Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 6s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Plants-Based Bioactivities: A review of Desmodium species

Uma Bharti[1], Nasiruddin Ahmad Farooqui[2], Ved Pal[3*], Shamin Ahmad[4], Praveen Kumar[5]

[1]Research Scholar,Translam Institute of Pharmaceutical Education and Research, Meerut (U.P)

[2]Professor and Head of the Department of Pharmaceutcial Chemistry, Translam Institute of Pharmaceutical Education and Research, Meerut (U.P)

[3*]Assistant Professor and Head of the Department of Pharmacognosy, College of Pharmacy, JSS University, Noida, U.P

[4]Professor and Director, Translam Institute of Pharmaceutical Education and Research, Meerut (U.P)

[5]Professor, Dept. of Pharmacology, Translam Institute of Pharmaceutical Education and Research, Meerut(U.P)

Corresponding Author:

Dr. Ved Pal

Department of Pharmacognosy, College of Pharmacy, JSS University, Noida

Email: vedpaldj2019@gmail.com

Cite this paper as: Uma Bharti, Nasiruddin Ahmad Farooqui, Ved Pal, Shamin Ahmad, Praveen Kumar, (2025) Plants-Based Bioactivities: A review of Desmodium species. *Journal of Neonatal Surgery*, 14 (6s), 867-874.

ABSTRACT

Three powerful Desmodium plant species—Desmodium gangitecum DC, Desmodium triflorum Linn, and Desmodium triquetrum Linn—that are members of the Fabaceae family were examined in this study due to their significant phytochemical, antioxidant, anti-inflammatory, and anti-asthmatic qualities. A well-researched traditional Indian medicinal herb for neurological disorders is Desmodium species. Its multidirectional therapeutic importance as an anti-leishmanial, anti-inflammatory, and cardio-protective medication has been shown by recent pharmacological research. Additionally, it has blood-purifying and detoxifying properties, which may be related to its immunomodulatory function.

The plant is abundant in phospholipids, alkaloids, pterocarpans, sterols, and flavonoids, according to phytochemical study. Relevance to ethnopharmacology: Traditional Chinese medicine has long used plants in the genus Desmodium (Fabaceae), including Desmodium gangeticum DC, Desmodium triflorum Linn, and Desmodium triquetrum Linn, to treat a variety of illnesses, such as rheumatism, pyrexia, dysentery, wounds, cough, malaria, hepatitis, hemoptysis, and more. The majority of species, according to traditional Chinese medicine theory, have the ability to reduce internal heat or fever, neutralize toxins, inhibit pain, stimulate blood circulation, suppress coughing, and ease dyspnea. The review emphasizes primarily on folkloric uses, pharmacological activities of the extracts, biological activities of isolated compounds, toxicity and safety profile of Desmodium speciesto provide a comprehensive data for researchers to hit upon new chemical entity responsible for its claimed traditional uses and further clinical trials. In this review, we have tried to consolidate the pharmacological studies on three potent Desmodiumspecies work done so far, along with a detailed documentation of its phytoconstituents and their reported pharmacological actions

Keywords: *Folk Medicine, Desmodium species, Phytoconstituents, asthma, Pro-inflammatory cytokines*

1. INTRODUCTION

According to World Health Organization (WHO), the herbal medicines have been defined as the finished, labeled medicinal products that contain active ingredients, aerial or underground parts of the plant or other plant material or combinations. For the assessment of safety, efficacy and quality of herbal medicines, specific set of guidelines has been set by World Health Organization (WHO). As per the estimation of WHO, around 80% of the world's population presently use herbal medicine for primary health care (WHO technical report series 1996) [1]. Since ancient time herbal medicine is playing crucial role in treatment of human diseases with limited side effects.The scientific evidences on safety and efficacy were recorded for various raw material plants and many of exiting herbal modern formulations. Medicinal plants constitute the main source of new pharmaceuticals and healthcare products. A great number of medicinal plants have been used for management of antitussive and other respiratory disorders [2-5]. of gestation to delivery of the baby.[1,2]

Desmodium is a genus in the flowering plant family Fabaceae, sometimes called tick-trefoil, tick clover, hitch hikers or beggar lice. There are dozens of species and the delimitation of the genus has shifted much over time. These are mostly inconspicuous legumes; few have bright or large flowers. Though some can become sizeable plants, most are herbs or small shrubs. Their fruit are loments, meaning each seed is dispersed individually enclosed in its segment. This makes them tenacious plants and some species are considered species in places. It is an ingredient of Ayurvedic preparations like 'Dashmoolarishta' and 'Dashmoolakwaath'recommended for post-natal care to avoid secondary complications.[6] Moreover, pharmacological studies reveal the potentiality of Desmodiumgangeticum DCextract and its active principles viz. desmodin, hordenine and gangetin as anti-amnesic, immunomodulator, anti-diabetic, antioxidant, cardio-protective, hepatoprotective, anti-inflammatory drug.[7] The extensive uses of DesmodiumgangeticumDC by different pharmaceutical industries coupled with the recent revival of interest in herbal medicine have led to an ever-increasing demand of this species. It has therefore become essential to search for a possible substitute for this species and to ensure the quality of the raw drug by pharmacognostic investigations. The situation has become more adverse as there is no detailed pharmacognosticaldata available on this species, it has become extremely important to make effort towards standardization of the plant material to be used as medicine, to maintain safety and efficacy of the formulations. Therefore the present work has been undertaken to establish various pharmacognostical and phytochemical parameters which could serve as a measures of authentication and quality control for commercial samples of the crude drug. In addition the detailed microscopy of the aerial parts of the plant (stem and leaf) had also been studied and documented which will be useful to pharmaceutical industries for the authentication of their commercial samples.[8] DesmodiumTriflorum (L.) DC (Fabaceae/Leguminosae) a medicinal plant is a very small terrestrial, annual, prostrate herb, up to 50cm long, slender branches rooting at nodes. Its leaves are small, alternate, stipulate and trifoliate. Flowers are irregular, bisexual, very small and bright purplish blue color. This plant is found on a wide range of soils and most commonly in dry, distributed in lawns, waste places and along road sides in tropical countries including India, Srilanka, Philippines and Taiwan. The plant is easily available throughout the states of India.[9] Desmodiumtriquetrum DC (Leguminosae, Subfamily-Papilionaceae) is an erect or sub erect undershrub, distributed throughout central and eastern Himalayas, South India and Sri Lanka. The leaves are used as a substitute for tea by hill tribes in upper Assam.The TrefleGros, (Tadehagitriquetrum), is a species of flowering plant in the legume family, Fabaceae. It belongs to the sub family Faboideae. The maximum height of this shrub tree is 3m. Leaves alternate, linear-oblong, ovate with a tapering tip. Flowers show raceme inflorescence type, which are small, pale purplish in color. Fruit is a hairy legume.It is widespread in all South Asian, East Asian, and Southeast Asian countries. [10-14]

Desmodiumgangeticum (DC)

Desmodiumtriflorum (Linn)

***Desmodiumtriquetrum* (Linn)**

Fig-Images of *Desmodium* species

Experimental section

Pharmacological profile of *Desmodiumgangeticum* DC

Plant Part	Type of extract	Pharmacological activity	Treatment procedure on animals	Finding activity/Trend/ Effective Dose	Observed mechanism

Aerial parts [14]	Flavonoid andalkaloid fractions	Antioxidant and anti-inflammatory	10 mg/kg, i.p. in rats	Flavonoid fraction exhibited anti-inflammatory activity better than alkaloid fraction and indomethacin. Flavonoid fraction exhibited better superoxide dismutase,glutathione peroxidase and catalase activity - superior antioxidant activity	Presence of polyphenols such as caffeic acid and chlorogenic acid, which are reported antioxidants, in the flavonoid fraction
Roots[15]	Ethyl acetate extract	Antioxidant against revascularization injury	100 mg/kg,p.o. for 30 days in rats	*In vitro* anti-oxidant activity (2-1000 µg/ml) Concentration dependent free radical scavenging. Half maximum inhibitory concentration (IC50) scavenging DPPH (36.3 µg/ml), superoxide (55.3 µg/ml), hydroxide (43.7 µg/ml), nitric oxide (39.4 µg/ml) and lipid peroxidation (248 µg/ml). *In vivo* anti-oxidant activity (100 mg/kg) Levels of cardiac enzymes such as CK, LDH, SGOT and SGPT improved by 50%.	Improvement of cardiac function. By improving the level of these cardiac enzymes like CK, LDH, SGOT and serum glutamic pyruvic transaminase (SGPT). By decreasing the release of LDH in coronary effluent. By decreasing the level of malondialdehyde in myocardial tissues.
Leaves[16]	Ethanolic	Analgesic and anti-inflammatory	50, 100 and 200 mg/kg; p.o. in rats	Models of Anti-inflammatory activity *Carrageenin-induced paw oedema* Dose dependent activity; 200 mg/kg maximally inhibited paw edema by 68% and 98%, upto 3 h and 5 h respectively. Models of	

				Analgesic activity *Hot plate test* All doses raised the threshold of heat tolerance, as observed from the increased reaction time (rt); 200 mg/kg increased rt by 3.8 seconds in a span of 1 h.	
		Free radical scavenging potential	250-1000 µg/ml	Formalin-induced paw licking testsOnly 100 and 200 mg/kg were effective, of which 200 mg/kg was most effective. Reduced licking time (time spent on licking) by 52% and 47% in early and late phase, better than standard drug indomethacin (32% and 29%). Antioxidant activity Dose dependent inhibition of nitric oxide and superoxide radicals	
Dried root[24]	Chloroform, Ethanolic and Aqueous alcoholic extracts of the plant *Desmodiumgangeticum* DC	Anti-asthmatic activity	200 mg/kg	The plant had been investigated in a systemic way covering its phytochemical and anti-asthmatic aspects to rationalize its use as a drug. In this present study, the anti-asthmatic effects of the chloroform, ethanolic and hydro-alcoholic dried root extracts of *Desmodium gangitecum* DC were evaluated.	There was a significant decrease in WBC count for extract-treated rats ascompared to sensitized control II (Ovalbumin) treated rats and the significance was observed for the estimation of total tissueprotein content as compared to sensitized control II treated rats. The extracts showed significant results of tissueMalonyldialdehyde(MDA) levels in the experimental rats as compared to sensitized control II treated rats and this studyindicates that the veracity of anti-asthmatic activity claimed by the natural medical practitioners of The Nilgiris.

Anti-inflammatory and anti-nociceptive activity

Aqueous decoction (5, 10 and 20 mg/kg) of roots and aerial parts of DesmodiumgangeticumDC showed anti-inflammatory and anti-nociceptive activity in-vivo in dose-dependent manner. The inhibition of swelling caused by carrageenan was equivalent to 14.58–51.02 % protection and in cotton pellet granuloma the protection was observed up to 14.43–38.67 %. Moreover, a significant increase in analgesio-meter-induced force and acetic acid induced writhing were observed equivalent to 6.56-67.66 % & 22.18–73.83 % protection respectively[17]. Juice of whole plant of DesmodiumgangeticumDC possess anti-rheumatic and anti-osteo arthritic activity via anti-inflammatory activity. The activity might be associated with several phytoconstituents like polyphenolics, pterocarpinoid (gangetin)[18]. Gangetin, a pterocarpens, isolated from n-hexane extract of root of DesmodiumgangeticumDCshowed significant anti-inflammatory activity in both exudative and proliferative phases of inflammation in rat model at dose of 50 and 100 mg/kg body weight[19]. The whole plant of Desmodiumgangeticum DC enhance the NO production of and provided resistance against infection established in peritoneal macrophage by the protozoan parasite Leishmaniadonovani[43]

Traditional uses and Ethno-pharmacology

Root powder is boiled with milk and half cup of it is prescribed for seven or more days by tribal people of JalgaonDistrict, Maharastra, India, to promote flatulence[20].Villagers of Sivagangai district, Tamilnadu, India, drink leaf decoction (locally known as Pulladi) twice a day for 2- 3 days to cure diarrhea and dysentery. Leaf paste is applied on anus once a day for two weeks to cure piles. [21]. Paliyar and Muthuvar Tribes, Theni District of Tamil Nadu, India, prescribe shade dried roots decoction (locallycalled Muvilaikurunthu) against asthma and other bronchial complications [22]. Tribes like Gond, Kols, Mushar, Baiga&Nutts in Vindhya region of Uttar Pradesh, India, administered orally rootpaste and powder to treat typhoid fever, cerebrospinal meningitis and also as an antidote of snake venom [23]. The roots of Desmodiumgangeticum DC were used traditionally used in the treatment of asthma [30].

Phytochemical Profile of *Desmodiumgangeticum* DC

Preliminary phytochemical screening reveals D. gangeticumis rich in flavonoids, alkaloids, steroids, terpenoids,phenylpropanoids, pterocarpans, coumarins and volatile oil[25]. Among the isolated compounds flavonoids, alkaloids and pterocarpans are considered as major bio-active constituents. Alkaloids like 5-methoxy N, N-dimethyl tryptamine, N-methyl- H4–Harman, β-carboliniumcation, indole-3-alkyl-amines have been isolated from aerial parts of the plant. Pterocarpans such as gangetin, gangetinin, desmodin, and desmocarpin were reported to be present in roots. Recently a new pterocarpan, gangetial, had been isolated from the chloroform extract of the roots of Desmodiumgangeticum. Flavones like 4,5,7-Trihydroxy-8-prenylflavone, 4-O-α-L-rhamnopyranosyl-(1→6)-β-d-glucopyranoside, 8-C-prenyl-5,7,5-trimethoxy- 3,4-methylenedioxyflavone, rutin and quercetin-7-O-β-d-glucopyranoside were also reported from the aerial parts. Phytosterols viz. β-sitosterol, α-amyrone, lupeol and its acetate, stigmastrol had been isolated from aerial parts. Moreover, aminoglucosylglycerolipid was reported for the first time from seed. Further, minor phytoconstituents viz. trans-5- hexadecenoic acid, salicylic acid, 5-O-methylgenistein-7-O-β-d-glucopyranoside, 3,4- dihydroxy benzoic acid, kaempferol- 7-O-β-d-glucopyranoside, and uridine triacetate were also reported. [26-29]

Pharmacological profile of *Desmodiumtriflorum* DC

In this study Mature whole plants of DesmodiumtriflorumLinn were evaluated of the antioxidant and antiproliferative activities of the crude methanol extract and various fractions of methanol extract like n-hexane, chloroform, ethyl acetate and n-butanol. the total phenolic content,1,1-diphenyl-2- picrylhydrazyl hydrate (DPPH) free radical scavenging activity, trolox equivalent antioxidant capacity (TEAC), reducing power, total flavonoid content of DesmodiumtriflorumLinn were evaluated for the exploration of its antioxidant activities. Furthermore, its antiproliferative activitieswere investigated through the MTT method. Itwas comparedwith the antioxidant capacities of known antioxidants, including catechin, α-tocopherol, trolox and ascorbic acid. Desmodiumtriflorum Linn, a medicinal plant from the Fabaceae family and also knownassan-dam-jin-cao, is commonly used by traditional Chinese medicine (TCM) cliniciansin Taiwan for the treatment of dysmenorrheal, muscle spasm, cough, pain and poisoning.The Taiwanese also call this plant “wings of fly” because of the shape and arrangementof the leaves [32]. Dried powder of whole plant DesmodiumTriflorumLinn when taken on empty stomach is useful in curing bone fracture [33]. DesmodiumTriflorumLinnleaf paste (or) external leaf paste in water is applied on forehead to bring down high fever [34].The fresh leaves of the plant are applied to wounds and abscesses that are usually difficult to heal. The paste is sometimes applied to sores and itch. The fresh juice of the plant is also recommended for use in dysentery and as a laxative [35]. The roots are reputedly carminative, tonic and diuretic and used in bilious complaints. The leaves are ground with cow’s milk; they are given daily in the morning. The main actions include antispasmodic, sympathomimetic, central nervous system stimulation, curare-mimetic activity and diuretic. In Philippines, a decoction is also used as mouth wash and as an expectorant. In Thailand, the whole plant is used as an antipyretic and to quench thrust. In Indonesia, Malaysia, Philippines, Laos and India, the plant in crushed form (or) a poultice of the leaves is externally applied on wounds, ulcers and for skin problems in general, apparently for its antiseptic properties [36].In this study an attempt to know the anthelmintic activity of the leaves and roots of the DesmodiumtriflorumLinn. For this work, the leaves and roots were extracted separately with cold water, Methanol andpetroleum ether by following maceration method. Various

doses of cold water, methanolic and combined (cold water,Methanol and petroleum ether) extracts were evaluated for their anthelmintic activity on adult Indian earthworms,Pheretimaposthuma. All extracts were able to show anthelmintic activity of 10mg/mL concentration. All the doses ofcold water, methanolic and combined extracts of DesmodiumtriflorumLinn DC showed dose dependent anthelminticactivity in comparison to standard drugs [37]

Phytochemical profile of *Desmodium triflorum* (Linn)

DesmodiumTriflorum (L.) DC contains chemical constituents Ursolic acid, Vitexin, Genistin, Fucosteroland rare diholosylflavane, 2-Glucosylvitexin. DesmodiumtriflorumLinn leaves contains total alkanoid, 0.01-0.015%, Phenethylamine(major alkaloid), Indole-3-acetic acid, Tyrumine, Trigonelline, Hypaphorine and Choline. DesmodiumTriflorumLinnroot contains the total alkaloid 0.01-0.018% Hypaphorine(major alkaloid), N, N-Dimethyl tryptophan betaine and Choline. The leaves are used in diarrhea, convulsions and as a galactagogue. [35, 38-40]

2. PHARMACOLOGICAL PROFILE OF *DESMODIUM TRIQUETRUM* (LINN)

Anti-inflammatory and *in vitro* antioxidant activity of *Desmodium triquetrum* Linn- DTE was found to be safe up to at a dose of 2000 mg/kg. Hence, the doses of 100, 200, and 300 mg/kg were selected for the activity. The results of this investigation suggest that DTE produced significant anti-inflammatory and and antioxidant activity. Carragenan administration to the control group resulted in increase in paw volume at 30 and 60 min and gradually decreased after 120 min. The treatment with DTE in all the doses showed significant decrease in the paw volume compared to control. The maximum inhibition of paw edema was observed at 60 min at the dose of 300 mg/kg body weight. The results were comparable with the standard drug. The maximum H2O2 scavenging activity was observed at 50 µg/ml of the test extract. NO is a potent pleiotropic mediator of physiological processes. DTE (25 to 75µg/ml) also moderately inhibited nitric oxide in a dose dependent manner. Standard ascorbic acid was found to have 76.82% activity at 75 µg/ml. Carrageenan induced inflammatory process is believed to be biphasic. DTE showed a significant anti-inflammatory activity in both phases of inflammation. Increase in cyclic adenosine monophosphate (cAMP)-phosphodiesterase (cAMP-PDE) activity in edematous tissue after carrageenan injection paralleled the increase in migrated cells as reported. It has been reported that alcohol extract of D. triquetrum was found to inhibit cAMP-PDE activity. Therefore, the possible mechanism for significant anti-inflammatory activity of DTE may be by inhibition of cAMP-PDE activity and also it can be attributed to its antioxidant activity as evidenced by the presence of flavonoids[41]. Desmodiumtriquetrum contains a wide variety of free radical scavenging molecules, such as phenolic and nitrogen compounds, terpenoids, and carotenoids that are rich in antioxidant activity [42]. The leaf extracts or pills are used for the treatment of piles[43].

Hepatoprotective and Antioxidant Activities of *DesmodiumTriquetrum* Linn- The effect of DTE on hepatospecific enzymes, serum bilirubin, SOD, CAT and GSH in rats with CCl4induced liver damage were review. There was a significant rise in the levels of SGOT, SGPT, SALP and serum bilirubin in CCl4 treated group as compared to normal. Administration of DTE significantly reduced the increased levels of these enzymes and serum bilirubin and caused a subsequent recovery as compared to silymarin treated group. Thus, the ethanol extract of Desmodiumtriquetrum Linn leaf has potent hepatoprotective and antioxidant activities against CCl4-induced liver toxicity. Further phytochemical and pharmacological investigations are underway to identify the active constituents responsible for hepatoprotection. Reaction of reactive species with cellular antioxidants causes depletion of antioxidant enzymes that may result in oxidative stress. The administration of DTE significantly preserved SOD and catalase activities thus exhibiting hepatoprotective activity due to inactivation of reactive oxygen species. GSH protects the cells by scavenging of free radicals. The DTE is reported to contain flavonoids, phenolic compounds and glycosides, which may be responsible for the hepatoprotective and antioxidant activities of the plant [44].

Phytochemical profile *Desmodiumtriquetrum* Linn

The preliminary phytochemical analysis of the extract confirmed the presence of flavonoids, glycosides, steroids, saponins, phenolic compounds and amino acids, The leaves of this plant contains tannins, alkaloids, hipaforin, trigonelin, tanning material, silicic and the fruits of this plants contains saponin and flavonoids while the roots contain saponins, flavonoids, tannins [41, 45].

3. SAFETY PROFILE

Toxicity of all threepotent *Desmodium speciesextract*/ Fractions were accessed in animal model (mice) at different doses (50–2000 mg) based on acute oral toxicity guidelines 423 and parameters like Itching, Body weight, skin reaction,hyperactivity, grooming, convulsions, sedation, hypothermia and mortality were observed. No mortality was observedfollowing oral administration of highest dose (2000 mg/kg) of extract. However, doses more than 1000 mg/kg producedprofuse watery stools, ptosis (dropping of upper eyelids) and lethargy in animals. Further, as traditional medicine no reports of toxicityof Desmodium species have been documented.

4. DISCUSSION

The three potent *Desmodium specieslike DesmodiumgangeticumDC, DesmodiumTriflorumLinn, Desmodiumtriquetrum* Linn, has been used for the treatment of various ailments in traditional and folklore medicine throughout India, China and other African countries. *Desmodiumgangeticum DC is* one of the main ingredients of several Ayurvedic formulations like *Dashamularishta, Chyavanaprasam* and *Agasthyarasayanam,* routinely prescribed to treat colic pain, *fever,respiratory* diseases. The decoction *of Dasamula and Laghupancamula*, polyherbal formulations are used in pain, hysteria, rheumatism, asthma, cardiac and renal *problems. Desmodiumtriflorum* and *Desmodiumtriquetrum* subsequently very useful as antioxidant and anti-inflammatory, piles etc. Isolated phytoconstituents like *Gangetin, Desmodin,* 5-Methoxy-N-dimethyltryptamine are considered as predominant bioactive constituents due to their diverse therapeutic potentiality. Although the constituents responsible for the pharmacological properties of the plant seem to have been determined, the molecular mechanisms of most of these principles are still unknown. The bioassay guided isolation, identification of the bioactive components is essential and in depth research is also crucial to reveal the structure-activity relationship of these active compounds. Based on these facts, the authors made upto date information highlighting the current ethno pharmacological and phytochemical status of the plant.

ACKNOWLEDGEMENT

Thankful to Translem Institute of Pharmaceutical sciences and research and College of Pharmacy, JSS University Noida.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

[1] Sharma Vikas, International Journal of Pharmacognosy and Phytochemical Research 2013-14, 5(4), 302-310.
[2] R Solanki. Int J Comprehensive Pharmacy, 2010, 1, 10-5.
[3] GR Saraswathy; R Sathiya; J Anbu; E Maheswari. Int. J. Pharm. Sci. Drug Res., 2014, 6, 129.
[4] GSeema; G Vikas; B Parveen; S Ranjit; M Mukesh. Int. J. Pharm Sci. Rev Res., 2010, 5, 59.
[5] Y Jahan; T Mahmood; P Bagga; AKumar; K Singh; M Mujahid. IJPSR, 2015, 6, 3689-97.
[6] Kamidi VK Int J Res Ayurved Pharm 2012, 3(6), 866-67.
[7] Vijaya K, J Chem Pharm Res 2011, 3(6), 850-55.
[8] AtanuBhattacharjee, International Journal of Biomedical Research 2013, 4 (10), 507-515.
[9] Venkateswara Rao Gavalapu, 2013; International Journal of Pharma Sciences, 3 (1), 156-158.
[10] G. A. Kalyani, Indian J Pharm Sci. 2011, 73(4), 463–466.
[11] http://www.theplantlist.orgs
[12] http://www.flowersofindia.
[13] http://indiabiodiversity.org
[14] Govindarajan R, Vijayakumar M, Rao ChV, Phytotherapy Research; 2007, 21(10),975-979.
[15] Kurian GA, Yagnesh N, Kishan RS, Journal of Pharmacy and Pharmacology; 2008, 60(4), 523-530.
[16] Sagar MK, Upadhyay K. American Journal of Phytomedicine and Clinical Therapeutics;2013, 1(3), 256-265.
[17] Rathi A, Rao CV, Ravishankar B, J Ethnopharmacol;2004,95, 259-63.
[18] Sharma K, Rani R, Dhalwal K, Shinde V, Mahadik K.Pharmacog Rev;2009, 3(5), 22–8.
[19] Amritpal S, Samir M, Ravi S.Int J IntrgratBiol;2008, 3(1), 57-72.
[20] Shubhangi P. Life sciences leaflets;2012, 5, 66-70.
[21] Maru RN, Patel RS.Int J Sci Res;2012, 2(9), 1-4.
[22] Jeyaprakash K, Ayyanar M, Geetha KN, Sekar T.Asian Pac J Trop Biomed; 2011, S20-S25.
[23] Richa SC.Int J Pharma and Bio Sci;2010, 1(4), B46-B53.
[24] Vedpal, Dhamodaran.P, S.P.Dhanbal, B. Duraiswamy, M.V.N.LChaitanya, International Journal of Multidisciplinary Research Review;2016, 1 (2). 109-115.
[25] Ning G, Tianhua L, Xin Y, He P, Chin Trad Herb Drug;2009, 40, 852–856.
[26] Abdullah Al H, Choudhury MH, ZafrulAzam, Bang Pharm J;2011, 14(1),49-52.
[27] Varaprasad MV, Balakrishna K, Sukumar E, Patra A. J Indian ChemSoc;2009, 86, 654–56.

[28] Mishra PK, Singh N, Ahmad G, Dube A, Maurya R.Bioorg Med ChemLett;2005, 15, 4543 46.

[29] Anurag S, Singh PK, J Ethnopharmacol2009; 121, 324–29.

[30] Kirtikar IR and Basu BD. DesmodiumDesv.-DesmodiumgangitecumDC: In: Indian Medicinal Plant. II Edition. International book distributors, Dehradoon. 1935; I, 758-760.

[31] Mishra PK, Singh N, Ahmad G, Dube A &Maurya R, Bioo. Med. Chem. Lett; 2005, 15, 4536-4543.

[32] Shang-ChihLai,Yu-Ling Ho, Shun-Chieh Huang, Tai-Hung Huang, Zhen-Rung Lai, The American Journal of Chinese Medicine; 2010,38 (2) 329–342.

[33] Prusti AB., beherakk, Ethnobotanical leaflets; 2007, 11, 148-63.

[34] SamvatsarS ,Ind J Traditional Knowledge; 2004, (3), 96-100.

[35] Adinarayana D and Syamsundar KV, 1982, CurrSci; 51, 936-7.

[36] Desmodiumtriflorum(L.)DCFabaceaeDicotyledon.Availablefrom;URL:http://www.oswaldasia.org

[37] Venkateswara Rao Gavalapu, PrabhanjanKolli, Sanjeev Kumar Korra, Manoj Kumar Kavuri, International Journal of Pharma Sciences; 2013, 3(1), 156-158.

[38] Yoganarsimhan, Medicinal Plants of India. Vol-1; Karnataka; Interline Publishers; 1996.

[39] Khare CP. editors, Indian Medicinal Plant. New York: Springerverlag; 2007.

[40] Rout SK and Kar DM, 2010, Int J Pharm Sci Rev Res; 3,19-23.

[41] G.A. Kalyani, Purnima Ashok, A.D. Taranalli, C.K. Ramesh, V. Krishna,3and A.H.M ViswanathaSwamy, Indian J Pharmacol. 2011, 43(6), 740–741.

[42] Zheng W, Wang SY, J Agri Food Chem; 2001 (49), 5165–70.

[43] New Delhi: Council of Scientific and Industrial Research. Anonymous. The Wealth of India. Raw materials; 1952, 42–43.

[44] G. A. Kalyani,C. K. Rameshand V. Krishna, Indian J Pharm Sci; 2011, 73(4), 463–466.

[45] http://www.wikiherb.info/2012/05/desmodium-triquetrum-l-dc.html.