

Conceptual study on Anthelmintic action of Kshara Agada: A review**Ranu Qureshi**

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Wardha, Maharashtra, India**Abstract**

In Agadatantra there are number of yoga are describe due to highly potential and fast acting ingredients. One such unique yoga (Formulation) describe by Acharya Charaka in Charaka Samhita is ksharagada yoga. Ksharagada is a yoga where Palash Kshar is prepared and several vishaghna drugs were added into it. It is indicated for the treatment of conditions manifested by poison such as inflammation, bloating, skin ailments, haemorrhoids, fistula-in-ano, liver diseases, anaemia, digestive ailments, respiratory ailments, psychological disturbances and also in worm manifestation (krumiroga). Ingredients of Ksharagada possess antibacterial, antioxidant, antimicrobial hepatoprotective and Anthelmintic action. The review is an attempt to provide collective knowledge on therapeutic, pharmacological and medicinal properties of Ksharagada with respect to its anthelmintic activity based on classical literature and available research.

Keywords: Ksharagada, Krumi, Anthelmintic action.**Introduction**

Man, the superior most of all the species is always remaining in search of One Prime Goal: The perfect health. From Vedic era to this age, all the researches have been directed by the eminent scholars to achieve the same. Ayurveda literatures are vast treasures of various drug formulations. Agada yogas are those formulations which counteract the deleterious actions of visha or poison over the senses and organs.¹ Although helminths (worms) infestation is not fatal, they sometimes leave greater impact on the growth and slow cognitive development of the children. Affect other system and may prove fatal. The major drawback in the fight against such parasite is insensibility to prevent them by immunization.

Ksharagada is one of the formulation described by Acharya Charaka.² It is indicated for the treatment of conditions manifested by poison such as Shotha (inflammation), Gulma (bloating), Twakdosa (skin ailments), Pandu (anaemia), haemorrhoids, fistula-in-ano, liver diseases, anaemia, digestive ailments, respiratory ailments, psychological disturbances and also in krumi roga. The ingredients are having antioxidant, antibacterial and hepatoprotective action. Ksharagada is available in gutika (pills) and churna (powder) form.³ The ingredients of kshara Agada according to Charaka Samhita and Charaka Samhita along with the Rasa Panchaka⁴

Material & Method:

Classical literature from Charaka Samhita was studied, and Research work related to ingredients of Ksharagada were compiled from various international journals. Interpretation and correlation of research and classical information was done to draw definite results.

Method of preparation

Preparation of Kshar:

The all part of dried Palash (*Butea monosperma*) was burnt totally with limestone. The ash part of plant was collected and mixed with water in 1:6 ratios. The mixture was filtered through filter paper for 21 times in a big vessel. Then filtrate was kept on fire at moderate temperature with continuous stirring. After complete evaporation of water whitish dry powder obtained, this is called Kshar.⁵

Properties of Kshara⁶. Kshara is not very penetrating, nor very soft, it is mild, spreading in nature, white in color, elevated when smeared, easy to remove and does not produce much secretions.

Preparation of Ksharagada:

Palasha (*Butea monosperma*) kshara is prepared and the powdered drugs are sprinkled and stirred while being cooked till the paste sticks to spoon. Pills are made from this paste and dried in shade.

Property of Haridra⁷(*Curcuma longa*)– *Curcuma longa* has katu, tikta rasa; ruksha laghu guna; usna veerya; katu vipaka; kusthagna (relieving skin disease) and vishagna (anti poisonous) karma. It contains phytoconstituents like curcumin, curcuminoids etc.

Anthelmintic activity⁸: The hydro-alcoholic extracts of *Curcuma longa*, *Zingiber officinale* and combination of *Curcuma longa* and *Zingiber officinale* rhizome extracts (1:1) were evaluated for their anthelmintic activity using *Pheretima posthuma* model (Indian earthworm). Extracts obtained from both rhizomes not only paralyzed but also killed the earthworms. Among the two drug extracts, *Curcuma longa* showed maximum vermifuge activity at the concentration of 50mg/ml. Combination of hydro-alcoholic rhizome extracts of *Curcuma longa* and *Zingiber officinale* also showed a significant anthelmintic activity. On the basis of the observations, it was concluded that both *Curcuma longa* and *Zingiber officinale* rhizomes extracts bearing a potential anthelmintic property.

Table 1: Rasa panchaka of the ingredients of Ksharagada

Dravya	Rasa	Guna	Veerya	Vipaka	Karma	Doshagnata
Haridra	Haridra Katu Tikta	Ruksa Laghu Usna	Usna	Katu	Kusthaghna	Visaghna
Surasmanjari	Tikta Katu	Ruksa Laghu	Usna	Katu	Kusthaghna Rucikara Krimighna	Kapha Vata Samaka
Daru haridra	Tikta Ruksa	Laghu	ushna	Katu	Visahara Kusthaghna	Pitta Kapha Samaka
jatamamsi	Tikta Kasaya Madhura	Snigdha Laghu	Sheeta	Katu	Vishagna	Twachya Tridosa Samaka
Hingu	Tikta Katu	Tiksna Laghu	Usna	Katu	Krimighna	Vata Kapha Samaka
Shweta Sariva	Tikta Madhura	Guru Snigdha	Sheeta	Madhura	Kusthaghna Visaghna Rucikara	Tridosa Samak

Krushna Sariva	Madhura	Snigdha, Guru Sukrala Ruchikar	Sheeta	Madhura	Vrana, Vishamjwara, Kushta,	Tridosh shamak
Madhuka	Kasaya Madhura	Guru Snigdha	Sheeta	Madhura	Balya, Sukrala	Vatapitta hara
Kushta	Tikta katu madhura	Laghu Ruksha	Usna	Katu	Kusthahara, hikka, kasahara	Vata Kapha hara
Shunti	Katu	Ruksha Tiksna	Usna	Madhura	Deepaniya, Kushtahara, shoolaghna	shoolaghna Vata Kapha hara
Pippali	Pippali Katu,	Laghu Snigdha	Usna	Madhura	Deepana, kushtahara, rasayana, shoolaghna	Vata Kapha hara
Maricha	Katu	Laghu Tiksna	Usna	Katu	Krimihara, kasahara	Kapha vata
Palasha	Palasha Katu tikta kashaya	Laghu, Snigdha	Usna	Katu	Krimighna Deepaniya Arshahara	Vata kaphahara
Laksha	Laksha Katu tikta	Laghu Snigdha	Usna	Katu	Kushtahara	Kapha Vata hara
Gairik	adhura kashaya	Snigdha. Shlakshan	Sheeta	Madhura	Varnya, jwarahar	Plttashamak
Saindhav	Lavana, Madhura	Snigdha, Tikshna, Sukshma	Sheeta	Madhura	Vrushya, Deepaniya	Tridoshhara
Harenu	Katu tikta	laghu	Sheeta	Katu	DeepanMedhya, Pachani, Vishaghna	Vatahara,, Kaphahara,

Property of Surasmanjiri⁹ (*Ocimum sanctum*)

Surasmanjiri has tikta, katu rasa; ruksha, laghu guna; usna veerya; kusthaghna, rucikara (appetizer), Krimighna (anti-helminthic) karma. *Ocimum sanctum* contains ursolic acid, polyphenols, anthocyanin and eugenol

Anthelmintic Activity¹⁰.

The formulated compound ursolic acid was also formulated at different concentration of 15, 20 and 25mg/ml as test. The time taken for the worm to lose its movement was considered for paralysis time and the time taken to drop its motility even in the occurrence of outside stimulus (when dipped in warm water at 55°C) and faded body color was measured for mortality time. Albendazole the standard drug at three different concentrations of 15, 20 and 25mg/ml with ethanol was made. Death time and paralysis time of each earthworm in the group was recorded hence Antihelminthic activity was evaluated due to compound ursolic acid present in it.

Property of Daruharidra¹¹ (*Berberis aristata*)

Daruharidra has tikta rasa; ruksha, laghu guna; usna veerya; katu vipaka; Visahara and kusthghna karma. *Berberis aristata* has alkaloid berberin. It is used as tonic, demulcent, diaphoretic and diuretic, in the treatment of skin disease, jaundice, and diarrhea.

Property of Jatamansi¹² (*Nardostachys jatamansi*)

Jatamansi has tikta, kasaya, madhura rasa; sita veerya; katu vipaka; vishaghna and tvachya (skin promoting effect) karma. *Nardostachys jatamansi* has sesquiterpene and coumarins as active principles.

Anthelmintic Activity¹³:

The hydroalcoholic extract of leaves of *Valeriana jatamansi* have shown anthelmintic activity at the doses 100, 200, 400 mg/ml. The result shows that hydroalcoholic extract possesses wormicidal activity and found to be effective as an anthelmintic may be due to presence of phenols as revealed in the phytochemical screening. The extract showed anthelmintic activity in dose-dependent manner giving shortest time of paralysis and death with 400 mg/ml concentration, for both the worms. Evaluation of anthelmintic activity was compared with reference standard Albendazole. This activity may be due to presence of polyphenolic compounds.

Property of Hingu¹⁴ (*Ferula asafoetida*)

Hingu has tikta, katu rasa; tiksna, laghu guna; usna veerya; katu vipaka; pacana (digesting action), rucikara, Krimighna karma. *Ferula asafoetida* contains sesquiterpene, coumarin.

Anti-helminthic activity¹⁵:

Sesquiterpinoid are another group of constituents which are found to have anti-helminthic properties and are found in this plant. The essential oils, flavonoids and terpenoids are found in this plant in which tannins are polyphenolic compounds contained in the extracts of *F. foetida* produced similar effects can be possible also they can bind to free protein in the gastrointestinal tract of host animal or glycoprotein on the cuticle of the parasite and result death of worm showing Antihelminthic activity.

Property of Sariva¹⁶ (*Hemidesmus indicus*)

Sariva has tikta rasa; guru, snigdha guna; sita veerya; madhura vipaka; rucikara, kusthaghna, visaghna karma. *Hemidesmus indicus* contain rutin as active principle.

Anthelmintic activity¹⁷: of steam distillates against earthworm model. The average paralysis and death time in case of *Hemidesmus* distillate alone was found to be 31 and 43 minutes respectively while it took more time to cause paralysis (85 min) and death (133 min) in case of *Hemidesmus*-Cow urine combination. In this case also *Hemidesmus* distillate alone was found to be more effective than combination trial.

Property of Yashtimadhu¹⁸ (*Glycyrrhiza glabra*)

Madhuka has tikta, madhura rasa; guru, snigdha guna; sita veerya; madhura vipaka; balya (improving strength) and sukrala (increasing sperm count) karma. *Glycyrrhiza glabra* contains glycyrrhizin.

Anthelmintic activity¹⁹.

The crude Ethanol extract of *Glycyrrhiza glabra* did produce anthelmintic activity against Indian earthworm *Pheretima posthuma*. The plant possesses significant anthelmintic activity at 100 mg/ml concentration measured by time taken for paralyse / death of the earth worms. The current investigation leads to conclusion that the roots of *G. glabra* have potent anthelmintic activity.

Property of Kustha²⁰ (*Saussurea lappa*)

Kustha has tikta, katu madhura rasa; laghu, ruksha guna; usna veerya; katu vipaka; kusthahara, hikkahara (relieving hiccups), kasahara (relieving cough) karma. *Saussurea lappa* contains sesquiterpene lactones as major phyto-constituent. It exhibits anti-in.

Antihelminthic activity²¹:

Dehydrocostus lactone and Costunolide exhibited strong larvicidal activity against *A. albopictus* with LC₅₀ values of 2.34 and 3.26 µg/mL, respectively, while the essential oil possessed LC₅₀ value of 12.41 µg/mL. The result indicated that the essential oil of *S. lappa* and the two isolated constituents possessed potential for use in control of *A. albopictus* larvae and could be useful in search of newer, safer and more effective natural compounds as larvicides

Property of Shunti²²(*Zingiber officinale*):

Shunti has katu rasa; ruksha, tiksna guna, usna veerya; madhura vipaka; deepaniya (appetizer), kusthahara and shoolaghna (relieving pain) karma. *Zingiber officinale* contains zingerol.

Antihelminthic activity²³:

The oil of *Piper longum* elicited that occurred between 12 to 15 minutes of exposure with 1:1000 v/v concentration of oil. The essential oil of *Piper longum* and its non-phenolic fraction did not significantly differ in their ability to inhibit the rhythmic motions, even though; minimal motions persisted in case of non-phenolic fraction (Kokate et al, 1980). Thus, it has happened obviously that, Trikatu churna is a mixed preparation of all these useful phytoconstituents, perhaps the synergistic interaction of alkaloids, flavonoids, tannins, lignins, steroids and other constituents in the extract may impart strong anthelmintic activity to the poly herbal preparation.

Property of Pippali²⁴ (*Piper longum*)-

Pippali has katu rasa; laghu, snigdha guna; usna veerya, madhura vipaka; deepaniya, kusthahara, rasayana (anti- ageing), shoolaghna karma. *Piper longum* contains piperin as main phytoconstituents. Bioavailability enhancer and larvicidal activity.

Antihelminthic activity²⁵:

The effect would be due to presence of alkaloids which may suppress the transfer of sucrose from the stomach to the small intestine together with its antioxidant effect which is capable of reducing the nitrate generation which could interfere in local homeostasis which is essential for the development of helminths. The possible mechanism of action of tannins may be interfere with energy generation by uncoupling oxidative phosphorylation, or may interfere with glycoprotein of cell surface, or can bind to free proteins in the gastrointestinal tract of host animal or glycoprotein on the cuticle of the parasite and cause death.

Property of Maricha²⁶ (*Piper nigrum*)

Maricha has katu rasa; tiksna guna; usna veerya; katu vipaka; krimihara, kasahara karma. *Piper nigrum* contains piperin as main phytoconstituents. It has ability to control worm infestations, cough and inflammations.

Antihelminthic activity²⁷:

The aqueous and ethanolic extract of *Piper nigrum*, Linn were evaluated for Anthelmintic activity. The dried powder of Black pepper (dried fruit) containing chemical constituent piperine were extracted and the activity was studied. Both aqueous and ethanolic extract collected were screened for preliminary phytochemical studies and also tested for Anthelmintic activity against Indian adult earthworm *Pheritima posthuma* (Annelida) and recorded the time taken for induction of paralysis and death. Some of these phytoconstituents may be responsible to show a potent Anthelmintic activity. It is also confirmed that these drugs triggers natural immune system to fight against various parasites and helminthes. This study reveals that *Piper nigrum* Linn shows potent Anthelmintic activity.

Property of Palash²⁸⁻³¹ (*Butea monosperma*)

Rasa : Madhura, Katu, Tikta, Kashaya Guna : Laghu, Ruksha, Sara, Virya : Ushna Vipaka : Madhura Karma : Deepana, Grahi, Kaphahara, Pittahara, Vatahara, Rakta Stambhana, Mutrala, Kushtaghna, Sandhaniya arshahar krimiaghna.

Antihelminthic activity³²:

Seeds of *Butea monosperma* administered as crude powder (CP) at doses of 1, 2 and 3 g/kg to sheep naturally infected with mixed species of gastrointestinal nematodes exhibited a dose and a time-dependent anthelmintic effect. The maximum reduction of 78.4% in eggs per gram of feces (EPG) was recorded on day 10 after treatment with 3 g/kg. Levamisole (7.5 mg/kg), a standard anthelmintic agent, exhibited 99.1% reduction in EPG.

Property of Laksha³³(*Laccifer lacca*)

Laksha has katu tikta rasa, laghu snigdha guna: ushna veerya :katu vipaka; kushtahara and kapha vata hara karma. The major constituent of sticklac is the resin (70-80%); other constituents present are: sugars, proteins, and soluble salts - 2-4; coloring matter - 1-2; wax - 4-6; sand, woody matter, insect bodies and other extraneous matter - 8-12; a volatile oil is present in traces. The second fraction possibly comprises interests of equivalent amounts of aleuritic acid, an isomer of aleuritic acid and laccolic lactone.

Properties of Gairik³⁴:

Gairik has madhura kashaya rasa snigdha vishada guna; sheetavirya; madhura vipaki; pittashamak, balya, vrana-ropan, netrya kaphahara, karma. Gairik is sweet in taste, smooth in quality, cold in potency is good for eyes. It has also astringent in taste. Gairika is useful in haemorrhoids, diseases, hiccup and vomiting. It acts as an antidote to poison and clears the disease caused by impure blood. (R.R.S.3/47)

Properties of Lavana³⁵ (Rock salt) :

Rasa : Madhura Virya : Sheeta Guna : Snigdha, Tikshna, Sukshma Vipaka : Madhura Doshagnata : Tridosahara. It has got Deepana and Vrishya properties in small doses, it is highly carminative and digestive. Saindhav plays the role of carrier and helps to reach the Basti Dravya at the microcellular level.

Properties of Harenu³⁶ (*Vitex Agnus-Castus*):

Harenu has Katu, Tikta Rasa, Guna Laghu Virya Shita Vipaka Katu Karma Deepan, Kaphahara, Medhya, Pachani, Vatahara, Vishaghna, Pittakara, Garbhapatini, Mukha vaimalyakara. Therapeutic Use: PMS galactagogue, potentials as an insect repellent. Chemical Constituent: alkaloids, flavonoids, diterpenoids, viterin, casterin, & steroidal hormone, precursors, have been isolated, from chemical analysis.

Observation & Result:

Ksharagada possess seventeen ingredients out of which maximum ingredients having research work on common action in anthelmintic activity, antibacterial, anti-inflammatory, anti-bacterial, antimicrobial, antifungal and antitoxic in action.

Discussion

There are many modalities to tackle krimi rogas, as per Charaka *Ksharagada* is one of them. *Kshar* has all the properties, such as Lekhana- debridement, Shodhana- cleaning, Vilayana- resolution and Shoshana- absorption of discharge and necrotic material. *Kshar* application over a particular disease is quite difficult and uneven. A definite shape of this particular drug is needed. *Ksharagada* has this quality along with homogeneous distribution of *Kshar*. *Ksharagada* has also quality of sustain release of drug because of its binding agent and poly herbal formulation. *Ksharagada* possess seventeen ingredients out of which Most of these drugs are having katu, tikta rasa; ushna veerya; katu vipaka; Kusthaghna, vishaghna, deepaniya and krimihara karmas. These drugs are very potent and reported to have actions such as anti-oxidant, anti-inflammatory, hepato-protective, anti-mutagenic, anti-bacterial, and anti-helminthic. Individually, some of these drugs have diuretic, diaphoretic actions

which are useful in elimination of poison mostly ingredients having research work on common action in anthelmintic activity.

Conclusion

Most of the ingredients of Ksharagada are having vishaghna, krimihara, deepaniya karmas. The use of Ksharagada in cases such as poisoning, worm infestations skin disorders, liver disorders, ano-rectal disorders, allergic problems is also justified theoretically. Individual ingredients of ksharagada possess promising anthelmintic activity and combination of ingredients having similar properties which enhance the desired action of drug and shows synergetic effect. The present paper enumerates various pharmacognostic and pharmacological aspects of the ksharagada this review also summaries the therapeutic potential of this Agada. Therefore *Ksharagada* can be considered as superior anthelmintic agent, however Research work needed on pharmacological & clinical ground to establish the classical claim.

References:

1. Sharma PV, Shodasanghrdayam, 14/1, Chaukhambhaorientalia, Varanasi.
2. Jadavji T, editor. Charaka Samhita, Chikitsa Sthana, Visha Chikitsa Adhyaya, 23/101-104, Reprint edition, ChaukhambhaOrientalia, Varanasi, 2015; 576.
3. Sastry JN, Dravya guna vijnana, 2nd edition Chaukhambhaorientalia Varanasi, 2005.
4. Vaidya HP, editor. Astangahrdayam, Sutra Sthana, ksharagni karma vidhi, 30/24, 10th edition, ChaukhambhaOrientalia, Varanasi, 2014; 355.
5. Anil Tripathi, S. J. Gupta., Role of kshara pichu and leech therapy in chronic non healing wound indian journal of research publication (2013)22 dec. 2012;7,12-16
6. Vaidya HP, editor. Astangahrdayam, Sutra Sthana, ksharagni karma vidhi, 30/24, 10th edition, ChaukhambhaOrientalia, Varanasi, 2014; 355.
7. Verma S, Singh DC, Singh R, Sanger RK. A Review - Curcuma Longa (Haridra): Emerging as Magical Herb From Traditions to the Pharmaceutical Industries. Ayushdhara 2016 Nov 5;1(2).
8. Rohini Singh *et al.* Anthelmintic activity of rhizome extracts of *Curcuma longa* and *Zingiber officinale* (zingiberaceae). International Journal of Pharmacy and Pharmaceutical Sciences. 3 Suppl 2; 2011: 236- 237.
9. Joshi B, Sah GP, Basnet BB, Bhatt MR, Sharma D, Subedi K, Pandey J, Malla R. Phytochemical extraction and antimicrobial properties of different medicinal plants: Ocimum sanctum (Tulsi), Eugenia caryophyllata (Clove), Achyranthes bidentata (Datiwan) and Azadirachta indica (Neem) Journal of Microbiology and Antimicrobials. 2011 Jan 30; 3(1): 1-7.
10. Nayak BS, Jena PK, Sahu NP, Nayak UK, Balakrishna Patro K. 2009. Comparative study of anthelmintic activity between aqueous and ethanolic extract of solanum surattense Linn. International Journal of Pharmacy and Pharmaceutical Sciences, 1(1): 103-107.
11. Mazumder PM, Das S, Das MK. Phyto-pharmacology of Berberis aristata DC: a review. Journal of Drug Delivery and Therapeutics. 2011 Sep 12;1(2): 46-50
12. Purnima MB, Kothiyal P. A review article on Phytochemistry and Pharmacological profiles of Nardostachys jatamansi DC-medicinal herb. J Pharmacogn Phytochem. 2015; 3(5): 102-6
13. Manjinder Kour, Harsimran Singh, Jagdeep Kaur* Department of Pharmacology, Sri Sai College of Pharmacy, Badhiani, Pathankot, Punjab, India Anthelmintic Activity of Hydroalcoholic Extract of Leaves of Valeriana Jatamansi
14. Iranshahy M, Iranshahi M. Traditional uses, photochemistry and pharmacology of asafetida (Ferula assafoetida oleo gum resin)- A review. Journal of ethnopharmacology. 2011 Mar 8; 134(1):1-0.
15. Gundamaraju. R Evaluation of antihelmintic activity of Ferula Foetida „Hinh the natural Indian spice” aqueous extract .Asian Pac J Trop Dis 2013;3:189191.

16. Saraswathy A, Vidhya B. HPTLC fingerprint profile of authentic and market sample of *Hemidesmus indicus* (Linn) R. Br. *International Journal of Pharmacy & Technology*. 2013 Apr; 5(1): 5230-39.
17. T.R.Prashithet.al., In vitro antimicrobial and anthelmintic activity of steam distillates of *Hemidesmus indicus* and *Swertiachirata* alone and in combination with Cow urine .*Kekuda bio technology and international journal*. 3(2), 2009 [81-86]
18. Kaur R, Kaur H, Dhindsa AS. *Glycyrrhiza glabra*: A phytopharmacological review. *International journal of pharmaceutical Sciences and Research*. 2013 Jul 1; 4(7): 2470.
19. Mounica P et al. Invitro evaluation of anthelmintic activity of *glycyrrhiza glabra* on indian earthworms *International Journal of Pharmacological Screening Methods/ Vol 7 / Issue 2 / 2017 / 51-54*
20. Pandey MM, Rastogi S, Rawat AK. *Saussurea costus*: Botanical, chemical and pharmacological review of an ayurvedic medicinal plant. *Journal of Ethnopharmacology* 2007 Apr 4; 110(3): 379-90.
21. Liu ZL, He Q, Chu SS, Wang CF, Du SS, Deng ZW. Essential oil composition and larvicidal activity of *Saussurea lappa* roots against the mosquito *Aedes albopictus* (Diptera: Culicidae). *Parasitology Research*. 2012; 110(6):2125-2130.
22. Ali BH, Blunden G, Tanira MO, Nemmar A. Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinale* Roscoe): a review of recent research . *Food and chemical toxicology*. 2008 Feb 29; 46(2): 409-20.
23. Kokate, C.K.; Chaudhari, G.N. and Nimbkar, A.Y. (1980). Search for anthelmintics of plant origin: activities of volatile principles of *Acorus calamus* and *Piper longum* against *Ascaris lumbricoides*, . *Asian Symposium on Medicinal Plants and Spices, Conference, Bangkok (Thailand)*, 15-19.
24. Kumar S, Kamboj J, Sharma S. Overview for Various Aspects of the health benefits of *Piper Longum* Linn. Fruit. *Journal of Acupuncture and Meridian Studies*. 2011 ;4(2):134-40
25. Bauri R. K., Tigga M. N and Kullu S. S., A review on use of medicinal plants to control parasites. *IJNPR*, 6(4): 268277, (2015).
26. Belemkar S, Kumar A, Pata MK. Pharmacological Screening of Herbal Extract of *Piper nigrum* (Maricha) and *Cinnamomum zeylanicum* (Dalchini) for Anticonvulsant Activity. *Ethnopharmacology*. 2013 Apr 5;2(2) 1-5.
27. Mrs. Vishin Ashish et al., Comparative Anthelmintic Activity and Phytochemical Evaluation of *Tridax procumbens* Linn Whole Plant Extract and *Piper nigrum* Linn Seed Extract on Indian Adult Earthworm *Int. J. Pharm. Sci. Rev. Res.*, 27(2), July – August 2014; Article No. 07, Pages: 54-571.
28. The Ayurvedic Pharmacopoeia of India, part -1 vol – 4, Govt of India, Ministry of Health & Family Welfare Dept. of Ayush. Pg.78. 144.
29. The Ayurvedic Pharmacopoeia of India, part -1 vol – 1, ,Govt of India , Ministry of Health & Family Welfare Dept. of Ayush. Pg.80. 145.
30. The Ayurvedic Pharmacopoeia of India, part -1 vol – 2, ,Govt of India , Ministry of Health & Family Welfare Dept. of Ayush. pg126
31. The Ayurvedic Pharmacopoeia of India, part -1 vol – 4, ,Govt of India , Ministry of Health & Family Welfare Dept. of Ayush. Pg.93. 147.
32. Prashanth D., Asha M.K., Amit A., Padmaja R., Anthelmintic activity of *Butea monosperma*; *Fitoterapia* 2001; 72; 421-422.
33. www.medical-explorer.com medicinal-ingredients.../laccifer-laccarders /
34. Sharma P.v. *madanapalanighantu-Commentary* by Chaukambha Orientalia, Varanasi (india); 1st ed. 1982. pg.432-433.
35. Sharma P.v. *madanapalanighantu-Commentary* by Chaukambha Orientalia, Varanasi (india); 1st ed. 1982. pg 344
36. The Ayurvedic Pharmacopoeia of India, part -1 vol – 5, Govt of India , Ministry of Health & Family Welfare Dept. of Ayush. Pg.154.