



Review Article

SHOTHAHARA ACTIVITIES OF DASHAMOOLA DRAVYAS AS AN ANTI INFLAMMATORY FORMULATION WITH SPECIAL REFERENCE TO CHARAK- A REVIEWGopal C Nanda^{1*}, R K Tiwari²¹Assistant Director In-charge, ²Research Officer (Pharmacognosy), RARIED, Lucknow, India.**KEYWORDS:** *Charak*, *Dashmoola*, anti-inflammatory, analgesic.**ABSTRACT**

In Ayurveda texts, Charak Samhita deals with 50 different group of 10 herbs each with specific action and uses. It also deals with different basic formulations like *Swarasa* (juice), *Kalka* (paste), *Kashaya* (decoction) etc. *Dashamoola* is one of such 50 group of herbs as the name contains root of ten different plants i.e. *Bilva*, *Gambhari*, *Shyonaka*, *Patala*, *Agnimantha*, *Prishniparni*, *Salparni*, *Kantakari*, *Vrihati* & *Gokshura*. Of these, first five's are known as *Brihad panchamoola* and the remaining as *Laghoo panchamoola*. It is used in the form of *Kwath* or *Arishta* (fermented decoction) or *Kashaya* according to Ayurveda. This formulation is used primarily for headache, relief of pain and swelling related to arthritis, pyrexia, abdominal distension and costo-chondral pain etc. It is also described as an analgesic used in arthritis and rheumatic conditions by the Ayurvedic practitioners. It is believed that the 10 ingredients of *Dashamoola* may be serving different roles like adjuvant, carrier agent and stabilizer etc. evident from several studies. After reviewing the different published literatures studies on experimental models have shown to possess anti-inflammatory and anti-analgesic activities which are enumerated in this paper.

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INTRODUCTION

The *Dashmoola* drugs are used in the treatment of various diseases of almost all the systems of the body specifically works on the respiratory, gastro-Intestinal, genito- urinary and central nervous systems apart from used in the musculo skeletal and joint diseases. The group *Dashmoola* is considered having immunomodulatory and general restorative tonic in geriatrics also.

Charaka Samhita and *Sushruta Samhita* are two main original classics of *Ayurveda*. Those texts mention thousands of single and compound formulations for alleviation of various disorders. *Dashamoola* as the name suggests contains roots of ten different plants i.e. *Bilva*, *Gambhari*, *Shyonaka*, *Patala*, *Agnimantha*, *Prishniparni*, *Salparni*, *Kantakari*, *Vrihati* & *Gokshura*. These five plants are known as *Brihad panchamoola* and the remaining as *Laghoo panchamoola*^[1]. It is used in the form of *Kwath* or *Arishta* according to Ayurveda^[2,3]. These formulations are used by the Ayurvedic practitioners in various conditions for headache, relief of pain and swelling related to arthritis, pyrexia, abdominal distension and costo-chondral pain. In Ayurveda "*Shotha*" denotes inflammation and oedema also in specific conditions. So, it is essential also to establish both the conditions where "*Vata*" is involved. It is described as an analgesic, anti-arthritic and anti-rheumatic properties^[4]. It is believed that the 10

ingredients of *Dashamoola* may be serving different roles like adjuvant, carrier agent and stabilizer etc.^[5] As per studies reviewed some of these ingredients have been evaluated in experimental models in inflammation and pain which have shown to possess anti-inflammatory and analgesic activities (NSAIDs).^[4,6,7]

Dashamoola has anti-inflammatory, analgesic and anti-platelet effects comparable to that of aspirin. Combination of *Dashamoola* with aspirin did not offer any advantage over aspirin alone. Further studies needed to prove *Dashamoola* to be a useful alternative to currently available non-steroidal anti-inflammatory drugs^[8].

Enumeration

The individual ingredients *Dashamoola kashaya* were found having anti-inflammatory and analgesic effects as per study results as follows:

1. *Aegle marmelos* (L.) Corr. (*Bilva*)

A. marmelos is commonly known as wood apple plant. *A. marmelos* is belonging to family Rutaceae. *Bael* trees are found in Indian sub-continent, tropical and sub-tropical countries. *A. marmelos* is known for various medicinal properties in traditional medicinal systems and used to cure a variety of diseases.

From the study it was found the decoction of *A. marmelos* roots relieves intermittent fever, melancholia and palpitation of heart [9].

Methanol extract of leaves of *A. marmelos* were reported to possess analgesic activity. *A. marmelos* was screened for analgesic activity by Acetic acid-induced writhing test in Swiss mice. The results indicated that methanol extract significantly reduced the writhing induced by acetic acid which showed significant analgesic activity [10].

Unripe fruit pulp of *A. marmelos* was reported to possess anti-inflammatory activity in inflammation induced by injecting 0.1 ml of 1% carrageenan in Sprague Dawley rats and after extract treatment of the inflamed rats significantly reduced the λ carrageenan [11]. Ethyl acetate and methanol extract of leaves of *A. Marmelos* were screened for *in vivo* anti-inflammatory activity in albino rats. Methanol extract of *Aegle marmelos* leaves showed significant anti-inflammatory activity at a dose of 100 mg/kg [12].

2. *Gmelina arborea* Roxb. (*Gambhari*)

Gmelina arborea Roxb is one of the important medicinal plants most widely propagated and cultivated species of the family Verbenaceae. It is commonly known as "*Kashmari*" and it is a beautiful fast growing avenue tree that grows throughout India. *Gambhari*, an essential component among *Dashamoola* is having *Rasayana* (rejuvenative), *Medhya* (Memory enhancer) & *Vrishya* (Aphrodisiac) activities have been related to its fruits [14, 15].

The roots are bitter, sweet, pungent, anodyne, demulcent, lactagogue, refrigerant, stomachic, galactagogue, laxative, anthelmintic, anti-inflammatory and tonic. The roots alleviate *Vata* and *Kapha*. It is used against dropsy, fever, gout, headache, rheumatism and sore throat. The root decoction is used for abdominal tumors [21].

Ethanol and aqueous bark extract of *Gmelina arborea* was evaluated and was found to be more significant on acetic acid induced test than tail flick test as compared to standard anti-inflammatory & analgesic drug like diclofenac sodium at a dose of 25mg/kg and thus it appears that the test compounds inhibit predominantly the peripheral pain mechanism [13-16]. Methanol extract of leaves of *G. arborea* also possesses analgesic activity [18].

Ethanol and aqueous bark extract of *G. arborea* possesses significant anti-inflammatory and anti-nociceptive activities in carrageenan induced inflammation in Wistar albino rats [17]. Isolated premnazole and isoxazole alkaloid from *G. arborea* bark extract exhibited significant anti-inflammatory activity in reducing cotton pellet- induced granuloma formation in rats [19-20].

3. *Oroxylum indicum* (L.)Vent. (*Shyonaka*)

Oroxylum indicum is a small to medium sized deciduous tree with light greyish brown, soft, spongy bark and belongs to family Bignoniaceae. Native of plant

is Indian subcontinent, in the Himalayan foothills with a part extending to Bhutan and southern China, in Indo-China and the Malaysia eco-zone.

The root bark of plant is acrid, bitter, pungent, astringent to the bowels, cooling, aphrodisiac, tonic, increases appetite, useful in "*Vata*", biliousness, fevers, bronchitis, intestinal worms, vomiting, dysentery, leucoderma, asthma, inflammation, anal troubles. It is used to treat diarrhoea, dysentery, diaphoretic, and rheumatism [22].

The *O. indicum* acts as an analgesic and anti-inflammatory agent. The analgesic and anti-inflammatory activities of *O. indicum* may be due to its ability to neutralize free radicals in Swiss albino mice by different methods [23].

Butanol extract of root bark *Oroxylum indicum* has been used since ages as analgesic agent. Reduction in number of writhing by any treatment as compared to vehicle treated animal was considered as a positive analgesic response, oral administration of n-butanol fraction significantly prolonged the reaction time in rats. Oral administration of n-butanol fraction also significantly reduced the number of writhing by 75.93 % as compared to aspirin 87.05 %. The analgesic activity has been attributed to the presence of flavonoids such as baicalein, ellagic acid, biochanin-A present in the roots of *Oroxylum indicum* [24, 27].

The root bark of *Oroxylum indicum* has been shown to inhibit chronic inflammation in Wistar rats [23]. Aqueous extract of leaves & Stem bark of *Oroxylum indicum* has also been anti-inflammatory activity against the ear swelling in mice [25]. Water extract was found to have obvious anti-inflammatory *Oroxylum indicum* has been found to provide the relief inflammation induced in the paws of rats against carrageenan induced rat paw oedema. The aqueous and alcoholic extracts of *Oroxylum indicum* were found to have significant anti-inflammatory activity [26, 27].

4. *Premna integrifolia* L. (*Agnimantha*)

Premna integrifolia Linn. belongs to family Verbenaceae and an important woody, medicinal plant is growing near western sea coast from Bombay to Molucca, Malaysia, Sri Lanka, Andaman and Nicobar. It is also found in forest of South India and West Bengal (Northern part). Moreover, it is also recorded as occurring in the plains of Maharashtra, Gujarat, North Karnataka, Assam, Khasi hills and Tarai.

Roots are bitter, pungent, heating, laxative, used in anaemia, fever, neuralgia and neurological disorders, inflammations, as cardio-tonic, carminative, digestive, stomachic, tonic [28].

Ethanol extract of leaves of *P. integrifolia* has analgesic activity and evaluated by using acetic acid induced writhing model in mice. The extract produced 52.17% acetic acid induced writhing inhibition in mice at a dose of 500 mg/kg body weight, which is comparable to standard anti-analgesic and anti-inflammatory drug the diclofenac sodium 65.21% at the dose of 25 mg/kg

body weight [29]. Analgesic activity was also evaluated using methanolic extract of *Premna integrifolia* (MEPI) bark by writhing test in rats [30].

Anti-inflammatory activity was observed in methanolic extract of *Premna integrifolia* (MEPI) bark by using carrageenan and other induced inflammatory model in rats/mice [31-37].

5. *Stereospermum suaveolens* DC. (*Patala*)

Stereospermum suaveolens DC is deciduous trees of Bignoniaceae family, indigenous to Southern and Central India.

Root and root bark is useful in *Vata* imbalance disorders, used for blood detoxification, hiccups, vomiting, oedema, inflammation and helps to relieve pain, to improve lactation in mother also [38].

Ethanol extract from the stem bark of *Stereospermum suaveolens* given orally at the doses of 200 and 400 mg/kg body weight, was assessed for analgesic and antipyretic properties on different experimental animal models and results showed that the ethanol extract from the stem bark of *Stereospermum suaveolens* (EES) possesses potent analgesic and antipyretic activity by dose-dependent manner [39].

The Aqueous extract of Root Bark of *Stereospermum suaveolens* DC showed significant anti-inflammatory activity against carrageenan induced paw oedema in rats [40]. EES of bark possesses maximum anti-inflammatory activity in a dose-dependent manner, in various experimental models [41].

6. *Uraria picta* (Jacq.) Desv. (*Prishniparni*)

Uraria picta DC. is a perennial herb belonging to family Fabaceae and widely distributed throughout India, Australia, Africa and all most all parts of Asia.

The plant is used for the treatment of heart trouble and fractured bone. The root has aphrodisiac properties; decoction is prescribed for cough, chills and fevers. Leaves are considered antiseptic and used in gonorrhoea. Pods are useful in sore-mouth of children. Roots and leaves are used for typhoid and tetanus [42].

U. picta Desv root aqueous extract significantly reduced acute and sub-acute inflammation, and showed effective and similar anti-inflammatory activity in rats [43].

Uraria picta root content flavonoid is known to exhibit a range of biological activities like antiinflammatory, anti-thrombotic, hepatoprotective properties due to its free radical scavenging ability. The activity elicited by the extract might be due to its ability to activate antioxidant enzymes [44].

Uraria picta root decoction is useful in cough, chills and fevers. Main contents of herbal plant *Uraria picta* is flavonoid, steroid are known to exhibit a range of biological activities like antiinflammatory, antianxiety, anti depressant properties also [45].

7. *Desmodium gangeticum* (L.) DC. (*Shalparni*)

Desmodium gangeticum (DG), a perennial shrub grows 2-4 feet high and is slender, diffusely branched and irregularly angled from the Fabaceae family. Plant

distributed 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.

Plant is Carminative, Rejuvenative, Aphrodisiac, used in fevers, oedema, kidney disorders and post-delivery complications. Roots have febrifuge, expectorant, diuretic properties. Root is anti-dysenteric, anti-diarrhoeal and galactagogue [46].

Aqueous extract of *Desmodium gangeticum* showed pronounced analgesic activity in the acetic acid induced abdominal writhing assay in the test animals [47].

The water decoction of root and aerial parts of *Desmodium gangeticum* was observed for anti-inflammatory and anti-nociceptive activity in experimental animals [48].

The hexane extract of root of *Desmodium gangeticum* showed significant anti-inflammatory effect both in exudative and proliferative phase of inflammation and also showed analgesic effect of the compound was significantly more prolonged in a dose of 100 mg/kg in comparison to Analgin in a dose of 500 mg/kg [49].

From the pharmacological activities reported so far, it is quite clear that plant primarily possesses good antioxidant properties, which facilitates its action as an anti-inflammatory, analgesic, anti-nociceptive, cardio-protective, anti-amnesic, antidiabetic, gastroprotective and antimicrobial [50].

8. *Solanum indicum* Linn. Syn. *Solanum anguivi* Lam. (*Vrihati*)

Solanum indicum Linn. Family Solanaceae a spiny herb, found throughout the warmer parts of Nepal and India, up to an elevation of 1,500 m.

The root is bitter pungent, heating, digestive, astringent to the bowels anthelmintic, removes foulness of the mouth, beneficial in cardiac troubles, useful in leucoderma, fever, asthma, pain bronchitis, vomiting, pruritus [51].

The fruit extract of *Solanum indicum* Linn. indeed possesses significant analgesic, antipyretic, anti-inflammatory and CNS depressant activity as depicted in the animal model [52].

Solanum anguivi Lam. exert their antiurolithiatic effect with multidimensional pharmacological actions as angiotensin converting enzyme inhibition, analgesic, antiinflammatory, antioxidant, antispasmodic, astringent, crystallization inhibition, diuretic, demulcent; litholytic, lithotriptic, Phospholipase A2 inhibition and by changing the ions concentrations in urine such as increase magnesium and citrate excretion e.g., decreasing the calcium and oxalates [53].

9. *Solanum xanthocarpum* Schrad and Wendl. (*Kantakari*)

Solanum xanthocarpum Syn. *Solanum surattense* is a very spiny diffused herb with a height of up to 1.2m. *Solanum xanthocarpum* Schrad and Wendl. (Solanaceae) is a prickly diffuse bright green perennial herb, commonly known as Yellow Berried Nightshade (*Kaṅṭakari*), woody at the base, 2-3 m height, found

throughout India,^[54,55] mostly in dry places as a weed on roadsides and waste lands^[56].

The dried fruit powder is used as an internal medicine and the oil extracted is used for external application in the treatment of leucoderma. Useful in cough, asthma, chronic rhinitis, dropsy, acute bronchitis and fever accompanied with chest affections. Stem, flowers and fruits are bitter and carminative. They are prescribed for relief in burning sensation in the feet accompanied by vesicular watery eruptions. Leaves are applied locally to relieve pain. The juice of berries is used in sore-throat. Like roots, seeds are also administered as an expectorant in asthma and cough. The plant is credited with diuretic properties and is used to cure dropsy ^[57].

Solanum surattense when used as an oral rinse showed considerable analgesic activity immediately after its usage. It can be thus safely used as an alternative emergency drug to relieve pulpal pain (pulpitis) in symptomatic patients ^[58].

In Ayurvedic text *S. xanthocarpum* fruits are recommended for the anti-inflammatory action and are also scientifically proved that extract of dried fruits of *S. xanthocarpum* possess anti-inflammatory activity in the acute phase ^[59,60].

Alkaloids have been found to be responsible for both analgesic and anti-inflammatory actions. In berries of *Solanum surattense*, highest amount of the flavonoid solasodine (5 g/kg) is present ^[61]. Flavonoids are known to interact with the cyclooxygenase system, so as to interfere with arachidonic acid synthesis and inhibit the production of prostaglandins which are involved in the late phase of acute inflammation and pain perception ^[62]. Methanolic extract of *Solanum surattense* leaf was found analgesic, anti-inflammatory and anxiolytic activities of in Swiss Albino mice model ^[63].

10. *Tribulus terrestris* Linn. (*Gokshura*)

Tribulus terrestris, belonging to family Zygophyllaceae, is of common occurrence in India ^[64]. *T. terrestris* (TT) is a well-patronized medicinal herb by Ayurvedic seers as well as by modern herbalists ^[65]. Plant is small prostrate, hirsute or silky hairy herb and found in waste land and dry habitats through the warmer region of India including west Rajasthan and Gujarat. The plant is used individually as a single therapeutic agent or as a prime or subordinate component of many compound formulations and food supplements ^[66,67].

Tribulus is used for kidney problems, including kidney stones, painful urination, a kidney disorder called Bright's disease, and as a "water pill" (diuretic) to increase urination; for skin disorders, including eczema (atopic dermatitis), psoriasis, and scabies; for male sexual problems, including erectile dysfunction (ED), involuntary release of semen without orgasm (spermatorrhea), and to increase sexual desire; for heart and circulatory system problems, including chest pain, high blood pressure, high cholesterol, and anaemia; for problems with digestion, including colic,

intestinal gas (flatulence), constipation, and to expel intestinal parasitic worms; for pain and swelling (inflammation) of the tissue lining the mouth (stomatitis) and sore throat; and for cancer, especially nose tumors ^[68].

Methanolic extract of plant at a dose of 100 mg/kg produced analgesic effect in male mice using formalin and tail flick test^[69]. Methanolic extract of *Tribulus terrestris* at dose 300 mg/kg has better anti arthritic activity in induced arthritic rats ^[70].

It has been specifically proven for anti-hypertensive, vasodilator, analgesic, anti-cholesterolemic, anti-cholinergic, anti-spasmodic, depressant, anti-arthritic, anti-inflammatory, aphrodisiac, antioxidant, diuretic, anti-bacterial, anti-tumor, hypoglycaemic, smooth and skeletal muscle relaxant activities on experimental animal models. Chloroform extract of the dried entire plant, administered intra peritoneally to mice showed analgesic effect ^[71,72].

The ethanolic extract of plant inhibits the expression of mediators related to inflammation and expression of inflammatory cytokines, which has a beneficial effect on various inflammatory conditions ^[73]. The methanolic extract of plant showed a dose-dependent inhibition of rat paw volume in carrageenan-induced inflammation in rats ^[74].

CONCLUSION

From the above observations it is perceived that *Dashamoola* in combined form has potential anti-inflammatory with analgesic effect as par reviewed of studies done which has been well documented by *Charaka* quite hundred years back. So far, the individual ingredients are concerned, it is also to say that all are having less or high potency of analgesic and anti-inflammatory actions. In Ayurveda, *Dashamoola* is a well established drug and commonly being prescribed also. It was an effect to evaluate/verify the analgesic & anti-inflammatory activities of *Dashamoola* as found "*Sothahara*" in Ayurveda. Since all these ingredients are "*Vatahara*" in nature. So, *Dashamoola* is safely used in both the conditions. However, it was observed that *Dashamoola* is a safe analgesic, anti-inflammatory along with anti-oedematous effects also. Further studies are essential to find out it's specific systematic action in the human being in future.

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REFERENCES

1. Sastri A. 1988. Rasaratna Samuchchaya of Sri Vagbhatacharya; 8thed. Chaukhamba Amara bharati Prakashan, Varanasi. pp. 95-98.
2. Sharma P.V., 2001. Dravyaguna - Vigyan. Vol. 2. Tiritiya Adhyay Hridiyadi Varga; Chaukhamba Prakashan; Varanasi.; pp. 221-222.
3. Gogte V. M., 2000. Ayurvedic Pharmacology and therapeutic uses of medicinal plants. In:

- Ramkrishnan S, editor. Dravyagunavidnyan. Mumbai: Bharatiya Vidya Bhavan; pp. 287-288.
4. Jabbar S, Khan M.T., Choudhuri M.S., Sil B.K., 2004. Bioactivity studies of the individual ingredients of the Dashamularishta. Pak J Pharm Sci.;17:9-17.
 5. Puranik G.V., Dhamankar P.V., 1964. Chapter 11 – Ayurvediya Aushadhee Pathasanyojana. In: Puranik GV, Dhamanskar PV, editors. Ayurvediya Aushadheekaran (Agam ani Pratyaksha) Part 2. 2nd ed. Mumbai: Dhootpapeshwar Publication; pp. 49-512.
 6. Niranjana A., Tiwari S.K., 2008. Phytochemical composition and antioxidant potential of *Desmodium gangeticum* (Linn.) DC. Nat Prod Res;7:35-39.
 7. Bose L.V., Varghese G.K., Habtemariam S. 2013. Identification of acteoside as the active antioxidant principle of *Premna serratifolia* root wood issues. Phytopharmacology; 4: 228-236.
 8. Parekar R.R., Bolegave S.S., Marathe P.A., Nirmala N. Rege N.N., 2015. Experimental evaluation of analgesic, anti-inflammatory and anti-platelet potential of *Dashamoola*. J Ayurveda Integr Med. 2015 Jan-Mar; 6(1): 11-18.
 9. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. Glossary of Indian Medicinal Plants. CSIR, New Delhi, pp. 8.
 10. Shankarananth V., Balakrishnan N., Suresh D., Sureshpandian G., Edwin E., Sheeja E., 2007. Fitoterapia, 78: 258-259.
 11. Rao Cb.V., Ojha S.K., Mehrotra S., Pushpangadan P., 2003. Acta Pharmaceutica Turcica, 45: 85-91.
 12. Gurulingappa H, Hallur MS, Yogesh J, Madhavi S, Bhat SV. Antiinflammatory assays of various extracts of medicinal plants. Indian J Pharm Sci 2002; 64: 498-500.
 13. Kaswala Rohith, Patel Vaibhav, Chakraborty Manodeep, Kamath Jagadish V., 2012. Phytochemical and Pharmacological profile of *Gmelina arborea*: An overview. International research journal of pharmacy; 3(2):61-64.
 14. Deepthi Pathala, Harini A., Dr. Hegde Prakash L. 2015. A Review on Gambhari (*Gmelina arborea* Roxb.) Journal of Pharmacognosy and Phytochemistry; 4(2): 127-132.
 15. Sharma P.V., 1981. Dravyaguna vigyana, Vol. II (Vegetable Drugs), Chaukhambha Bharati Academy, Varanasi; pp. 225-228.
 16. Parhi P.K., Pattanayak P., Mishra P., Pani M.K., 2011. An In-Vivo Study on Analgesic and Antipyretic Activity of Bark Extracts of *Gmelina arborea*. Inter J Pharm Sci Rev and Res.; 10(2): 78-81.
 17. Gangwar A., Ghosh A.K., Hoque M., Saxena V. 2013. Analgesic Activity of *Gmelina arborea* Roxb in Colony Bred Swiss Mice and Wister Rats. Inter J Pharmacog and Phytochem Res.; 5(1); 66-67.
 18. Yogesh A. Kulkarni, Ritesh Panjabi, Vishvas Patel, Aditi Tawade, Alok Gokhale. 2013. Effect of *Gmelina arborea* Roxb in experimentally induced inflammation and nociception; Journal of Ayurveda and Integrative Medicine. 2013;4(3)152-157.
 19. Barik B.R., Bhowmik A.K., Dey A.K., Patra A., Chatterjee A., 1992. Premnazole, an isoxazole alkaloid of *Premna integrifolia* and *Gmelina arborea* with anti-inflammatory activity. Fitoterapia 1992; 63:295-299.
 20. Kulkarni Y.A., Panjabi R., Patel V., Tawade A., Gokhale A., 2013. Effect of *Gmelina arborea* Roxb in experimentally induced inflammation and nociception. J Ayurveda Integr Med.; 4:152-157.
 21. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. Glossary of Indian Medicinal Plants. CSIR, New Delhi, pp. 126.
 22. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. Glossary of Indian Medicinal Plants. CSIR, New Delhi, pp. 182.
 23. Lalrinzuali K., Vabeiryureilai M., and Jagetia G.C., 2016. Investigation of the Anti-Inflammatory and Analgesic Activities of Ethanol Extract of Stem Bark of *Sonapatha Oroxyllum indicum* In Vivo, International Journal of Inflammation Volume 2016, 1-8 pages.
 24. Zaveri Maitreyi and Jain Sunita, 2010. Anti-inflammatory and analgesic activity of root bark of *Oroxylum indicum* Vent. Journal of Global Pharma Technology; 2(4):79-87.
 25. Upaganlawar A., Tenpe C.R., Yeole Y.G., 2009. Anti-inflammatory activity of aqueous extract of *Oroxylum indicum* Vent. Leaves extract-preliminary study. Pharmacologyonline; 1: 22-26.
 26. Laupattarakasem P., Houghton P.J., Hoult J.R., Itharat A., 2003. An evaluation of the activity related to inflammation of four plants used in Thailand to treat arthritis. Journal of Ethnopharmacology; 85(2-3): 207- 15.
 27. Ahad A., Ganai A.A., Sareer O., Najm M.Z., Kausar M.A., Mohd M., Siddiqui W.A., 2012. Therapeutic Potential of *Oroxylum Indicum*: A Review: Journal of Pharmaceutical Research and Opinion 2: 10 (2012) 163- 172.
 28. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. Glossary of Indian Medicinal Plants. CSIR, New Delhi, pp. 203.
 29. Kumar K.U., Soma P., Kumar S.S., Chandra S.M., Kumar B.S., 2011. Assessment of analgesic and antibacterial activity of *Premna integrifolia* Linn. (Family: *Verbenaceae*) leaves. Int. J. Pharm. Sci. Res.;2:1430-1435.
 30. Khatun H., Majumder R., Mamun A., Alam E.K., Jami S.I., Alam B., 2014. Preliminary pharmacological activity of the methanolic extract of *Premna integrifolia* barks in rats. Avicenna J Phytomed.; 4: 215-224.
 31. Barik B.R., Bhowmik A.K., Dey A.K., Patra A., Chatterjee A., Joy S., 1992. Premnazole, an isoxazole alkaloid of *Premna integrifolia* and *Gmelina arborea* with anti-inflammatory activity. Fitote.; 63: 295-299.

32. Rathore R.S., Prakash A., Singh P.P., 1997. Preliminary study of anti-inflammatory and anti-arthritic activity. *Rheumatism.*; 12: 130.
33. Sasidharan N. Peechi, 2010. Qualitative and quantitative analysis of biologically active principles, baicalein, luteolin and psoralen from *Oroxylum indicum*, *Premna serratifolia*, *Aegle marmelos* and their Allied Species. KFRI Research Report No. 350 (KFRI/486/05), Kerala Forest Research Institute; pp. 1-57.
34. Singh C.R., Nelson P., Boopathy S., 2012. *In-vitro* conservation and protective effect of *Premna serratifolia* Linn. - An important medicinal tree. *Int J Pharm Appl.*; 3: 332-343.
35. Gokani R.H., Lahiri S.K., Santani D.D., Shah M.B., 2011. Evaluation of anti-inflammatory and antioxidant activity of *Premna integrifolia* root. [Last accessed on 2016 March 02]; *J Complement Integr Med.* 2011 8 Available from <http://www.degruyter.com/view/j/jcim.2011.8.issue1/jcim.2011.8.1.1216/jcim.2011.8.1.1216.xml?format=INT>, DOI:10.2202/1553-3840.1216.
36. Prashant Y. Mali., 2016. Pharmacological potentials of *Premna integrifolia* L. *Anc Sci Life.* 2016 Jan-Mar; 35(3): 132-142.
37. Khatun H., Majumder R., Mamun Al., Alam E.K., Jami S.I., Alam B., 2014. Preliminary pharmacological activity of the methanolic extract of *Premna integrifolia* barks in rats; *Avicenna J. Phytomed.* 2014 May-Jun; 4(3): 215-224.
38. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. *Glossary of Indian Medicinal Plants.* CSIR, New Delhi, pp. 234.
39. Mpharm T.B., Kumar C.T.; 2010. Analgesic and antipyretic activities of ethanol extract of *Stereospermum suaveolens*. *J Diet Suppl.* 2010 Jun; 7(2):104-116.
40. Kharat Usha, Chanshetti Rahul, Chavan Vaishali, Naik Yashaswini And Date Namrata; 2012. Evaluation of anti-inflammatory potential of aqueous extract of root bark of *stereospermum suaveolens* dc. *Int J Pharm Pharm Sci*, Vol 4, Suppl 3, 494-496.
41. Balasubramanian T., Chatterjee T. K., Sarkar M. & Meena S.L.. 2010. Anti-inflammatory effect of *Stereospermum suaveolens* ethanol extract in rats *Pharmaceutical Biology*, Volume 48 (3), pages 318-323.
42. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. *Glossary of Indian Medicinal Plants.* CSIR, New Delhi, pp. 250.
43. Ghildiyal Shivani, Gautam M.K., Joshi V.K., and . Goel R. K. 2013. Anti-inflammatory activity of two classical formulations of *Laghupanchamula* in rats. *J Ayurveda Integr Med.* 2013 Jan-Mar; 4(1): 23-27.
44. Kale R. H., Halde U. K., Biyani K. R., 2012. Protective Effect of Aqueous Extract of *Uraria Picta* on Acetaminophen Induced Nephrotoxicity in Rats. *International Journal of Research in Pharmaceutical and Biomedical Sciences*, Vol. 3 (1) Jan - Mar 2012, pp-110-113.
45. Garg N., Garg M., Maan A.S., Sandhu B.S., Mittal S., Goyal S., 2012. Phytochemical Studies and Anti Anxiet Activity of *Uraria Picta* Leaves. *Journal of Pharmaceutical Research and Opinion* 2 (5): pp 39 - 40.
46. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. *Glossary of Indian Medicinal Plants.* CSIR, New Delhi, pp. 94.
47. Jabbar S., Khan M.T., Choudhari M.S., 2001. The effect of aqueous extract of *Desmodium gangeticum* DC (Leguminosae) on the central nervous system, *Pharmazie* 56: 506-508.
48. Rathi A., Rao Ch.V., Ravishankar B., De S., Mehrotra S., 2004. Anti-inflammatory and anti-nociceptive activity of the water decoction *Desmodium gangeticum*. *J Ethnopharmacol.* 2004 Dec; 95(2-3): 259-263.
49. Ghosh D., Anandakumar A., 1983. Anti-inflammatory and analgesic activities of gangetin - A pterocarpenoid from *Desmodium gangeticum*. *Ind. J. Pharmac*, 15 (4): 391-402.
50. Ganju R.K., Mudgal, P.P., Arun kumar, G., 2014. Pharmacological and Phytoconstituent Profile of *Desmodium Gangeticum*-An Update. *International Journal of Pharmacognosy and Phytochemical Research*; 6(3): 643-657.
51. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. *Glossary of Indian Medicinal Plants.* CSIR, New Delhi, pp. 229.
52. Deb P.K., Ghosh R., Chakraverty R., Debnath R., Das L., Bhakta T., 2014. Phytochemical and Pharmacological Evaluation of Fruits of *Solanum indicum* Linn. *Int. J. Pharm. Sci. Rev. Res.*, 25(2), Mar - Apr 2014; Article No. 06, Pages: 28-32.
53. Ahmed S., Hasan M.M., Mahmood Z.A.. 2016. Antiuro lithiatic plants: Multidimensional pharmacology. *Journal of Pharmacognosy and Phytochemistry*; 5(2): 04-24.
54. Sharma P.C., Yelne M.B., Dennis T.J., 2001. *Database on medicinal plants used in Ayurveda*; Vol. 4. New Delhi: C.C.R.A.S., Dept of ISM and H, Ministry of Health and Family Welfare, Govt of India; pp. 269-287.
55. Pardhi P., Jain P.A., Ganeshpurkar A., Rai G., 2010. Anti-microbial, anti-oxidant and anthelmintic activity of crude extract of *Solanum xanthocarpum*. *Pharmacogn J*; 2: 400-404.
56. Roshy J.C., Ilanchezhian R., Patgiri B.J., 2012. Therapeutic potentials of kantakari (*Solanum xanthocarpum* Schrad. and Wendl.) *Ayurpharm Int J Ayur Alli Sci*; 1:46-53.
57. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. *Glossary of Indian Medicinal Plants.* CSIR, New Delhi, pp. 230.

58. Vijay Amirtharaj L., Srinivasan N., Sireesha Abburi, Karthikeyan K. and Mahalaxmi S. 2015. Evaluating the Analgesic Efficacy of *Solanum surattense* (Herbal Seed Extract) in Relieving Pulpal Pain – An In-vivo Study. *Dentistry*; 5:4; pp 1-3.
59. Anwikar S., Bhitre M. 2010. Study of the synergistic anti-inflammatory activity of *Solanum xanthocarpum* Schrad and Wendl and *Cassia fistula* Linn. *Int J Ayurveda Res.* Vol. 1:167–171.
60. More S.K., Lande A.A., Jagdale P.G., Adkar P.P., and Ambavade S.D. 2013. Evaluation of anti-inflammatory activity of *Solanum xanthocarpum* Schrad and Wendl (*Kañṭakāri*) extract in laboratory animals. *Anc Sci Life*. 2013 Apr-Jun; 32(4): 222–226.
61. Gawande A., Wankhade S., Shankhopal K.V., Shinde G.B., 1991. Isolation, purification and characterization of solasodine – A Steroidal alkaloid from *Solanum surattense* berries. *Indian Drugs* 28: 149-150.
62. Dubois R.N., Abramson S.B., Crofford L., Gupta R.A., Simon L.S., 1998. Cyclooxygenase in biology and disease. *FASEB J* 12: 1063-1073.
63. Huque A., Biswas Sujit, Md. Abdullah-Al-Mamun, Bhuiyan J. R., Rashid Md. H., Jahan A., 2015. Analgesic, Anti-Inflammatory and Anxiolytic Activity Evaluation of Methanolic Extract of *Solanum Surattense* Leaf in Swiss Albino Mice Model. *International Journal of Pharmaceutical and Clinical Research* 2015; 7(1): 68-76.
64. Trease G.E., Evans W.C. 2002. *Pharmacognosy. A taxonomic approach to the study of medicinal plants and animal derived drugs*; 15th ed. Singapore: Harcourt Brace and Company Asia Pvt. Ltd; p. 27.
65. Duke J., Duke P.K., Cellier J.L. 2002. *Duke Handbook of medicinal herbs*; 2nd edn. United States: CRC Press; p. 595.
66. Nadkarni K.M. 1927. *Indian Materia Medica*; Mumbai: Popular Prakashan; pp. 1230–1231.
67. *The wealth of India. Raw materials*. 1972. CSIR Publications and Information Directorate, New Delhi Vol. 9: p. 472.
68. Chopra R. N., Nayar S.L. and Chopra I.C., 1956. *Glossary of Indian Medicinal Plants*. CSIR, New Delhi, pp. 247.
69. Heidari M.R., Mehrabani M., Pardakhty A., Khazaeli P., Zahedi M.J., Yakhchali M. 2007. The analgesic effect of *Tribulus terrestris* extract and comparison of gastric ulcerogenicity of the extract with indomethacine in animal experiments. *Ann N Y Acad Sci.*; 1095:418–427.
70. Mishra N.K., Biswal G.S., Chowdary K.A., Mishra G. 2013. Anti-arthritis activity of *Tribulus terrestris* studied in Freund's Adjuvant induced arthritic rats. *J Pharm Educ Res*; 4(1): 41-46.
71. Evan W.C. 2005. *Trease and Evans Pharmacognosy*. 15 ed. India; Saunder: pp.43.
72. Lubna Fatima, Arshiya Sultana, Saad Ahmed and Shabiya Sultana, 2015. Pharmacological activities of *Tribulus terrestris* linn: a systemic review. *World journal of pharmacy and pharmaceutical sciences*, Volume 4, Issue 02, 136-150.
73. Oh J.S., Baik S.H., Ahn E.K., Jeong W., Hong S.S. 2012. Anti-inflammatory activity of *Tribulus terrestris* in RAW264.7 Cells. *J Immunol*. 88: 54.2.
74. Baburao B., Rajyalakshmi G., Venkatesham A., Kiran G., Shyamsunder A., Gangarao B. 2009. Anti-inflammatory and antimicrobial Activities of methanolic extract of *Tribulus terrestris* linn plant. *Int J Chem Sci*. 7:1867–1872.

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