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## Anthelmintic Activity of Plants: A Review

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### ABSTRACT

Medicinal plants were the potent source of many pharmacological activities. Among that the plants of anthelmintic action has attained a great interest due the capability of the plant and its compound to treat a disease that causes major economic loss and reduced livestock production to the livestock holders. The pathogenic infection causes the severe effect of mortality and other problems that were uncontrolled due to the anthelmintic resistance that is developed in the host organism. Even though, many synthetic drugs were manufactured; they produce more side effect than that of the treatment efficacy. Hence, the need for the exploration of the plants for the treatment has attained a great interest and this review gives the list of few medicinal plants that were capable of reducing the helminthic infection.

**Key words:** Anthelmintic, helminthiasis, vermifuge, *Chenopodium album*, trichostrongylid nematodes, *Haemonchus contortus*

### INTRODUCTION

Gastrointestinal parasite becomes a serious threat to the livestock production in the developing nations. In spite of the development of anthelmintic resistance in the parasites of higher economical significance, chemotherapy is still used widely for the purpose of controlling the helminthes (Jabbar *et al.*, 2007). Helminthiasis which is caused by the helminthes infection is proved to be a major constraint in the livestock production all around the globe. As mentioned above, chemotherapeutics remain the corner stone for treating the helminthiasis by overcoming certain factors such as chemical residues and toxicity, increased cost, non-adaptability of drugs and non-availability in the remote areas (Hussain *et al.*, 2011).

For example, breeding of small ruminants plays as a widespread economic activity in Northeastern Brazil. However, gastrointestinal nematode limits the production by causing high mortality rates in herds during the rainy season. Epidemiological investigations that were carried out in that region proved that sheep and goats were infected completely by nematodes and that *Haemonchus contortus* was found to be the most prevalent species. Synthetic anthelmintics were the only source for the control of the gastrointestinal nematode by means of continuous and intensive use in the recent decades. However, certain constraints like the high cost of these drugs and the usual development of the nematode-resistant populations, along with the risk of contamination of the animal products and environment have lead to the search for control alternatives. The usage of medicinal plants for the above problem is more acceptable from the ancient period since they have the advantage of sustainable supply and are ecologically acceptable (Oliveira *et al.*, 2009).

*Chenopodium album* L. belonging to the Chenopodiaceae family has been found to possess diuretic, laxative, sedative, hepatoprotective and antiparasitic properties (Jabbar *et al.*, 2007). The

seeds of *Caesalpinia crista* L. a member of the Fabaceae family are used to treat asthma, chronic fever, cough, headache, stomach or bowel upset (Jabbar *et al.*, 2007). *Trianthema portulacastrum* L. belongs to the Aizoaceae family and is used widely as anthelmintic vermifuge and antirhematitis, alexiteric, analgesic and stomachic, laxative (Jabbar *et al.*, 2007). *Musa paradisiaca* L. of the Musaceae family has been used traditionally to treat inflammation, rheumatism, gripe, diabetes, hypertension, cough and bronchitis, antidote for snake bite, diarrhea (Hussain *et al.*, 2011). *Cocos nucifera* L. belongs to the Palmae family and is used for the treatment of gastrointestinal parasitism (Oliveira *et al.*, 2009). *Hedera helix* L. of the Araliaceae family is used to treat diseases of the gastrointestinal tract and gall-stones and for the treatment of inflammations and burns, cough, neuralgia and rheumatism (Egualde *et al.*, 2007a). Concoctions obtained from the bark, roots and fruits of *Rapanea melanophloeos* and *Myrsine africana* trees which are members of the Myrsinaceae family have been widely used as anthelmintics in humans and livestock (Githiori *et al.*, 2002). *Albizia schimperiana* of the Fabaceae family is known for its anthelmintic properties (Githiori *et al.*, 2002). *Leucas martinicensis* of the Lamiaceae family is as an anthelmintic (vermifuge) and also in the treatment of cancer, diarrhea and stomach pain (colic), schistosomiasis, asthma (Githiori *et al.*, 2002). *Rumex abyssinicus* a member of the Polygonaceae family is widely used in the treatment of headache, hemorrhoid, ascaris, scabies, leprosy, fungal skin infection, wound, eczema and soar throat and to control mild forms of diabetes. The decoction obtained from the root or leaf powder of the plant is used as vermifuge (Githiori *et al.*, 2002). *Leonotis ocyimifolia* of the Lamiaceae family is used for the treatment of hook worm infection. Flowers and roots are used against gout, leishmaniasis and cancer (Githiori *et al.*, 2002). *Albizia gummifera* belonging to the Fabaceae family is used in the treatment of guinea-worm and as a vermifuge in children (Egualde *et al.*, 2011). *Combretum molle* of the Combretaceae family is used to treat Human ailments, including abdominal discomfort, body pains, respiratory disorders, colds and fevers, ear and eye ailments, schistosomiasis, hookworms, dysmenorrhoea and infertility in women, leprosy, syphilis, microbial infections and general body weakness (Ademola and Eloff, 2010). *Brucea javanica* a member of the Simaroubaceae family is used for the treatment of cancer, amoebic dysentery and malaria (Wang *et al.*, 2011). *Carica papaya* is a member of the Caricaceae family and the leaves of this plant are routinely consumed as food (Satrija *et al.*, 1995). *Coriandrum sativum* of the Apiaceae family is used widely in the treatment of stomach ache, ascariasis and hepatitis in human (Egualde *et al.*, 2007b). Liquid waste from *Agave sisalana* commonly known as sisal possess anthelmintic efficacy (Botura *et al.*, 2011). *Khaya senegalensis* belonging to the Meliaceae family is used as an vermifuge, taenicide and as antimicrobial agent (Ademola *et al.*, 2004). *Paris polyphylla* of the Lilaceae family is antifebrile, alexipharmic, detumescent, demulcent, hemostatic and the treatment of hepatopathy (Wang *et al.*, 2010). *Ocimum sanctum* a member of the Lamiaceae is widely used as an anthelmintic, expectorant, antipyretic, insecticidal and in a variety of skin diseases (Asha *et al.*, 2001). *Ficus* species of the Moraceae family is a vermifuge (De Amorin *et al.*, 1999). *Butea monosperma* belongs to the Papilionaceae family and its gum is being used as an astringent. The seeds of *Butea monosperma* are used as laxative and anthelmintic; leaves and flowers are tonic, aphrodisiac and diuretic (Prashanth *et al.*, 2001). *Artemisia brevifolia* of the Asteraceae family is used as an anthelmintic (Iqbal *et al.*, 2004). *Pycnanthus angolensis* a member of the Myristicaceae family has been used as a haemostatic, an analgesic, anthelmintic, anti-inflammatory and also in treating craw-craw and pneumonial infections (Gbolade and Adeyemi, 2008). *Sphenocentrum jollyanum* of the Menispermaceae family is used as an Analgesic, aphrodisiac and for treating cough and wounds (Gbolade and Adeyemi, 2008). *Ziziphus nummularia* of the Rhamnaceae family is being used

as an analgesic (Bachaya *et al.*, 2009). *Acacia nilotica* belongs to the Fabaceae family and has used widely as an astringent, insect repellent. *Calotropis procera* a member of the Asclepiadaceae family is used as an expectorant, anti-helminthic, laxative, purgative, anti-inflammatory and diuretic (Iqbal *et al.*, 2005). *Azadirachta indica* commonly known as neem, a member of the Meliaceae family is used traditionally in treating indigestion, tick infestation and toxemia (Iqbal *et al.*, 2010). *Artemisia absinthium* a well-known ornamental plant is used as a vermifuge, an insecticide, in the treatment of chronic fevers and for inflammation of the liver, as an antispasmodic and antiseptic, antipyretic, anthelmintic, tonic and diuretic and for the treatment of stomach aches (Tariq *et al.*, 2009). *Nauclea latifolia* belongs to the Rubiaceae family and is used widely to treat gastrointestinal worm infections, malaria, fever, stomach ache and liver diseases (Onyeyili *et al.*, 2001). *Zingiber officinale* is a member of the Zingiberaceae family and has been showed to be effective against arthritis, rheumatism, sprains, muscular aches, pains, sore throats, cramps, constipation, indigestion, vomiting, hypertension, dementia, fever, infectious diseases and helminthiasis (Iqbal *et al.*, 2006).

#### ANTHELMINTIC EFFECTS OF THE ABOVE MEDICINAL PLANTS

***Chenopodium album* L:** Seed kernel and crude aqueous and methanolic extract of the plant part have been used and tested against trichostrongylid nematodes of sheep and tested for adult motility assay and egg hatch test. They found that plant exhibited dose and time-dependent anthelmintic effects by causing mortality of worms and inhibition of egg hatching (Jabbar *et al.*, 2007).

***Caesalpinia crista* L:** Whole plant and crude aqueous and methanolic extract, Trichostrongylid nematodes of sheep, adult motility assay and egg hatch test, plant exhibited dose and time-dependent anthelmintic effects by causing mortality of worms and inhibition of egg hatching (Jabbar *et al.*, 2007).

***Trianthema portulacastrum* L:** Whole plant was extracted with crude aqueous and methanol and the extracts are veteran adjacent to gastrointestinal nematodes of sheep by adult motility assay and egg hatch test. The plant found to contain dose and time dependent anthelmintic effects on live worms as well as egg hatching (Hussain *et al.*, 2011).

***Musa paradisiaca* L:** Leaves of the plant was extorted aligned with crude aqueous and methanol are investigated against sheep gastrointestinal nematodes via adult motility assay and egg hatch test, dose and time dependent anthelmintic effects were found on live worms as well as egg hatching (Hussain *et al.*, 2011).

***Cocos nucifera* L:** Fruit of this plant was extracted with ethyl acetate and tested on sheep nematodes by egg hatching and larval development tests. These extract were found to contain 100% efficacy on egg hatching and 99.77% on larval development (Oliveira *et al.*, 2009).

***Hedera helix* L:** Aqueous and hydro-alcoholic extracts of ripe fruits were investigated against eggs and adult nematode parasites with faecal egg count reduction, packed red cell volume and total worm count reduction. Hydro-alcoholic extract illustrated better *in vitro* activity aligned with adult parasites compared to the aqueous extract (Eguale *et al.*, 2007a).

**Myrsine Africana:** Aqueous extract of leaves and fruits of the plant was checked with nematode parasite. The faecal nematode egg counts, packed red cell volume, live weight were identified and concluded that it is not efficacious against *H. contortus* in sheep (Githiori *et al.*, 2002).

**Rapanea melanophloeos:** Fruits and aqueous extracts were tested against nematode parasite and determined for faecal nematode egg counts, packed red cell volume, live weight and found that no efficacious against *H. contortus* in sheep (Githiori *et al.*, 2002).

**Albizia schimperiana oliv:** Stem bark was extracted with crude aqueous and hydro-alcohol and tested with eggs and larvae of *Haemonchus contortus* species. Egg-hatching and larval development assay was conducted. The extract found to induce the complete inhibition of egg hatching at concentration less than or equal to 1 mg mL<sup>-1</sup> (Egualé *et al.*, 2011).

**Leucas martinicensis (Jacq) R. Br; Rumex abyssinicus Jacq; Leonotis ocymifolia (Burm. f.) Iwarsson:** Crude aqueous and hydro-alcoholic extracts of aerial parts of plants were tested against eggs and larvae of *Haemonchus contortus*. The extracts were initiate complete inhibition of egg hatching at concentration less than or equal to 1 mg mL<sup>-1</sup> (Egualé *et al.*, 2011).

**Senna occidentalis (L.) Link (Egualé *et al.*, 2011); Combretum molle (R. Br. ex G. Don) (Ademola and Eloff, 2010):** Leaves and crude aqueous and hydro-alcoholic extracts of these plants were tested against eggs and larvae of *Haemonchus contortus*. Extracts were induced the complete inhibition of egg hatching at concentration less than or equal to 1 mg mL<sup>-1</sup> in a concentration-dependent manner.

**Combretum molle (R. Br. ex G. Don):** Leaf and acetone extract, *Haemonchus contortus* ova and larvae, egg hatch and larval a development and viability assay *in vitro*, the extracts inhibited egg hatching and development of the larvae of *H. contortus* in a concentration-dependent manner (Ademola and Eloff, 2010).

**Brucea javanica:** Dried fruits of the plant with methanol were extracted and tested against *Dactylogyrus Intermedius* (Monogenea) in goldfish, Bruceine A and D found to exhibit significant activity against *D. intermedius* than the positive control mebendazole (Wang *et al.*, 2011).

**Carica papaya L:** Papaya latex was checked adjacent to *Heligmosomoides polygyrus* infections in mice. The papaya latex showed an antiparasitic efficacy (Satrija *et al.*, 1995).

**Coriandrum sativum:** Crude aqueous and hydro-alcoholic extracts of the seeds were tartan against egg and adult nematode parasite. Faecal egg count reduction (FECR) and Total Worm Count Reduction (TWCRC) parameters were checked. Both the extracts were found to inhibit the hatching of eggs completely at a concentration less than 0.5 mg mL<sup>-1</sup> (Egualé *et al.*, 2007b).

**Agave sisalana perr:** Aqueous extract from sisal waste was tested with gastrointestinal nematodes in goats and checked for Faecal Eggs Counts (FECs), co-procultures and post-mortem worm counts. It showed low efficacy for the parasitic stages and was moderately effective against eggs and free-living stages. Furthermore, the treatment was not toxic to the goats (Botura *et al.*, 2011).

**Khaya senegalensis:** Bark and ethanolic and aqueous extracts were experienced against gastrointestinal nematodes of sheep by a larval development assay, The activity of the extract is identified as concentration dependent *in vivo* (Ademola *et al.*, 2004).

**Paris polyphylla:** Rhizome was extracted with methanol and checked against *Dactylogyrus intermedius*, Dioscin and polyphyllin D exhibited significant activity against *D. intermedius* (Wang *et al.*, 2010).

**Ocimum sanctum:** Essential oil from the plant was studied in *Caenorhabditis elegans* model with microwell plate assay. The essential oil of *O. sanctum* and eugenol showed potent anthelmintic activity (Asha *et al.*, 2001).

**Ficus species:** Latex was tested in NIH mice naturally infected with *Syphacia obvelata*, *Aspiculuris tetraptera* and *Vampirolepis nana*. The observed high acute toxicity with hemorrhagic enteritis, in addition to a weak anthelmintic efficacy, does not recommend the use of these lattices in traditional medicine (De Amorin *et al.*, 1999).

**Butea monosperma:** Seeds with methanol extract were deliberated in *Caenorhabditis elegans* by microwell plate assay. The methanol extract of *B. monosperma* seeds showed potent anthelmintic activity (Prashanth *et al.*, 2001).

**Artemisia brevifolia:** Crude aqueous and methanol extracts of whole plant were studied *in vitro* *Haemonchus contortus*, *in vivo* sheep naturally infected with mixed species of gastrointestinal nematodes. It was found that, although, *Artemisia brevifolia* whole plant possesses anthelmintic activity against nematodes, it is not comparable with levamisole at any of the doses tried in this study (Iqbal *et al.*, 2004).

**Pycnanthus angolensis:** Stem bark with chloroform and methanol extract were tested against *Eudrilus eugeniae* by Petridish method. The Methanolic extract of *P. angolensis* was found to be more active than its chloroform extract (Gbolade and Adeyemi, 2008).

**Sphenocentrum jollyanum:** Ethanol extract of fruits and seeds was checked with *Eudrilus eugeniae* using Petri-dish method. Fruit ethanolic extract of *S. jollyanum* was found to be more potent than the seed extract (Gbolade and Adeyemi, 2008).

**Ziziphus nummularia, Acacia nilotica:** Crude methanolic extract of bark for *Ziziphus nummularia* and Fruit for *Acacia nilotica* was studied adjacent to trichostrongylid nematodes of sheep by conducting adult motility assay, egg hatch test and the larval development assay. This reveal the dose and time-dependent anthelmintic effects (Bachaya *et al.*, 2009).

**Calotropis procera Ait. F:** Crude aqueous and methanolic extract of flowers were tested with live *Haemonchus* (H.) *contortus* and measured for egg count percent reduction and found to possess good anthelmintic activity against nematodes (Iqbal *et al.*, 2005).

***Azadirachta indica* A. Juss:** Aqueous and methanol extract of seed part was checked with gastrointestinal nematodes of sheep and determined for faecal egg count reduction and larval counts from co-procultures. *Haemonchus contortus* and *Trichostrongylus* species were found to be susceptible to the tested compound (Iqbal *et al.*, 2010).

***Artemisia absinthium*:** Aqueous and ethanol extracts of aerial parts was verified with ovine nematodes. Worm motility inhibition and faecal egg count reduction assays were performed and concluded that ethanol extract to be more effective (Tariq *et al.*, 2009)

***Nauclea latifolia*:** Crude aqueous extract of the stem and bark with ovine nematodes was assayed and illustrated for faecal egg count reduction. The extract identified to improve haemoglobin and leucocytosis values in worm-infected sheep (Onyeyili *et al.*, 2001).

***Zingiber officinale* Roscoe:** Crude Powder (CP) and Crude Aqueous Extract (CAE) of dried ginger, gastrointestinal nematodes of sheep, Eggs Per Gram (EPG) of faeces, Both CP and CAE exhibited a dose and a time-dependent anthelmintic effect (Iqbal *et al.*, 2006).

## CONCLUSION

Medicinal plants were used from the ancient period for the treatment of the above diseases but without knowing their actual mechanism and the compound that is responsible for the curing action. But now, due to the advancement in the research field there were many research studies conducted to reveal the power of the plant and its compound in the treatment of the helminthic infection. Still, further research study is needed to explore more plants for the treatment and to reduce the cost of the synthetic anthelmintic drugs. The chemically provided drugs are more costly and provide higher side effects when compared to the natural drugs that are obtained from the plant source were cheaper and provide lesser effect on the host organism. Hence, further study must be carried out to explore the plant of higher efficiency and lesser side effect.

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