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TINOSPORA CORDIFOLIA: ETHNOBOTANY, PHYTOPHARMACOLOGY AND PHYTOCHEMISTRY ASPECTS

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ABSTRACT: *Tinospora cordifolia* (Thunb.) Miers, (Guduchi) is an evergreen perennial climber. This deciduous and dioecious plant belongs to the family Menispermaceae. It is a plant of significant medicinal importance in the Indian system and designated as Rasayana. Its efficacy has been also recognized by the modern system of medicine. The whole plant is used medicinally however; the stem is approved for use in medicine. This is due to higher alkaloid content in the stems than in the leaves. This plant has been known to possess immunomodulatory, hypoglycaemic, antioxidant, anti-hyperglycaemic, antiallergic, anti-inflammatory, diabetes mellitus, hypoglycemia and several other properties also. The plant mainly contains alkaloids, glycosides, steroids, diterpenoid lactones, sesquiterpenoid, aliphatic compound and other miscellaneous compound. The present review is an attempt to highlight the various ethnobotanical and traditional uses as well as the various pharmacological, phytochemical and clinical reports on *T. cordifolia*.

INTRODUCTION: *Tinospora cordifolia* (Thunb.) Miers, (Guduchi) is one of the important dioecious plants. In Hindi, the plant is commonly known as *Giloe*¹ which is a Hindu mythological term that refers to the heavenly elixir that has saved celestial beings from old age and kept them eternally young. In Ayurveda, it is designated as Rasayana drug recommended to enhance general body resistance, promote longevity and as antistress and adaptogen²⁻³. The fact that it is called "Amrita" signifies its use for revitalization and its importance in Ayurveda. This significant plant is also mentioned in important Pharmacopoeias⁴⁻⁶.

Distribution: It is indigenous to areas of India, Myanmar, Sri Lanka, China, Thailand, Philippines, Indonesia, Malaysia, Borneo, Vietnam, Bangladesh, North Africa, West Africa, and South Africa⁷⁻¹⁰. It typically grows in deciduous and dry forests at elevations up to 1000ft.

Origin and Habitat: *T. cordifolia* is a climbing shrub native to lower elevation in tropical areas of the Indian subcontinent and climbs numerous types of trees¹¹. It prefers wide range of soil, acid to alkaline and it needs moderate level of soil moisture.

The Family: *T. cordifolia* belongs to the family Menispermaceae¹²⁻¹⁴ which consists of about 70 genera and 450 species that are found in tropical lowland regions. They are generally climbing or twining, rarely shrubs. This family is a rich source of alkaloid and terpenes¹⁵.

The Genus: The genus *Tinospora* Miers (Menispermaceae) has about 32 species distributed in tropical Africa, Madagascar, Asia to Australia and the Pacific Islands¹⁶⁻¹⁸. In India, the genus is represented by four species; two species, *T. cordifolia* (Thunb.) Miers and *T. sinensis* (Lour.) Merr., are known to occur

in South India and other two *T. crispa* (L.) Hook.f. & Thomson and *T. glabra* (Burm.f.) Merr., are reported from Northeast India and the Andaman Islands¹⁹.

The Species: *Tinospora cordifolia* (Thunb.) Miers

Synonyms:

1. *Menispermum crispum* Linnaeus, Sp. Pl., ed. 2, 2: 1468. 1763
2. *Tinospora gibbericaulis* Handel-Mazzetti
3. *Tinospora mastersii* Diels
4. *Tinospora rumphii* Boerlage
5. *Tinospora thorelii* Gagnepain.

Vernacular Names: The common names are Gilo (Arabic); *Amarlata* (Assamese); *Gadancha*, *Guluncha*, *Giloe* (Bengali); *K'uan chu Hsing* (Chinese); *Culancha* (French); *Tinospora* (English); *Gado*, *Galo*, *Gulo* (Gujerati); *Giloe*, *Gulbel*, *Gurcha* (Hindi); *Amrytu*, *Sittamrytu* (Malayalam); *Ambarvel*, *Giroli*, *Gulvel* (Marathi), *Garjo* (Nepali); *Gulanca* (Oriya); *Gulbel* (Persian); *Gilo* (Punjabi, Kashmiri), *Amrita*, *Guduchi*, (Sanskrit); *Gurjo* (Sikkim); *Amridavalli*, *Niraidarudian* (Tamil); *Guduchi*, *Iruluchi* (Telugu) and *Guruch* (Urdu)²⁰⁻²².

Botanical Description: *T. cordifolia* is a large extensively spreading glabrous, dioecious perennial deciduous climber, grows on wide range of hedges and trees. It is reported to bear distinct male and female flowers²¹⁻²³. Its stem, when fresh, have a green succulent bark covered by a thin brown bark and are studded with warty lenticels when dry, the stem shrinks and the bark separate from the wood. Branches are sending down slender pendulous fleshy roots, terete, striate, with tubercled, pale sometimes shining or glabrous bark.

Leaves membranous, 7-9 nerved, 5-10 cm, roundish, cordate or heart shaped (giving name *cordifolia* to the plant) with a 2.5- 7.0 cm petiole. The flower bloom in summer. Racemes is rather lax, 5.0 cm, elongating and often longer than leaves. The male flowers are small, yellow or green in colour, and occur in clusters in the axils of small subulate bracts. Sepals are 6, 3 outer very small, ovate-oblong, acute, the inner 3 larger, membranous, broadly elliptical, concave, yellow.

Petals are 6, equal, broadly spathulate, each loosely embracing a stamen, claw cuneate, reflexed to apex, pistillode. Female flowers usually solitary, similar to male, but sepals green, margins not reflexed, staminode short, linear. Carpels 1-3, widely separated on the short fleshy gynophores, dorsally convexed, and scarlet. The fruit are the size and shape of a large pea and turn from green to red when ripe in winter and mucilaginous²⁴.

Nutritive Composition of *Tinospora cordifolia*: *T. cordifolia* contains high fibre (15.9%), sufficient protein (4.5%-11.2%), sufficient carbohydrate (61.66%), and low fat (3.1%). Its nutritive value is 292.54 calories per 100 g. It has high potassium (0.845%), high chromium (0.006%), sufficient iron (0.28%) and sufficient calcium (0.131%), important in various regulatory functions²⁵.

Properties – in Ayurveda: Ayurveda advocates the treatment for the entire body as a single unit. With modern medicine it gives a synergistic activity and antagonises and minimise the toxicity of modern drug. *T. cordifolia* referred to as Guduchi (plant which protects from diseases, Sanskrit), has been described in ancient textbooks of Ayurveda including *Sushruta Samhita* and *Charak Samhita*. Other synonyms used for Guduchi which refer to its various properties and uses, include Chhinnaruha/Chhinnodbhava (for the plant's capacity to grow from the cut side), Vatsadini (eaten by grazing animals), Pittaghni (bile destroying), Amruta (imparts immortality), Rasayana (capacity to improve quality of rasa, the primordial tissue which in turn strengthens all other tissues), Chakrangi/Chakraakshana (for its wheel-like appearance), Jwaranashi/Jwarari (potent antipyretic), Vayastha (prevents ageing), Amrutsambhava (ambrosia), Bhishakpriya (favourite of physicians), Saumya (not harmful) and Tikta (bitter taste).

The stems, leaves, and roots are used in medicine^{11, 26-27}. In Ayurveda, *T. cordifolia* is used as "rasayana" which in Sanskrit implies circulation of "rasa"- the nutrient. The ancient Indian physician, Charaka described rasayana as anti aging, increasing the life span, promoting intelligence, improving memory and freedom from diseases, indicating an immunostimulant effect²⁸ and also used as an antispasmodic and an anti-diarrhoeal agent²⁹.

Herbalist Sebastian Pole writes that “those growing up neem trees are said to be the best synergy between these two bitter plants enhances guduchi’s efficacy.” It is a traditional belief that *Guduchi satva* obtained from the *Guduchi* plant growing on *neem* tree (*Azadirachta indica*) is bitterer and more efficacious and is said to incorporate the medicinal values of *neem*³⁰.

T. cordifolia has been described in Ayurveda in various dosages form. These include Swaras (juice from the fresh stem: 10–20 mL/day), Kalka (paste of fresh stem: 10 g/day), Churna (powdered dry stem: 1–3 g/day), Kwatha (hot water extract from ground dried stem: 20–30 mL two to three times a day), Fant (hot water infusion: 10–20 mL/day), Arishta (stable processed formulation from a decoction of *T. cordifolia* containing self-generated alcohol), Satwa (sedimented starchy extract of the stem: 750 mg to 2 g/day) Ghana (solidified aqueous extract: 500 mg to 1 g three to four times a day), along with lipid formulations of *T. cordifolia* processed in ghee or oil (Guduchi Ghrita: 10–20 g/day) and Guduchi Taila (for external application)³¹. Guduchi is recognized in the Indian Pharmacopoeia and also used in several compound formulations as an ingredient for the treatment of general weakness,

fever, dyspepsia, dysentery, gonorrhoea, secondary syphilis, urinary diseases, impotency, gout, viral hepatitis, skin diseases, and anaemia³²⁻³⁴, leprosy, fever, asthma, anorexia, jaundice, gout, skin infections, diabetes, chronic diarrhoea, dysentery³⁵⁻⁴².

Ethnobotanical, Folk and Tribal Uses: There are over 400 different tribal and other ethnic groups in India. Each tribal group has its own tradition, folk language, beliefs and knowledge about the use of natural resources as medicines⁴³. *T. cordifolia* finds a special mention for its use in tribal or folk medicine in different parts of the country. Almost all the parts of the plant are documented to be useful in ethno botanical surveys conducted by ethno botanists⁴⁴⁻⁴⁵. In folk and tribal medicine, whole plant, powdered root and stem bark, decoction of root and stem, juice of the root, juice or paste of the leaves, and stem of the *T. cordifolia* are being used to treat various ailments viz. fever, jaundice, diarrhoea, dysentery, general debility, cough, asthma, leucorhea, skin diseases, fractures, eye disorders, bites of poisonous insects, venomous snake etc. Ethnobotanical uses of *T. cordifolia* are given in

Table 1.

TABLE: 1. ETHNOBOTANICAL USES OF TINOSPORA CORDIFOLIA

S. No.	Plant part	Ethnobotanical uses
1	Leaves	Used in the treatment of gout and ulcer
2	Stem	The stem is bitter stomachic, stimulates bile secretion, diuretic, enriches the blood, cures jaundice, useful in skin diseases, The juice is useful in diabetes, vaginal and urethral discharges low fevers and enlarged spleen ²¹ (Stem as an infusion) used to drunk as a vermifuge, jaundice, against intestinal worms (Stem as decoction) used for washing sore eyes and syphilitic sores, antipyretic, antimalarial Starch (statue) obtained from stem used for chronic diarrhoea and some form of obstinate chronic dysentery, deal with intestinal problems and improve digestion ⁴⁸
3	Stem +Root	Combination with other drugs as an antidote to snake bite and scorpion sting ⁴⁹⁻⁵¹
4	Fruit	Dried fruit with ghee or honey used as tonic and treatment of jaundice and rheumatism.
5	Bark	Anti-allergic, anti-spasmodic, anti-leprotic ⁵²⁻⁵⁴
	NS	Urinary diseases, syphilis, skin diseases, bronchitis ⁵⁵
	NS	Promote longevity and increase body’s resistance ⁵⁶ . Stimulate the immune system ⁵⁷⁻⁵⁹

NS=not specify

Pharmacology: As evident from the ayurvedic and ethnobotanical reports, *T. cordifolia* has various medicinal uses. In present times, the extracts/fractions (mainly aqueous and alcoholic sometimes methanolic, chloroform, ether, petroleum ether, acetone, successive, bitter or non-bitter and other fractions)

even chemical constituents of this drug have been subjected for numerous pharmacological, pre-clinical and clinical investigations. The medicinal traits and biological activities endorsed are presented in **Table 2.**

TABLE 2: PHARMACOLOGICAL ACTIVITIES OF *TINOSPORA CORDIFOLIA*

Immunomodulatory ^{57,60-68}	Antioxidant ^{10,69-75}	Anti-hyperglycaemic ⁷⁶⁻⁷⁹
Anti-diabetic ⁸⁰⁻⁸²	Antimalarial ⁸⁰⁻⁸²	Anti-inflammatory ^{43,53,73,83-88}
Antitumor ^{53,64,72,89,90-92}	Anti-allergic ^{73,93}	Antineoplastic activity ^{89,94}
Antipyretic ^{53,72,80-82}	Antiamoebic, Antihelmentic ^{53,80-82}	Anti hyperlipidimic ⁹⁵
Immunobiological activity ⁹⁶⁻⁹⁹	Antigout, Antiasthmatic ⁸⁰⁻⁸²	Antiasthmatic, Antigonorhoeal ⁸⁰⁻⁸²
Antigonorrhoeal ⁸⁰⁻⁸²	Antiperiodic ⁸⁰⁻⁸²	Antiperiodic ⁸⁰⁻⁸²
Mental disorder ¹⁰⁰	Androgenic ¹⁰¹	Radioprotective ¹⁰²
Antifertility effects ¹⁰³	Anticoagulant ⁷²	Antiemetic and Antiicteric ⁸⁰⁻⁸²
Antigonorrhoeal ⁸⁰⁻⁸²	Antiatherogenic ^{53,80-82}	Diuretic ¹⁰⁴
Anticancer ^{89,105-107}	Learning and memory enhance ¹⁰⁸	Anti-depression ¹⁰⁹
Anti-stress ¹¹⁰⁻¹¹³	Anti-ischemic ¹¹⁴	Anti hyperlipidimic ⁹⁵
Hypolipidaemic ^{72,115-116}	Antileprotic ⁴³	Antispasmodic ^{43,117-118}
Antimicrobial ⁷²	Antiulcer ¹¹⁹⁻¹²⁰	Analgesic ^{53,80-82}
Help to dissolve urinary calculi ¹²¹	Malaria ¹²²	Obstructive jaundice ¹²³⁻¹²⁴
Infections ¹²⁵	Hepatoprotective ^{64,126}	Prevent hepatotoxicity ¹²⁷⁻¹²⁸
Phagocytes ¹²⁹	Hepatic and splenic injury ^{130,131}	Diabetes mellitus ¹³²

Phytochemistry: A variety of constituents have been isolated from *T. cordifolia* plant. They belong to different classes such as alkaloids, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides.

Three major groups of compounds; protoberberine alkaloids, terpenoids and polysaccharides are considered as putative active constituents of *T. cordifolia*⁴⁶⁻⁴⁷. These chemical constituents are listed in **Table 3** and their role in various therapeutic actions is listed in **Table 4**.

TABLE 3. PHYTOCHEMISTRY OF *TINOSPORA CORDIFOLIA*

Part	Chemical type	Active principle	Ref.
Stem	Alkaloids	Berberine, palmatine D, choline D, tinosporine, Magnoflorine, tetrahydropalmatine, isocolumbin	133-138
		18-norclerodane glycoside	139
	Glycosides	Furanoid diterpene glycoside	140-141
		Tinocordiside	142-143
		Syringin	144-145
		Syringin-apiosylglycoside, Tinocordifolioside, cordioside, cordifolioside A, cordifolioside B, palmatoside C31, palmatoside F31, cordiofolioside B2, cordifolioside D2, cordifolioside	139-140 141,143-144, 146-148
	Sesquiterpenoid	Tinocordifolin	150
Root	Alkaloid	Palmatine	136,149
Aerial parts	Steroids	b-sitosterol, d-sitosterol, g-sitosterol b-hydroxyecdysone, ecdysterone, makisterone, giloinsterol jateorine, columbin	151-152
Whole plant	Diterpenoid lactones	Furanolactone, tinosporon, columbin	153-155
	Aliphatic compound	Octacosanol, heptacosanol	156
	Miscellaneous compound	Nonacosan-15-one 3, (a,4-dihydroxy-3-methoxy-benzyl)-4-(4-hydroxy-3-methoxy-benzyl)-tetrahydrofuran, Tinosponidine, 6 cordifol, 6 Cordifelone, 6 Jatrorrhizine	157-158

TABLE 4: MECHANISM OF ACTION OF SOME IMPORTANT PHYTOCHEMICALS ¹⁵⁹⁻¹⁷²

Phytochemicals	Activity	Mechanism of action
Quinones	Antimicrobial	Binds to adhesions, complex with cell wall, inactivate enzymes
Flavanoids	Antimicrobial	Complex with cell wall, binds to adhesins Inhibits release of autacoids and prostaglandins,
	Antidiarrhoeal	Inhibits contractions caused by spasmogens, Stimulates normalization of the deranged water transport across the mucosal cells, Inhibits GI release of acetylcholine
Polyphenols and Tannins	Antimicrobial	Binds to adhesions, enzyme inhibition, substrate deprivation, complex with cell wall, membrane disruption, metal ion complexation
	Antidiarrhoeal	Makes intestinal mucosa more resistant and reduces secretion, stimulates normalization of deranged water transport across the mucosal cells and reduction of the intestinal transit, blocks the binding of B subunit of heat-labile enterotoxin to GM1, resulting in the suppression of heat-labile enterotoxin-induced diarrhea, astringent action
	Anthelmintic	Increases supply of digestible proteins by animals by forming protein complexes in rumen, interferes with energy generation by uncoupling oxidative phosphorylation, causes a decrease in G.I. metabolism
Coumarins	Antiviral	Interaction with eukaryotic DNA
Terpenoids and essential oils	Antimicrobial	Membrane disruption
	Antidiarrhoeal	Inhibits release of autocoids and prostaglandins
Alkaloids	Antimicrobial	Intercalates into cell wall and DNA of parasites
	Antidiarrhoeal	Inhibits release of autocoids and prostaglandins
	Anthelmintic	Possess anti-oxidating effects, thus reduces nitrate generation which is useful for protein synthesis, suppresses transfer of sucrose from stomach to small intestine, diminishing the support of glucose to the helminthes, acts on CNS causing paralysis
Lectins and Polypeptides	Antiviral	Blocks viral fusion or adsorption, forms disulfide bridges
Glycosides	Antidiarrhoeal	Inhibits release of autocoids and prostaglandins
Saponins	Antidiarrhoeal	Inhibits histamine release <i>in vitro</i>
	Anticancer	Possesses membrane permeabilizing properties
	Anthelmintic	Leads to vacuolization and disintegration of teguments
Steroids	Antidiarrhoeal	Enhance intestinal absorption of Na ⁺ and water

REFERENCES:

- Bhandari C and Vanaushadhi Chandrodaya. Chaukhamba Sanskrit Sansthan. Varanasi, First Edition 2006; Vol. 3. p. 86.
- Patwardhan B and Gautam M .Drug Discov Today 2005; 10:495–502
- Patil M, Patki P, Kamath HV and Patwardhan B .Ind Drugs 1997; 34:211–215
- British Pharmaceutical Codex (BPC). Published by Pharmaceutical Society of Great Britain (PSGB) 1907; current Twelve Edition, published in 1994.
- Indian Pharmacopoeia. Guduchi, Published by Indian Pharmacopoeia Commission, Govt. Of India. 2007; Vol 3. pp 2037-2034.
- Ayurvedic Pharamacopoeia of India. Guduchi, Published by Dept of AYUSH, Ministry of Health & Family Welfare, Govt. Of India. 1999; Part 1-Vol. 1. Pp.53-55.
- Pendse VK, Mahavir MM, Khanna KC and Somani SK. Anti-inflammatory and related activity of *Tinospora cordifolia* (Neem giloe). Indian drugs 1981; 19: 14-71.
- Singh J, Sinha K, Sharma A, Mishra NP and Khanuja SP. Traditional uses of *Tinospora cordifolia* (Guduchi) J Med Aromat plant Sci 2003; 25: 748-51.
- Mia MMK, Kadir MF, Hossan MS and Rahmatullah M. Medicinal plants of the Garo tribe inhabiting the Madhupur forest region of Bangladesh. 2009.

10. Jain S, Sherlekar B and Barik R. Evaluation of antioxidant potential of *Tinospora cordifolia* and *Tinospora sinensis* Int J Pharm Sci Res 2010; 1:11; 122-8.
11. Premila MS. Ayurvedic Herbs: A clinical Guide to the Healing Plants of Traditional Indian Medicine. New York: Haworth Press 2006; pp. 69-76, 175-176.
12. Wealth of India: A dictionary of Indian Raw Materials and Industrial Products. First Edition Vol X. New Delhi: CSIR; 2003. Anonymous; pp. 251-2.
13. Aima RK. "Pictorial Guide to Plants". Natraj Publishers First Edition Dehradun 2003; pp. 454-5.
14. Vaidya DB. "Materia Medica of Tibetan Medicine". Delhi: Sri Satguru Publications. 1994; p. 163.
15. Abhimanyu Sharma, Asmita Gupta, Sakshi Singh and Amla Batra. *Tinospora cordifolia* (Willd.) Hook. F. & Thomson - A plant with immense economic potential. J. Chem. Pharm. Res., 2010, 2(5):327-333. ISSN No: 0975-7384, CODEN(USA): JCPRCS
16. Forman LL. A revision of *Tinospora* (Menispermaceae) in Asia to Australia and the Pacific. Kew Bull. 1981; 36(2): 375-421.
17. Kubitzki K, Rohwer JG and Bittrich V. The Families and Genera of Vascular Plants, vol. II. Berlin/Heidelberg, Germany: Springer-Verlag. 1993
18. Mabberley DJ. The Plant-Book. A Portable Dictionary of the Vascular Plants Cambridge: Cambridge University Press. 2005.
19. Pramanik A and Gangopadhyay M. Menispermaceae. In: Sharma BD, Balakrishnan NP, Rao RR. And Hajra PK. (eds) Flora of India 1. Calcutta: Botanical Survey of India. 1993.
20. The Ayurvedic Pharmacopoeia of India. Part I. First Edition Vol. 1. New Delhi: Department Of AYUSH, Ministry of Health and FW. 2001; pp. 53-5.
21. Kirtikar KR and Basu BD. Indian Medicinal Plants, Lalit Mohan Basu, Allahabad 1918; vol. I, pp. 75-80.
22. Anon. The Wealth of India: Raw Materials, Council of Scientific and Industrial Research, New Delhi. 1956; vol. X, pp. 251-252.
23. Hooker JD. Flora of British India, L Reeve & Co. London 1875; vol. I, pp. 96-97.
24. Kirtikar KR and Basu BD. Indian Medicinal Plants. Second Edition, Edited and enlarged by Blatter E, Caius JF and Mhaskar KS. International Book Distributors, Dehra Dun, Vol 1, 2005, pp. 77-81.
25. Nile SH and Khobragade CNN. Determination of nutritive value and mineral elements of some important medicinal plants from western part of India. J Med Plants 2009; 8:5; 79-88.
26. Pandey G. Dravyaguna Vijnana. Varanasi: Krishnadas Academy 2002; Second Edition pp. Vol. 1 pp. 697-710.
27. Krishna K, Jigar B and Jagruti P. Guduchi *Tinospora cordifolia*: Biological and Medicinal properties, a review. The Internet Journal of Alternative Medicine 2009; Vol.6 Num.2 pp. 1-10.
28. Badara VA, Thawani VR, Wakode PT, Shrivastava MP, Gharpure KJ and Hingorani LL. Efficacy of *Tinospora cordifolia* in allergic rhinitis. J Ethnopharmacol 2005; 96: 445-9.
29. Warriar PK, Nambiar VPK, Ramankutty C and Nair RV. Indian medicinal plants: a compendium of 500 species. 1996; 5: 283.
30. Sinha K, Mishra NP, Singh J and Khanuja SP. *Tinospora cordifolia* (Guduchi): A reservoir plant for therapeutic applications: A review Indian J Trad Know. 2004; 3: 247-70.
31. Panchabhai TS, Kulkarni UP and Rege NN. Validation of Therapeutic Claims of *Tinospora cordifolia*: A Review Phytother. Res. 22, 425-441 (2008) Published online 31 December 2007 in Wiley Inter Science (www.interscience.wiley.com) DOI: 10.1002/ptr.2347).
32. Gupta SS, Verma SC, Garg VP and Rai M. Anti-diabetic effects of *Tinospora cordifolia*. Effect on fasting blood sugar level, glucose tolerance and adrenaline induced hyperglycemia. Indian J Med Res. 1967; 55:733-745.
33. Chopra RN, Chopra IC, Handa KL and Kapur LD. Chopra's Indigenous Drugs of India Second Edition Calcutta, India: B.K. Dhur of Academic Publishers 1982; 426-428.
34. Chintalwar G, Jain A and Sipahimalani A. An immunologically active arabinogalactan from *Tinospora cordifolia*. Phytochemistry 1999; 52: 1089-1093.
35. Tripathi B. Charak Samhita part I Varanasi: Chaukhambha Krishnadas Academy 2003; p. 454.
36. Bhatta KR, Bhatta RK and Swami LR. Siddha Bhaisaiya Mani Mala Vaishwanara Hindi commentary. Third Edition Varanasi: Chaukhambha Krishnadas Academy 2003. p.31.
37. Sharma AR. Sushrut Samhita: Sushrutvimarshini Hindi Commentary along with special Deliberation etc. Part II. Varanasi: Chaukhambha Surbharati Prakashan 2001; p. 311, 317.
38. Sharma AR. Sushrut Samhita: Sushrutvimarshini Hindi Commentary along with special deliberation etc. Part I. Varanasi: Chaukhambha Surbharati Prakashan 2000; p. 419.
39. Chunekar KC and Pandey GS. "Guduchyadi Varga Bhavprakash Nidhantu" Varanasi: chaukhambha Bharati Academy 2006; p. 269.
40. Tripathi RD. Astanga Samgraha (Sutrasthana). Varanasi: Chaukhambha Sanskrit Pratisthan 2006; p. 142, 315.
41. Tripathi I. "Arkaprakash Tritiya Shatak Varanasi: Chaukhambha Krishnadas Academy 2006; p.45.
42. Sharma PV and Sharma GP. "Kaiyadeva Nighantu" Varanasi: Chaukhambha Orientalia 2006; p. 5.
43. Singh SS, Pandey SC, Srivastava S, Gupta VS and Patro B. Chemistry and medicinal properties of *Tinospora cordifolia* (Guduchi). Indian Journal of Pharmacology. 2003; 35:83-91.
44. Lalramnghinglova H. Ethno- Medicinal plants of Mizoram Dehradun; Bishen Singh Mahendra Pal Singh. 2003; p.293.
45. Sood SK, Parmar S and Lakhnupal TN. Ethnic plants of India used in cancer cure. Dehradun: Bishen Singh Mahendra Pal Singh. 2005; P. 235.
46. Chintalwar G, Jain A, Sipahimalani A, Banerji A, Sumariwalla P, Ramakrishnan R and Sainis K Phytochemistry 1999;52:1089-1093
47. Bisset N and Nwaiwu J. Planta Med 1983;48:275-279
48. Rustorjee Naserwanjee Khory and Nanabhai navrosji Katrak: Materia, Medica of India and their therapeutics: Komal Prakash, Pg 31.
49. Kirtikar KR and Basu BD. Indian medicinal plants. Volume I. Lalit Mohan Publishers, India 1933; 77.
50. Nadkarni KM and Nadkarni AK. Indian Materia Medica, Mumbai: Popular Prakashan Private Limited Third Edition Vol. 1. 1976; pp. 356-365, 1220-1221.
51. Zhaotf, Wang X and Rimando AM. Chec. "Folk tonic medicinal plants: *T.sgittata* var. *Cravaniana* and *Mahonia beabi*." Planta med 1991; 57: 505
52. Nayampalli SS, Desai NK and Ainapure SS. Indian J Pharm. 1986; 18, 250-2.
53. Ikram M et al. Journal of Ethnopharmacol. 1987; 19(2): 185-192.
54. Asthana JG, Jain S, Mishra A and Vijaykanth MS. Indian Drugs 2001; 38, 82-6.
55. Treadway S. Exploring the universe of ayurvedic botanicals to manage bacterial infections. Clinical Nutrition Insights. 1998; 6 (17): 1-3.
56. Kapur P, Jarry H, Wuttke W, Pereira BMJ and Wuttke DS. Evaluation of the antiosteoporotic potential of *Tinospora cordifolia* in female rats. Maturitas 2008; 59: 329-338.

57. Nagarkatti DS, Rege NN, Desai NK and Dahanukar SA. Modulation of Kupffer cell activity by *Tinospora cordifolia* in liver damage. J Postgrad Med. 1994; 40:65-7.
58. Rege NN, Bapat RD, Koti R, Desai NK and Dahanukar S. Immunotherapy with *Tinospora cordifolia*: A new lead in the management of obstructive jaundice. Indian J Gastroenterol 1993; 12; 5-8.
59. Vasudevan DM and Sreekumari S. Text book of biochemistry for medical students. New Delhi: Jaypee Brothers Medical 1995; 194-195.
60. Dahanukar SA, Thatte UM, Pai N, More PB and Karandikar SM. Immunotherapeutic modification by *Tinospora cordifolia* of abdominal sepsis induced by caecal ligation in rats. Indian J Gastroenterol 1988; 7: 21-3.
61. Thatte UM, Kulkarni MR and Dahanukar SA. Immunotherapeutic modification of Escherichia coli peritonitis and bacteremia by *Tinospora cordifolia* J Postgrad Med 1992; 38:1; 13-5.
62. Thatte UM, Rao SG and Dahanukar SA. *Tinospora cordifolia* induces colony stimulating activity in serum. J Postgrad Med 1994; 40; 202-24.
63. Bapat RD, Rege NN, Koti RS, Desai NK and Dahanukar SA. Can we do way with PTBD? HPB Surg 1995; 9: (1); 5-11.
64. Prince PSM and Menon VP. Antioxidant activity of *Tinospora cordifolia* roots in experimental diabetes. Journal of Ethnopharmacology 1999; 65: 277-281.
65. Manjrekar PN, Jolly CI and Narayanan S. Comparative studies of the immunomodulatory activity of *Tinospora cordifolia* and *Tinospora sinensis*. Fitoterapia 2000; 71 (3): 254-257.
66. Dikshit V, Damre AS, Kulkarni KR, Gokhale A and Saraf MN. Preliminary screening of immunocin for immunomodulatory activity. Indian J Phar Sci 2000. 62: 257.
67. Bishayi B. Roychowdhury S, Ghosh S and Sengupta M. Hepatoprotective and immunomodulatory properties of *Tinospora cordifolia* in CCl4 intoxicated mature albino rats. J Toxicol Sci 2002; 27:3; 139-46.
68. Nair PK, Melnick SJ, Ramachandran R, Escalon E and Ramachandran C. Mechanism of macrophage activation by (1, 4) -alpha-D-glucan isolated from *Tinospora cordifolia* Int Immunopharmacol 2006; 6;1815-24.
69. Robak J and Gryglewski RJ. Flavonoids are scavengers of superoxide anions. Biochem Pharmacol 1998; 37; 837-45.
70. Kumar PV, Shashidhara S, Kumar MM and Sridhara BY. Effect of *Luffa echinata* on lipid peroxidation and free radical scavenging activity. J Pharm Pharmacol 2000; 52; 891-8.
71. Stanely P et al. Journal of Ethanopharmacol. 2000; 70: 9-15.
72. Mary N et al. Phytomedicine 2003; 10: 474-482.
73. Leyon PV and Kuttan G. Effect of *Tinospora cordifolia* on the cytokine profile of angiogenesis-induced animals. International Immunopharmacology 2004; 1569-1575.
74. Singh RP, Banerjee S, Kumar PV, Raveesha KA and Rao AR. *Tinospora cordifolia* induces enzymes of carcinogen/drug metabolism and antioxidant system, and inhibits lipid peroxidation in mice. Phytomedicine 2006; Jan 13 (1-2): 74-84.
75. Manjusha GV, Rajathi K, Alphonse JKM and Meera KS. Antioxidant potential and antimicrobial activity of *Andrographis paniculata* and *Tinospora cordifolia* against pathogenic organisms. J Pharm Res 2011; 4-2: 452-5.
76. Raghunathan K and Sharma PV. The aqueous extract of Gulvel caused reduction of blood sugar in alloxan-induced hyperglycaemic rats and rabbits. J Res Indian Med 1969; 3: 203-9.
77. Grover JK, Vats V and Rathi SS. Anti-hyperglycaemic effect of *Eugenia jambolana* and *Tinospora cordifolia* in experimental diabetes and their effects on key metabolic enzymes involved in carbohydrate metabolism. J Ethnopharmacol 2000; 73:461-70.
78. Nagaraja PK, Kammar KF and Devi S. Modulation of morphology and some gluconeogenic enzyme activity by *Tinospora cordifolia* (Willd.) in diabetic rat kidney. Biomed Res.2007; 18; 179-83.
79. Umamaheshwari S and Mainzen Prince PS. Antihyperglycaemic effect of logen- Excel, an ayurvedic herbal formulation in streptozotocin - induced diabetes mellitus. Acta Pol Pharm 2007; 10:1375-1386.
80. Agarwal VS. Drug Plants of India. Kalyani Publishers, Ludhiana; First edition (Volume II) 1997; 688.
81. Indian Herbal Pharmacopoeia. A joint Publication of Regional Research Laboratory, Jammu tawi and Indian Drug Manufacturer's Association, Mumbai Volume 1998; 1: 99-104; 156-64.
82. Bhavamishra. Bhavaprakasha Nigantu. Chaukhamba Bharti Academy, Varanasi 1998; 270.
83. Chopra RN, Nayar SL and Chopra IC. Glossary of Indian Medicinal plants. CSIR. New Delhi. 1956.
84. Patel SR, Goyal RK and Shah DS. Studies on the pharmacological effects of *Tinospora cordifolia*. J Res Ind Med. 1977; 13(2):46-57.
85. Gulati OD and Pandey DC. Anti-inflammatory activity of *Tinospora cordifolia* Rheumatism. 1982; 17: 76-83.
86. Gulati OD. Clinical trial of *Tinospora cordifolia* in Rheumatoid Arthritis. Rheumatism. 1980; 15: 143-8.
87. Jana U, Chattopadhyay RN and Shw BP. Preliminary studies on anti-inflammatory activity of *Zingerber officinale* Rosc. *Vitex negundo* Linn. and *Tinospora cordifolia* (Willd) Miers in albino rats. Indian J Pharm. 1999; 31: 232-33.
88. Faheem A, Ali M and Shokat RM. Anti-inflammatory activity and the standardization of *Tinospora cordifolia* stem bark. Traditional system of medicine. New Delhi: Narosa Publishing House 2006; 414-7.
89. Jagetia GC, Nayak V and Vidyasagar MS. Evaluation of the antineoplastic activity of guduchi *Tinospora cordifolia* in cultured HeLa cells. Cancer Lett. May. 1998; 127 (1-2): 71-82.
90. Vedavathy S and Rao KN. Antipyretic activity of six indigenous medicinal plants of Tirumala hills, Andhra Pradesh, India. J Ethnopharmacol. 1991; 33: 193-6.
91. Mathew S and Kuttan G. Antioxidant activity of Gulvel and its usefulness in the amelioration of cyclophosphamide-induced toxicity. J Exp Clin Cancer Res.1997; 16:4; 407-11.
92. Perumalsamy R et al. Fitoterapia 2005; 76: 697-699.
93. Chaudhary R, Jahan S and Goyal PK. Chemopreventive potential of a medicinal plant *Tinospora cordifolia* on skin carcinogenesis in mice. J Environ Pathol Toxicol Oncol. 2008; 27(3): 233-243.
94. Singh N, Singh SM and Shrivastava P. Immunomodulatory and antitumor actions of medicinal plant *Tinospora cordifolia* are mediated through activation of tumor-associated macrophages. Immunopharmacol Immunotoxicol 2005; 26:145-62.
95. Hamsa TP and Kuttan G. *Tinospora cordifolia* ameliorates the urotoxic effect of cyclophosphamide by modulating GSH and cytoxiking levels. Exp. Toxicol. Pathol. 2010; 1: 1-8.
96. Atal CK, Sharma ML, Kaul A and Khajuria A. Immunomodulating agents of plant origin, I: preliminary screening. J. Ethnopharmacol. 1986; 18(2):133-41.
97. Thatte U, Chabbria S, Karandikar SM and Dahanukar S. Immunotherapeutic modification of E.coli induced abdominal sepsis and mortality in mice by Indian medicinal plants. Indian Drugs 1987; 25 (3): 95-97.
98. Kapil A and Sharma S. "Immuno potentiating compounds from *T.cordifolia*." J. Ethnopharmacol 1997; 58: 89-95.

99. Manjekar P et al. *Fitoterapia* 2000; 7(1), 254-257.
100. Kulkarni SK and Verma A. BR-16A (Mentant-(R), an herbal preparation improves learning and memory performance in mice. *Indian Drugs* 1993; 30 (3): 97-107.
101. Kapur P, Pereira BM, Wuttke W and Jarry H. Androgenic action of *Tinospora cordifolia* ethanolic extract in prostate cancer cell line LNCap, *Phytomedicine*. 2008.
102. Pahadiya S and Sharma J. Short communication: Alteration of lethal effects of gamma rays in Swiss albino mice by *Tinospora cordifolia*. *Phytotherapy Research*. 2003; 17: 552-554.
103. Gupta RS and Sharma A. The Antifertility effect of *Tinospora cordifolia* (Willd.) Stems extracts in male rats. *Indian J Exp Biol* .2003; 41: 885-9.
104. Sunanda S, Nayampalli SS, Ainapure SS, Samant BD, Kudtarkar RG, Desai NK and Gupta KC. a comparative study of diuretic effects of *Tinospora cordifolia* and hydrochlorothiazide in rats and a preliminary phase I study in human volunteers. *J Postgrad Med*. 1988; 34 (4): 233-6.
105. Dhuley JN. Effect of some Indian herbs on macrophage functions in ochratoxin a treated mouse. *J Ethnopharmacol*. 1997; 58(1):15-20.
106. Metthew S and Kuttan G. Immunomodulatory and antitumour activities of *Tinospora cordifolia*. *Fitoterapia* 1999; 70:35-43.
107. Jagetia GC and Rao SK. Evaluation of cytotoxic effects of dichloromethane extract of guduchi *Tinospora cordifolia* Miers ex Hook f & Thoms on cultured HeLa Cells. Evidence based Complement Alternat Med. 2006; 3 (2):267-272.
108. Agarwal A, Malini S, Bairy KL and Rao MS. Effect of *Tinospora cordifolia* on learning and memory in normal and memory deficit rats. *Indian J Pharmacol* .2002; 34: 339-49.
109. Dhingra D and Goyal PK. Evidences for the involvement of monoaminergic and Gabaergic system in antidepressant-like activity of *Tinospora cordifolia* in mice. *Indian J Pharm Sci* 2008; 70 (6): 761-7.
110. Sarma DN, Khosa RL, Chansauria JP and Sahai M. Antiulcer activity of *Tinospora cordifolia* Miers and *Centella asiatica* Linn. Extracts. *Phytother Res* 1995; 9: 589.
111. Sarma DNK, Khosa RL, Chansauria JPN and Sahai M. The Antistress activity of *Tinospora cordifolia* and *Centella asiatica* extracts. *Phytother Res* 1996; 10: 181-3.
112. Patil M, Patki P, Kamath HV and Patwardhan B. Antistress activity of *Tinospora cordifolia* (Willd) Miers. *Indian Drugs*. 1997; 34 (4): 211-5.
113. *Indian Journal of Pharmacology*. Chemistry and medicinal properties of *Tinospora cordifolia* learning. 2003; 35, 83-91
114. Rao PR, Kumar VK, Viswanath RK and Subbaraju GV. Cardioprotective activity of alcoholic extract of *Tinospora cordifolia* in ischemia-reperfusion induced myocardial infarction in rats. *Bio Pharm Bull* 2005; 28: 2319-22.
115. Mainzen S, Prince P, Menon VP and Gunasekaran G. Hypolipidaemic action of *Tinospora cordifolia* roots in alloxan diabetic rats. *J Ethnopharmacol* 1999; 64: 53-7.
116. Stanley M, Prince P, Menon VP and Gunasekaran G. "Hypolipidaemic action of *T.cordifolia* roots in alloxan diabetic rats." *Journal of Ethnopharmacol* 1999; 64: 53-7.
117. Lather A, Gupta V, Bansal P, Sahu M, Sachdeva K and Ghaiye P. An Ayurvedic Polyherbal formulation Kaishore Guggulu: A Review. *Int J Pharm Biol Archiv* .2011; 2-1; 497-503.
118. Kamble R, Sathaye S and Shah DP. Evaluation of antispasmodic activity of different Shodhit Guggul using a different Shodhan process *Indian J Pharm Sci* 2008; 70:3, 368-72.
119. Sarma DNK, Khosa RL, Chansauria JPN and Ray AK. The effect of *Tinospora cordifolia* on brain neurotransmitters in stressed rats. *Fitoterapia*.1995; 67(5): 421-2.
120. Bafna PA and Balaraman R. Anti-ulcer and anti-oxidant activity of pepticare: A herbo mineral formulation. *Phytomed*. 2005; 12; 264-70.
121. Rai M and Gupta SS. Experimental evaluation of *Tinospora cordifolia* (guduchi) for dissolution of urinary calculi. *J Res Ind Med*, 1967; 2(1):115-16.
122. Singh RK. *Tinospora cordifolia* as an adjuvant drug in the treatment of hyper-reactive malarious splenomegaly: Case reports. *J Vector Borne Dis* 2005; 42: 36-8.23.
123. Rege N, Bapat RD, Koti R, Desai NK and Dahanukar S. Immunotherapy with *Tinospora cordifolia*: A new lead in the management of obstructive jaundice. *Indian J Gastroenterol* 1993; 12:5-8.
124. Rege NN, Nazareth HM, Bapat RD and Dahanukar SA. Modulation of immunosuppression in obstructive jaundice by *Tinospora cordifolia* *Indian J Med Res* 1989; 90: 478-83.
125. Lumba SP, Parmar TL, Bali H and Lumba R. Role of Septilin in Fungal Otitis Externa, Chronic sinusitis, Chronic Tonsillitis and Chronic Suppurative Otitis Media. *Probe XXII*: 1983; 3: 178-80.
126. Mehrotra R, Katiyar CK and Gupta AP. "Hepato protective compositions and composition for treatment of conditions related to hepatitis B and E infection." US patent 749296. 2000.
127. Panchabhai TS, Ambarkhane SV, Joshi AS, Samant BD and Rege NN. Protective effect of *Tinospora cordifolia*, *Phyllanthus emblica* and their combination against antitubercular drugs-induced hepatic damage: An experimental study. *Phytother Res*.2008; 22:646-50.
128. Adhvaryu MR, Reddy N and Vakharia BC. Prevention of hepatotoxicity due to antituberculosis treatment: A novel integrative approach. *World J Gastroenterol* 2008.
129. Purandare H and Supe A. Immunomodulatory role of *Tinospora cordifolia* as an adjuvant in surgical treatment of diabetic foot ulcers: a prospective randomized controlled study. *Indian J. Med Sci*. 2007; 61(6): 347-35.
130. Bishayi B, Roychowdhury S, Ghosh S and Sengupta M. Hepatoprotective and immunomodulatory properties of *Tinospora cordifolia* in CCl4 intoxicated mature albino rats. *J Toxicol Sci* 2002; 27:3; 139-46.
131. Singh RK. *Tinospora cordifolia* as an adjuvant drug in the treatment of hyper-reactive malarious splenomegaly: Case reports. *J Vector Borne Dis* 2005; 42: 36-8.23.
132. Stanely P et al. *Journal of Ethnopharmacol*. 1999; 64: 53-57.
133. Qudrat -I- Khuda M, Khaleque M and Ray N. *Sci Res (Dacca)* 1964; 1, 177.
134. Pachaly P and Schneider C. *Arch Pharma (Weinheim ger)* 1981; 314, 251.
135. Bisset NG, Nwaiwu J *Planta Medica* .1983; 48, 275.
136. Sarma DNK, Padma P and Khosa RL. *Fitoterapia* 1998; 69, 541.
137. Kumar S, Verma NS, Pande D and Srivastava PS. *In vitro* regeneration and screening of berberine in *T. cordifolia*. *Journal of Medicinal and Aromatic Plant Sciences*. 2000; 22: 61.
138. Padhya MA. "Biosynthesis of Isoquinoline alkaloid berberine in tissue cultures of *T. cordifolia*" *Indian drugs* 1986; 24:47-8.
139. Khan MA, Gray AL and Waterman PG. Tinosporaside, an 18-norclerodane glucoside from *T.cordifolia*. *Phytochemistry*, 1989; 28: 273- 275.
140. Bhatt RK and Sabata BK. Furanoid diterpene glucoside from *T. cordifolia*. *phytochemistry* 1989; 28: 2419-2422.
141. Swaminathan K, Sinha UC, Bhatt RK, Sabuta RBK and Tavale SS. "Structure of Tinosporide, a diterpenoid furanolactone from *T.cordifolia* miers," *Acta crystallogm* 1989; 45 : 134-6.
142. Maurya R, Wazir V, Tyagi A and Kapil RS. "Clorodane diterpenoids from *T.cordifolia*." *Phytochemistry* 1995; 38 : 559-61.

143. Ghosal S and Vishwakarma RA. Tinocordiside, a new rearranged cadinane sesquiterpene glycoside from *T. cordifolia*. Journal of Natural Product 1997; 60: 839-841.
144. Sipahimalani AT, Noerr H and Wagnor H. Phenyl propenoid glycosides and tetrahydro furanlignan glycosides from the adaptogenic plant drugs *T. cordifolia* and *Drypetes rox burghii*. planta Medica. 1994. 60: 596-597.
145. Kapil A and Sharma S. "Immuno potentiating compounds from *T. cordifolia*." J. Ethnopharmacol 1997; 58: 89-95.
146. Wazir V, Maurya R and Kapil RS. Phytochemistry 1995; 38, 447.
147. Maurya R, Wazir V, Tyagi A and Kapil RS. Phytochemistry 1995; 38, 559.
148. Maurya R, Dhar KL and Handa SS. Phytochemistry 1997; 44, 749.
149. Pathak AK, Agarwal PK, Jain DC, Sharma RP and Howarth OW. Indian J Chem Sci. B 1995; 34, 674.
150. Maurya R and Hardass. "Tinocordifolin, a sesquiterpene from *T. cordifolia*." Phytochemistry 1998; 49: 1343-6.
151. Pathak AK, Agarwal PK, Jain DC, Sharma RP and Howarth OW. "NMR studies of 20b-hydroxy ecdysone, a steroid, isolated from *T. cordifolia*." Indian j. chem sec b 1995; 34: 674-6.
152. Gangan VD, Pradhan P and Sipahimalani AT. Indian J Chem Sec B 1997; .36, 787.
153. Ahmad M, Kazi AB, Karim R, Khaleque A and Miah MAW. Structure of tinosporide, a furanoid diterpene from *T. cordifolia*. Journal of Bangladesh Academy of sciences 1978; 2: 25- 30.
154. Hanuman JB, Bhatt RK and Sabata BK. A diterpenoid furano lactone from *T. cordifolia*. Phytochemistry 1986; 25: 1677-1680.
155. Qudrat-I-Khuda M, Khaleque A, Bashir A, Roufk MDA and Ray N. Studies on *T. cordifolia* – Isolation of tinosporon, tinosporic acid and tinosporol from fresh creeper. Scientific Research, 1966; 3: 9-12.
156. Dixit SN and Khosa RL. "Chemical investigation of *T. cordifolia*." Indian J. Appl Chem 1971; 34: 46-7.
157. Khaleque A, Miah MAW, Huq MS and Abdul BK. Sci Res (Dacca) 1970; 7, 61.
158. Khaleque A, Miah MAW, Huq MS and Abdul BK. Pak J Sci Ind Res. 1971; 14, 481.
159. Cowan MM. Plant products as antimicrobial agents. Clinical; microbiology reviews 1999; 12(4): 564-582.
160. Kumar R, Sharma RJ, Bairwa K, Roy RK and Kumar A. Pharmacological review on natural anti diarrhoeal agents. Der Pharma Chemica 2010; 2(2): 66-93.
161. Sutar N, Garai R, Sharma US and Sharma UK. Antihelmintic activity of *Platyclusus orientalis* leaves extract. International Journal of Parasitology Research. 2010; 2(2): 1-3.
162. Mute VM. Antihelmintic effect of *Tamarind indica* linn leaves juice extract on *Pheretima posthuma*. International Journal of Pharma Research and Development. 2009; 7: 1-6.
163. Sharma US, Sharma UK, Singh A, Sutar N and Singh PJ. *In vitro* antihelmintic activity of *Murraya koenigii* linn. Leaves extracts. International Journal of Pharma and Bio Sciences. 2010; 1(3): 1-4.
164. Mali RG, Mahajan SG and Mehta AA. *In-vitro* antihelmintic activity of stem bark of *Mimusops elengi* Linn. Pharmacognosy Magazine. 2007; 3(10): 73-76.
165. Patel J, Kumar GS, Qureshi MS and Jena PK. Antihelmintic activity of ethanolic extract of whole plant of *Eupatorium odoratum*. International Journal of Phytomedicine 2010; 2: 127-132.
166. Roy H. Preliminary phytochemical investigation and antihelmintic activity of *Acanthospermum hispidum* DC. Journal of Pharmaceutical Science and Technology 2010; 2 (5): 217-221.
167. Cruz ASP. Antihelmintic effect of *Solanum lycocarpum* in mice infected with *Aspicularis tetraptera*. The journal of American science 2008; 4(3): 75-79.
168. Wang GS, Han J, Zhao LW, Jiang DX, Liu YT and Liu XL. Antihelmintic activity of steroidal saponins from *Paris polyphylla*. Phytomedicine. 2010; 17: 1102-1105.
169. Vidyadhar S, Saidulu M, Gopal TK, Chamundeeswari D, Rao U and Banji D. *In vitro* antihelmintic activity of the whole plant of *Enicostemma littorale* by using various extracts. International Journal of Applied Biology and Pharmaceutical Technology. 2010; 1(3): 1119-1125.
170. Shaibani TRMA, Phulan MS and Shiekh M. Antihelmintic activity of *Fumaria parviflora* (Fumariaceae) against gastrointestinal nematodes of sheep. Int. J. Agric. Biol. 2009; 11: 431-436.
171. Bachaya HA, Iqbal I, Khan MN, Jabbar J, Gilani AH and Din IU. *In vitro* and *In vivo* antihelmintic activity of *Terminalia arjuna* bark. Int. J. Agric. Biol. 2009. 11: 273-278.
172. Maniyar Y, Bhixavatimath P and Agashikar NV. Antidiarrheal activity of flowers of *Ixora coccinea* Linn. In rats. J Ayurveda Integr Med. 2010; 1: 287-291.

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