdc. commonly known as African gram or jungle mat bean belonging to family *Fabaceae* (alt. *Leguminosae*), Subfamily *Faboideae*, Tribe *Phaseoleae* and Subtribe *Phaseolinae*. The plant is known in different languages by different names like ranmoong, mugani (Hindi), mudgaparni, kaakaparni, suuryaparni, vanamudga (Sanskrit) and kaatupayaru (Siddha).

DISTRIBUTION

Species of the genus *Phaseolus* are annual or perennial herbs or twiners found throughout the tropics¹⁰ and warm temperate regions of the world. Five of the species occur in India and three out of these are cultivated worldwide mainly for their edible pods¹¹. *Phaseolus trilobus*¹² is native to Asia. It is found throughout India on grasslands, road verges, irrigated lands, drain edges, and banks of irrigation channels, in forests at low altitudes and in open rich soil, on Himalayas, up to 7000 ft. and southwards to Ceylon, Burma¹³, Malay Islands, Afghanistan, Abyssinia, Nubia¹⁴. It is also grown in Africa, Australia, Madagascar, Mauritius and South America. It is a weed of mixed forests which is also found in Kurukshetra and Tosham¹⁵.

MORPHOLOGICAL DESCRIPTION

This rare species is a regenerating, climbing, trailing annual or perennial herb having numerous stems from a woody rootstock (0.6-0.9 m)^{16,17}. It is long, prostrate, wiry, slender, glabrous and hairy. Leaves are alternate and trifoliate¹⁸, petioles (3.8-7.5 cm) are long, grooved, glabrous or with a few scattered hairs; stipules (4-16 mm.) are long, ovate-oblong, subacute, attached above the base, ciliate; leaflets (1.3-2.5 cm) are long and broad, commonly 3-lobed¹⁹ (the middle lobe the largest and oblong, broadly spatulate, obtuse, the lateral lobes often oblong or more or less spatulate, obtuse or subacute), all pale green, membranous, glabrous or with few hairs on the nerves, base subacute. Flowers arise in few flowered racemes at the apex. They are medium sized (under 2cm), reddish or bluish on axillary racemose peduncles, linear, very long pointed velvety pods and seeds (6-12) and are reniform with a dark brown shining seed coat²⁰. Flowering and fruiting occur

from September to October, extending to November.

ECOLOGY

Phaseolus trilobus requires warm climate for its growth and to some extent can tolerate drought conditions. Water logging is harmful to the crop. It is largely found on well drained, alkaline, dark, cracking clay soils but also on sandy and red loamy soils of similar reaction (pH 6.5-9) in tropical climate²¹. The crop can also be grown in red lateritic soil, black cotton soil and sandy loam soils²². It is moderate tolerant of salinity producing 50% maximum growth in soil with electrical conductivity of 9.7 dS/m²³. Annual rainfall (700-900 mm) with a 5-7 month dry season is preferable²⁴. Temperature around 25-27°C²⁵ is required and flowering occurs within 30 days of sowing.

PHYTOCHEMISTRY

Biologically active chemical constituents reported from roots, seed, leaf and seed coat includes dalbergioidin, kievitone, phaseollidin and flavonoid glycosides viz. Quercetin, kaempferol, vitexin, isovitexin²⁶ have been reported. The fruit of this plant is found to contain proteins, minerals and vitamin K²⁷ and vitamin C²⁸. Apart from these the plant also known to contain friedelin, epifriedelin, stigmasterol and tannins. The bean contains methionine, tryptophan and tyrosine. The seed protein contained lysine, valine, leucine and phenylalanine²⁹. Important structures are given in Figure 1.

TRADITIONAL USES

Plant is grown widely in India, Pakistan and Sudan as a short-term pasture and green manure crop. Pods seeds are edible and have been reported to be used as

delicious food³⁰ by tribal of Chhattisgarh. It has been reported that the plant is extensively used by tribal people of Nandurbar district of Maharashtra, India in the treatment of jaundice and other liver disorders²⁷.

Whole plant of *Phaseolus* is used as febrifuge in Bihar²⁹. Plant is also used as green fodder and is much relished by cattle^{31,32}. It is rejuvenating, bitter, cold, sweet on digestion, constipating, roborant, aphrodisiac. Soup made of them is very nutritious and given after recovery from acute illness. A poultice is useful for checking secretion of milk and reducing distention of mammary glands³³. It is also used in rheumatism and phthisis²¹.

Leaves of the plant are used as sedative, coolant, antibilious, tonic^{29,34}, in irregular fever in the form of decoction^{13,20,31,35}. Paste of the leaves is applied to the eyes to improve the sight, and also in ophthalmia and in haemorrhoids^{36,37}. It is also recommended in snake-bite³⁸.

Fruit is cooling, dry, bitter, with a flavor, aphrodisiac, astringent, styptic, anthelmintic and good for eyes. Consumption of the fruit cures inflammation, fever, burning sensation, thirst, piles, dysentery, cough, gout, biliousness²⁰. Fruit is also recommended in snake-bite and scorpion-sting^{20,36}. It is also used in gout and tuberculosis¹⁸. In Ayurveda, the juice of the plant is prescribed to cure rat-bite fever.

Roots are bitter, sweet, aphrodisiac, germicidal, cooling, for curing fever, cough, diarrhea, haemorrhoids, ophthalmology, dyspepsia and vitiated conditions of *vatta*, *pitta* and *kapha*³⁹.

PHARMACOLOGICAL REPORTS

Hepatoprotective and antioxidant properties of the plant were assessed by Frusule RA and et al. They found that the

methanol and aqueous extracts of the plant possess hepatoprotective activity comparable to Silymarin and the antioxidant activity of the plant extractives has been confirmed using *in vitro* and *in vivo* antioxidant models viz. anti-lipid peroxidation assay, superoxide radical scavenging assay and glutathione estimation in liver. The antioxidant activity was found to be comparable with ascorbic acid²⁷.

UV-B radiations have negative impact on the growth of plants but *P. trilobus* shows defense mechanism against them. To prove this Ravindran KC, investigated that the exposure of the plant to the UV-B radiations activated several defense mechanisms in morphology, anatomy, UV absorbing compounds and also induced the antioxidant defense mechanisms altogether contributing to the maintenance of the structural integrity of the leaf cell components⁴⁰.

MARKETED PRODUCTS

Herbal plants have been used for medicinal applications from earliest time, when man began caring for his body and health. Ayurved, Siddha, Unani and Homoeopathy are largely based on the plants. The emphasis of development of new biologically active molecule has been gradually replaced by use of total herbs as medicine and food supplements. Several products utilizes *Phaseolus* as such.

Chyavanprash - It is an important ingredient of a well known Ayurvedic health-promotive & diseases -preventive product *Chyavanprash*. Chyavanprash is a powerful free radical scavenger formula and when taken regularly, helps build immunity, decreases fatigue, strengthens digestive power, and keeps the memory bright and the lungs clear⁴¹.

Gold-360 - Leaves of *Phaseolus trilobus* are used in this preparation⁴². It is greatest

Rejuvenative, Anti-Aging, Hormone Balancing tonic.

Amrit Kalash 600 g Paste & 60 Tablets - Amrit Kalash is the most effective known food supplement having anti-oxidant properties as *Phaseolus trilobus* is main ingredient of this valuable drug⁴³.

CONCLUSION

The traditional knowledge with its holistic and systems approach supported by experimental base can serve as an innovative and powerful discovery engine for newer, safer and affordable medicines. Possibilities are still there for finding out further biologically active constituents. Looking to the versatile traditional uses of *Phaseolus trilobus* and modern pharmacological reports the plant claims immense potential for its utilisation in pharmaceutical sector. The outcome of these investigations will determine the possible development of drugs from *P. trilobus*.

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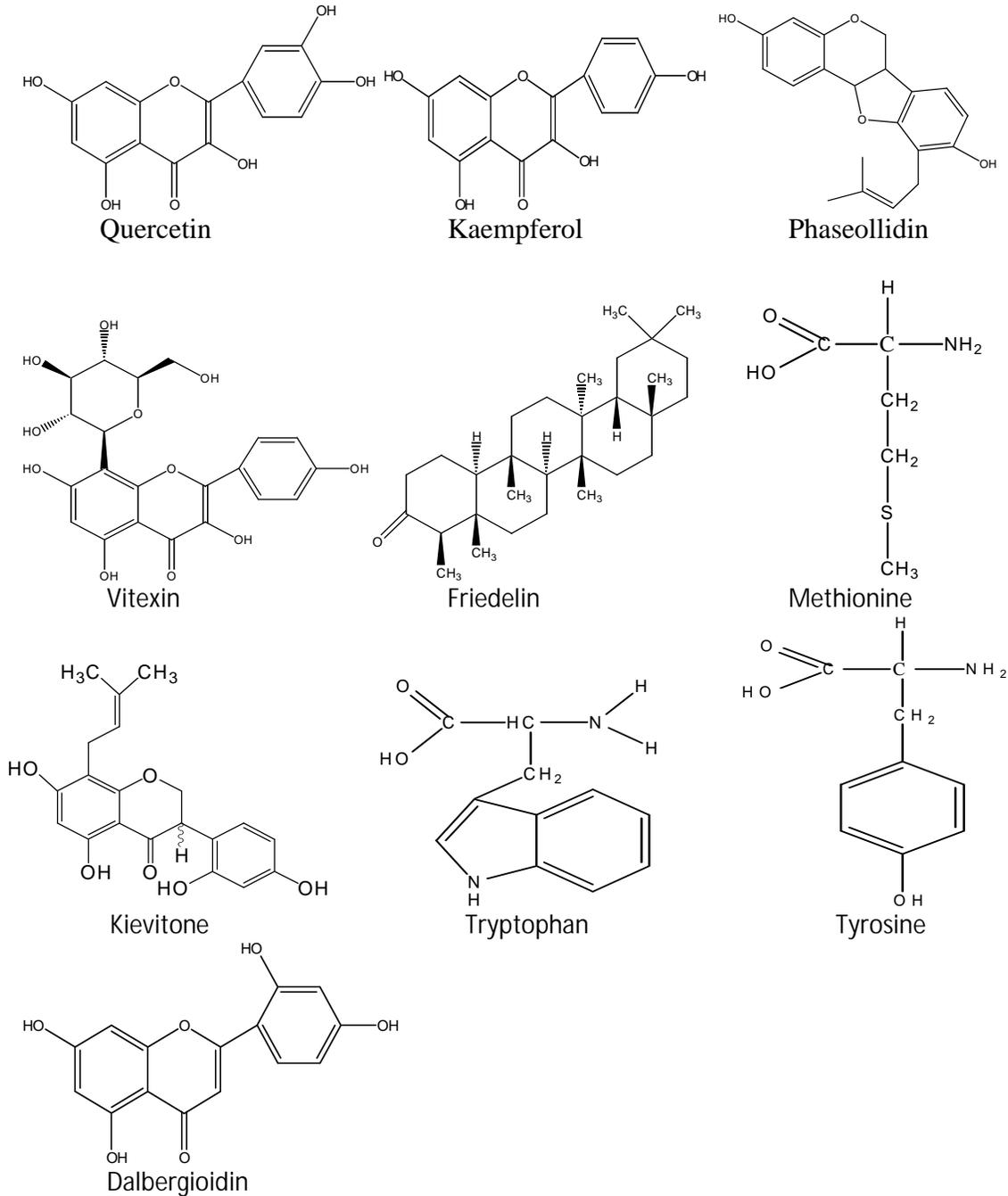


Figure 1: Structures of the important constituents of *P. trilobus*