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Review article



Overview on Anthelmintics herbs used in Siddha medicine

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ABSTRACT

Helminthiasis, worm infestation is the most common problem irrespective of gender and age that accounts due to poor sanitation, hygiene, malnutrition and crowded living conditions. Currently available antihelminthic drugs are contraindicated in pregnancy and their use are restricted in certain conditions. There is potent need for herbal originated anthelmintics for the safe of humankind. There is increasing interest from the medical and scientific communities to include them in evidence-based medicine, and this is consolidated by a more sympathetic attitude on the part of regulatory authorities than has previously been the case. Numerous medicinal plants justify the therapeutic value of herbs. The herbal drugs are collected from Siddha medical literature and reviewed for its pharmacological activities in the database.

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INTRODUCTION

As per World Health Organisation, Helminthiasis is the major global problems, in tropicals. There are innumerable incidences of human infections caused due to helminths worldwide due to increased world travel and immigration from the developing countries. Worm infestations contribute to the prevalence of malnutrition, anaemia, eosinophilia and pneumonia in developing countries.

Helminths infections are the most common infections in man which affects the large proportions of the world's population. In the treatment of parasitic diseases, the anthelmintics drugs are used indiscriminately. Recently the use of anthelmintics produces toxicity in human beings. Hence the development and discovery of new substances acting as anthelmintics are being derived through plants which are considered to be the best source of bioactive substances.

Parasitosis has been of concern to the medical field for centuries and the helminths still cause considerable problems for human beings. Internal parasitic infection is a great threat to the productivity of the sheep and goat industry as well. The helminths are multicelluar organism with three germ layers showing a bilateral symmetry. They are divided into phylum nemathelminths (Roundworms: nematodes) and plathyhelminths (flatworm: cestodes & trematodes).

The common parasites are roundworms, hookworms, threadworms, filarial worms and schistosomes. The drugs which either kill or expel infesting helminths are called antihelminthic drugs, vermicides or vermifuges. In the recent years tremendous progress has been made in the development of antihelmintic drugs. Most of the existing synthetic drugs including the benzimidazoles and imidazothiazoles (such as levamisole) were developed in the last decade. However, development of the resistance against these drugs has led to the persistent search to discover new classes of antihelmintics, especially those with novel modes of action.

Prevalence of helminths:

More than 1.5 billion people, or 24% of the world's population, are infected with soil-transmitted helminth infections worldwide. Infections are widely distributed in tropical and subtropical areas, with the greatest numbers occurring in sub-Saharan Africa, the Americas, China and East Asia. Prevalence of parasitic helminths, especially gastrointestinal nematodes is recognized as a major constrain in the livestock industry due to the huge economic loss. Over 267 million preschool-age children and over 568 million schoolage children live in areas where these parasites are intensively transmitted, and are in need of treatment and preventive interventions.

Control of helminths

WHO's control interventions are based on the periodic administration of anthelminthics to groups of people at risk, supported by the need for improvement in sanitation and health education. WHO recommends annual treatment in areas where prevalence rate of soil-transmitted helminthiases is between 20% and 50%, and, a bi-annual treatment in areas with prevalence rates of over 50%.

Herbs and helminths

Medicinal plants are the source of great economic value in the Indian subcontinent. Herbal medicine is still the main source of medicine and about 75-80% of the whole population, mainly in developing countries for primary health care because of better cultural acceptability, better compatibility, with the human body and fewer side effects. Nowadays multiple drug resistance has been developed due to the indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of infectious disease. In addition to this

problem, the uses of antibiotics are associated with adverse effects on the host including hypersensitivity, immuno-suppression and allergic reaction. Therefore, there is a need to develop alternative antimicrobial drugs for the treatment of infectious diseases from medicinal plants.

Embelia ribes

Yared et al, In *vivo* cestocidal activity of the crude hydroalcoholic extract of *E. schimperi* showed 100 % parasite clearance at 1000 mg/kg, while the diammonium salt of embelin showed 85.3 % parasite clearance at 750 mg/kg. The *in vitro* anthelminthic activity study revealed that the LC₅₀ value of the crude extract and albendazole were 228.7 and 51.33 µg/mL, respectively. Evaluated the efficacy of the seed oil of *E. ribes* against *Pheritima posthuma* to determine the time of paralysis and time of death and found out that the seed oil was found to be more potent in both parameters than the standard drug reference, piperazine citrate(1).

Caesalpinia crista

Jabber et al, the anthelmintic activity of Caesalpinia crista (L.) (Fabaceae) seed kernel and Chenopodium album (L.) (Chenopodiaceae) whole plant in order to justify their traditional use in veterinary medicine. In vivo anthelmintic activity was evaluated in sheep naturally infected with mixed species of gastrointestinal nematodes by administering crude powder (CP) and AME in increasing doses (1.0-3.0 g/kg). maximum reduction in eggs per gram (EPG) of faeces was recorded as 93.9 and 82.2% with Caesalpinia crista and Chenopodium album AME at 3.0 g/ kg on day 13 and 5 post-treatment(2).

Acorus calamus

Napth et al, investigated the *in vivo* anthelmintic activity of a standardized methanolic extract obtained from the rhizomes *A*. *calamus* in a rodent model. The study revealed that b-asarone is the active principle of plant.

The HPLC analysis of local variety of *A. calamus* revealed that active fraction contains 83.54% (w/w) of b-asarone. The *in vivo* study revealed that treatment of *H. diminu-ta* infected rats by a single 800 mg/kg dose of rhizome extract for 5 days results into 62.30% reduction in eggs per gram of feces counts and 83.25% reduction in worm counts of animals. These findings compared well with the efficacy of a reference drug, praziquantel. The active principle b-asarone showed slightly better anthelmintic effects than crude extract. In acute toxicity assay, a single oral 2000 mg/kg dose of extract did not reveal any signs of toxicity or mortality in mice, and the LD50 of the extract was noted to be >2000 mg/kg. Taken together, the results of this study indicate that rhizomes of *A. calamus* bear significant dose-dependent effects against intestinal helminths.(3)

Carica papaya

Sapaat et al, studies the anthelmintic activity potential of papaya seeds against Hymenolepis diminuta in rats which is to determine the effectiveness of papaya seeds on helminths especially H. diminuta in rats and to determine the effective dose level on helminths in rats. This study showed that the reduction percentages in EPG for papaya seeds treatment for both doses level were very high which is 96.8% for 0.6g kg-1 dose level and 96.2% for 1.2 g kg-1 dose level. The results of present study indicated that the latex of Carica papaya showed significantly demonstrated paralysis, and also caused death of worms especially at higher concentration as compared to standard reference Piperazine citrate and control.From the result it is conclude that the latex of Carica papaya showed significant Anthelmintic activity.(4)

Ocimum sanctum

Kanojiya et al, studied the leaves of Ocimum sanctum have been traditionally used for various ethno-veterinary practices as well as medicinal purpose for the treatment of Hemintic activity. In vitro larvicidal potential of crude aqueous and hydro-alcoholic extracts of the bulb of O. sanctum was investigated for its efficacy. The results of present study indicated that the plant showed significantly demonstrated paralysis, and also caused death of worms especially at higher concentration as compared to standard reference Piperazine citrate and control. From the result it is conclude that it showed significant Anthelmintic activity.(5)

Adhatoda vasica

The present study specifically indicated that the crude ethanolic and aqueous extracts of the leaves of *Adhatoda vasica Nees* produced anthelmintic activity against african earthworm *Eudrilus eugeniae*. The ethanolic extract caused paralysis at 4.5011 ± 0.1457 min. and time of death was 10.4350 ± 0.1434 min while the aqueous extract revealed paralysis in 9.4806 ± 0.1016 min and time of death

death of 22.4210 ± 0.1313 min, respectively against the earthworm E. eugeniae. The study has shown that ethanolic and aqueous leaves extracts of A. vasica have significant anthelmintic activity. But the ethanolic extract of A. vasica showed most significant anthelmintic activity as compared to the aqueous extracts and standard.(6)

Calotropis procera

Rama et al, Anthelmintic activity of both ethanolic and aqueous extracts of *Calotropis procera* flowers, *Azadirachta indica* leaves and *Punica granatum* fruit peel in comparison with albendazole was evaluated through in vitro studies by the worm motility inhibition assay. Significant anthelmintic effects (p < 0.0005) were observed on live *Gastrothylax indicus* worm as evident from their mortality at 4 h post exposure to both ethanolic and aqueous extracts. LC-50 values were determined to be 12.05 mg/ml \pm 3.24 and 23.52 mg/ml \pm 6.4 for *C. procera*, 24.37 mg/ml \pm 4.11 whereas it was 29.23 µg/ml \pm 4.51 for albendazole. It is reported percentage inhibition of 41.84 of HeLa cells with 512 µg/ml of ethanolic flower extract of *C. procera*. (7)

Ficus benghalensis

*Manoj et al, evaluated the aq*ueous extracts of Ficus benghalensis at 20 mg/ml concentration shows paralysis at 3.44 min and death at 4.34 min, whereas methanolic extract shows paralysis at 3.02 min and death at 4.36 min. These two extracts show good anthelmintic activity as compared to other extracts [Fig. 1]. Chloroform at 20 mg/ml causes paralysis at 3.71 min and death at 4.91 min; and petroleum ether at 20 mg/ml shows paralysis at 4.03 min and death aft er 6.18 min. The standard drug, Albendazole shows paralysis at 2.68 min and death aft er 5.29 min. All the values are expressed as mean \pm SEM (n = 6). All the extracts were found not only to paralyze (Vermifuge) but also to kill the earthworms (Vermicidal). The aqueous and methanolic extract was found to be more effective to execute the earthworm.

Moringa oleifera

Caborda et al evaluated the efficacy of five extract concentrations (0.95, 1.95, 3.9, 7.8, and 15.6 mg/mL) were tested through egg hatch assay and larval motility test in the moringa oleifera. It was done, after phytichemical analysis and ovicidal assay was performed, the ethanolic and aqueous extracts showed 95.89% and 81.72% egg hatch inhibition at 15.6 mg/mL, respectively. The ovicidal activity of 15.6 mg/mL ethanolic extract was comparable with that of albendazole (p > 0.05). The LC₅₀ against the eggs was recorded at 2.91 and 3.83 mg/mL for ethanolic and aqueous extracts, respectively. In the larvicidal assay, the ethanolic and aqueous extracts exhibited 56.94% and 92.50% efficacy at 7.8 mg/mL, respectively.(8)

Azadirachta indica

Nirmala J et al, studied anthelmintic efficacy of crude neem (*Azadirachta indica*) leaf powder against strongyle infections in cattle. It was studied in 3 different groups and served as infected untreated control. Faecal sample from each animal of these groups was examined on day 0, 7, 14 and 28 post treatments and EPG was analysed.

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The result was significant decrease (p < 0.05) in EPG in Group A and B after day 7 post treatment but there was no significant variation in terms of EPG in control group. It is concluded that crude neem leaf powder has anthelmintic property and it can further be studied to isolate the active component to produce herbal anthelminthics.(9)

Butea monosperma

Singh et al studied to evaluate in vitro anthelmintic efficacy of aqueous extract of seeds of Butea monosperma (Lam.) Kuntze against H. contortus. Phytochemical analysis of extract showed high concentration of phenolic $(11.93 \pm 0.64 \text{ mg of GAE/g of extract})$, flavonoids $(238.17 \pm 19.14 \text{ mg of quercetin/g extract})$ and tannin $(10.80 \pm 0.70 \text{ mg of GAE/g of extract})$ content. The observations revealed that parasites were sluggish and movement was little at 4 h post exposure of 25, 50 mg/ml and very sluggish in 100 mg/ml concentration. The extract showed complete mortality of the adult H. contortus worms at the concentrations of 100 mg/ml at the time exposure of 6 h and with the concentration of 50 mg/ml at the post exposure of 8 h. At 25 mg/ml concentration 50 % mortality was recorded at 6 h and complete at 8 h post exposure. The LC₅₀at 6 and 8 h were 45.20 and 17.50 mg/ml respectively. Levamisole at concentration of 0.5 mg/ml caused 50 % mortality at 2 h post exposure and full mortality at 4 h post exposure. These cidal effects may be due to presence of high phenolic, flavonoids and tannin content in the extract. The results confirm the aqueous extract of B. monosperma (Lam.) Kuntze on adult H. contortus worms

Conclusion

The World Health Organization recognized that 85 % of people in developing countries still rely on traditional medicine for human and animal health care. Plant materials are rich source of nutrients and naturally occurring bioactive molecules especially phenolic, flavonoids and tannin contents. Dietary supplementation of these phytomedicine boost immune system to destroy invading microorganisms. The challenges for the companies that are engaged in anthelmintic behavior of the drugs are not shared by wealthy phase because anthelmintic drugs market is cost effective and it is a prime concern. Herbal anthelmintics are very essential for the hour and safest of the mankind.

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Nil

CONFLICTS OF INTEREST

None declared.

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