International Journal of Pharmacy and Biological Sciences-IJPBS™ (2019) 9 (2): 605-611
Online ISSN: 2230-7605, Print ISSN: 2321-3272
Review Article | Pharmaceutical Sciences | Open Access | MCI Approved
UGC Approved Journal

Anthelmintic Activity of Some Medicinal Plants: A Short Review

Pavan Kumar Kokkula*, Rajeev Imadi, Prasad Garrepally, S Nikitha
Department of Pharmacology, Unity College of Pharmacy, Raigiri, Bhongiri, Yadadri Bhuvanagiri Dist, Telangana State- 508 116

Received: 15 Jan 2019 / Accepted: 12 Mar 2019 / Published online: 1 Apr 2019
Corresponding Author Email: pawan0004@gmail.com

Abstract
Medicinal plants are one of the best natural sources of pharmacological activities with less side effects but possess less efficacy compared to synthetic medicines. Parasitic helminths cause huge health issues for mankind and livestock and major economic loss by declined livestock production. Many crude drugs were proved to possess anthelminthic activity in traditional systems and used by many ethnic groups throughout the world, are screened for anthelmintic activity by invitro and invivo screening models. This present review presents some medicinal plants which possess vermifuge and vermicidal activity proved scientifically by using preclinical screening methods and there is need for further investigation to develop a lead molecule for novel herbal products.

Keywords
Anthelminthic activity, medicinal plants, livestock, vermifuge and vermicidal

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INTRODUCTION
Helminthiasis is also called as worm infection and it is a macro parasitic disease occurs in mankind and animals. The helminths reside in the git of humans and animals, but they also burrow into different organs and causes different infections such as Liver (fasciolosis), Lung (paragonimiasis), Muscle (cysticercosis), Skin (strongyloidiasis), Lymph (filariasis), Eye (river blindness), Brain (paragonimiasis) respectively. Helminthiasis is transmitted by ingestion of contaminated food, contaminated water, mosquitoes and flies. It is more prevalent in tropical and subtropical areas including sub-Saharan Africa, central and East Asia and the Americas. In men, helminths Infections are more common than female. Helminthiasis is one of the causative factors for malnutrition, Iron deficiency anaemia, cognitive changes and increased susceptibility to tuberculosis, HIV and malaria. The second most prevalent parasitic disease of humans after malaria is Schistosomiasis due to poor management practices. Anthelmintic acts as vermifuges (stunning) or vermicides (killing). Stomach pain, nausea and vomiting, dizziness, spinning sensation, headache and temporary hair loss are the most common side effects of anthelmintic drugs. Now a days the availability of allopathic drugs is not sufficient for the treatment of helminthiasis of huge population and they developed resistance or not effective. There are no major side effects when ayurvedic drugs are used for treatment of helminthiasis and scientific evidence is required for use of plant products in Ayurveda.

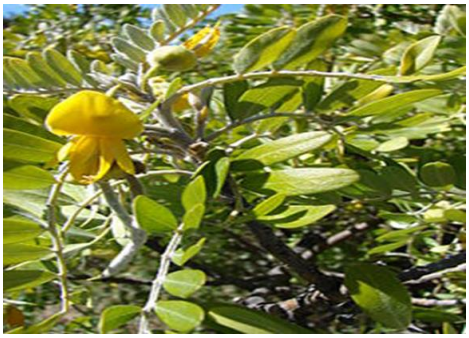

Fig No.1: *Sophora interrupta* plant

Sophora interrupta is a woody perennial shrub belongs to the family *Fabaceae*. Abortifacient, anti-bacterial, anti-cholesterolemic, anti-inflammatory, anti-spasmodic, diuretic, emetic, emollient, febrifuge, hypotensive, purgative, styptic and tonic are pharmacological properties of the plant[1].

Fig No.2: *Jussiaea hyssopifolia G. Don* plant

Jussiaea hyssopifolia G. Don belongs to the family *Onagraceae*, grows in dumpy areas. It possesses the astringent, carminative, laxative and diuretic activities[2].

Fig No.3: *Allium sativum* plant

Allium sativum is a bulbous plant belongs to the family *Amaryllidaceae*.It is used in the treatment hypertension, cancer, common cold, and cabbage root fly and red mite in poultry are controlled by *Allium sativum* and it acts as an antimicrobial agent, nematicide, insecticide, and preservative in meat and fish preparations[3].

Fig.No.4: *Curcurbita mexicana* plant

Cucurbita is an herbaceous vine belongs to the family Cucurbitaceae.Vitamin A and vitamin C are obtained from fruits of Cucurbita and also used in the preparation of pumpkin pie, biscuits, bread, desserts, puddings, beverages, and soups[3].

Fig.No.5: *Ficus religiosa* plant

Ficus religiosa is a large dry season-deciduous or semi-evergreen tree belongs to the family Moraceae .It acts as an anti-asthmatic, anti-diabetic, anti-diarrheal, antiepileptic, anti-inflammatory, anti-infective, anti-dysenteric, Immune booster, and also effective against sexual disorders, gastric problems and piles, teeth disorders and skin disorders like sores[3].

Fig.No.6: *Nerium olender* plant

Nerium olender is a shrub or small tree belongs to the family *Apocynaceae*. It is effective against heart conditions, asthma, epilepsy, cancer, painful menstrual periods, leprosy, malaria, ringworm, indigestion, and STDs, and used topically to treat skin problems and warts. It also possesses an analgesic, anti-anxiety, antioxidant, antidiabetic, antibacterial, antifungal and insecticidal activities[4].

Fig.No.7: *Luffa cylindrica (L.)* plant

Luffa cylindrica (Linn.) belongs to the family *Cucurbitaceae.* Fruits showed an anthelmintic, carminative, laxative, depurative, emollient, expectorant, and diuretic and lactagogue activities, and also effective against fever, syphilis, tumours, bronchitis, splenopathy, leprosy, ascites, jaundice, biliary and intestinal colitis and enlarged liver. Seeds are useful in the treatment of asthma, sinusitis, fever, and seed oil tincture is useful in skin infections. The plant possesses anti-tubercular and antiseptic activities. Snake-bites are treated by leaves extract[5].

Fig.No.8: *Thespesia lampas (Cav.)* plant

Thespesia lampas (Cav.) is a tall and undershrub growing on hill slopes belongs to the family *Malvaceae*, leaves are effective against inflammation, ringworms and skin diseases and roots and fruits effective against STDs (gonorrhea and syphilis)[6].

Fig.No.9: *Clitoria ternatea (Linn.)* Plant

Clitoria ternatea Linn is a perennial twinning herb belongs to the family *Fabaceae.* It showed laxative, diuretic, brain tonic, antiulcer activities, and also effective against headache and snakebite[7].

Fig.No.10: *Guazuma ulmifolia Lam.* plant

Guazuma ulmifolia Lam., is a medium-sized tree belongs to the family *Sterculiaceae.* The bark is effective against diarrhea, hemorrhages, fever, coughs, bronchitis, asthma, gastrointestinal pain and hypertension, and also used as uterotonics[7].

Fig.No.11: *Madhuca indica Gmel.* plant

Madhuca indica Gmel, a tree grows throughout the sub-tropical region belongs to the family *Sapotaceae.* Edible fats are obtained from seeds and washing soaps are prepared from them.

Fig.No.12: *Leonotis nepetiifolia (Linn.)* plant

Leonotis nepetiifolia (Linn.) belongs to the family *Lamiaceae.* The plant is effective against asthma, rheumatism, rickets, diarrhoea, fever, malaria, analgesic in menstrual pains, headaches and wounds[8].

Fig.No.13: *Curcuma longa (Linn.)* plant

Curcuma longa (Linn.) is a perennial plant belongs to the family *Zingiberaceae.* It has analgesic, antibacterial, antioxidant, expectorant and flavouring agent activities. The rhizomes are effective against inflammation[9].

Fig.No.14: *Zingiber officinale* plant

Zingiber officinale is an herbaceous rhizomatous perennial flowering plant belongs to the family *Zingiberaceae*. Powdered dry ginger root acts as a flavoring agent. Ginger shows effect against nausea and vomiting resulting from pregnancy or chemotherapy, and heartburn, it also possesses an analgesic, anti-inflammatory and antipyretic activities [9].

Fig.No.15: *Ficus benghalensis* plant

Ficus benghalensis is a tree belongs to the family *Moraceae*. It is effective against diarrhea, dysentery, piles, teeth disorders, rheumatism, skin disorders like sores, and diabetes. It also acts as an Immuno booster. Lipid peroxidation is inhibited by plant extract[10].

Fig.No.16: *Pongamia glabra* plant

Pongamia glabra is a tree belongs to the family *Papilionaceae*. Leaves acts as digestive, laxative, anthelmintic and effective against wounds and inflammation. Flowers showed antidiabetic activity. Fruits and seeds possess an anthelmintic property and used to treat keratitis and urinary discharges. Oil isolated from plant possess anthelmintic activity and effective against rheumatism, leucoderma, scabies, wounds, leprosy, piles and ulcers. Snakebite is treated by all parts of the plant [11].

Sophora interrupta

Methanolic leaf extract of the plant was extracted by Soxhlet apparatus and the crude extract was subjected to qualitative tests for the identification of various active constituents and checked against *Pheretima posthuma*(Indian adult earthworms) using petridish method and earthworms are divided into standard group(Albendazole 10mg/ml),test

groups(5mg/ml,10mg/ml,15mg/ml,20mg/ml,25mg/ml and 30mg/ml) and control group(normal saline) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and the effect increased with concentration[1].

Jussiaea hyssopifolia G. Don

Methanolic extract of whole plant was extracted by soxhlet apparatus and investigated against *Pheretima posthuma* (Indian adult earthworms) using petridish method and earthworms are divided into standard group(Albendazole 10mg/ml),test groups(100mg/ml,200mg/ml and 300mg/ml) and control group(2% gum acacia) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and the effect increased with concentration[2].

Allium sativum, Zingiber officinale, Curcurbita mexicana & Ficus religiosa

Methanolic extract of each plant was extracted by soxhlet apparatus and studied against adult motile *Haemonchus contortus*(red stomach worm) using petridish method and red stomach worm are divided into control group (normal saline) and test groups and the crude extracts used to determine motility and survival of *Haemonchus contortus* and efficacy increases with exposure time increase and *Allium sativum,Zingiber officinale* and *Ficus religiosa* showed 100% efficacy and *Curcurbita mexicana* and normal saline showed 83.4% and 50% efficacy on 6 hours post exposure respectively[3].

Nerium olender

Aqueous extraction of flowers of *Nerium olender* was extracted by decoction method and the crude extract was subjected to qualitative tests for the identification of various active constituents and studied against *Pheretima posthuma* (Indian Adult Earth Worms) using petridish method and earthworms are divided into standard group (Albendazole 15mg/ml),test groups(15mg/ml,25mg/ml,50mg/ml and 100mg/ml) and control group(normal saline) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and the effect increased with concentration[4].

Luffa cylindrica Linn.

Aqueous and methanol extracts of *Luffa cylindrica Linn.*leaves are extracted by soxhlet apparatus and studied against *Pheretima posthuma* (Indian Adult Earth Worms) using petridish method and earthworms are divided into standard group(Albendazole 20mg/ml),test groups (AELC group 50mg/ml and 100mg/ml),(MELC group 50mg/ml and 100mg/ml)) and control group(0.5% CMC) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and the effect increased with concentration. The methanolic extract of plant possesses significant invitro anthelmintic activity at 100 mg/ml concentration measured by time taken for paralyse / death of the earth worms than aqueous extract[5].

Thespesia lampas (Cav.)

Aqueous extract of roots was extracted by maceration method and investigated against *Pheretima posthuma* (Indian Adult Earth Worms), *Ascaridia galli* (Roundworm) and *Raillietina spiralis* (Tapeworm) using petridish method and earthworms are divided into standard group(Piperazine 10mg/ml),test groups(10mg/ml,20mg/ml and 50mg/ml) and control group(distilled water) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and the effect increased and time decreased with concentration[6].

Clitoria ternatea Linn. Guazuma ulmifolia Lam., Madhuca indica Gmel.

Ethanolic extract of each plant was extracted by soxhlet apparatus and the crude extract was subjected to qualitative tests for the identification of various active constituents and investigated against *Pheretima posthuma* (Indian Adult Earth Worms) using petridish method and earthworms are divided into standard group(Piperazine 10mg/ml),test groups((*Clitoria ternatea* group 25mg/ml,50mg/ml and 100mg/ml), (*Guazuma ulmifolia* group 25mg/ml,50mg/ml and 100mg/ml) and (*Madhuca indica* group 25mg/ml,50mg/ml and 100mg/ml)) and control group(normal saline) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and the effect increased with concentration. The ethanolic extract of *Madhuca indica* possesses significant invitro anthelmintic activity at 100 mg/ml concentration measured by time taken for paralyse / death of the earth worms than piperazine and it is necessary to identify and isolate the possible active phytoconstituents responsible for the anthelmintic activity and study its pharmacological actions[7].

Leonotis nepetifolia Linn.

Ethyl acetate and Methanol(95%) extracts of leaves are extracted by soxhlet apparatus and aqueous extract of leaves was extracted by maceration method and the crude extract was subjected to qualitative tests for the identification of various active constituents and studied against *Pheretima posthuma* (Indian Adult Earth Worms) using

petridish method and earthworms are divided into standard group (Albendazole 25 mg/ml / 50 mg/ml / 75 mg/ml), test groups [(Aqueous group 25 mg/ml / 50 mg/ml / 75 mg/ml), (methanol group 25 mg/ml / 50 mg/ml / 75 mg/ml), (Ethyl acetate group 25 mg/ml / 50 mg/ml / 75mg/ml)] and control group(normal saline) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and the effect increased with concentration. The methanolic extract of plant possesses significant invitro anthelmintic activity at 75 mg/ml concentration measured by time taken for paralyse / death of the earth worms than standard drug and it is necessary to identify and isolate the possible active phytoconstituents responsible for the anthelmintic activity and study its pharmacological actions[8].

Curcuma longa & Zingiber officinale

Ethanolic(70%) extract of rhizomes of each plant was extracted by soxhlet apparatus and the crude extract was subjected to qualitative tests for the identification of various active constituents and investigated against *Pheretima posthuma* (Indian Adult Earth Worms) using petridish method and earthworms are divided into standard group (Piperazine 20 mg/ml), test groups (10mg/ml / 20mg/ml / 50mg/ml) and control group (normal saline) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and the effect increased with concentration. The ethanolic extract of *Zingiber officinale* possesses significant invitro anthelmintic activity at 50mg/ml concentration measured by time taken for paralyse / death of the earth worms than *Curcuma longa* and the combination of crude extracts is more significant than the individual drugs[9].

Ficus benghalensis

Aqueous extraction of roots of *Ficus benghalensis* was extracted by decoction method and the crude extract was subjected to qualitative tests for the identification of various active constituents and studied against *Pheretima posthuma* (Indian Adult Earth Worms) using petridish method and earthworms are divided into standard group(Albendazole 20mg/ml),test groups [(Aqueous extract group 20mg/ml),(methanol extract group 20mg/ml),(Chloroform extract group 20mg/ml),(petroleum ether extract group 20mg/ml)] and control group(5% DMF in normal saline) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and it is concluded that all the extracts of roots of *Ficus benghalensis* have potent anthelmintic activity when compared with the conventionally used drug and is equipotent to standard anthelmintic drug. Further studies using in vivo models are required to carry out and establish the effectiveness and pharmacological rationale for the use of Ficus benghalensis as an anthelmintic drug. The drug may be further explored for its phytochemical profile to identify the active constituent responsible for anthelmintic activity[10].

Pongamia glabra

Methanol extract of leaves, wood, bark and pericarp of the fruit of P. glabra were extracted by Soxhlet apparatus and seeds were extracted with Soxhlet apparatus by using petroleum ether (60-80^{o} C), ethyl acetate and methanol as a solvent and the crude extract was subjected to qualitative tests for the identification of various active constituents and studied against *Pheretima posthuma* (Indian adult earthworms) using petridish method and earthworms are divided into standard group(Albendazole 20mg/ml and Nitazoxamide (20 mg/ml)),test groups [(Total Methanolic Extracts of various parts of *Pongamia glabra* (20mg/ml,each)),(Petroleum Ether Extract/Ethyl Acetate Extract/Methanolic Extract of seeds of P. glabra (20 mg/ml, each))] and control group(5% DMF in normal saline) and the crude extracts determined paralysis time and death time and showed vermifuge activity and vermicidal activity and it is concluded that all total methanolic extract of seed of P. glabra showed best anthelmintic activity at 20 mg/ ml concentrations when compared with the conventionally used drug and is equipotent to standard anthelmintic drug(except total methanolic extracts of wood) and ethyl acetate extract of seeds of P. glabra is more potent than standard drugs. Further studies using in-vivo models are required to carry out and establish the effectiveness and pharmacological rationale for the use of *Pongamia glabra* as an anthelmintic drug. The drug may be further explored for its phytochemical profile to identify the active constituent responsible for anthelmintic activity[11].

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