



INDO AMERICAN JOURNAL OF PHARMACEUTICAL RESEARCH



AN OVERVIEW OF THE SIDDHA POLYHERBAL FORMULATION - ATHIMADHURA CHOORANAM FOR MIGRAINE HEADACHE

Mathipriya T¹, Kasirajan N², Maanickha Chelvi KS²

¹Siddha physician, Sankarankovil, Tamilnadu.

²Siddha Regional Research Institute, Thiruvananthapuram.

ARTICLE INFO

Article history

Received 14/03/2018

Available online

31/03/2018

Keywords

Siddha Herbs,
Migraine Headache And
Anti Inflammatory Activity.

ABSTRACT

The Siddha system of medicine is one of the ancient and primitive medical systems. The major strength of this Siddha system is its ease handiest, wide accessibility, naturalness of the products and cost effective. Siddha medicine has specialized therapeutic procedures for rejuvenation, health promotion and prevention. "Siddha Materia Medica" (Medicinal Plants Division) illustrates a safer and more potent poly herbal formulation "Athimadhura Chooranam" (AMC) comprised of three herbal ingredients such as *Glycyrrhiza glabra*, *Pimpinella anisum* and root bark of *Plumbago zeylanica*. This formulation is very effective an anti-inflammatory and analgesic. The aim of this systematic review of the literature was to summarize the literature on the safety and anti inflammatory and analgesic activity of the above herbs. Textbooks on medicinal plants, research papers and their bibliographies were also searched. These included studies on the anti-pyretic, anti-allergic, anti-bacterial, anti-viral, anti-hepatotoxic, anti-tussive & expectorant, antioxidant activity, etc, and also phyto compounds were identified. Conclusion of this review validates that all ingredients of AMC have anti inflammatory and analgesic activity based on research papers and Siddha literature.

Corresponding author

Dr. N. Kasirajan

Research Associate (Siddha)

Siddha Regional Research Institute

Poojappura, Thiruvananthapuram, India.

dr.kasibsms@gmail.com

Please cite this article in press as **N. Kasirajan et al.** An Overview of the Siddha Polyherbal Formulation - Athimadhura Chooranam for Migraine Headache. *Indo American Journal of Pharmaceutical Research*.2018;8(03).

INTRODUCTION

Migraine is a common, chronic, neurological disorder, characterized by recurrent unilateral headache and some people have experience an aura involving neurologic symptoms. The pathophysiology of migraine headache was caused by inflammation of blood vessels. Recommended initial treatment for those with mild to moderate symptoms are simple analgesics such as non-steroidal anti-inflammatory drugs (NSAIDs)^[1]. In worldwide Nonsteroidal anti-inflammatory drugs (NSAIDs) are used for the treatment of arthritis, headache, joint and muscle disorders etc., Migraine headache also mainly treated by NSAIDs. NSAIDs is actively like excellent anti-inflammatory, analgesic and antipyretic. But chronic users of non-steroidal anti-inflammatory drugs often result in gastric irritation, renal perfusion, cardiovascular disorder, damage the central nervous system, etc.^[2,3]. Traditional Siddha system of medicine provides many anti-inflammatory drugs and avoids such above side effects. Making into account, we select a polyherbal formulation – Athimadhura chooranam (AMC) which has a literature background that has already been narrated in Siddha Materia Medica (Medicinal Plants Division-Murugesha Mudhaliyar). This formulation comprised of three plants viz: Athimadhuram (*Glycyrrhiza glabra* Linn.), Sombu (*Pimpinella anisum* Linn.) and Kodiveli verpattai (Root bark of *Plumbago zeylanica* Linn.). This formulation of medicine act against migraine headache and fever^[4]. Many researches in-vitro, in-vivo clinical studies have already been done on these plants and we focused on the positive safety profile of this formulation.

MATERIALS AND METHODS

This review article pertain bibliographic search and other pharmacological activities of the ingredients of AMC have been collected from published papers available at online. A focused collection has been made to evaluate the anti inflammatory, analgesic activities of *Glycyrrhiza glabra*, *Pimpinella anisum* and *Plumbago zeylanica*, cyclooxygenase inhibitor. The major mechanism of action of NSAIDs in Migraine headache is the inhibition of cyclooxygenase^[5]. This review also analysis the various in-vitro and in-vivo studies of ingredients of AMC.

RESEARCH STATUS OF THE PROPOSED HERBS

Glycyrrhiza glabra Linn.

It is a perennial herb with underground stems growing up to a height of 1m. It is distributed in the sub-tropical and warm temperate regions of the world. In India, it is reported to be cultivated in Baramulla, Srinagar, Jammu, Dehra Dun, Delhi and South India. It belongs to the family Fabaceae. It is also known as Liurice in English and Athimadhuram in Tamil as Common Southern Indian Name. Roots and rhizomes are the parts commonly used in this plant. The main chemical constituent of licorice is glycyrrhizin (about 2 - 9 %), a triterpene saponin with low hemolytic index. Glycyrrhetic (glycyrrhetic) acid (0.5 - 0.9 %), the aglycone of glycyrrhizin is also present in the root. Other active constituents of licorice include isoflavonoids, chalcones, coumarins, triterpenoids and sterols, lignans, amino acids, amines, gums and volatile oils^[6]. Licorice is known to exhibit many pharmacological actions, including anti-inflammatory, analgesic, anti-pyretic, anti-allergic, anti-bacterial, anti-viral, anti-hepatotoxic, anti-convulsive and anticancer. Licorice also has Anti-tussive & expectorant activity, Antioxidant activity, Skin lightening and skin tightening activity, Anticoagulant, Hair growth stimulatory activity, Anti diabetic activity, Immunostimulatory effects. Licorice root extract, glycyrrhetic acid gives anti-inflammatory action similar to glucocorticoids and mineralocorticoids^[7]. Dexamethasone (Corticosteroids) is very effective in preventing recurrent headache and standard treatment for the migraine headache^[8]. Prolonged treatment with dexamethasone upregulates the inhibitor 11-(beta)-hydroxysteroid dehydrogenase^[9]. In humans, after oral administration of *Glycyrrhiza glabra*, the main constituent of licorice, glycyrrhizic acid is hydrolyzed to glycyrrhetic acid by intestinal bacteria possessing a specialized (beta)-glucuronidase. Glycyrrhetic acid is 200-1,000 times more potent inhibitor of 11 β -HSD which is involved in corticosteroid metabolism^[10]. In vitro studies on glycyrrhizic acid inhibits the inflammatory process. It inhibits the cyclooxygenase activity and prostaglandin formation (specifically prostaglandin E2), which is play a key role in the generation of the inflammatory response as well as indirectly inhibiting platelet aggregation^[5,11,12,13]. Glycyrrhizin, a triterpene glycoside isolated from the root of licorice, and administered to the lipopolysaccharide (LPS) -induced mastitis in mice. This in vivo study showed glycyrrhizin had a protective effect on LPS -induced mastitis in mice and reported to have anti-inflammatory activities^[14]. Indian licorice (*G.glabra*) is one of the ingredients in Siddha medicine Aswathy chooranam. The prepared medicine was subject to in-vitro Cox inhibitor studies using THP-1 Cell line. And this study shows the result as the medicine Aswathy chooranam and that ingredient *G.glabra* has Anti-inflammatory properties.

The test drug, along with its efficacy in lowering Tissue nitrite levels, thereby increasing Oxy-hemoglobin in the blood circulation^[15]. The Comparative study of effectiveness of *Glycyrrhiza glabra* vs. omeprazole and misoprostol for the treatment of aspirin-induced gastric ulcers shows that *Glycyrrhiza glabra* can be used in NSAID-induced gastric ulcer as an alternative to omeprazole and misoprostol^[16]. In vitro and In vivo study of Isoliquiritigenin, a Flavone from root of *G.glabra* shows the result of analgesic and uterine relaxant effects in dysmenorrhea^[17]. The aqueous root extract of *G.glabra* has intensified cognitive activity such as memory, language, perception, judgment and reasoning. Roots of *G.glabra* also possess antipyretic, antihyper, sedative and anxiolytic activities^[18]. Glycyrrhizin has hepatoprotective activity and In Japan it has been intravenously used for the treatment of chronic hepatitis B and improves liver function. In vitro studies have indicated that glycyrrhizin improves the intracellular transport and suppresses hepatitis B virus (HBV) surface antigen (HbsAg). Influenza-A H1N1 virus has developed the ability to cross pig to human's barrier and has spread widely amongst humans. Polysaccharide fractions from *Glycyrrhiza glabra* stimulate macrophages and hence elevate and assist immune stimulation. In vitro glycyrrhizin analog N-acetylmuramoyl peptide (MDP) having potential immune stimulating properties and its efficacy against the influenza virus that is mediated by stopping the virus replication showed in vivo. It inhibits virus growth and inactivates virus particles^[19].

The licorice powder and extract can be used to treat sore throat, cough and bronchial catarrh. Glycyrrhizin is responsible for demulcent action of licorice. In vivo study with mice showed the result that, Ethanolic extract of *G. glabra* was found to be responsible for inhibition of 35.62% SO₂ gas induced cough. Licorice flavonoids have strongest antioxidant activity. Ju, H.S. reported that licorice flavonoids are 100 times stronger than that of antioxidant activity of vitamin E. hydro-methanol extract from the root of *Glycyrrhiza glabra*, has potent antibacterial activity. In vivo studies against malarial parasite (*P. yoelii*) with oral doses of 1000 mg kg⁻¹ have shown to eradicate that parasite completely. Antihyperglycemic activity of root extract of licorice in albino mice had shown the result of anti-lipidemic and antihyperglycemic activity at low doses. Comparative studies between licorice root extract and Minoxidil 2% showed better hair growth stimulator activity than 2% Minoxidil. It can give better results while used in herbal formulations in the treatment of various types of Alopecia^[7]. Glycyrrhizin, 18 β glycyrrhetic acid and Liquiritigenin from licorice has anti-allergic activity which can relieve IgE induced such as asthma and dermatitis. (Kumar Anil et al) Traditionally Licorice decoction or powder with honey prescribed for anemia^[20]. Hot flash at menopausal age is not life threatening. But it causes discomfort and affecting daily living activities. At Shahid Beheshti Medical University in 2010, a double blind clinical trial was conducted to determine the effects of licorice root. 90 postmenopausal women were examined. In this study, consumption of 3 capsules of Licorice extract (each capsule contains 110 mg of extract) for 4 weeks leads to significant reduction in hot flash frequency and intensity and in postmenopausal women^[21].

***Pimpinella anisum* Linn.**

It belongs to the family Umbelliferae (Apiaceae), is an aromatic plant known as anise or aniseed. The most used part is seeds. It is an annual grassy herb attaining 30–50 cm height with white flowers and small green to yellow seeds which is harvested in August and September^[22]. It is reported to be cultivated in Uttar Pradesh., Punjab, Assam and Orissa. The fruit gave volatile oil consisting mainly of *trans*-anethole (70 – 90 %), with estragole, anise ketone, anisic acid, beta-caryophyllene, anisaldehyde, linalool. The fruit contained traces of furocoumarins; seeds gave benzoic acid, caffeic acid, containing protein and myristicin. Roots afforded sterols, coumarins and flavone glycosides. Aniseed has been demonstrated to increase the mucociliary transport *in vitro* and to significantly increase liver-regeneration in rats^[6]. The aromatic Anise aetheroleum oil is prepared from *Pimpinella anisum*. This oil is used as analgesic in migraine and also as carminative, aromatic, disinfectant and diuretic in traditional medicine^[23]. Screening for the analgesic activity study showed that extracts from *Pimpinella anisum* has exhibited significant analgesic activity of benzoquinone. In a study by Tas, essential oil of *Pimpinella anisum* showed a significant analgesic effect similar to morphine and aspirin^[22]. Another study for fixed oil of *P. anisum* in mice showed that analgesic and anti inflammatory activity more than etodolac as strong as Indomethacin. This analgesic effect is comparable to that of 100 mg/kg aspirin and 10mg/kg morphine. Combination of essential and fixed oil of *P. anisum* acts on the nervous system as analgesic and essential oil acts against morphine induced nervous disorders^[24]. Comparative study an analgesic effect of anise oil with Paracetamol showed the results, that essential oil in higher doses was significantly more effective than fixed oil^[25]. Aqueous extract from anise administered to rats, which is produced by gastric ulceration. This study showed that Anise aqueous suspension possesses significant cytoprotective and anti-ulcer activity against experimentally-induced gastric lesion. The Gastroprotective activity of anise suspension act against NSAID-induced gastric ulcers^[26]. Aniseed alcoholic extracts and oil exerted a relaxing effect on *in vitro* pre-contracted smooth muscles from different organs (tracheal and ileal) by antagonizing several contractions-inducing agents. Van Dongen and Leusink, 1953 described a method to study the ciliary movements of the air passage and to study expectorant activity of anise oil. In cats, 2 drops of anise oil administered intragastrically. It caused hypersecretion of mucus, in the air passages and stimulated ciliary removal of mucus^[27]. Anticonvulsant effects of an essential oil of the fruits of *Pimpinella anisum* were studied in male mice. This study showed the results that *P. anisum* increases the verge of clonic seizures induced by i.v. infusion of PTZ, and it can also block tonic convulsions induced by i.p. injection of PTZ. Moreover, *P. anisum* possesses anticonvulsant activity against tonic seizures induced by MES. Anise seed essential oil reduces the volume of urine by increased activity of the renal Na⁺-K⁺-ATPase^[22]. Comparative studies of both aniseeds and coriander seeds showed the results of decreased blood sugar level. But not brought down below normal, so the seeds are antihyperglycemic. The seeds also decreased serum lipids, lipoproteins and improved HDL as a result of the hypolipidemic activity^[28]. Other pharmacological activities antibacterial, antiviral, antifungal, hepatoprotectivity, antioxidant effects were documented. Clinically anise oil has effects of constipation, dysmenorrhea, nausea and obesity^[22,23].

***Plumbago zeylanica* Linn.**

Plumbago zeylanica L. is a semi climbing sub shrub. It comes under the family of Plumbaginaceae. It is cultivated in gardens throughout India; also found wild in Peninsular India. It is commonly known as Ceylon Leadwort, Leadwort in English and Chittramoolam, Kodiveli in Tamil. *P. zeylanica* contains a variety of important chemical compounds^[6]. The major chemical constituents of *P. zeylanica* are naphthoquinone derivatives Plumbagin yielded from the root. Both *P. indica* and *P. zeylanica* contain about 0.9% plumbagin. It's present in whole parts of the plant. Various parts of the plant possess naphthaquinones, alkaloids, glycosides, steroids, triterpenoids, tannins, phenolic compounds, flavanoids, saponins, coumarins, carbohydrates, fixed oil and fats and proteins^[29]. The hydroalcoholic extract of the root bark of *P. zeylanica* has shown the presence of Plumbagin, Phytosterol and Polyphenol. These are all having anti-inflammatory and moderate analgesic activity. In vivo study by Thanigavelan, hydroalcoholic extract (single dose of 350 mg/kg b.wt and 250 mg/kg b.wt dose for 45 days) administered to paw edema in the rat which is induced by Carrageenan injection. This study has shown the results that a hydroalcoholic extract of the root bark of *P. zeylanica* act against inflammatory process. The mechanism of this extract might be due to prostaglandin inhibition. In another study, Analgesic effect was determined by using a hot plate and tail immersion in rats. In this study hydroalcoholic extract has shown analgesic activity as strong as Paracetamol^[30]. Root of *P. zeylanica* is useful in the treatment of Migraine.

The root of this plant is mixed with sesame oil known as Chitramoola ennai is used in treating migraine and all types of headache on using as oil bathing^[31]. From the root of *P.zeylanica*, the methanol extract and pure compound 3 β -hydroxylup-20(29)-ene-27, 28-dioic acid (PZP) were isolated and both have anti-invasive and antitumor activity. In Indian system of medicine, the plant has been recommended for the treatment of various ailments such as dyspepsia, piles, diarrhea, skin diseases and used to increase digestive power and improve appetite. Ethno pharmacological studies revealed by many studies have indicated the effect of antidiarrheal activities, antiallergic, insecticidal, antidiabetic, hepatoprotective, hypolipidaemic, antibacterial, antifungal and antimicrobial activities^[32]. The wound healing activity of the ethanolic root extract of *Plumbagin Zeylanica* was found in Wistar rats^[33].

CONCLUSION

It is concluded that the poly herbal Siddha medicine *Athimadhura chooranam* which is being widely used by Practitioners of Siddha Medicine and Traditional Healers to treat Migraine headache by anti inflammatory and analgesic activities of those herbs. And it can prevent or cure the NSAIDs induced gastric ulcer. Pharmacological studies showed these results. This review clearly shows the Antiinflammatory and analgesic properties of *Athimadhura chooranam* and it can be used safely.

CONFLICT OF INTEREST:

There is no conflict of interest.

ABBREVIATIONS:

- | | |
|--|---------|
| 1. Athimadhura chooranam | – AMC |
| 2. Nonsteroidal anti-inflammatory drugs | – NSAID |
| 3. Hydroxysteroid dehydrogenase | – HSD |
| 4. Lipopolysaccharide | – LPS |
| 5. Hepatitis B virus | – HBV |
| 6. hHpatitis B virus (HBV) surface antigen | –HbsAg |
| 7. N-acetylmuramoyl peptide | – MDP |
| 8. Pentylenetetrazol | – PTZ |
| 9. Maximal Electroshock Seizure | – MES |
| 10. High Density Lipoprotein | – HDL |
| 11. 3 β -hydroxylup-20(29)-ene-27, 28-dioic acid | – PZP |

REFERENCES

1. Carolyn J. Hildreth, MD; Cassio Lynn, MA; Richard M. Glass, MD JAMA.2009;(24):2608. doi:10.1001/jama.301.24.2608 Migraine Headache.
2. Yun-Bi Lu, PhD Dept. of Pharmacology, School of Medicine, Zhejiang University yunbi@zju.edu.cn *Nonsteroidal Anti-Inflammatory Drugs* analgesic, anti-inflammation, antipyretic.
3. John F. Rothrock, MD Editor-in-Chief, *Headache* Director, Headache Treatment and Research Center University of Alabama Birmingham, AL, USA . Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) for Acute Migraine Treatment.
4. Murugesu Muthaliar, Siddha Materia Medica (Vegetable section), Publisher; Tamilnadu Siddha Medical Council, Chennai. Vol I, Fourth edition; 1988- 132,232,448.
5. Arpad Pardutz and Jean Schoenen NSAIDs in the Acute Treatment of Migraine: A Review of Clinical and Experimental Data 2010, 3, 1966-1987; doi:10.3390/ph3061966
6. C. P. Khare Indian Medicinal Plants. Springer. New Delhi (2008)
7. Monica Damle SVKM's Dr. Bhanuben Nanavati *Glycyrrhiza glabra* (Liquorice) - a potent medicinal herb IJHM - 2014; 2(2): 132-136
8. Amandeep Singh, MD, Harrison J. Alter, MS, MD, Brita Zaia, MD PROGRESSIVE CLINICAL PRACTICE Does the Addition of Dexamethasone to Standard Therapy for Acute Migraine Headache Decrease the Incidence of Recurrent Headache for Patients Treated in the Emergency Department? A Meta-analysis and Systematic Review of the Literature ACADEMIC EMERGENCY MEDICINE 2008; 15:1223–1233 a 2008 by the Society for Academic Emergency Medicine
9. Satoshi Suzuki, Kaori Koyama, Andrew Darnel, Hironori Ishibashi, Seiichi Kobayashi, Hiroshi Kubo, Takashi Suzuki, Hironobu Sasano, and Zygmund S. Krozowski Dexamethasone Upregulates 11 β -Hydroxysteroid Dehydrogenase Type 2 in BEAS-2B Cells Am J Respir Crit Care Med Vol 167. pp 1244–1249, 2003 DOI: 10.1164/rccm.200210-1139OC on February 5, 2003
10. Varsha Sharma, R. C. Agrawal *Glycyrrhiza Glabra*- A Plant For The Future Vol 2 Issue 3, July – Sep 2013
11. Kuma Anil, Dora Jyotsna Reviwe an *Glycyrrhiza glabra* (Liquorice) JPSI 1 (2) March – April 2012 1-4
12. Emanuela Ricciotti, PhD and Garret A. FitzGerald, MD. Prostaglandins and Inflammation Arterioscler Thromb Vasc Biol. 2011 May ; 31(5): 986–1000. doi:10.1161/ATVBAHA.110.207449
13. Okimasu E, Moromizato Y, Watanabe S, Sasaki J, Shiraishi N, Morimoto YM, Miyahara M, Utsumi K. Inhibition of phospholipase A2 and platelet aggregation by glycyrrhizin, an antiinflammation drug Acta Med Okayama, 1983 Oct;37(5):385-91.
14. Yunhe Fu, Ershun Zhou, Zhengkai Wei, Dejie Liang, Wei Wang, Tiancheng Wang, Mengyao Guo, Naisheng Zhang and Zhengtao Yang Glycyrrhizin inhibits the inflammatory response in mouse mammary epithelial cells and a mouse mastitis model doi:10.1111/febs.12801
15. A. Shifana Raheema, C. Aswini, M. Sathya, S. Merish and Thomas M. Walter *In-Vitro* Anti-Inflammatory Screening Of A Poly Herbal Siddha Medicine, “*Ashwathi Chooranam*” IJPSR, 2014; Vol. 5(10): 4395-4399E-ISSN: 0975-8232; P-ISSN: 2320-5148
16. Mesut Sancar1, Thaer Hantash1, Betul Okuyan1, Sule Apikoglu-Rabus1, Zeynep Cirakli2, Mine G. Gulluoglu3 and Fikret Vehbi Izzettin Comparative effectiveness of *Glycyrrhiza glabra* vs. omeprazole and misoprostol for the treatment of aspirin-induced gastric ulcers African Journal of Pharmacy and Pharmacology Vol. 3(12). pp. 615-620, December, 2009
17. Shi Y, Wu D, Sun Z, Yang J, Chai H, Tang L, Guo Y. Analgesic and uterine relaxant effects of isoliquiritigenin, a flavone from *Glycyrrhiza glabra* doi: 10.1002/ptr/3715
18. Kosuri Kalyan Chakravarthi, Ramakrishna Avadhani, Rao Sudharshanram Narayan Effect of *Glycyrrhiza glabra* Root Extract on Learning and Memory in Wistar Albino. Int J Biol Med Res. 2012 ; 3 (3) : 2059 – 2064
19. R. K. Harwansh, K. C. Patra1, S. K. Pareta1, J. Singh1, R. Biswas Pharmacological Studies on *Glycyrrhiza glabra*: A Review Pharmacologyonline 2: 1032-1038 (2011)
20. Asha Roshan, Navneet Kumar Verma, Chaudari Sunil Kumar, Vikash Chandra, Devendra Pratap Singh, Manoj Kumar Panday Phttochemical Constituent, Pharmacological Activities and Medicinal Uses Through the Millenia of *Glycyrrhiza glabra* Linn: A Review IRJP 2012, 3 (8) ISSN 2230 – 8407
21. Fatemeh Nahidi , Elham Zare, Faraz Mojab and Hamid Alavi-majd Effects of Licorice on Relief and Recurrence of Menopausal Hot Flashes ServicesIranian Journal of Pharmaceutical Research (2012), 11 (2): 541-548
22. Asie Shojaii and Mehri Abdollahi Fard Review of Pharmacological Properties and Chemical Constituents of *Pimpinella anisum* ISRN Pharmaceutics Volume 2012, Article ID 510795, 8 pages doi:10.5402/2012/510795
23. Khaled Mohamed Mohamed Koriem Approach to pharmacological and clinical applications of *Anisi aetheroleum* Asian Pac J Trop Biomed 2015; 5(1): 60-67
24. Tas A, Ozbek H, Atasoy N, Altug ME, Ceylan E. Evaluation of analgesic and antiinflammatory activity of *Pimpinella anisum* fixed oil extract. Indian Veterinary Journal, vol. 83, no. 8, pp. 840–843, 2006.
25. Jamshidzadeh A, Hamed A, Altalqi A, Najibi A Comparative Evaluation of Analgesic Activities of Aniseed Essential and Fixed Oils IJPRS/V3/11/00025 ISSN NO: 2277 – 7873
26. Ibrahim A Al Mofleh, Abdulqader A Alhaider, Jaber S Mossa, Mohammed O Al-Soohaibani, Syed Rafatullah Aqueous suspension of anise “*Pimpinella anisum*” protects rats against chemically induced gastric ulcers 2007 February 21; 13(7): 1112-1118 World Journal of Gastroenterology ISSN 1007-9327
27. Vittorio Silano, Gioacchino Calapai *Pimpinella anisum* L. (Aniseed And Anise Oil) European Medicines Agency Evaluation Of Medicines For Human Use London, 10 August 2006 Doc. Ref: EMEA/HMPC/137421/2006

28. Ullagaddi Rajeshwari, Iyer Shobha, Bondada Andallu Comparison of aniseeds and coriander seeds for antidiabetic, hypolipidemic and antioxidant activities Spatula DD. 2011; 1 (1):9-16
29. Manu Pant, Ankita Lal, Swati Rana, Anju Rani *Plumbago zeylanica* L.: A Mini Review International Journal Of Pharmaceutical Applications ISSN 0976-2639. Online ISSN 2278 – 6023 Vol 3, Issue 3, 2012, pp 399-405
30. Thanigavelan, Kaliyamurthi Venkatachalam, Lakshmanakumar Venkatachalam, Sasikala Natarajan, Pitchiah Kumar Murugan, Justus Antony Savarimuthu Hydroalcoholic Extract of *Plumbago Zeylanica* Linn root bark exhibit Analgesic and Anti-Inflammatory activities in Experimental Rat models AJPHR 2014, Volume 2, Issue 4 ISSN:2321–3647
31. Smita S. Chaudhari, G. S. Chaudhari A Review on *Plumbago zeylanica* Linn. - A Divine Medicinal Plant Int. J. Pharm. Sci. Rev. Res., 30(2), January – February 2015; Article No. 20, Pages: 119-127 ISSN 0976 – 044X
32. Kumar Ganesan, Sharmila Banu Gani Ethnomedical and Pharmacological Potentials of *Plumbago zeylanica* L- A Review AJPCT1[3][2013]313-337 ISSN 2321 – 2748
33. Ankita Sharma And Nimali Singh A Multifarious Potent Herb: *Plumbago Zeylanica* –A Mini Review International Journal of Recent Scientific Research Vol. 6, Issue, 6, pp.4825-4829, June, 2015 ISSN: 00976 – 3031.



54878478451180311



Submit your next manuscript to **IAJPR** and take advantage of:

Convenient online manuscript submission

Access Online first

Double blind peer review policy

International recognition

No space constraints or color figure charges

Immediate publication on acceptance

Inclusion in **Scopus** and other full-text repositories

Redistributing your research freely

Submit your manuscript at: editorinchief@iajpr.com

