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Review Article



Anthelmintic activity of plants against various worm infections

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Abstract

Worms that having parasitic activity are termed helminths. Helminthiasis stands as the most common disease world ever. Anthelmintics are drugs used to destroy the parasitic worms or remove them from the infected host. The term anthelmintic should not be restricted just to drugs acting locally to expel worms from the gastrointestinal tract. Various types of worms penetrate tissues and the drugs used to act against systemic infections should be included also under the general term anthelmintic. The plants that possessing medicinal activity were the potent source of many pharmacological activities. Among that the plants of anthelmintic activity have attained a great significance because of the capability of the plant and its compound to cure or manage the disease. We can see so many reports, especially from Africa indicating the effectiveness of herbal constituents against worm infections in animals. Here several plants having anthelmintic activity against various worms have been reviewed and presented.

Keywords Anthelmintic, helminth, helminthiasis, worms

Introduction

Helminthiasis is termed a worm infection that causes morbidity to its host. They infect humans and animals causing stunted growth and substantial threat to health. There are so many types of helminths including filarial worms, onchocerciasis worms, schistosomes, soil-transmitted helminths (STH), and intestinal nematodes. The common symptoms of helminthiasis are diarrhea, malnutrition, abdominal pain, enlarged liver and spleen, fatigue. The worm burden in the infected person due to the long-term exposure to worms may lead to the morbidity and severity of disease in almost all kinds of worm infections. The reduced response of helminths to drugs possesses health complications to both humans and animals. Worldwide newly developed anthelmintic drugs minimize the effect of parasites that are resistant to the existing drugs thereby managing the parasite during all stages of their life cycle (Idris et al., 2019). Medicinal Plants possess several chemical constituents having several biological activities including the resistance of plants against pests and diseases (Zenebe et al., 2017). The human and animal parasitic worms zoologically belong to the classes Cestoda (Tapeworms), Trematoda (Flukes), and nematode (Roundworms).

Cestode infections

Cestodes (Tapeworms) are flat segmented worms. Tapeworm infections are most seriously caused by dwarf tapeworms, pork, fish, beef.

Trematode infections

Trematodes (Flukes) are generally flat, leaf-shaped unsegmented worms. They are animals of a low order of development. The most important flukes parasitic in man is three species of *Schistosoma* (*S. mansoni*, *S. harmatobium*, *S. Japonicum*) that are found on the lumen of veins. The intermediate hosts are aquatic or amphibious snails. In tropical and subtropical regions schistosomiasis stands as a widespread disease; about 200 million persons suffer from it.

Nematode infections

Nematodes are of a higher organization than flatworms. They are unsegmented worms. The nematodes parasitic to man include roundworms, hookworms, whipworms, threadworms, and pinworms (Singh et al., 1999).

These are some plants that have anthelmintic activities *Chenopodium album*, *Trianthema portulacastrum*, *Cocos nucifera* Linn, *Rapanea melanophloeos*, *Albizia schimperiana*, *Leucas martinicensis*, *Rumera abyssinicus*, *Leonotis orymlifolia*, *Albizia gummifera*, *Combretum molle*, *Khaya senegalensis*, *Butea monosperma*, *Artemisia brevifolia*, *Artemisia absinthium*, *Nauclea latifolia* (Rajeswari, 2014).

Plants used in trematode infections

Alpina nigra

Alpina nigra is a traditionally used medicinal plant, the aqueous shoot extract of which is used by the local peoples of North-East India to cure helminth infections. The ethanolic shoot extract of *Alpina nigra* has great activity in some enzymes which have an active role in metabolism like malate dehydrogenase, lactate dehydrogenase, phosphoenolpyruvate carboxy kinase, pyruvate kinase, acetylcholine esterase, etc can be seen in trematodes treated with the crude extracts of plants. The ethanolic extract of *Alpina nigra* was found to have the highest anthelmintic efficacy at its highest dose causing paralysis and death. The untreated control of trematode showed physical activity (Roy & Swargiary, 2009).

Allium cepa

Edible parts of onion contain organosulphur derivatives that can have therapeutic effects on bacteria, viruses, fungi, protozoa, worms, and tumors. Many studies showed that *Allium cepa* possessing several biological activities which includes anti-parasitic properties against Giardia, Entamoeba histolytica etc.

Cryptosporidium parvum

Cryptosporidium parvum is an intracellular parasite that infects the gastric epithelial cells in vertebrates. Cinnamon oil and *Allium cepa* oil combined will possess a greater beneficial effect in cryptosporidium-infected mice. Fecal smear test and oocyst count indicating that treatment of mice with the combination of *Allium cepa* oil and cinnamon oil for 17 days have a mild infection compared to another.

Leishmaniasis

Anti-leishmanial effects of aqueous onion extract on *L.major*, *L.mimicana*, *L.tropica*, *L.infantum*, and *L. donavani* have been investigated. The results have been shown that a concentration of 1.25 mg/ml can kill all the species of leishmaniasis (Cheraghipour et al., 2020).

Allium sativum

Anti trematode effects of garlic were studied with the context of intestinal food-borne trematodes by using the Echinostoma caproni mouse model (Mantawy et al., 2011). Dietary doses of garlic were daily administered on three groups of mice first is given before infection as prophylaxis second for after infection as therapeutic and third for both before and after infection as continuous. Mice in the fourth group that does not

expose to garlic are considered as control. Considerable alterations were found on swelling, vacuolization changes in the secretory bodies, and furrowing was detected in garlic exposed parasites while performing scanning and transmission electron microscopy. The secretion of protein reduces markedly with garlic dosage and up-regulation of some proteins were observed such as tER-ATP as in garlic treated worms.

Plants used for cestode infections

Acorus calamus

The rhizomes of the plant *Acorus calamus* are commonly used for helminth infections especially for cestodiasis in India and Africa. The methanolic extract obtained from the rhizomes of *Acorus calamus* was used to investigate the anthelmintic activity on rodents. The plant has b-acarone as active constituent. An *in-vitro* study revealed that treatment of *H. diminuta* infected rats by a single 800 mg /kg dose extract of rhizome for 5 days results in a reduction of 62.3% of egg per gram of feces counts and 83.25% reduction in worm counts of animals. These results were compared with the standard drug praziquantel (Nath & Yadav, 2016).

Caesalpina bonducella (L)

In the traditional system of India leaves of *Caesalpina bonducella* (L) have been consumed as a traditional remedy to treat the helminthic infections of the intestine. The anthelmintic activity of leaf extract of *Caesalpina bonducella* was investigated on *Hymenolepis diminuta*. The treatment efficacy was evaluated by monitoring the feces count, eggs per gram count, and worm count of animals by using different doses of plant, extract. In the *in-vitro* study 30, mg/ml concentration of extract caused morbidity of *Hymenolepis diminuta* in 2.5 hours. This finding suggests that the extract of leaf of *Caesalpina bonducella* possesses significant anthelmintic effects and supports its use in traditional, medicine (Gogoi & Yadav, 2016).

Houttuynia cordata

It is a perennial, herbaceous plant that grows wild in moist and shady places across India and many Asian countries. The leaves of the plant have anthelmintic properties and are consumed by the tribles for intestinal worm infections in North Indian regions. The effectiveness of this plant extract was evaluated by monitoring the effect of the extract on larval, immature, and mature *Hymenolepis diminuta* infections in rats. The effect of the extract is studied with the standard drug praziquantel. *H. Cordata* extract possesses a dose-dependent and moderate to a moderately high level of effectiveness against several stages of parasites except for the mature stage, the efficacy of extract was maximum. Comparatively more numbers of helminths were eliminated from the host if the extract is administered during the post-treatment period. It is worth mentioning here that alkaloids, flavonoids, and essential oils constitute the major chemical constituents of the aerial part of *H.cordata*. There have been many published reports which demonstrate the presence of anthelmintic activity in

these plant constituents. Worm load reduction (%) = No of cysticercoids inoculated – No of worms recovered/No: of cysticercoids inoculated×100

The anti cestodal activity of leaf extract of *H. cordata* was investigated against a zoonotic cestode, *Hymenolepis diminuta*, in experimentally infected albino, rats (Yadav & Temjenmongla, 2011).

Plants used for nematode infections

Andrographis paniculata Nees

Andrographis paniculata Nees leaves contain various immunomodulatory and anthelmintic compounds such as saponin, tannin & andrographolide (Indrati et al., 2019). Some other compounds present in the *Andrographis paniculata* Nees are flavonoids which is an anti-inflammatory compound and tannins which causes the coagulation of protein and acts on their metabolism and homeostasis condition and thus killing the nematodes. Another compound found in the *Andrographis paniculata* Nees leaves is saponin glycosides, which contribute death to the nematodes by lowering the surface tension of the membrane wall and inhibits acetylcholine esterase activity which cause muscle paralysis and death to the nematodes. Andrographolide, the immunomodulatory compound present in the leaves of *Andrographis paniculata* Nees would kill the nematodes and increase the anti body production. The leaf extract capsule was supplemented orally to the Ettawah cross breed goats against gastrointestinal nematode endoparasites. Both blood and faeces samples are collected every two weeks for ten months. Helminthiasis incidence was analyzed by total samples with positive endoparasite infestation and the eggs per gram of the faeces (EPG).

Senegalia gaumeri

Senegalia gaumeri methanol water extract was shown to have ovicidal activity against *Haemonchus contortus* worms *in vitro* (Castañeda-Ramírez et al., 2019). The plant has p-coumaric acid as a chief constituent which showed potent anthelmintic effect against the larval stage of *Haemonchus contortus*. The compounds which having anthelmintic activity against *haemonchus contortus* eggs include acetogenins, terpenes, alkaloids, and more recently derivatives of caffeoyl and coumaroyl. A recent study reported a strong ovicidal effect against *H. contortus* eggs of a methanol: water extract of *Senegalia gaumeri*, a plant of Fabaceae family used as fodder for ruminants. Exposure to plant extract will prevent the emergence of larvae from the eggs.

Caesalpinia coriaria

Hydro-alcoholic extract of leaves and fruits of *Caesalpinia coriaria* possess ovicidal activity against *Haemonchus contortus* and *H. Placei* while using egg hatching inhibition test. Hydro alcoholic extract of the fruits and leaves shows the presence of condensed tannins. The amount of free condensed tannins is greater than in other leguminous species on the same region. Phenols, tannins may negatively impact

nematode egg hatching by binding to the egg cuticle which is rich in glycoproteins, forming a tannin protein complex that may alter embryo development and eventually the hatching process (Rojo-Rubio et al., 2019). There is a good number of condensed tannins in those leaves, and the plant also shows the presence of methyl gallate, gallic acid, etc. Hydro-alcoholic extract of the plant contains gallic acid that shows highest ovicidal activity against parasite species. The ovicidal effect of the plant could also be related to the combined effects of phenols such as methyl gallate, gallic acid, and flavonoids which can interfere with the process of embryo development of the larvae within the egg.

Conflict of Interest

The author hereby declares no conflict of interest.

Consent for publication

The author declares that the work has consent for publication.

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References

- Castañeda-Ramírez, G. S., de Jesús Torres-Acosta, J. F., Sandoval-Castro, C. A., Borges-Argáez, R., Cáceres-Farfán, M., Mancilla-Montelongo, G., & Mathieu, C. (2019). Bio-guided fractionation to identify *Senegalia gaumeri* leaf extract compounds with anthelmintic activity against *Haemonchus contortus* eggs and larvae. *Veterinary parasitology*, 270, 13-19.
- Cheraghipour, K., Marzban, A., Ezatpour, B., Moradpour, K., & Nazarabad, V. H. (2020). The role of onion (*Allium cepa*) in controlling parasitic diseases: a mini review. *Herbal Medicines Journal*, 4(4), 175-180.
- Gogoi, S., & Yadav, A. K. (2016). In vitro and in vivo anthelmintic effects of *Caesalpinia bonducella* (L.) Roxb. leaf extract on *Hymenolepis diminuta* (Cestoda) and *Syphacia obvelata* (Nematoda). *Journal of interventional ethnopharmacology*, 5(4), 427.
- Idris, O. A., Wintola, O. A., & Afolayan, A. J. (2019). Helminthiasis; prevalence, transmission, host-parasite interactions, resistance to common synthetic drugs and treatment. *Heliyon*, 5(1), e01161. <https://doi.org/10.1016/j.heliyon.2019.e01161>
- Indrati, R., Ihsan, N., Sofjan, O., & Suyadi, S. (2019). Ethanol extraction of *Sambilo* leaves (*Andrographis paniculata* Nees) and evaluation of its immunomodulatory activity towards gastrointestinal nematode infestation in Ettawah Crossbred goats. *Livestock Research for Rural Development*, 31(12).
- Mantawy, M. M., Ali, H. F., & Rizk, M. Z. (2011). Therapeutic effects of *Allium sativum* and *Allium cepa* in *Schistosoma mansoni* experimental infection. *Revista do instituto de medicina tropical de são paulo*, 53(3), 155-163.
- Nath, P., & Yadav, A. K. (2016). Anthelmintic activity of a standardized extract from the rhizomes of *Acorus calamus* Linn.(Acoraceae) against experimentally induced cestodiasis in rats. *Journal of interventional ethnopharmacology*, 5(4), 390.
- Rajeswari, V. D. (2014). Anthelmintic activity of plants: a review. *Res J Phytochem*, 8(3), 57-63.
- Rojo-Rubio, R., González-Cortazar, M., Olmedo-Juárez, A., Zamilpa, A., Arece-García, J., Mendoza-Martínez, G. D., ... & Mendoza-de Gives, P. (2020). *Caesalpinia coriaria* fruits and leaves extracts possess in vitro ovicidal activity against *Haemonchus contortus* and *Haemonchus placei*. *Veterinaria México*, 6(4), 1-13.

Roy, B., & Swargiary, A. (2009). Anthelmintic efficacy of ethanolic shoot extract of *Alpinia nigra* on tegumental enzymes of *Fasciolopsis buski*, a giant intestinal parasite. *Journal of Parasitic Diseases*, 33(1-2), 48-53.

Singh, H., & Kapoor, V. K. (1999). *Organic pharmaceutical chemistry* (5th ed.).

Yadav, A. K. (2011). Anticestodal activity of *Houttuynia cordata* leaf extract against *Hymenolepis diminuta* in experimentally infected rats. *Journal of Parasitic Diseases*, 35(2), 190-194.

Zenebe, S., Feyera, T., & Assefa, S. (2017). In vitro anthelmintic activity of crude extracts of aerial parts of *Cissus quadrangularis* L. and leaves of *Schinus molle* L. against *Haemonchus contortus*. *BioMed research international*, 2017.

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