

REVIEW ARTICLE

**A review on pharmacological
activities of *Pithecellobium
Dulce* extract, and there
effective doses**

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ABSTRACT

Pithecellobium species (leguminosae) are widely distributed in the tropics, chiefly in Asia and America. *Pithecellobium dulce* Benth, a most versatile medicinal plant, has attracted a worldwide prominence in recent years, owing to its wide range of medicinal properties and diverse utility. All plant parts of the *P. dulce* elaborates a vast array of biologically active compounds and have been demonstrated to exhibit antidiabetic, locomotor, anti venom, free radical scavenging, protease inhibitor, anti inflammatory, anti bacterial, anti mycobacterial, abortifacient, spermicidal, anti convulsant, anti ulcer, anti diarrheal, anti fungal, anti tubercular, anti tumor and anti oxidative properties. Here the compounds present in different parts of *P. dulce* and biological activities of their extracts or the chemical constituents as reported in the literature since 1962 to 2013 have been reviewed.

INTRODUCTION

Pithecellobium dulce (Roxb.) Benth. (Family Leguminosae, sub family Mimosoideae) is one of 100-200 species in this genus. *Pithecellobium dulce* is the only species that has become widespread outside its origin. It is now common and naturalized in India and tropical Africa, especially along coasts. It is notably weedy in the Caribbean islands (including Cuba, Jamaica, Puerto Rico, and St. Croix), and in Florida and Hawaii, USA, but less so where population and animal pressure keep it contained (1). *Pithecellobium dulce* is a thorny tree which can become weedy. In Hawaii it has a reputation as a pest in grass pastures, but normally only when fields have been left nitrogen-starved. It is a tree with many uses; food (sweet pods), firewood, honey, fodder, soap oil, tannin, hedges and shade--and it can survive hostile climates. The generic name refers to the curly pod, that mimics an ape's earring (pithekos ellobium), and the species name "dulce" refers to the sweet pod. Many N-fixing trees are alternately praised and cursed. Hardy, tenacious, seedy, and able to provide their own nitrogen, they often colonize soils and sites that are difficult or impossible for other trees. *Pithecellobium dulce* is such a tree(2). *Pithecellobium dulce* thrives in dry warm climates where annual

rainfall is 400 to 1650 mm. It is typical of lowlands, but can be found at elevations above 1,500 m in Mexico and East Africa. This species is found on most soil types, including clay, limestone, and sands. *Pithecellobium* species are noted for their tolerance of heat, salinity, and impoverished soils. They are also tolerant of drought conditions. It contains the Tannin, 25.36%; fixed oil, 18.22%, olein. A glycoside quercitin has been isolated. Seeds have been reported to contain steroids, saponins, lipids, phospholipids, glycosides, glycolipids and polysaccharides. Bark yields 37% tannins of the catechol type. Leaves yield quercitin, kaemferol, dulcitol and afezilin(3).

BIOLOGICAL ACTIVITY

Abortifacient Activity

The isoflavonoid isolated from root extract, tested on female rats, showed dose dependent estrogenic activity by increasing dose weight from 15.5 ± 0.25 mg in control to 34.2 ± 0.68 mg in orally treated rats (1.25 mg/kg/day for 4 days) (4)

Anti Inflammatory Activity

The saponin (contain two genin acids, oleanolic acid (8) and echinocystic acid with

xylose, arabinose and glucose as sugar moieties) obtained from fruits of *P.dulce* has been studied against the exudative and proliferative phase of inflammatory reaction in albino rats by using carrageenin induced oedema and formaldehyde induced arthritis models. (5).

Antivenom Activity

Polyphenols from the aqueous extract of *Pithecellobium dulce* was tested for their inhibitory activities against *Naja kaouthia* (NK) venom by invitro neutralization method. (5)

Protease Inhibitor Activity

Delgado report (7) for the first time the isolation and characterization of a protease inhibitor from the seeds of *Pithecellobium dulce*.

Spermicidal Activity

In view of the importance of saponins as possible spermicidal agents, the saponins of *P. dulce* were also subjected to tests for spermicidal property by banergi et al.The sapogenin showed the activity in the dilution of 0.03% against human semen (8)

Antimicrobial Activity

The powder, methanolic and aqueous extracts of *P. dulce* seeds have proved fungistatic and possess fungicidal effects against plant pathogens like *Fusarium oxysporum*, *Botrytis cinerea*, *Penicillium digitatum* and *Rhizopus stolonifer*. Several triterpene saponins, pitheduloside A, B, E, F and I inhibited in vitro mycelial growth of *Rhizopus stolonifer* and *colletotrichum gloeosporioides*, respectively. The less-polar hexane extract and polar methanolic extract of this plant screened against various bacteria and fungi were also found to be active (9, 10, 11)

Antitubercular Activity

The hexane, chloroform and alcoholic extracts of the leaves were studied for their antimycobacterial activity by BACTEC460TB- Radiospirometric system. The alcoholic extract at the concentration 20mg/ml showed highest activity when comparable with standard drugs like, streptomycin, isoniazid, rifampicin, ethambutol and pyrazinamide (12, 13)

Activity against CCl₄-Mediated Hepatic Oxidative Impairments and Necrotic Cell Death

Treatment with Aqueous extract of *Pithecellobium dulce* both pre- and post-CC14 administration prevented the toxin-induced hepatic damage (14).

Anti-Inflammatory and Anti-Bacterial Properties

From fresh flowers of *Pithecellobium dulce* (Roxb.) Benth, glycoside quercetin has been isolated. In vitro anti-inflammatory and anti-bacterial properties have been studied in the ethyl acetate extract of *P. dulce* which contain glycosides.

Anti-Microbial Studies

This is *in-vitro* method by using EtOAc fraction isolated from flower which is containing the flavonoid glycoside, Mueller-Hinton agar (2.5mL) medium for growth of organisms was added to sterile Petri-dishes. The organisms is *Staphylococcus aureus*(gram +ve), *Escherichia coli* and *Salmonella typhi* (gram –ve) and Standards containing streptomycin at concentration of 50,100 and 200 µg/mL and a control containing no drug were prepared. Solutions of the test compound (EtOAc residue) at six different concentrations

viz., 25, 50,100,200,300 and 400 µg/mL in sterile water were prepared (15).

Anti-Ulcerogenic Activity

In ulcer control animals the activities of H (+), K (+) - ATPase and myeloperoxidase were found to be significantly raised up and found to be decreased in drug pretreated animals. Gastric ulcer was induced by administering alcohol (or) acetylsalicylic acid (or) hypothermic restraint stress to rats pretreated with HAEPD (200 mg/kgbw for 30 day). The effects of *Pithecellobium dulce* compare with omeprazole as standard drug (17).

Hypolipidemic activity

In an anti-hyperlipidemic activity of *Pithecellobium dulce* aqueous extract of leaves was isolated against triton induced hyperlipidemia in rats. The dose of PD was 200µg/kg (p.o) to the triton induced hyperlipidemic rats. *Pithecellobium dulce* has shown a significant decrease in the levels of serum cholesterol, phospholipids, triglyceride, LDL, VLDL and significant increase in the level of serum HDL. Aqueous extract fraction decreased serum level of total cholesterol, LDL and increased the serum HDL cholesterol level (18).

Locomotor activity

CNS depressant activity, aqueous and alcoholic extracts of leaf of *P. dulce* was evaluated using actophotometer in albino mice. CNS depression action of extracts may be due to increase in the concentration of GABA in brain. The potency of alcoholic and aqueous extracts of leaf was compared with that of chlorpromazine at a dose of 100mg / kg (19).

Neuropharmacological profile

Aqueous and ethanolic extracts was evaluated for several neuropharmacological activity in swiss albino mice. Results from experimental model for locomotion and motor coordination of both extracts showed a major reduction in activity (20).

Antioxidant properties

Pithecellobium dulce fruit was utilized for the extraction of anthocyanin and evaluate the antioxidant activity. *Pithecellobium dulce* fruit pericarp anthocyanin, flavanoids and as a major source of poly phenol antioxidants can be evaluated. Here anthocyanin and phenolic content of the study indicated two different extracts and free radical scavenging activity to determine *Pithecellobium dulce* between fruit pods (21).

Adulticidal Activity

Among five solvent extracts tested, The LC₅₀ and LC₉₀ values of *P. dulce* leaves and seeds against *Cx. quinquefasciatus* were 234.97, 309.24 ppm and 464.86, 570.80 ppm, respectively. The maximum efficacy was observed in the methanol extract of leaves of *P. Dulce* for excellent potential against filariasis vector mosquito, *Cx. quinquefasciatus*(22).

Analgesic and anti-inflammatory activities

Using hot plate test and acetic acid-induced in mice and for anti-inflammatory using rat paw edema test. Activity in mouse at the doses of 200 and 400mg/kg body weight. Utilize methanol extract. A significant ($p < 0.0005$) analgesic effect with 200 mg / kg and 400 mg / kg was observed in both trials. 3 hours maximum anti-inflammatory response in the 200 and 400 mg / kg dose of extract was produced (23).

Acute and sub-acute toxicity study

Hydroalcoholic fruit extract (HAEPD) of *Pithecellobium dulce* (Leguminosae) was carried out to evaluate the acute and sub-acute toxicity. Albino rats were treated orally with 100, 200 and 500 mg kg(-1) bodyweight (BW) of HAEPD for 90 days to assess its sub-acute toxicity. HAEPD at single doses of 100, 500, 1000, 2000 and 4000 mg kg(-1)

BW was also administered to rats to assess its acute toxicity. The LD(50) was found to be 3916 mg kg(-1) BW and potential effective doses for efficacy studies are 100 and 300 mg kg(-1) BW as the minimum and maximum doses, respectively(24).

Micropropagation of *Pithecellobium Dulce* (Roxb.) Benth and assessment of genetic fidelity of micropropagated plants using molecular markers.

Benth of *Pithecellobium dulce* (a multipurpose leguminous tree) Shoot bud induction with 4.4 μ M 6-benzyladenine (BA) and multiplication was achieved on media supplemented with 4.4 μ M BA + 0.73 μ M phenylacetic acid (PAA) i.e. up to 7 shoot buds in the period of 5–6 weeks. Addition of adenine sulphate (AdS) to this medium further enhanced the number of shoot buds up to 10. In green house in pots containing sand, soil and manure (1:1:1). Genetic stability of micropropagated clones was evaluated using Random amplified polymorphic DNA (RAPD) (25).

RESULT AND DISCUSSION

Pithecellobium Dulce Extract fraction of various extract show's differ activity such as Abortifacient activity, Anti inflammatory activity, Antivenom activity, Protease

inhibitor activity, Spermicidal activity, Antimicrobial activity and Antitubercular activity from alcoholic extract at the concentration 20mg/ml showed highest activity when comparable with standard drugs. In Anti-inflammatory, antibacterial, and Anti-Microbial Studies Observed culture growth at a lower and higher concentration of the drug. Anti-ulcerogenic activity compare with omeprazole as standard drug. Hypolipidemic activity, Locomotor Activity compared with that of chlorpromazine. Neuro pharmacological Profile showed a major reduction in activity. Antioxidant properties *P. Dulce* for excellent potential against filariasis vector mosquito. Acute and sub-acute toxicity study, Micropropagation of *Pithecellobium dulce*. This is the first report of an efficient protocol for regeneration of *P. dulce* through organogenesis.

CONCLUSION

Pharmacological activity of *Pithecellobium Dulce* Extract, And There Effective Doses are well performed from many researchers, this review articles compile the data of biological activity. And conclude that *Pithecellobium Dulce* is an essential plant as recent treatment for various abnormalities or disease

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