



Review Article

A COMPREHENSIVE REVIEW ON IN VITRO ANTHELMINTIC ACTIVITIES OF SOME AYURVEDIC PLANTS

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ABSTRACT

Ayurveda, the Science of life, commonly uses medicinal plants for treating various diseases. Numerous medicinal plants are being used traditionally for treating parasitic infections in India. In Ayurveda, worm infestation in the gastro intestinal tract is known as *Krimi roga*. Many Ayurvedic medicinal plants are used traditionally for treating *Krimi roga*. Use of synthetic drugs anthelmintic for treating parasitic infestations causes serious toxic side effects in human. Use of Ayurvedic plants has no such side effects and, economical. The paper highlights anthelmintic activities of some of the most important Ayurvedic medicinal plants carried out *in vitro* in various pharmacological models. A brief review of *In vitro* anthelmintic activities of thirteen Ayurvedic medicinal plants published by various researchers is illustrated in this paper. The medicinal plants discussed here are *Vidanga: Embelia ribes* Burm. F., *Kalmegh: Andrographis paniculata* (Burm.f.) Nees, *Gunja: Abrus precatorius* L., *Kiratatikta: Swertia chirata* L., *Khadira: Acacia catechu* (L.f.) Willd., *Ativisha: Aconitum heterophyllum* Wall. ex Royle, *Saptaparna: Alstonia scholaris* (L.) R. Br., *Aragvadha: Cassia fistula* L., *Nimba (Azadirachta indica* A. Juss.), *Brahmi: Bacopa monnieri* (L.) Penn., *Mandukaparni: Centella asiatica* (L.) Urban, *Vacha: Acorus calamus* L. and *Chirbhita: Carica papaya* L.

**KEYWORDS:** Ayurvedic, Medicinal Plants, Anthelmintic.

INTRODUCTION

Ayurveda, the 'Science of life' is an oldest Indian system of Medicine which stresses a balance of three basic humors or energetic i.e. *Vata* (air), *Pitta* (bile) and *Kapha* (phlegm). According to Ayurveda these three regulatory principles are important for health because when these are in balanced state, the body is healthy but when imbalanced disease occurs. Medicinal plants are integral part of Ayurveda for treating various diseases. In Ayurveda, worm infestation in the gastro intestinal tract is known as *Krimi roga*. Many Ayurvedic medicinal plants are used traditionally for treating *Krimi roga*. Use of synthetic drugs anthelmintic for treating parasitic infestations causes serious toxic side effects in human. Use of Ayurvedic plants has no such side effects and, economical. This review describes some of the most common Ayurvedic medicinal plants used as Anthelmintic.

DISCUSSIONS

The paper highlights anthelmintic activities of some of the most important Ayurvedic medicinal plants carried out *in vitro* in various pharmacological models. A brief review of *In vitro* anthelmintic activities of thirteen Ayurvedic medicinal plants published by various researchers is illustrated in this paper.

**1. Vidanga: Embelia ribes** Burm. F.

Embelin from *Embelica ribes* at the concentrations of 2, 4, 6, 8 and 10mg/ml showed profound and better anthelmintic activity against *Pheretima posthuma* than albendazole.<sup>[1]</sup> Ethanolic extract of seeds of *Embelia ribes* in the concentrations of 10-200µg/mL exhibited potent anthelmintic activity against roundworm *Rhabditis pseudoelongata*<sup>[2]</sup>. Vidangadi churna- an Ayurvedic formulation containing *Embelia ribes*, *Hordeum vulgare*, *Mallotus philippinensis*, *Terminalia chebula* showed potent *in vitro* anthelmintic activity against adult earthworm *Pheretima posthuma*<sup>[3]</sup>. Aqueous extract of *Embelia ribes* fruit showed in the concentrations of 3% and 5% showed potent anthelmintic activity against Indian adult earth worm *Pheretima posthuma*<sup>[4]</sup>.

**2. Kalmegh: Andrographis paniculata** (Burm.f.) Nees

Ethanol and aqueous extracts of *Andrographis paniculata* demonstrated anthelmintic activity against adult earth worms (*Pheretima posthuma*) in three concentrations i.e. 25, 50, 75mg/ml against Indian adult earthworm *Pheretima posthuma*<sup>[5]</sup>. Aqueous extract of *Andrographis Paniculata* leaves showed dose dependent anthelmintic activity against the adult earthworms *Pheretima posthuma* in the concentrations of 10, 25 and 50mg/ml<sup>[6]</sup>.

**3. Gunja: *Abrus precatorius* L.**

Methanolic extracts of *Abrus precatorius* leaf showed dose-dependent anthelmintic activity against Indian adult earthworms *Pheretima posthuma* and *Tubifex tubifex* were at the concentrations of 5, 10 and 15mg/ml<sup>[7]</sup>. Aqueous extract of *Abrus precatorius* leaves showed significant dose-dependent anthelmintic activity against *Pheretima posthuma* at 1,2,4 and 8mg/ml<sup>[8]</sup>. Aqueous extract of *Abrus precatorius* root showed anti-cestodal activity against *Hymenolepis diminuta* in-vitro. Both aqueous extracts of root and stem of *Abrus precatorius* showed anthelmintic activity against schistosomes of *Schistosoma mansoni*<sup>[9]</sup>. Methanolic extract of *Abrus precatorius* leaf and stem showed dose dependent anthelmintic activity against *Pheretima posthuma* as compared to a standard drug Albendazole. The mean paralyzing time of *Pheretima posthuma* with the dose of 25mg/ml was found to be  $17.6 \pm 2.6$  minutes in leaf extract, and  $31.16 \pm 1.04$  minutes in stem extract. In the meantime, Albendazole at the same concentration causes paralysis in 31.76 minutes<sup>[10]</sup>. Ethanolic extracts of red seed of *Abrus precatorius* at the concentration of 20mg/ml and 40mg/ml caused paralysis and death of earthworms *Pheretima posthuma*. However, the anthelmintic activity of the extract was found to be less than standard drug albendazole<sup>[11]</sup>.

**4. Kiratiktika: *Swertia chirata* L.**

Crude aqueous and methanolic extracts of *Swertia chirata* whole plant at 25mg/ml showed anthelmintic effect on live *Haemonchus contortus*<sup>[12]</sup>. Steam distillates of *Swertia chirata* alone and in combination of cow urine showed anthelmintic activity against Indian earth worm *Pheretima posthuma* in-vitro.<sup>[13]</sup>

**5. Khadira: *Acacia catechu* (L.f.) Willd.**

Alcoholic extract of heartwood of *Acacia catechu* Willd and its ethyl acetate fractions at the concentrations of 25, 50, 75 and 100mg/ml showed dose-dependent anthelmintic activity against Indian adult earth worms (*Pheretima posthuma*) in vitro. The ethyl acetate fraction of alcoholic extracts exhibited potent anthelmintic activity compared to alcoholic extract as evidenced by a significant decrease in time of paralysis and death<sup>[14]</sup>. Ethanol: water (1:1) extract of *Acacia catechu* leaves at the concentrations of 25, 50, 75 and 100mg/ml was found to possess potent anthelmintic activity and petroleum ether extract was found to be least activity, while ethanol: water (1:1) extract had intermediate anthelmintic activity against *Pheretima posthuma*<sup>[15]</sup>. Methanolic extract of *Acacia catechu* heartwood at the concentrations of 20, 40, 60, 80 and 100mg/ml showed dose-dependent anthelmintic activity against *Pheretima posthuma*<sup>[16]</sup>.

**6. Ativisha: *Aconitum heterophyllum* Wall. ex Royle**

Alcoholic and aqueous extracts of *Aconitum heterophyllum* root at the different concentrations showed dose dependent anthelmintic activity against Indian earth worm *Pheretima posthuma* at the

concentrations of 10%, 20%, 40%, 60%, 80%, and 100%<sup>[17]</sup>.

**7. Saptaparna: *Alstonia scholaris* (L.) R. Br.**

Chloroform extracts of *Alstonia scholaris* demonstrated potent anthelmintic activity against *Pheretima posthuma* at concentration 20mg/ml but less effective than standard drug albendazole<sup>[18]</sup>. Chloroform, ethanol and aqueous extracts of *Alstonia scholaris* (L.) stem bark and roots showed dose-dependent anthelmintic activity against *Pheretima posthuma* at various concentrations (6.25, 12.5, 25, 50, 75 and 100 mg/ml). Ethanol extract of stem bark exhibited more effective activity than roots extract at all the tested concentrations<sup>[19]</sup>.

**8. Aragvadha: *Cassia fistula* L.**

Methanolic extract of *Cassia fistula* L. fruit pulp and seeds at the concentration of 100mg/ml caused significant paralysis as well as death of earth worm *Pheretima posthuma* in vitro as compared to the reference drug Piperazine citrate<sup>[20]</sup>. Water pod extract of *Cassia fistula* in the concentrations of 1%, 2%, 5% displayed a significant anthelmintic activity in a dose dependent manner against common earthworm *Pheretima posthuma*<sup>[21]</sup>.

**9. Nimba: *Azadirachta indica* A. Juss.**

Aqueous extract of *Azadirachta Indica* leaves at various concentrations (10-70mg/ml) exhibited anthelmintic activity in dose-dependent manner against earthworms (*Pheretima posthuma*), tapeworms (*Raillietina spiralis*) and roundworms (*Ascaridia galli*). Maximum activity was observed at the concentration of 40mg/ml for all three types of worms. The plant extract exhibited more potent activity at lowest concentration (10mg/ml) against round worm *Ascaridia galli*<sup>[22]</sup>. Methanol extract of *Azadirachta indica* at the concentration of 4mg/ml showed 40% mortality after 24 hours of treatment on 3<sup>rd</sup> stage *Haemonchus contortus* larvae from goats<sup>[23]</sup>. Aqueous extract of *Azadirachta indica* at the concentration of 100µg/ml showed paralysis time of  $31.34 \pm 0.05$  minutes and death time of  $62.50 \pm 1.8$  minutes in helminthes<sup>[24]</sup>.

**10. Brahmi: *Bacopa monnieri* (L.) Penn**

n-butanolic fraction of *Bacopa monnieri* was found more potent than the ethyl acetate and aqueous fractions when their anthelmintic activity was evaluated separately on adult Indian earth worm, *Pheretima posthuma*. The activities were comparable with the reference drug piperazine citrate (15mg/ml) and albendazole (10mg/ml)<sup>[25]</sup>.

**11. Mandukaparni: *Centella asiatica* (L.) Urban**

Leaf extracts of *Centella asiatica* at the concentrations 5, 10, 20 and 40mg/ml exhibited moderate level of efficacy against the poultry tapeworm *Raillietina echinobothrida*, with the mean mortality time ranged from 5 to 14.66 hours. Praziquantel used as reference anthelmintic for comparisons at concentrations 5-40mg/ml, however, showed higher

efficacy against the tapeworm than that of the extract [26].

### 12. Vacha: *Acorus calamus L.*

Crude methanolic, ethanolic and aqueous extracts of *Acorus Calamus L.* exhibited significant anthelmintic activity against Indian adult earthworms (*Pheretima posthuma*) at 100 mg/ml *in vitro*. Peak activity was exhibited by the methanolic extract at the concentration of 100 mg/ml [27].

### 13. Chirbhita: *Carica papaya L.*

*Carica papaya* latex and root showed significant anthelmintic activity at various concentrations (100%, 50%, and 20%) against Indian adult earthworms (*Pheretima posthuma*). It showed shortest time of paralysis (P=24.5 min) and death (D=56min) in 100% concentration, while the time of paralysis and death will increase in 50% concentration (P=28min&D=64min) and in 20% concentration (P=34min&D=74min) respectively as compare to Piperazine citrate (10mg/ml) used as standard reference (P= 24 min& D= 54) and distilled water as control [28,29]. *In vitro* ED<sub>50</sub> value of *Carica papaya* was found to be 12.50mg/ml against nematode *Ascaris suum* [30].

### CONCLUSIONS

From the present review it can be concluded that Ayurvedic plants discussed here are very much effective for the treatment of parasitic infestations.

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