



WORLD JOURNAL OF PHARMACOLOGICAL RESEARCH AND TECHNOLOGY

A REVIEW ON HERBAL ANTHELMINTIC AGENTS

Chandrakant Salhaita¹, P.K. Choudhury¹, Maya Sharma^{1*}

¹Pacific College of Pharmacy, Pacific Academy of Higher Education and Research University
Udaipur, 313024, Rajasthan, India.

ABSTRACT

Herbal anthelmintic drugs, derived from plants with potent bioactive compounds, have been utilized in traditional medicine for centuries to treat parasitic worm infections. These natural remedies are considered effective, affordable, and relatively safe alternatives to synthetic anthelmintics. Commonly used herbs such as *Azadirachta indica* (Neem), *Artemisia absinthium* (Wormwood), *Allium sativum* (Garlic), and *Cucurbita pepo* (Pumpkin seeds) exhibit broad-spectrum activity against various helminths, including roundworms, hookworms, tapeworms, and pinworms. Their mechanisms of action primarily involve disrupting the metabolic processes of the parasites, causing paralysis, egg destruction, and boosting the host's immune response. Although evidence from in-vitro and animal studies supports their efficacy, clinical research in humans remains limited. Furthermore, while herbal anthelmintics are generally considered safe, improper use or excessive dosages may lead to adverse effects. This review emphasizes the therapeutic potential of herbal anthelmintics, their mechanisms, safety profiles, and the need for more rigorous clinical studies to validate their effectiveness.

Keywords: Anthelmintic, Herbal, parasites, clinical studies, Earth worm.

INTRODUCTION

Helminthiases, or helminth infections, are among the most common infections worldwide, affecting billions of people, particularly in tropical and subtropical regions. Helminths are parasitic worms that inhabit various parts of the human body, including the intestines, liver, lungs, and blood vessels, depending on the species. The major classes of helminths that affect humans are nematodes (roundworms), cestodes (tapeworms), and trematodes (flukes) [1]. Common examples include *Ascaris lumbricoides*, *Taenia solium*, and *Schistosoma* species. These parasitic infections are closely associated with poor hygiene, inadequate sanitation, and limited access to clean water and healthcare services. Although not always fatal, helminth infections are a major cause of morbidity, leading to anemia, malnutrition, and impaired physical and cognitive development in children [2]. In severe cases, such as neurocysticercosis and schistosomiasis, these infections can result in life-threatening complications [3]. Treatment typically involves the use of synthetic anthelmintic drugs such as albendazole, mebendazole, praziquantel, and ivermectin [4]. While these drugs have been effective and form the cornerstone of mass deworming programs, the emergence of drug resistance due to their widespread and repeated use has become a growing concern [5,6]. This issue has prompted an urgent search for new and effective anthelmintic alternatives. Among the most promising avenues is the use of herbal medicine, which has a long history in traditional health systems for treating parasitic infections [7]. Medicinal plants are known to contain a variety of bioactive compounds including alkaloids, tannins, flavonoids, and saponins, many of which have demonstrated antiparasitic effects in in vitro and in vivo studies [8]. Plant-based treatments are often regarded as being more accessible, cost-effective, and potentially less prone to resistance development than their synthetic counterparts [9].

The exploration of plant-derived anthelmintics offers a valuable strategy, especially in developing countries where helminthiases are endemic and access to conventional drugs may be limited. This review discusses the types of helminths affecting humans, the issue of anthelmintic resistance, and the emerging evidence supporting the anthelmintic potential of herbal remedies.

Methods for Studying Anthelmintic Activity

The effectiveness of several plant materials as anthelmintic has additionally been tested in vivo. The criteria for this kind of activities include the evacuation of worms from their hosts or a decrease in the quantity of eggs per gram of faeces (EPG) that the host with the infection passed when compared to animals that had been given commercial anthelmintics. As an example, oral feeding of Indonesian papaya (*Carica papaya*) decreased parasites burden upto 100% within seven days after treatment for pigs who were infected with *Ascaris suum*. Similar to this, various

Salhaita et al., WJPRT, 2025

other plant extracts discovered with anthelmintics qualities were examined for their effectiveness against gastrointestinal nematodes in experimentally infected sheep. Most in vitro studies on the anthelmintics properties of plant, their oils, or their extracts have been conducted based on their toxicities to earthworms. The majority of compounds that are poisonous to earthworm cause an initial irritability or agitation, which causes the worm to die. Anthelmintics possibly sometimes eject the parasite due to this effect if their concentration does not increase enough to kill the worm. In one of the anthelmintic activity investigation, worms from houseflies that mimic parasitic pinworms found in humans were produced under laboratory settings, revealing a novel technology. Using housefly worm and earthworms, researchers examined the anthelmintic effect of several medications. Hookworms, *H. contortus*, tapeworm, and/or *A. lumbricoides* have also been utilized by certain researchers to assess the in vitro anthelmintic activity of various plant materials. To assess the effectiveness of plant items against the eggs of *Haemonchus contortus* or other trichostrongylids, a modified egg hatch assay is frequently utilized. A modified version on the larval development assay (LDA) or larval motility assays, which are frequently used to test a parasite resistance to anthelmintics, have been employed by some other researchers doing in vitro studies.

Herbal Plants with Anthelmintic Activity

***Carica papaya* (Papaya)**

Papaya, particularly its seeds, has demonstrated significant anthelmintic activity. Studies have shown that papaya seeds contain bioactive compounds, such as benzyl isothiocyanate, which exhibit anthelmintic properties by causing paralysis of parasitic worms. The seeds can disrupt the integrity of worm membranes and prevent their normal motility, leading to the death of the parasite. **Active Compounds:** Benzyl isothiocyanate, papain, and flavonoids.

Mechanism of Action: Paralysis of worms, inhibition of egg hatchability, and digestion of worm tissue by papain.

***Azadirachta indica* (Neem)**

Neem is a widely recognized plant in traditional medicine, particularly in India, for its broad-spectrum medicinal properties. Neem's anthelmintic activity is attributed to the presence of compounds such as azadirachtin, nimbin, and nimbidin, which exhibit ovicidal (egg-killing) and larvicidal effects. Neem has been shown to be effective against a wide range of gastrointestinal parasites, including roundworms and hookworms.

Active Compounds: Azadirachtin, nimbin, nimbidin.

Mechanism of Action: Disruption of helminth development, inhibition of egg hatching, and impact on parasite motility.

***Allium sativum* (Garlic)**

Salhaita et al., WJPRT, 2025

Garlic, a common kitchen herb, has been used for centuries for its therapeutic benefits. Its anthelmintic activity is primarily attributed to allicin, a sulfur-containing compound. Allicin has been shown to interfere with the energy metabolism of parasites, leading to their death. Garlic also has antimicrobial, anti-inflammatory, and immune-boosting effects, making it an ideal candidate for combating parasitic infections.

Active Compounds: Allicin, ajoene.

Mechanism of Action: Disruption of energy metabolism in parasites, paralysis, and enhancement of immune response.

***Artemisia absinthium* (Wormwood)**

Wormwood is another traditional remedy used for parasitic infections. It is particularly effective against intestinal worms like roundworms, pinworms, and tapeworms. The bioactive compounds artemisinin and sesquiterpene lactones have shown efficacy in disrupting the motility and digestive function of helminths.

Active Compounds: Artemisinin, sesquiterpene lactones, flavonoids.

Mechanism of Action: Disruption of helminth motility and feeding, inhibition of enzyme systems involved in glucose metabolism.

***Cucumis sativus* (Cucumber)**

The seeds of cucumber have demonstrated anthelmintic activity, particularly against tapeworms. Studies indicate that cucumber seeds contain compounds that can paralyze and expel intestinal worms.

Active Compounds: Cucurbitacins, flavonoids.

Mechanism of Action: Paralysis and expulsion of intestinal worms.

***Punica granatum* (Pomegranate)**

Pomegranate, particularly its rind and seeds, is known for its anthelmintic properties. The presence of ellagic acid and punicalagin helps in combating parasitic infections. Pomegranate is particularly effective against intestinal nematodes, such as *Ascaris lumbricoides* and *Strongyloides stercoralis*.

Active Compounds: Ellagic acid, punicalagin.

Mechanism of Action: Interference with parasite reproductive cycle and inhibition of motility.

***Chenopodium ambrosioides* (Epazote)**

Epazote is a plant traditionally used for treating intestinal parasites. The active compound ascaridole, found in the plant, has been shown to be particularly effective against roundworms and tapeworms. It acts by affecting the nervous system of the parasite, causing paralysis.

Active Compounds: Ascaridole, flavonoids.

Mechanism of Action: Paralysis of worms, inhibition of motility and reproduction.

Salhaita et al., WJPRT, 2025

***Nyctanthes arbor-tristis* (Night blooming jasmine)**

The biological components of *nyctanthes arbor-tristis* have significant anthelmintic action, making them a potential replacement for routinely prescribed and expensive anthelmintic medications for the de-worming of grazing animals.

Active Compounds: Flavonoids, Tannins.

Mechanism of action: Disruption of helminth motility and feeding, inhibition of enzyme systems involved in glucose metabolism.



Carica papaya linn (a)



Azadirachta indica (b)



Allium sativum (c)



Artemisia absinthium (d)



Cucis sativus (e)



Punica Grantum (f)



Chenopodium ambrosioides (g)

Nyctanthes arbor-tristis (h)

Figure 1. (a-h) Plants with proven anthelmintic property

Mechanisms of Action of Herbal Anthelmintic Agents

Herbal anthelmintic agents can act through various mechanisms to control parasitic infections. Some of the primary mechanisms include:

Paralysis of the Worms

Many herbal plants contain compounds that disrupt the neuromuscular system of the parasite, causing paralysis and preventing the worm from attaching to the host's intestines. For instance, papaya seeds and wormwood act through neuromuscular blockade.

Inhibition of Egg Hatchability

Some plant extracts, such as Neem, inhibit the development and hatching of worm eggs, thus preventing further contamination and proliferation of the infection.

Disruption of Energy Metabolism

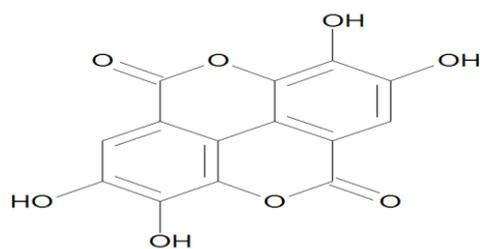
Compounds like allicin in garlic and artemisinin in wormwood interfere with the metabolic pathways of parasites, particularly by inhibiting glycolysis or mitochondrial function, which is essential for their survival.

Damage to the Protective Cuticle

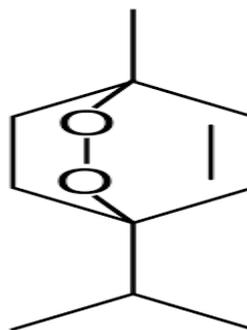
Certain plants, such as pomegranate and neem, cause damage to the worm's protective cuticle, leading to desiccation or immune system recognition and elimination.

Reproductive Inhibition

Some herbs, like pomegranate, inhibit the reproductive cycle of parasitic worms by affecting hormone systems or the development of reproductive organs.



I. Ellagic Acid



J. Ascaridole

Figure 2. Chemicals agents effective against anthelmintics

Challenges in the Use of Herbal Anthelmintics

While herbal plants offer a promising alternative to synthetic drugs, there are several challenges in their use:

Standardization of Dosage: The potency of herbal remedies can vary depending on the plant's age, geographical location, and method of preparation.

Lack of Clinical Data: While many studies show promising results in *in-vitro* or animal models, there is limited clinical trial data to support the safety and efficacy of herbal anthelmintics in humans.

Toxicity and Side Effects: Some herbal plants, when consumed in high doses, can be toxic. For example, pomegranate rind has been associated with toxicity when used in large quantities.

Resistance Development: Although herbal remedies generally have a lower risk of resistance development compared to synthetic drugs, resistance to some plant-based compounds can still occur over time.

Regulatory Issues: Herbal products often lack the regulatory approval necessary for consistent quality, safety, and efficacy.

Future Perspectives

For optimization of the therapeutic potential of herbal plants for anthelmintic use, future research should focus on:

Phytochemical Isolation and Standardization: Isolation and identification of the active compounds responsible for anthelmintic activity, followed by the standardization of formulations to ensure consistent efficacy.

Combination Therapies: Development of combination therapies that blend herbal remedies with conventional drugs to enhance efficacy, reduce resistance, and minimize side effects.

Clinical Trials: Conducting more clinical trials to establish the safety, dosage, and effectiveness

Salhaita et al., WJPRT, 2025
of herbal anthelmintics in humans.

Nanotechnology for Drug Delivery: Using nanotechnology to improve the bioavailability and targeted delivery of herbal anthelmintic compounds.

CONCLUSION

Herbal plants represent a rich source of natural anthelmintics with a wide range of bioactive compounds that can be harnessed for the treatment of helminthic infections. Despite the promising results in preclinical studies, more rigorous research and clinical trials are needed to validate the safety and efficacy of herbal remedies. As part of an integrated approach to combating parasitic infections, herbal anthelmintics could complement existing treatments, particularly in regions where access to pharmaceutical drugs is limited. Traditional medicinal plants have been extensively studied for their potential anthelmintic properties. Various plant species have been demonstrated promising results in invitro & in vivo studies, showing anthelmintic activity against different types of helminthes. Some examples of these medicinal include *Adhotoda vesica*, *Aerva lanata*, *Azadirachta indica*, *caria papaya* and many other. These plants contain bioactive compounds that have the potential to paralyze or kill parasites, making them a potential source for the development of new anthelmintic drugs. Traditional medicinal plants offer a potential alternative or complementary approach to conventional anthelmintic drugs. In conclusion, helminthiasis is a prevalent and challenging diseases caused by parasitic worm called helminths. It affects both humans and animals, causing a wide range of diseases and health complications. The misuse of drugs has led to emergence of drug resistance, highlighting the need for the discovery of novel anthelmintic compound.

ACKNOWLEDGEMENT

The authors are thankful to the Pacific College of Pharmacy, Udaipur, Rajasthan for encouragements and necessary facilities support.

AUTHOR'S CONTRIBUTION

Dr. Maya Sharma provided the guidance to proceed with this paper with the support of Dr. P.K Choudhury.

REFERENCES

1. Hotez PJ, Kamath A. Neglected tropical diseases in sub-Saharan Africa: review of their prevalence, distribution, and disease burden. *PLoS Negl Trop Dis*. 2009;3(8):e412.
2. Bethony J, Brooker S, Albonico M, Geiger SM, Loukas A, Diemert D, et al. Soil-transmitted helminth infections: ascariasis, trichuriasis, and hookworm. *Lancet*. 2006;367(9521):1521–32.
3. Garcia HH, Del Brutto OH. Neurocysticercosis: updated concepts about an old disease. *Lancet Neurol*. 2005;4(10):653–61.

Salhaita et al., WJPRT, 2025

4. Keiser J, Utzinger J. Efficacy of current drugs against soil-transmitted helminth infections: systematic review and meta-analysis. *JAMA*. 2008;299(16):1937–48.
5. Geerts S, Gryseels B. Anthelmintic resistance in human helminths: a review. *Trop Med Int Health*. 2001;6(11):915–21.
6. Kaplan RM. Drug resistance in nematodes of veterinary importance: a status report. *Trends Parasitol*. 2004;20(10):477–81.
7. World Health Organization. *Traditional Medicine Strategy 2014–2023*. Geneva: WHO Press; 2013.
8. Eguale T, Tilahun G, Debella A, Feleke A, Makonnen E. In vitro and in vivo anthelmintic activity of crude extracts of *Corymbia citriodora* and *Myrsine africana*. *J Ethnopharmacol*. 2007;112(3):531–6.
9. Ademola IO, Eloff JN. Anthelmintic efficacy of bark of *Peltophorum africanum* (Fabaceae) against gastrointestinal nematodes of sheep. *Vet Parasitol*. 2011;179(1–3):103–9.
10. van der Ree AM, Martin A, Harvey PJ, Thompson AR, van der Werff ten Bosch JJ. The helminth parasite proteome at the host–parasite interface – informing diagnosis and control. *Exp Parasitol*. 2015;157:1–10.
11. Jabbar A, Iqbal Z, Kerboeuf D, Muhammad G, Khan MN, Afaq M. Anthelmintic resistance: the state of play revisited. *Life Sci*. 2006;79(26):2413–31.
12. Ramos F, Portella LP, Soccoi JR, Cezar AS, Sangioni LA, Vogel FSF, et al. Anthelmintic resistance in gastrointestinal nematodes of beef cattle in the state of Rio Grande do Sul, Brazil. *Int J Parasitol Drugs Drug Resist*. 2016;6(1):54–9.
13. Aremu AO, Pendota SC, Komane-Mofokeng B, Patzke G, Van Staden J. Potential of South African medicinal plants used as anthelmintics – their efficacy, safety concerns and reappraisal of current screening methods. *S Afr J Bot*. 2012;82:134–50.
14. Matsuda H, Morikawa T, Toguchida I, Harima S, Yoshikawa M. Hepatoprotective amide constituents from the fruit of *Piper chaba*: structural requirements, mode of action, and new amides. *Bioorg Med Chem*. 2009;17(6):2215–24.
15. Silva AAS, Correia HG, Bezerra FS, Campos RS, Galdino SL, Araujo DA, et al. Activity of cycloartane-type triterpenes and sterols isolated from *Musa paradisiaca* fruit peel against *Leishmania infantum chagasi*. *Phytomedicine*. 2014;21(6):775–9.
16. Accioly MP, Bevilaqua CM, Rondon FC, Morais SM, Machado LK, Almeida CA, et al. Leishmanicidal activity in vitro of *Musa paradisiaca* L. and *Spondias mombin* L. fractions. *Vet Parasitol*. 2012;187(1–2):79–84.
17. Agyare C, Koffuor GA, Mensah AY, Osei-Asante S, Annan K, Boakye YD. An ethnopharmacological survey and in vitro confirmation of the ethnopharmacological use of

Salhaita et al., WJPRT, 2025

medicinal plants as anthelmintic remedies in the Ashanti region, in the central part of Ghana.

J Ethnopharmacol. 2014;158 Pt A:255–63.

18. Vijayakumar S, Presannakumar G, Vijayalakshmi NR. Antioxidant activity of banana flavonoids. *Fitoterapia.* 2008;79(4):279–82.
19. Gachet MS, Schubert A, Becker A, Kuhn T, Cuendet M, Christen P, et al. Assessment of anti-protozoal activity of plants traditionally used in Ecuador in the treatment of leishmaniasis. *J Ethnopharmacol.* 2010;128(1):184–97.
20. Jawla S, Gupta A, Singla RK, Gupta P, Singh M. Antimicrobial and antihyperglycemic activities of *Musa paradisiaca* flowers. *Asian Pac J Trop Biomed.* 2012;2(9):S914–8.
21. Ferreira JRO, Vieira PMA, Silva AP, Costa DC, Silva RA, Moraes MO, et al. Induction of G2/M arrest, caspase activation and apoptosis by α -santonin derivatives in HL-60 cells. *Toxicol In Vitro.* 2013;27(7):2202–9.
22. Shi YL, Tu PF, Xu XJ, Li YQ, Song SY. Biological effects of toosendanin, a triterpenoid extracted from Chinese traditional medicine. *Prog Neurobiol.* 2007;82(1):1–10.
23. World Health Organization. *Investing to Overcome the Global Impact of Neglected Tropical Diseases: Third WHO Report on Neglected Tropical Diseases.* Geneva: WHO; 2015.
24. Pullan RL, Smith JL, Jasrasaria R, Brooker SJ. Global numbers of infection and disease burden of soil-transmitted helminth infections in 2010. *Parasit Vectors.* 2014;7:37.
25. Ndjonka D, Abladam E, Djafsia B, Ajonina C, Zofou D, Abongwa M, et al. Natural products as a source for treating neglected parasitic diseases. *Int J Mol Sci.* 2013;14(2):3395–439.
26. Wink M. Medicinal plants: a source of anti-parasitic secondary metabolites. *Molecules.* 2012;17(11):12771–91.

***Correspondence Author: Maya Sharma, Pacific College of Pharmacy, Pacific Academy of Higher Education and Research University Udaipur, 313024, Rajasthan,**