

Review Article

SGVU Journal of Pharmaceutical Research & Education

ISSN: 2456-4508

JPRE

Journal homepage: <http://www.gyanvihar.org/researchjournals/>

**A Review on Anthelmintic Synthetic Drugs and Anthelmintic Medicinal
Plant**

Satkar Prasad^{1*}, Anand Chaurasiya², Ravindra Pal Singh¹

1. School of Pharmacy, Suresh Gyan Vihar University Mahal Jagatpura, Jaipur, 302017
Rajasthan (INDIA)
2. Mellenium college of Pharmacy, Bhopal, M.P. (INDIA)

ABSTRACT

Helmentic infections are among the most widespread infections in humans, distressing a huge population of the world. Normally, the worm lives in GI tract and liver. Most of the synthetic medicine is curing helminthiasis, Synthetic anthelmintic drugs Albendazole, Mebendazole, Niclosamide, Piperazine, Praziquantel, Diethyl carbamazine, Levamisole, Ivermectin, Oxamniquineare are generally using for helminthiasis, but they also have too much adverse effect and toxicity i.e. vomiting, nausea, diarrhea, edema, peptic ulceration etc. So it has been observed alternate / herbal medicine system having beneficial effect on human being to minimize the drawback over synthetic drugs. Hence this review focuses on helminthes, different type of worm, synthetic anthelmintic drug & herbal medicinal drug to treat helminthiasis.

Key Word: Helmintic, Albendazole, Mebendazole, Niclosamide, piperazine.

INTRODUCTION

Nature was the main source of drug in ancient times, the progress and growth of the human race is inseparably linked to the increasing scientific knowledge, man has been able to obtain over the centuries. Green plants are necessary for all animal life on earth, since they convert solar energy into organic carbon compounds which is used as a basic energy for animals.

The curiosity of the man now a day's probes into the past and brings to light even fragmentary information about traditional method of our ancestors, and it makes a fascinating study.⁽¹⁾ All Medicinal plants and their derived medicines are widely used as natural alternatives to synthetic chemicals in traditional cultures in the world and they are becoming most popular in modern society.⁽²⁾ In the herbal medicine field of there has been an exponential development in last few decades in developed and developing countries. Herbal medicine is increasingly most popular due to its natural origin and lesser side effects.⁽³⁾ Historically, all medicinal preparations are originate from plants, either in the simple form of raw plant materials otherwise in the refined form of crude extracts, mixtures, etc.⁽⁴⁾ Most of

the developing countries have assumed traditional medical practice as an integral part of their culture. Traditional medicines include -Ayurveda, Siddha medicine, Unani, Ancient Iranian medicine, Islamic medicine, Irani medicine, Traditional Korean medicine, Traditional Chinese medicine, Acupuncture, Traditional African medicine. The Indian traditional medicines have had practiced successfully in modern age, have hardly been studied for scientific validation. India is a rich cultural heritage of traditional medicines, Ayurveda and siddha system of treatments which is chiefly comprised two widely flourishing system of treatments.⁽⁵⁾

Helmentic infections are among the most widespread infections in humans, distressing a huge population of the world. Although the majority of infections due to helminthes are generally restricted to tropical regions and cause enormous hazard to health and contribute to the prevalence of under nourishment, anaemia, eosinophilia and pneumonia. Parasitic diseases cause ruthless morbidity affecting principally population in endemic areas. The gastro-intestinal helminthes becomes resistant to currently available anthelmintic drugs therefore there is a foremost problem in treatment of helminthes diseases. Hence there is an increasing demand towards natural anthelmintics.⁽⁶⁾

Soil-transmitted helmenthiasis

Soil-transmitted helmenthiasis (STH) is a group of parasitic infections of the intestine caused by nematode worms usually transmitted by soil. STH is the most prevalent of neglected tropical diseases and is responsible for significant morbidity and, indirectly, mortality in poor developing countries. STH contributes to general weakness, malnutrition, iron-deficiency anemia, and impaired physical and intellectual development in school-age children.⁽⁷⁾ the three main causative worms of soil-transmitted helmenthiasis of public health importance are:

a) Whipworm

The human whipworm (*Trichuris trichiura* or *Trichocephalus trichiuris*), is the third most common roundworm found in humans. The name "whipworm" refers to the shape of the worm; the worms look like whips with wider "handles" at the posterior end. There is an estimated 800 million people infected worldwide. It is also highly prevalent in children. Co-infection of whipworm with *Giardia*, *Entamoeba histolytica*, *Ascaris lumbricoides*, and hookworm is common. Symptoms range from asymptomatic through vague digestive tract distress for light infestations to emaciation with dry skin and diarrhea (usually mucoid and/or bloody) for heavy infestations. In children, heavy infections could lead to growth retardation. Whipworm infestation is detectable by stool examination, which can detect eggs and charcot-leyden crystals. The Kato-Katz is the technique of choice for diagnosis and quantification of infection with *T. trichiura*. Adult worms may be seen in a prolapsed rectal mucosa.⁽⁸⁾

b) Hookworm

Human hookworm infection is a soil-transmitted helminthiasis infection caused by nematode parasites *Necator americanus*, *Ancylostoma duodenale* or both. Mild infections with hookworm cause mild diarrhea and abdominal pain. More severe infections with hookworm can create serious health problems for newborns, children, pregnant women, and persons who are malnourished. Hookworm infection is the leading cause of anemia and protein malnutrition in developing nations, afflicting an estimated 740 million people. Hookworm infection may be associated with dermatitis, eosinophilia, pulmonary infiltrates, pneumonitis,

and urticarial rash. Gastrointestinal symptoms would include mild abdominal pain, nausea, vomiting, and anorexia. Iron-deficiency anemia due to blood loss is often associated with hookworm.⁽⁹⁾

c) Round worm (*Ascaris*)

Ascariasis, one of the most common human helminthic infections, is caused by the intestinal parasite *Ascaris lumbricoides* (*A. lumbricoides* [large roundworm], affecting an estimated one billion persons at any one time worldwide. It affects 50 percent of populations in tropical and subtropical areas. Globally, *Ascariasis* causes an estimated 20,000 deaths per year. The clinical effects include a wide range of manifestations. Most potential and common complications comprise pneumonitis due to passage of worms in the lungs, with pulmonary eosinophilia (Loeffler's syndrome); intestinal obstruction by mass of worms; biliary obstruction and pancreatic obstruction by worms. Infection with *A. lumbricoides* may contribute substantially to child morbidity when associated with malnutrition, pneumonia, enteric diseases and vitamin A deficiency. *Ascariasis* adversely affects children's growth and development.

Drug Used as Anthelmintic⁽¹⁰⁾

Following drugs are used as a anthelmintic which have various mechanism of action

Albendazole

A broad spectrum oral anthelmintic Albendazole is a drug of choice and its mechanism of action is through inhibitory microtubule synthesis in nematodes, thus irreversibly impairing glucose uptake. As a result intestinal parasites are immobilized.

Mebendazole

It is broad spectrum anthelmintic which selective and irreversibly block glucose uptake by adult intestinal – dwelling nematodes and cestodes and their tissue- dwelling larve. Inhibition of glucose uptake appears to lead to endogenous depletion of glycogen stored within the parasite. The lack of glycogen result in a decreased formation of adenosine triphosphate, required for survival and reproduction of the helminth. As Mebendazole acts by affecting the entire energy metabolism, it is used as a standard drug for anthelmintic activity.⁽¹⁰⁾

Niclosamide:

Niclosamide was the drug of choice for tapeworm infections and which is inversely damage proximal segment separating worms from the intestinal wall and thus expelling them out of the host body. (Rang and Dale2003).

Piperazine

Piperazine can be used to treat infection with the common round worm and the thread worm. It reversibly inhibits neuromuscular transmission in the worm, probably by acting like GABA, on GABA-gated chloride Channels in nematode muscle. As a result paralysed worm are expelled alive.

Praziquantel

It is broad spectrum anthelmintic drug, which acts by altering calcium homeostasis in parasite cells causing contraction of the musculature and eventually result in paralysis and death of the worm.

Diethyl carbamazine

A piperazine derivative, it is active in filarial infections. It has been suggested that it modifies

the parasite so that it becomes susceptible to the host's normal immune response. It may also interfere with the parasite's arachidate metabolism.

Pyrantel Pamoate

A derivative of tetrahydropyrimidine that act by depolarizing the helminth neuromuscular junction, causing spasm and paralysis. It also has some anticholinesterase activity.

Levamisole

A drug effective in common round worm infection, acts by stimulating and subsequently blocking the neuromuscular junctions. This paralyzing the worms to be expelled out.

Ivermectin

A semisynthetic agent, obtained from an actinomycete, is thought to paralyse the worm by opening chloride channels and increasing chloride conductance.

Oxamniquine

Active against schistosoma mansoni, it affects both mature and immature form of parasite. It's mechanism of action may involve interaction in the DNA and its selective action may be related to the ability of the parasite to concentrate the drug.

Metriphonate

It's action is thought to be due to an inhibitory effect on cholinesterases in the helminth causing paralysis.

Thiabendazole

It is benzimidazole poly anthelmintic, which covered practically all species of nematodes i.e round worm, hook worm, pin worm, Trichuris Strongyloides and trichinella spiralis. It inhibit development of eggs of worm and kills larve.

Herbal drug Used as Anthelmintic

Helminthes infections are the most common infection in man affecting the large proportions of the world population. The synthetic anthelmintic drugs are having too much adverse effect and toxicity and many of them are not recommended for young children and pregnant ladies. In the treatment of parasitic disease, the anthelmintic drugs are used indiscriminately. Recently the use of anthelmintic produces toxicity in human beings hence the development and discovery of new substance which acting as anthelmintic are being derived through plants. Various plants were used in venereal diseases to promote healing of wounds, swelling, abscesses, rheumatism and treating pain in lower extremities, skin diseases, leucorrhoea, dysentery, and fever.⁽¹¹⁾

S. No.	Name of Plants	Family	Part used	Effective against
1	Allium sativum (12)	Lillaceae	Bulb	Round-worms
2	Annona senegalensis(13)	Annonaceae	Leaf, bark, root	Nippostrongyllus braziliensis
3	Acacia albida(14)	Fabaceae	Seeds	Sheep, goat
4	Adhatoda vesica(15)	Acanthaceae	Roots	GI nematodes

5	<i>Ageratum conyzoides</i> (16)	Asteraceae	Leaves, flowers	Tape-worms
6	<i>Alangium lamarekii</i> (17)	Alangiaceae	Roots and bark	Hook-worms, ascarids
7	<i>Albizia anthelmintica</i> (18)	Fabaceae	Bark	Anthelmintic
8	<i>Azadirachta indica</i> (19)	Meliaceae	Cake and leaves	Anthelmintic
9	<i>Bixa orellana</i> (20)	Bixaceae	Seeds	<i>Ascaridia galli</i> , <i>Ascaris suum</i>
10	<i>Butea frondosa</i> (21)	Fabaceae	Seeds	<i>Ascaridia galli</i>
11	<i>Calliandra calothyrsus</i> (22)	Fabaceae	Legume	<i>Haemonchus contortus</i> , <i>Trichostrongylus</i> , <i>Strongyloides papillosus</i>
12	<i>Capillipedium foetidum</i> (23)	Poaceae	Oil, grass	<i>Pheretima posthuma</i>
13	<i>Carum copticum</i> (24)	Umbelliferae	Seeds	<i>Ascaris lumbricoides</i> ;
14	<i>Chenopodium album</i> (25)	Chenopodiaceae	Leaves	Nematodes
15	<i>Commiphora mukul</i> (26)	Burseraceae	Oleo-gum resin	Tape-worms, hookworms
16	<i>Cucurbita moschata</i> (27)	Cucurbitaceae	Seeds	Cestodes
17	<i>Cyathocline lyrata</i> (28)	Asteraceae	Essential oil	Tape-worms, hookworms
18	<i>Datura quercifolia</i> (29)	Solanaceae	Fruit	<i>Ascaridia galli</i>
19	<i>Diospyros scabra</i> (30)	Ebenaceae	Seeds	Fasciolosis, lungworms
20	<i>Dodonea viscosa</i> (31)	Sapindaceae	Leaves	Intestinal-worms
21	<i>Embelia ribes</i> (32)	(Myrsinaceae	Seeds	Tape-worms
22	<i>Eupatorium triplinerve</i> (33)	Asteraceae	Flowers	<i>Ascaris lumbricoides</i> and <i>Taenia solium</i>
23	<i>Gardenia lucida</i> (34)	Rubiaceae	Essential oil	Tape-worms, earthworms
24	<i>Hagenia abyssainicia</i> (35)	Rosaceae	Fruit	Round-worms

25	Helleborus niger(36)	Ranunculaceae	Stem	Ascaris lumbricoides
26	Hyoscyamus niger(37)	Solanaceae	Seeds	Nematode
27	Lagenaria siceraria(38)	Cucurbitaceae	Seeds	Cestodes, moniezia
28	Lantana trifolia(39)	Verbenaceae	Fruit	Fasciolosis, lungworms
29	Lawsonia inermis(40)	Lythraceae	Leaves	Fasciolosis
30	Mitragyna stipulosa(41)	Rubiaceae	Roots	Guinea-worm
31	Moringa oleifera(42)	Moringaceae	Seeds	Ascaris suum
32	Randia dumetorum(43)	Rubiaceae	Seeds	Earth-worms, tapeworms
33	Swertia chirata(44)	Gentianaceae	Whole plant	Ascaridia galli
34	Trichilia emetic(45)	Meliaceae	Bark	Fasciolosis, lungworms
35	Uvaria hookeri(46)	Annonaceae	Root ,bark	Haemonchus contortus
36	Vernonia amygdalina(47)	Asterac	Stem, bark	Haemonchus contortus

CONCLUSION

Ancient classical literature and ethno medical surveys describe the use of plant in traditional medicine or the treatment of helminthic infection. Most of the developing countries believed in traditional medicine and folk medicine because having no side effect over the synthetic drugs. Consequently, the demand for the herbal formulation is increasing day by day. The main goal of medicinal plants and traditional health systems is solving the health care problems of the world are gaining increased attention. Because of this resurgence of interest, Hence this review concluded that the herbal drug possesses the anthelmintic activity it has been proved by earth worm model give many link to develop future trial.

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