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DESMODIUM GANGETICUM: A PHARMACOLOGICAL REVIEW ON CNS & CVS STUDIES.

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ABSTRACT
India is rich in ethnic diversity and traditional knowledge that has resulted in various ethno botanical researchesin medicines which play an important role in health services. About three quarters of the world population depends on herbal medicines for health care. The plant *Desmodium gangeticum* has been used from ancestors as medicine in the treatment of variousailments. Many of the Ayurvedic formulations contain this Medicinal Plant. In this review article an attempt was made to Study on *Desmodium gangeticum* such as Physical characteristics, Morphological studies, microscopical studies & Pharmacological activity on Cardiovascular & Central Nervous System activities of the above mentioned plant.

KEYWORDS: Myocardial Infraction, Ischemic heart disease, Central Nervous System, Cardio Vascular System.

Desmodium Gangeticum: A Pharmacological review on CNS & CVS studies

India is rich in ethnic diversity and traditional knowledge that has resulted in various ethno botanical research of which one study has revealed a deep understanding of medicinal plants supported by high consensus.[1]

Desmodium gangeticum (DG), a traditional medicinal plant belongs to family Leguminaceae. Traditionally known as Shalparni in Sanskrit, Salpani in Hindi.[2]

Taxonomic Position.[3]
Kingdom: *Plantae.*
Subkingdom: *Tracheobinota.*
Super Division: *Spermatophyta.*
Division: *Mangoliophyta.*
Class: *Magnoliopsida.*
Sub Class: *Rosidae.*
Order: *Fabales.*
Family: *Fabacae.*
Genus: *Cassia.*

Plant Morphology

It is a green herb plant branched under-shrub, stem woody, branched, irregular angled. Leaves are unifoliate or trifoliate 1–2 cm long, flowers looks small pink to purple in color. The lateral roots are very strong, light yellow in color and smooth in texture.[4] This perennial shrub grows 2-4 feet high and is slender, diffusely branched and irregularly angled.The inflorescence is a terminal or axillary, many flowered, slender, elongate raceme, 15-30cm, long with a few ascending branches in the lower part.Flowers are small in size with minute setaceous bracts on short upwardly directed pedicels. Calyx tubeshort, finely downy and cleft to the middle into two lips ; upper lip having two clefts, thelower three partite, teeth are short and triangular, corolla exerted 4mm long with violet or white,standard 3mm broad, orbicular, cuneate at base, wings are obliquely oblong, more or less adheringto the keel, incurved.Stamens are nine –anthers uniform. Ovary sessile or stipitate, many are ovuled, incurved with minute capitate stigma. Fruits are compressed, slightly falcate, six to eight jointed glabrescent lomentum, slightly indented above, joints separatingwhen ripe, indehiscent, one seeded, more or less straight or lightly curved above and rounded onthe lower side. Seeds compressed without a strophiole.[5] Dry seeds whenmechanically injured and kept for germination could break the seed dormancy giving 22%germination.[6]

Active Constituents[7, 8]

Gangetin

Gangetin m.p.98-100 D – 204.5 (CHCl3) M.F.C2 H28 O5. IR:(CCl4) 3618 and 3470 cm–1 . UV Alcmax 277 sh, 286, 303 sh and 314 nm. NMRS 1.46, 1.5 (each 3H, s, CMe2), 1.79br, 1.83 br(each 3H, CH:CMe2), 3.37 br (2H,d, CH2-CH:CMe2), 4.01 (3H, s, OMe), 5.33 (1H, m, CH:CMe2)5.58, 6.58 (ABq, J=10 Hz, chromen protons), 6.25 (1H, s, AH), 6.37, 6.37, 6.96 (2H, ABq,J=8Hz, ArH).

Gangetinin
Gangetininm.p. 136-8°, M.F.C26H26O5 D–200° (CHCl3), m/z 418 Alcmax 234, 278 and 318nm. NMR 3.40 (1H, m, H: 6a), 4.21 (1H, q, J = 6,10 Hz, H-11a).

Desmodin
Desmodinm.p. 236-8°, D–250° (CHCl3), M.F.C.22H22O6, m/z 382 Alcmax 228, 287 and 303nm. NMR 3.3 (1H, m, H-6a), 3.66 (1H, t, J = 10 Hz, H-6ax), 4.21(1H, q, J=6, 10Hz, H-6 sq) and 5.60 (1H, d, J=6Hz, H-11a).

Apart from the above chemical constituents, three pterocarpans seven alkaloids namely, N,N-dimethyl tryptamine and its oxide, hypaporsine, hordenine, candicine, N-methyl tyramine and ß- Phenylethylamine have been reported from the roots.[9]

Ayurvedic Preparation & various biological activities.
It is used in 'Ayurvedic' preparations like 'Dashmoolarishta', 'Dashmoolakwaath'and for treatment of rheumatism, jaundice, paralysis, puerperal fever, filaria, edema and nervous disorders.[10] It is one of the important plants used in indigenous system of medicine as bitter tonic, febrifuge, digestive, anticatarrhal, antiemitic, has been widely used by many Ayurvedic and Unani physicians for curing fever, typhoid, piles, bronchitis, dysentery, asthma and various other inflammatory conditions arising from 'vata' disorder.[11] [12] Alkaloids isolated from aerial part comprise indol-3-alkyl-amines and β-carbolines, and have anticholinesterase, smooth muscle and CNS stimulant activities.[13] Gangetin, a pterocarpan, shows anti-fertility[14], Anti ulcer[15], anti oxidant[16], cardiotonic[17], antidiabetic[18], anti-inflammatory and anti-nociceptive.[19]

Important Formulations[20]
1. Dasamularishtam
2. Chyavanaprasam
3. AgusthyaRasayanam
4. Sukumaragritham
5. DasamulaKatuthiayadiKashyam
6. Dasamulathailam
7. Danvantrathailam
8. Mahamashathailam
9. Anuthailam
10. Vidaryadigritham.

CNS & CVSACTIVITY

Plant part	Extract type	Pharmacological Activity	Treatment schedule	Findings/ Activity trend/ Effective dose	Mechanisms Proposed
Aerial parts and Roots	Aqueous extract	Antiamnesic[21]	50, 100 and 200 mg/kg; p.o. for 7 days in mice	100 and 200 mg/kg improved memory of both younger and older mice in interoceptive and exteroceptive behavioral models.	By improving learning and memory. By reversing scopolamine-induced amnesia. By reducing acetyl cholinesterase activity (due to indol-3-alkyl-amines and brain.
Leaves and roots	Aqueous extract	Antiamnesic[22]	100 mg/kg and 200 mg/kg, p.o. for 7 successive days,	*D. gangeticum*increased mice brain acetylcholine content and decreased acetyl cholinesterase activity in a similar manner to the standard cerebro-protective drug piracetam.	By improving learning and memory. By reversing scopolamine-induced amnesia. By reducing acetyl cholinesterase activity (due to indol-3-alkyl-amines and brain.
Roots	Methanolic extract	Cardioprotective effect against ischemia reperfusion injury[23]	50 and 100 mg/kg; p.o. for 30 days in rats	*In vitro* anti-oxidant activity (5-50 µg/ml) IC50 for superoxide radical scavenging:21 µg/ml and hydroxyl radical scavenging: 50 µg/ml.	*In vivo* models Both doses are active. However, 50 mg/kg found better.
Roots	Aqueous extract	Cardioprotective effect[24]	3ml/100g b.w.; p.o. for 30 days in isoproterenol-induced myocardial infraction in rats	Extract prevented increase in enzyme creatinine phospho kinase level during peak infarction in the heart and liver tissues. Other cardio specific enzyme markers such as lactate dehydrogenase (LDH), alkaline phosphatase (ALP) and serum glutamic	Decreased LDL, total cholesterol and triglycerides in the rat heart. Lowered thiobarbituric acid reactive substances (TBARS) and improved activity of myocardial catalase and glutathione reductase.

				oxaloacetictransaminase in the serum also reduced in activity.	
Root	Methanolic extract	Antihypertrophiceffect in isoproterenol-induced cardiomyoblasts[25]	Exposing H9c2 cell line to β-adrenergic receptor agonist, isoproterenol, for 96 hours.	Cell line studies showed significant increase in ROS generation, dissipation of [INCREMENT]Ψm, and permeability transition pore opening in ISO-treated cells.	Desmodium was found to attenuate ISO-induced hypertrophy by reduction of ROS generation, restoration of [INCREMENT]Ψm, and prevention of permeability transition pore opening.
Root	Methanolic extract	Post-conditioning effect in isolated perfused rat heart by stimulating muscarinic receptors[26]	Ischemic post condition (POC) mimetic action of DG methanol root extract was evaluated and compared by using standard drugs that acts as muscarinic receptor agonist and antagonist, namely acetylcholine (Ach) and atropine (Atr) by Lagandroff perfusion technique.	The physiological parameters like left ventricular developed pressure, end diastolic pressure and working index of isolated rat heart showed significant recovery similar to the recovery by POC.	Showed better antioxidant status in myocardial tissue homogenate and mitochondrial, complemented by the levels of cardiac specific marker proteins in myocardial tissue and perfusate.
Roots	Aqueous extract	Cardioprotection.[27]	dose of 50 mg/kg	Mitochondrial and sarcoplasmic ATPase during ischemia reperfusion injury was found to be effective in the rat heart for the management of ischemic reperfusion injury	Creatine phosphokinase in coronary perfusate found to be declined. Sarcoplasmic ATPase and mitochondrial enzymes were significantly ($P<0.05$) improved in drug treated rat hearts.
Root	Ethyl acetate extract	Myocardial ischemia reperfusion[28]	*Desmodium gangeticum* root (100 mg/ kg body weight)	Free radicals were scavenged by the extract in a concentration-dependent manner within the range of the given concentrations in all models.	A significant improvement of cardiac function and a decrease in the release of lactate dehydrogenase in coronary effluent, as well as the level of malondialdehyde in myocardial tissues was observed.
Root	Aqueous extract	Ischemic reperfusion injury induced oxidative stress.[29]	*Desmodium gangeticum* on lipid peroxides and antioxidants in ischemic reperfusedWistar albino male rats.	Significant elevation in lipid peroxide products (thiobarbituric acid reactive substances) and decreased activity of antioxidant enzymes (superoxide dismutase, catalase, glutathione peroxidase and glutathione reductase) were observed in the rat hearts during ischemia reperfusion phase.	Significantly improved preservation of antioxidant enzymes and subsequent reduction in lipid peroxidation. heart showed significant improvement in the antioxidant activities indicating cardio protective effect of aqueous extract of *Desmodium gangeticum* in myocardium affected by ischemia reperfusion insult.
Root	Methanolic Extract	*Desmodium gangeticum* roots preserves	Mitochondrial fractions were significantly	Antioxidant enzymes (superoxide dismutase, catalase, glutathione	By improving the antioxidant function of mitochondria against IR- mediated oxidative

		mitochondrial respiratory enzymes, protecting rat heart against oxidative stress induced by reperfusion injury.[30]	increased during ischaemia reperfusion.	peroxidase (GPx) and glutathione reductase) in the myocardial tissue homogenate and mitochondria decreased significantly during ischaemia reperfusion, accompanied by a decreased activity of mitochondrial respiratory enzymes	stress. *Desmodium gangeticum* possesses the ability to scavenge the free radicals generated during ischaemia and ischaemia reperfusion and thereby preserves the mitochondrial respiratory enzymes that lead to cardioprotection.

CONCLUSION

Desmodium gangeticum serves as one of the main ingredient of famous Ayurvedic preparations. The present review reveals that in addition to Ayurveda, it finds place in folk medicine and other indigenous systems of medicine. Thus, the utility of *Desmodium gangeticum* as a medicinal plant has increased many folds over a period of time. It is clear that *Desmodium gangeticum* primarily possesses good antioxidant properties, which facilitates its action as an cardio vascular studies & central nervous system.

REFERENCES

1. TB Shyma, AG Devi prasad. "Traditional use of medicinal plants and its status among the tribes in mananthavady of wayanad district, Kerala". World research journal of medicinal & aromatic plants, 2012; 1(2): 22-26.
2. KN Iyer."Pharmacognosy of Ayurvedic Drugs (Travancore–Cochin)". University of Travancore, Central Research Institute, Trivendrum: India Series, 1953; 97.
3. Anonymous. The Wealth of India, C.S.I.R., New Delhi, Vol.III, 1956; 41.
4. JD Hooker. The Flora of British India, L.Reeve& Go. Ltd., England, Vol.II, 1961; 168.
5. K NarayanaAiyar, AN Namboodiri, M.Kolammal. "Pharmacognosy of Ayurvedic Drugs", The Central Research Institute, Trivandrum, 1957; 97-100Series 1, No.3.
6. SA Chaghatai, SS Khan, S Sultan. "*Nat.Acad. Sci. Lett"*, 1978; 1(6): 199-200.
7. KKPurushothaman, VM Kishore, V.Narayanaswami."*J.Chem. Soc"*, 1971; 2420-2422.
8. KKPurushothaman, S Chandarasekaran, KBalakrishna."*Phytochemistry"*, 1975; 14: 1129-1130.
9. S Ghosal, PK Banerjee."*Aust.J. Chem"*, 1969; 22(9): 2029-2031.
10. SJabbar, MT Khan, MS Choudhuri, BK Sil. "Bioactivity studies of the individual ingredients of the Dashamularishta." Pak J Pharm Sci, 2004; 17(1): 9-17.
11. KRKirtikar, BD Basu. *DesmodiumDesv*, in "Indian medicinal plants", International Book Distributors, Dehradun, India, 1987; 756.
12. S Rastogi, MM Pandey, AK Rawat. "An ethnomedicinal, phytochemical and pharmacological profile of *Desmodium gangeticum* (L.) DC. and*Desmodiumadscendens* (Sw.) DC". J Ethnopharmacol, 2011; 136(2): 283-296.
13. SGhosal and SK Bhattacharya. Desmodium alkaloids, Part-II: "Chemical and pharmacological evaluation of *Desmodium gangeticum". Planta Med*, 1972; 22: 434- 440.
14. A Muzaffer, NR Pillai,AK Purushothaman. "Examination of biochemical parameter after administration of Gangetin in female albino rats".J. Res. Ayurveda Sidha, 1982; 2: 172-175.
15. P Dharmani,*et al*.,"*Desmodium gangeticum* : a potent anti-ulcer agent". Indian J. Exp. Biol, 2005; 43: 517-521.
16. R Govindarajan,*et al*.,"Studies on the antioxidant activities of *Desmodium gangeticum ".* Biol. Pharm. Bull, 2003; 26: 1424-1427.
17. GA Kurian, S Philip,T Varghese. "Effect of aqueous extract of the *Desmodium gangeticum* DC root in the severity of myocardial infarction". J. Ethnopharmacol, 2005; 21: 457-461.
18. J Hanumanthachar. "Antidiabetic activity of *Desmodium gangeticum* in albino rats". PlantaIndica, 2005; 1: 4-8.
19. A Rathi, V Rao, B Ravishankar, S De,S Mehrotra. "Anti-inflammatory and anti-nociceptive activity of the water decoction *Desmodium gangeticum".* J. Ethnopharmacol, 2004; 95: 259-263.
20. TS VijayaKirubha, M Jegadeesan, S Kavimani."Studies on *Desmodium gangeticum* : A review". J of Chemical and Pharmaceutical Research, 2011; 3(6): 850-855.
21. H Joshi, M Parle. "Antiamnesic effects of *Desmodium gangeticum* in mice". YakugakuZasshi, 2006; 126(9): 795-804.
22. JHanumanthachar, P Milind. "Pharmacological Evidences for the Antiamnesic Effects of *Desmodium gangeticum* in mice".Iranian Journal of Pharmaceutical Research, 2007; 6(3): 199-207.
23. GA Kurian, N Yagnesh, RS Kishan, J Paddikkala. "Methanol extract of *Desmodium gangeticum* roots preserves mitochondrial respiratory enzymes, protecting rat heart against oxidative stress induced byreperfusion injury". Journal of Pharmacy and Pharmacology, 2008; 60(4): 523-530.

24. Kurian GA, Philip S, Varghese T. Effect of aqueous extract of the Desmodium gangeticum DC root in the severity of myocardial infarction. J Ethnopharmacol, 2005; 97(3): 457-461.
25. VSankar, B Pangayarselvi,A Prathapan, KG Raghu."*Desmodium gangeticum* (Linn.) DC. exhibitsantihypertrophic effect in isoproterenol-induced cardiomyoblasts via amelioration of oxidative stress and mitochondrial alterations". J CardiovascPharmacol, 2013; 61(1): 23-34.
26. GAKurian, J Paddikkala."Methanol extract of *Desmodium gangeticum* DC root mimetic post-conditioning effect in isolated perfused rat heart by stimulating muscarinic receptors". Asian Pac J Trop Med, 2012; 5(6): 448-54.
27. GA Kurian,J Paddikkala. "Role of Mitochondrial Enzymes and Sarcoplasmic ATPase in Cardioprotection Mediated by Aqueous Extract of *Desmodium gangeticum* DC Root on Ischemic Reperfusion Injury". Indian J Pharm Sci, 2010; 72(6): 745-52.
28. GAKurian, A Seetharaman, N Subramanian, J Paddikkala. "A Novel Approach for Oral Delivery of Insulin via "*Desmodium gangeticum"* Aqueous Root Extract. J Young Pharm, 2010; 2(2): 156-61.
29. GAKurian, S Suryanarayanan, A Raman, J Padikkala. "Antioxidant effects of ethyl acetate extract of *Desmodium gangeticum* root on myocardial ischemia reperfusion injury in rat hearts. Chin Med. 2010; 22: 5-3.
30. GA Kurian,J Padikkala. "Administration of aqueous extract of *Desmodium gangeticum* (L) root protects rat heart against ischemic reperfusion injury induced oxidative stress. Indian J Exp Biol, 2009; 47(2): 129-35.
31. GAKurian, N Yagnesh, RS Kishan, J Paddikkala. "Methanol extract of *Desmodium gangeticum* roots preserves mitochondrial respiratory enzymes, protecting rat heart against oxidative stress induced by reperfusion injury". J Pharm Pharmacol, 2008; 60(4): 523-30.
32. GA Kurian, S Philip, T Varghese. "Effect of aqueous extract of *Desmodium gangeticum* DC root in the severity of myocardial infarction. J Ethnopharmacol, 2005; 97(3): 457-61.
33. R Govindarajan*etal*., "Studies on the antioxidant activities of *Desmodium gangeticum"*. Biol Pharm Bull, 2003; 6(10): 1424-7.