



REVIEW OF LITERATURE: PHYTO PHARMACOLOGICAL STUDIES ON *PITHECELLOBIUM DULCE*

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ABSTRACT

Key Words

Pithecellobium,
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Pithecellobium dulce (Benth) belonging to family Leguminosae is a small to medium sized evergreen, spiny legume tree the crown is broad spreading with irregular branches. The plant is widely distributed in India and also found in Southeast Asia and locally known as Seema Chinta. The leaves are bipinnate with two pairs of leaflets, fruits becomes reddish as they ripen and very sweet in taste, so it is called as Jungli jalebi. *Pithecellobium dulce* has played an important role in traditional medicine. The decoction of *Pithecellobium dulce* leaves is useful for intestinal disorders, Ear ache and Tooth ache. Thus, the modern pharmacological and phytochemical investigation of *Pithecellobium dulce* is valuable for herbal therapy which has an Antidiabetic, Abotificient, Antifungal, Antitubercular, Antiulcer, Antiinflammatory, and Analgesics properties. Fruits of *Pithecellobium dulce* used to treat Ulcer, Diabetes and Rheumatism. The aqueous extract of *Pithecellobium dulce* leaves has shown significant in Antidiabetic activity by Streptozotocin induced diabetes in rats. Seeds of *Pithecellobium dulce* possess Antivenom property. Phytochemical investigation of *Pithecellobium dulce* have revealed the presence of various Phytoconstituents such as Alkaloids, Flavanoids, Glycosides, Saponins, Fatty acids, Steroids, Tannins, Terpenoids. Seven saponins named as Pithedulosides A-G were isolated from the seeds of *Pithecellobium dulce*. Anti-tumour compounds like β -Sitosterol, Campesterol, Stigmasterol, a-spinasterol were reported from the heart wood of *Pithecellobium dulce*.

INTRODUCTION:

Pithecellobium dulce Benth belongs to family Leguminosae, is an evergreen tree widely distributed in the greater part of India and is also found in Southeast Asia. *P. dulce* is one of the familiar species among them, commonly referred as manila tamarind,^[1] as its sour taste resembles tamarind. The generic name is derived from the Greek word as

'*Pithekos*' meaning an ape and lobos referring to a pod and the species name as '*dulce*' in Latin means sweet in allusion to the edible pulp of the pod.^[2] The Leguminosae is one of the largest families of flowering plants with 18,000 species classified into around 650 genera. The family is usually divided into three sub families like Papilionoideae, Caesalpiniodeae and Mimosoideae^[3], is a

large and economically important family of flowering plants which includes trees, shrubs and perennial or annual herbaceous plants, which are easily recognized by their fruit (legume) and their compound, stipulated leaves. Many legumes have characteristics like flowers and fruits^[4]. The family is widely distributed, and it is the third largest family in terms of number of species. Many species of trees in this family are important for their timber.

Taxonomical Classification of *Pithecellobium dulce* Benth

Kingdom	:	Plantae
Sub Kingdom:		Viridiplantae
Infra Kingdom :		Streptophyta
Division	:	Tracheophyta
Order	:	Fabales
Family	:	Leguminosae
Genus	:	<i>Pithecellobium</i>
Species	:	<i>dulce</i>

Vernacular Names:

English	:	Sweet Tamarind
Telugu	:	Seema Chinta
Hindi	:	Jangle jalebi
Bengali	:	Dekhani babul
Tamil	:	Kodukkaapuli
Kannada	:	Kottampuli
Malayalam	:	Korukkapuli

Botanical Description: The height of *Pithecellobium dulce* is commonly 10-15mtrs, but ranges from 15-18mtrs. Crown is broad spreading with irregular branches upto 30 mtrs.

Leaves: Leaves are bipinnate, with 2 pairs of 2 kidney shaped leaflets. New leaf growth coincides with loss of old leaves, giving the tree an evergreen appearance. Thin spines are in pairs at the base of leaves and range from 2 to 15 mm in length.

Flowers: The flowers are small white heads 1cm in diameter, each flower has a hairy corolla and calyx surrounding about 50 thin stamens united in a tube at the base.

Pods:

Pods are 10-15x1.5 cm, the colour becomes reddish-brown. Each pod contains 5-10 shiny black seeds. The tightly coiled seed pods are the main characteristic feature of this tree, and make it easy to distinguish.^[5]

Bark:

The bark is grey becomes rough and eventually peeling.

Traditional Uses:

Decotion of the leaves is used for intestinal disorders, ear ache and tooth ache. Pods are used for Indigestion and Ulcers. Leaves are used as an Emollient and Astringent. Bark of the plant is useful to treat dermatitis and eye inflammation. Seed Oil is has Spermicidal and Anti odema properties. The leaves when applied as plasters used for pains and Veneral sores. The fruit peel decotion is used to treat swellings.



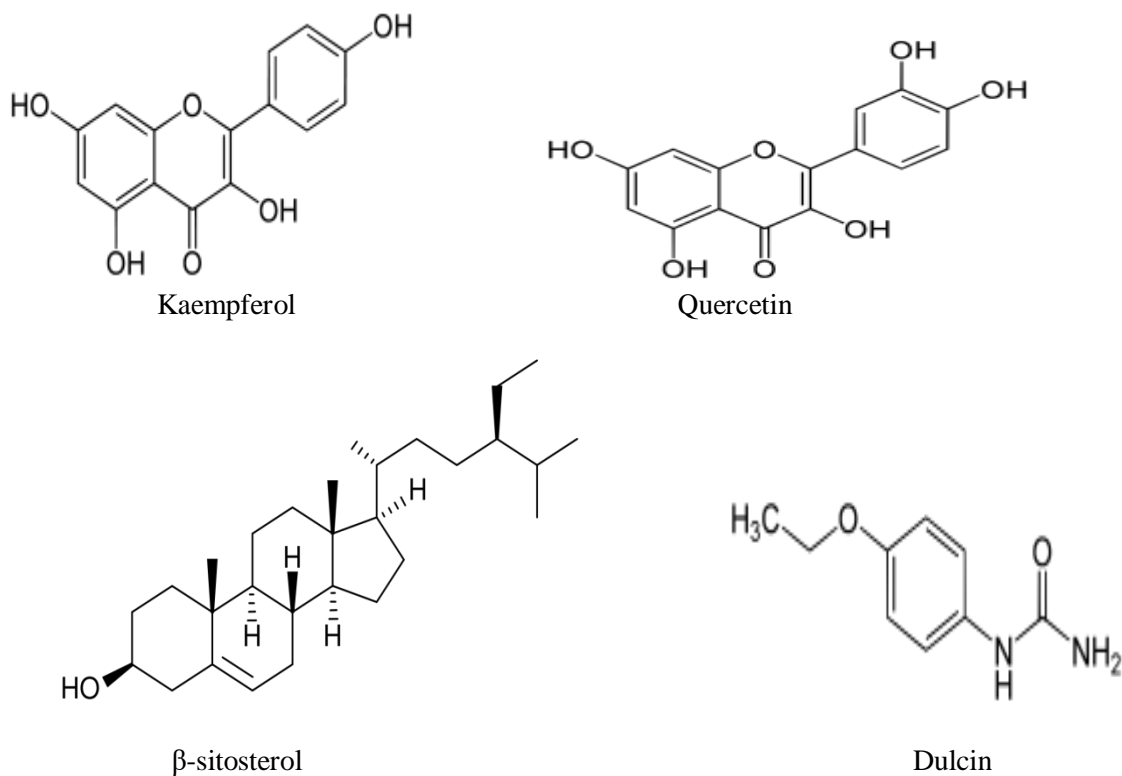
Table 1: Number of *Pithecellobium* Species :

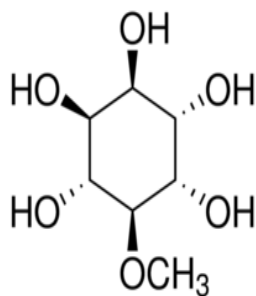
S.no	Name of the plant	Isolated phyto-constituents	References
1.	<i>Pithecellobium albicans</i>	Gallic acid Afzelin Kaempferol Quercetin Quercitrin Spinasterol	Gonzalo J. Mena-Rejón ^[6]
2.	<i>Pithecellobium arboretum</i>	Oleonolic acid α Spinasterol	Helmut Ripperger ^[7]
3.	<i>Pithecellobium clypearia</i>	1-Octacosanol -O-galloylplumbo catechin Penta-hydroxyflavan- 7-gallate Tetrahydroxyflavan-7- gallate	Jie Kang, Chao Liu, ^[8]
4.	<i>Pithecellobium cauliflorum</i>	Glucosylsterol	Leila VilelaAlegrio ^[9]
5.	<i>Pithecellobium cubense</i>	Oleonolic acid α -Spinasterol	Helmut Ripperger ^[7]
6.	<i>Pithecellobium jiringa</i>	Djenkolic acid Gallocatechin Procyanidinds	Hamidun Bunawan, ^[10]
7.	<i>Pithecellobium lucidum</i>	Julibroside Galloyl acid Ethyl gallate Gallocatechin gallate	Ma S ¹ , Lv H, Ding G, Yu S, Chen X. ^[11]
8.	<i>Pithecellobium monodelphum</i>	Biodiesel contains: Methyl palmitate Methyl sterate Methyl arachidate Methyl lineolate	Sanjay Basumatary ^[12]
9.	<i>Pithecellobium multiflorum</i>	Lupeol α - Spinasterol	Sarath, Gunasekera, Geoffrey A. Cordell, Norman Farnsworth ^[13]
10	<i>Pithecellobium saman</i>	Epilupeol Lupenone α - Spinasterol α - Spinasterone	Consolacion Ragasa ^[14]

Table 2: Past phytochemical work on *Pithecellobium dulce* :

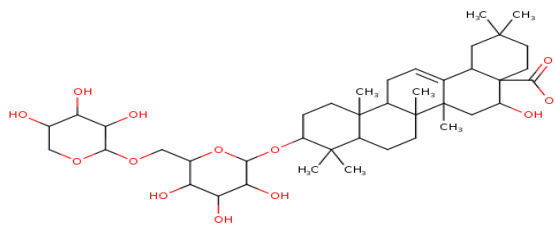
Plant Part Used	Compounds Isolated	References
Stem Bark	A novel prenylated flavanoid 3-prenylapigenin-7-o-rutinoside	Sexana & Singhal,1998 ^[15]
Bark	Beta-Sitosterol, Campesterol, Stigmasterol and α -spinasterol	Nigam & Mitra,1968 ^[16]
Leaves	Quercetin, Kaempferol, Cyclitol, Dulcitol and Afezilin, Octacosanol, β -D-glucoside of α -spinasterol, α -spinasterol and kaempferol-3-rhamnoside	Adinarayana & Chetty,1985 ^[17] Nigam & Mitra,1968 ^[16]
Seeds	Seven saponins named Pithedulosides A-G and Four Oleanane-type triterpene glycosides named Pithedulosides H-K, A bidesmodic triterpenoid saponin, Dulcin, A novel acylated triterpenoid saponin, named as Pithecelloside	Yoshikawa <i>et al.</i> ,1997 ^[18,19] Sahu & Mahato,1994 ^[20,21] Niranjan <i>et al.</i> ,1999 ^[22]
Flowers	Quercetin 3-O-rhamnoside (quercitrin)	P.G.R. Chandran and S. Balaji ^[23,24]
Fruit Peel	Pinitol	Sukantha <i>et al.</i> , 2015 ^[25]

Fig 1: Isolated compounds from *Pithecellobium dulce*





Pinitol



Pitheduloside-A

Table 3: Past pharmacological work on *Pithecellobium dulce* :

Plant Part Used	Activity Done	References
Leaves	Anti-Diabetic Activity	Sugumaran et al.,2009 ^[26]
	Anti- Inflammatory Activity	S.Arul Selvan, P.Muthukumaran ^[27]
	Anti- Oxidant Activity	Shankar D. Katekhaye, Maheshkumar S. Kale ^[28]
	Anti-Tubercular Activity	Shanmugakumaran et.al; ^[29]
	CNS Depressant Activity	M.Sugumaran,T. Vetrichelvan ^[30]
	Anti-Microbial Activity	Mukesh kumar ,KiranNehra ^[31]
	Anti-Fungal Activity	Shanmugakumaran SD et.al ^[32]
	Analgesic Activity	S.Arul Selvan1 ,P.Muthukumaran2 ^[27]
	α -Glucosidase & α -Amylase inhibitory Activity	Shankar D. Katekhaye Dnyaneshwar M. Nagmoti2 ^[33]
	Neuropharmacological Activity	Mule V.S., Potdar V.H., Jadhav

	<p>Free- Radical Scavenging Activity.</p> <p>Larvicidal & Ovicidal Activity</p> <p>In Vitro Anti-Helmenthic Activity</p> <p>Anti-Bacterial Activity</p> <p>Anti- Diarrhoeal Activity</p> <p>Hypolipidemic Activity</p>	<p>S.D.^[34]</p> <p>Shankar D. Katekhaye, Maheshkumar S. Kale ^[28]</p> <p>M. Govindarajan, M. Rajeswary^[35]</p> <p>M.Sugumaran,T.Vetrichelvan S. Darlin Quine.^[36]</p> <p>R. Kalavani, R.Sabitha Bhanu, K.A.Jayanthi ^[37,38]</p> <p>Sugumaran,T.Vetrichelvan S. Darlin Quine^[39]</p> <p>Sundarrajan et,al^[40]</p>
Fruits	<p>Anti-Diabetic Activity</p> <p>Anti-Oxidant Activity</p> <p>Anti-Microbial Activity</p> <p>Gastroprotective Activity</p> <p><i>In Vitro</i> Anti-Diabetic Activity</p> <p>Anti-Inflammatory Activity</p> <p>H⁺, K⁺ ATPase Inhibitory Activity</p> <p>Free radical Scavenging Activity.</p> <p>Hepato-Protective Activity</p> <p>Cardio-Protective Activity</p> <p>Acute, Sub-Acute Toxicity Studies</p> <p>Anti Bacterial Activity</p>	<p>A.Sukantha & Subhashini^[41]</p> <p>S.Pradeepa & S.Subramanian^[42]</p> <p>P. Ponmozhi, M.Geetha.^[43]</p> <p>S.Pradeepa & S.Subramanian^[44]</p> <p>Jayaraman Megala & Arumugam Geetha^[45,46]</p> <p>S.Praylin Singh & Sugirtha P.Kumar^[47]</p> <p>Bhargava. et,al 1970^[48]</p> <p>Megala & Geetha,2010^[49]</p> <p>Megala & Geetha,2010^[49]</p> <p>Pabitra Bikash Pal, Sankhadeep Pal.^[50]</p> <p>PakutharivuThangarajan, Anitha Anumanthan.^[51]</p> <p>Jayaraman Megala and Arumugam Geetha.^[52]</p> <p>Sukantha TA, Subashini KS^[53]</p>

Seeds	Anti-Ulcer Activity	Palanivel, Sorabh Kumar Agrawal ^[54]
	Anti-Fungal Activity	L. Barrera-Necha, S. Bautista-Baños, ^[55]
	Anti-Venom Activity	Pithayanukul, P., P. Ruenraroengsak ^[56]
	Anti-Diabetic Activity	Dnyaneshwar Madhukar Nagmoti ^[57,58]
	In-Vitro Inhibiting Effect	P.R.Siva kumar,A.P.Srikanth ^[59]
	Larvicidal & Ovicidal Activity	M. Govindarajan,. Rajeswary ^[60]
	Anti-Oxidant andsFree radical Scavenging Activity	Dnyaneshwar M. Nagmoti ^[61]
Bark	Anti-Diabetic Activity	A.Raghu Praveen*, K.Hari Prasath ^[62]
	Anti-Inflammatory activity	R.N.Yadava & Archana Chakravarty ^[63]
	Anti-Microbial Activity	Mukesh Kumar1 and Kiran Nehra* ^[64]
	α Glucosidase & α Amylase inhibitory Activity	Shankar D. Katekhaye Dnyaneshwar M. Nagmoti2 ^[33]
	Anti-Oxidant & Free Radical ScavengingActivity,	Shankar D. Katekhaye, Maheshkumar S. Kale ^[65]
	Acute, Sub-Acute Toxicity Studies	Gérard , Kossivi Dosseh ^[66]
	Hepato-Protective Activity	R.L.Singh and Mamta Shukla ^[67]
Root	Abortifient Activity	Banerjee,2005 ^[68]
	Estrogenic Activity	Saxena & Singal; 1998 ^[69]

CONCLUSION:

Pithecellobium dulce is an evergreen tree belonging to family Leguminosae. The extensive literature survey revealed that *Pithecellobium dulce* is a plant of wide usage in traditional medicine. The plant shown the presence of many chemical constituents which are responsible for pharmacological and

medicinal properties. The various *Pithecellobium* species are claimed for the treatment of different disorders, but still they are not satisfactorily exploited. Furthermore, phytochemical investigation of the plant extracts is an important tool for the determination of the phytochemicals, responsible for specific pharmacological activity. The

Phytochemical investigation of *Pithecellobium dulce* revealed the presence of various constituents such as alkaloids, flavanoids, saponins, steroids, glycosides.

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