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Studies on *Desmodium gangeticum:* A review

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ABSTRACT

Traditional and folklore medicines play an important role in health services around the globe. About three quarters of the world population relies on plants and plant products for health care. The plant Desmodium gangeticum has been used in folklore medicine in the treatment of various ailments. Many of the Ayurvedic formulations contain this medicinal plant and is considered as Master of Medicinal Plant in Ayurveda due to its wide use in formulations. In this detailed review article called Studies on Desmodium gangeticum, the Botany, Chemistry and Biological activities of the above mentioned plant is presented.

Key words : *Desmodium gangeticum*, Leguminosae, Gangetin, Desmodin.

INTRODUCTION

In the Ayurvedic literature certain drugs have been clubbed together and given group names. Dasamula which literally means the ten roots is one such group. Factually only nine of them are roots, the 10th one Gokshura, the anatomical part of which used is the fruit. Prisniparni is an ingredient of Dasamula and is botanically identified as *Desmodium gangeticum* DC. Family - Leguminosae. According to Bavaprakasa [1], the following descriptive synonyms are given.

Prisniparni, Prthkparni, Chitraparnyahi, Parnyapi Krestuvinna, Simhapucchi, Kalasi, Dhavaniguha

The Dasamula or ten roots are: *Hedysarum gangeticum, Uraria lagopoides, Solanum jacquinii, Solanum indicum, Tribulus terrestris, Aegle marmelos, Colonanthes indica, Gmelina arborea, Strereospermum suaveolens* and *Premna spinosa.*

The ten drugs together are used in the remittent fever and puerperal fever, inflammation of the chest and affections of the brain and in generally other diseases caused by the tridoshas [2].

Official anatomical parts used: Root
Habit and habitat

A common shrub: 2-4 ft high, found almost throughout India ascending to 5000ft. from Himalayas. It is very variable and is met with in its various forms in forest and waste land.

Synonyms
Desmodium latifolium, Hedysarum gangeticum and *Hedysarum collinum* [3].

Regional names[4]

Sanskrit	-	Prisniparni
Hindi	-	Salpan, Salpani
Bengali	-	Salpani
Gujarathi	-	Selman
Marati	-	Radbhal
Malayalam	-	Pullati,Orila
Tamil	-	Pulladi,Orilai
Telegu	-	Gitanaram, Kolakuporna
Urdu	-	Shalwan

Description
It is slender, suberect ,diffusely branched under shrub, 2-3 ft high; stem woody ,branches slender, irregularly angled and clothed with upwardly directed short soft grey hairs (Fig.1).

Fig 1: *Desmodium gangeticum*

Leaves unifoliate, alternate, stipules, stipulate ; petioles 1-2cm long; stipules 6-8 mm long, linear subulate, striate at the base ; blade ovate or ovate lanceolate, acute the margins some what

waved , glabrous and green above, paler and clothed with dense, soft, whitish appressed hairs beneath, reticulately veined, base rounded, truncate or subcordate; main nerves 8-12 pairs[5] .

The inflorescence is a terminal or axillary, many flowered, slender, elongate raceme, 15-30cm long with a few ascending branches in the lower part. Rachis slender, pubescent and somewhat angular.

Flowers small with minute setaceous bracts on short upwardly directed pedicels. Calyx tube short, companulate, finely downy ,and cleft to the middle into two lips ; upper lip two cleft, the lower three partite ; teeth short and triangular ,corolla exerted 4mm long , violet or white ; standard 3mm broad, orbicular, cuneate at base ; wings obliquely oblong, more or less adhering to the keel; keel petals obtuse, incurved.

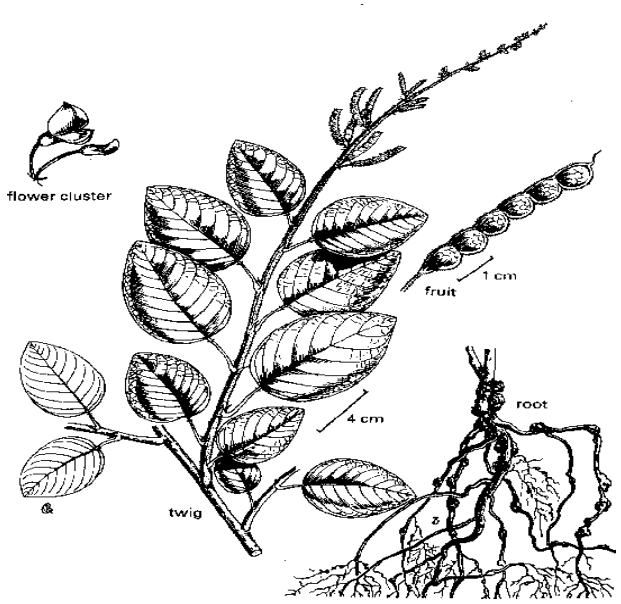

Fig.2 Various parts of *Desmodium gangeticum*

Stamens diadelphous –one and nine –anthers uniform. Ovary sessile or stipitate, many ovuled; style filiform, incurved, with minute capitate stigma. Fruits compressed, slightly falcate, moniliform, six to eight jointed glabrescent lomentum, slightly indented above, joints separating when ripe, indehiscent, one seeded, more or less straight or lightly curved above and rounded on the lower side. Seeds compressed reniform without a strophiole [6]. Dry seeds when mechanically injured and kept for germination could break the seed dormancy giving 22% germination [7].

Macroscopic characters of root

The tap root is poorly developed and the lateral roots are very strong, nearly uniformly cylindrical, light yellow and smooth .They have a thick central strand of wood surrounded by a comparatively thin but tough bark and bear at their distal ends a large number of small very much branched fibrous rootlets with several bacterial nodules of various size attached to them.

The root bark is yellowish white in colour and has a leathery texture .It is easily peelable. The outer skin is very soft. The middle bark has a slight yellowish tint and the inner bark appears lighter coloured than the parts outside. The wood itself is small but possesses a slightly mucilaginous sweetish taste.

Substitutes and Adulterants

Desmodium latifolium DC. is often used as a substitute for *Desmodium gangeticum* in parts of Travancore and Cochin . *Uraria picta* Desv. is used in some parts of India as prisniparni.

Fig.3. Roots of *Desmodium gangeticum*

Qualitative Tests

Inorganic–Carbonate, chloride, sulphate, phosphate, silica, iron, aluminium, magnesium and potassium. Organic-Sterols, Pterocarpans [8]

Constituents

D.gangeticum on chemical examination yield pterocarpans-gangetin, gangetinin and desmodin [9, 10] (Fig.4).

Gangetin

Gangetin m.p.98-100 $(\alpha)_D$ – 204.5 ($CHCl_3$) M.F.C_2 H_{28} O_5. IR:(CCl_4) 3618 and 3470 cm^{-1} . UV λ^{Alc}_{max} 277 sh, 286, 303 sh and 314 nm. NMRS 1.46, 1.5 (each 3H, s, CMe_2), 1.79br, 1.83 br (each 3H, CH:CMe_2), 3.37 br(2H,d, CH_2-CH:CMe_2), 4.01 (3H, s, OMe), 5.33 (1H, m, CH:CMe_2) 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

Gangetinin m.p. 136-8°, M.F.$C_{26}H_{26}O_5$ $(\alpha)_D$–200° ($CHCl_3$), m/z 418 λ^{Alc}_{max} 234, 278 and 318 nm. NMR δ 3.40 (1H, m, H: 6a), 4.21 (1H, q, J = 6,10 Hz, H-11a)

Desmodin

Desmodin m.p. 236-8°, $(\alpha)_D$–250° ($CHCl_3$), M.F.C.$_{22}H_{22}O_6$, m/z 382 λ^{Alc}_{max} 228, 287 and 303 nm. NMR δ 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 three pterocarpans seven alkaloids viz.N,N-dimethyl tryptamine and its oxide, hypaporsine, hordenine, candicine, N-methyl tyramine and ß- Phenylethylamine have been reported from the roots [11].

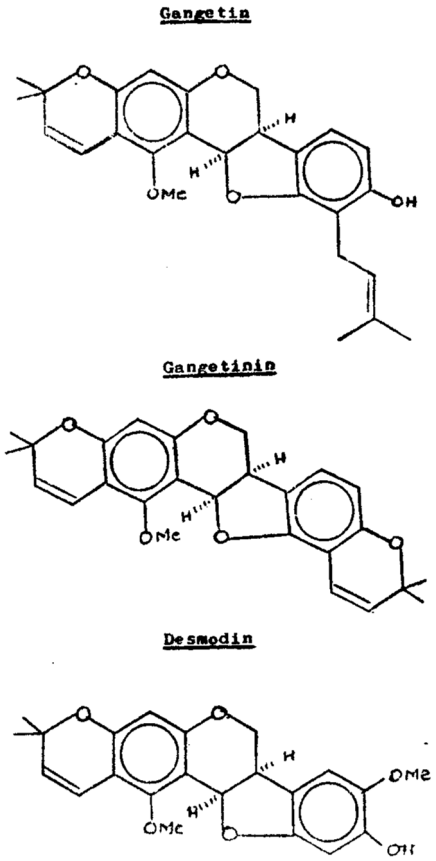

Fig.4. Structures of Gangetin, Gangetinin, Desmodin

Biological activity

Gangetin showed significant anti-inflammatory activity in the exudative and proliferative phases of inflammation the doses 50 and 100 mg/kg orally. The compound showed significant analgesic activity, but antifertility, antipyretic activity in albino rats. It did not show any acute toxicity in mice upto 7g/Kg orally [12]. Gangetin moderate anti-implantation activity in female albino rats at levels of 40, 60.6,50 and 62.5% at dose levels 20, 40, 80 and 160 mg/Kg. It did not show any antieostrogenic activity [13]. Biochemical studies in uterus of female albino rats after the administration of Gangetin showed that it did not change pH, sodium or potassium but decreased glycogen, acid phosphatase and alkaline phosphatase [14]. Seed extract of *Desmodium gangeticum* was tested for agglutination of 11 different types of *Pseudomonas aeruginosa* [15]. Gangetin showed 87.5% anti implantation activity at 100 mg/kg body weight in 50% at 50 mg/kg body weight in female rats. In male rats the sterility studies seminal vesicle and testes showed no change in pH, alkaline and acid phosphatase, reducing sugar, protein, sodium, potassium and calcium [16].

Important Formulations

1. Dasamularishtam
2. Chyavanaprasam
3. Agusthya Rasayanam
4. Sukumara gritham
5. Dasamula Katuthiayadi Kashyam
6. Dasamula thailam
7. Danvantra thailam
8. Mahamasha thailam

9. Anu thailam
10. Vidaryadi gritham

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.

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