RESEARCH PAPER

Pharmacological Evaluation of Cordia myxa (Lasura) Fruit Extract for In Vitro Anthelmintic Activity

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Abstract

Background: Helminth infections remain an important public health concern, particularly in developing regions with inadequate sanitation and limited access to healthcare. Medicinal plants are valuable sources of natural compounds that may possess pharmacological activities. *Cordia myxa* L., commonly known as Lasura, is a traditionally used medicinal and edible plant with reported phytochemical and biological properties.

Objective: The present study aimed to evaluate the *in vitro* anthelmintic activity of *Cordia myxa* fruit extract against adult *Eisenia fetida* earthworms, using albendazole as the reference drug.

Materials and Methods: Mature fruits of *Cordia myxa* were collected from Haridwar District, Uttarakhand, India, in April 2026, and authenticated by Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh. The dried fruit powder was extracted by soxhlet using ethanol. The extract was evaluated at concentrations of 20, 40 and 60 mg/mL. Albendazole at 20 mg/mL was used as the standard drug, and normal saline served as the control. Paralysis time and death time were recorded as the principal outcome measures.

Results: The alcoholic extract exhibited activity at all three tested concentrations. At 20, 40 and 60 mg/mL, the respective paralysis times were 40, 34 and 22 minutes, while the corresponding death times were 48, 39 and 32 minutes. Albendazole at 20 mg/mL produced paralysis and death times of 15 and 27 minutes, respectively. The progressive reduction in both response times with increasing extract concentration indicated a dose-dependent response under the experimental conditions.

Conclusion: The findings indicate that *Cordia myxa* fruit extract possesses *in vitro* activity against *Eisenia fetida*, with a concentration-dependent response.

Keywords: *Cordia myxa*; Lasura; anthelmintic activity; *Eisenia fetida*; albendazole; medicinal plants; dose-dependent response.

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Introduction:

Helminth infections constitute an important public health concern, particularly in tropical and subtropical regions where inadequate sanitation, contaminated environments and limited access to healthcare facilitate transmission. Soil-transmitted helminth infections may cause nutritional deficiencies, anaemia, gastrointestinal disturbances and impaired physical development. Children and populations living in resource-limited settings are particularly vulnerable to these consequences [1].

Conventional anthelmintic medicines, including albendazole and mebendazole, play an important role in the prevention and treatment of soil-transmitted helminth infections. However, continued research into new bioactive compounds remains valuable for identifying potential pharmacological leads and improving the understanding of antiparasitic mechanisms. Medicinal plants are of particular interest because they contain structurally diverse natural products that may exhibit biological activities.

Pharmacognosy provides a scientific basis for the identification, authentication, quality evaluation and

investigation of medicinal plant materials. Botanical authentication, appropriate extraction procedures and phytochemical characterization are essential for reproducible research because the chemical composition of plant extracts can vary according to geographical origin, maturity, environmental conditions and extraction methods. Preliminary phytochemical screening can identify broad classes of constituents that warrant further investigation.

Natural products, including tannins, flavonoids, saponins, terpenoids and phenolic compounds, have been investigated for various pharmacological properties. Certain constituents may interact with proteins, cellular membranes or metabolic pathways. However, the presence of a particular phytochemical class does not independently establish biological activity, and the mechanism of action of a plant extract must be demonstrated experimentally.

Cordia myxa L., commonly known as Lasura or Lasoda, belongs to the family Boraginaceae. It is a fruit-bearing tree valued for its edible fruits and traditional medicinal uses. Previous investigations have examined the phytochemical composition and biological properties of *Cordia myxa*, including antimicrobial and antioxidant activities [2,3]. A review by Oza and Kulkarni also describes the traditional uses, phytochemistry and pharmacological properties reported across medicinal species of the genus *Cordia* [4]. These publications provide a scientific rationale for further investigation of the plant, although they do not establish its anthelmintic efficacy.

In vitro screening methods have frequently employed earthworms to examine changes in movement, paralysis and mortality following exposure to test substances. Such models are accessible for preliminary laboratory investigations, but earthworms are free-living annelids rather than parasitic helminths. Consequently, activity against earthworms should be interpreted as preliminary screening evidence and not as direct proof of efficacy against human intestinal parasites [5].

Considering the traditional importance of *Cordia myxa* and its reported phytochemical diversity, the present study was undertaken to evaluate the activity of its fruit extract against adult *Eisenia fetida* earthworms. Albendazole was included as the reference drug, and paralysis time and death time were recorded at different extract concentrations.

Materials and Methods

Collection and authentication of plant material: Fresh, mature fruits of *Cordia myxa* were collected from naturally occurring trees and trees growing under natural farming conditions in Haridwar District, Uttarakhand, India. The plant material was authenticated by Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India. The authentication reference number was UHF/FP/HERBARIUM/2026/1827. The collected fruits were dried at room temperature, reported as approximately 30–40°C, and pulverized using a mechanical grinder. The resulting powder was used for extraction.

Preparation of fruit extract: The powdered fruits of *Cordia myxa* were extracted using a Soxhlet apparatus. Briefly, 100 g of coarsely powdered fruit material was accurately weighed and placed in the extraction thimble of the Soxhlet apparatus. A sufficient quantity of ethanol was used as the extraction solvent, and the extraction was carried out under continuous reflux until the extraction process was complete. The resulting extract was filtered, and the solvent was removed using a suitable evaporation technique to obtain the concentrated fruit extract. The dried extract was stored in a properly labelled, airtight container under appropriate conditions until further use in the anthelmintic evaluation.Preparation of test and standard doses: The fruit extract was evaluated at concentrations of 20, 40 and 60 mg/mL. These concentrations were selected to examine changes in paralysis and death times with increasing extract concentration. Normal saline was used as the vehicle for preparing the test solutions of the *Cordia myxa* fruit extract. Normal saline alone served as the negative control to assess any effects attributable to the vehicle. The test solutions were prepared using normal saline, and the same vehicle was used consistently throughout the experiment. Albendazole, reported as a product of GlaxoSmithKline, was used as the reference drug at a concentration of 20 mg/mL.

Experimental animals: Adult earthworms identified as *Eisenia fetida* were used for the *in vitro* evaluation. The worms were obtained from the Agriculture Office, Chambaghat, Solan, Himachal Pradesh, India. The reported average length of the earthworms was 2–6 cm, with a width of 0.1–0.3 cm.

Experimental procedure: The experimental procedure was based on the earthworm-based screening approach described in the original manuscript, which cited Ghosh et al. [6]. Adult *Eisenia fetida* earthworms were exposed to the respective test preparations in Petri dishes. According to the available protocol, six worms were used per Petri dish. The treatment groups comprised normal saline control, albendazole at 20 mg/mL and *Cordia myxa* fruit extract at concentrations of 20, 40 and 60 mg/mL.

Two principal outcome measures were recorded:

Paralysis time: The time required for the worm to cease observable movement, according to the experimental criteria used by the investigators.

Death time: The time required for the worm to show no movement following the prescribed external stimulus, according to the criteria used in the experiment.

Both parameters were recorded in minutes. Shorter response times were interpreted as indicating a faster effect under the experimental conditions. The final report should specify the observation period, exact criteria for distinguishing paralysis from death, experimental temperature and number of independent replicates, according to the original laboratory records.

Preliminary phytochemical screening: Preliminary phytochemical screening reveals the glycosides, carbohydrates, tannins, saponins and flavonoids as possible constituents of the fruit extract.

Statistical analysis: The original experimental plan specified one-way analysis of variance (ANOVA), followed by Dunnett's multiple-comparison test, with $p < 0.05$ considered the threshold for statistical significance.

Results and Discussion:

***In vitro* activity of *Cordia myxa* fruit extract:** The activity of *Cordia myxa* fruit extract was evaluated by recording the paralysis and death times of adult *Eisenia fetida* earthworms. Albendazole at 20 mg/mL served as the reference drug, while normal saline was used as the control.

The control group showed no observed paralysis or mortality during the experimental observation period. The extract-treated groups demonstrated progressively shorter paralysis and death times as the concentration increased from 20 to 60 mg/mL.

Table 1: *In vitro* activity of *Cordia myxa* fruit extract against *Eisenia fetida*

Treatment	Concentration (mg/ml)	Paralysis time (in minutes)	Death time (in minutes)
Control (normal saline)	--	No paralysis observed	Nom death observed
Standard (Albendazole)	20	15±90	27±56
Alcohlic extract of *C myxa*	20	40±34	48±56
	40	34±45*	39±87*
	60	22±54*	32±17*

*p<0.05 when compared with standard albendazole

Results are mean±SEM (n=6)

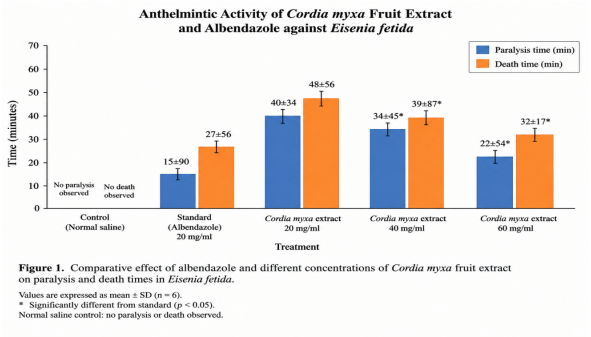


Figure 1. Comparative effect of albendazole and different concentrations of *Cordia myxa* fruit extract on paralysis and death times in *Eisenia fetida*.

Values are expressed as mean ± SD ($n = 6$).
* Significantly different from standard ($p < 0.05$).
Normal saline control: no paralysis or death observed.

Fig. 1: Graphical representation of result

Effect of concentration on paralysis time: The paralysis time decreased from 40 minutes at 20 mg/mL to 34 minutes at 40 mg/mL and 22 minutes at 60 mg/mL. This progressive reduction indicates that increasing the extract concentration was associated with a faster paralysis response under the experimental conditions. Albendazole at 20 mg/mL produced paralys**is** in 15 minutes, which was faster than the response observed with the extract at all three tested concentrations.

Effect of concentration on death time: The death time decreased from 48 minutes at 20 mg/mL to 39 minutes at 40 mg/mL and 32 minutes at 60 mg/mL. The shortest death time among the extract-treated groups was observed at 60 mg/mL. Albendazole at 20 mg/mL produced death in 27 minutes, compared with 32 minutes for the extract at 60 mg/mL. Thus, the extract exhibited a slower response than the reference drug under the reported experimental conditions.

Discussion: The present study investigated the preliminary activity of *Cordia myxa* fruit extract against adult *Eisenia fetida* earthworms. The results demonstrated that the extract produced observable paralysis and mortality responses, with both response times decreasing as the concentration increased from 20 to 60 mg/mL.

The progressive reduction in paralysis time from 40 to 22 minutes and death time from 48 to 32 minutes supports a concentration-dependent response in the tested model. These findings provide preliminary evidence of biological activity associated with the fruit extract.

Concentration-dependent response: Concentration-dependent changes in paralysis and mortality times are useful observations in preliminary pharmacological screening because they indicate whether a test preparation produces progressively faster effects over the investigated concentration range.

In the present study, both outcome measures decreased consistently with increasing extract concentration. The findings therefore support the presence of a concentration-dependent response against the test organism.

Nevertheless, the response times alone do not establish a mechanism of action or prove efficacy against human intestinal helminths. Repeated experiments, appropriate statistical analysis and testing in scientifically relevant parasitic models would be necessary to establish the reproducibility and significance of these observations [5].

Comparison with albendazole: Albendazole was used as the reference drug at 20 mg/mL and produced paralysis and death times of 15 and 27 minutes, respectively. At the highest tested extract concentration of 60 mg/mL, the corresponding times were 22 and 32 minutes.

Although the fruit extract demonstrated activity, its response was slower than that of albendazole. The comparison should be interpreted cautiously because the extract is a complex mixture of constituents, whereas albendazole is a defined active pharmaceutical ingredient.

The results indicate promising preliminary activity but do not establish equivalent potency or comparable efficacy to albendazole. Further concentration–response experiments and statistical comparisons are necessary to characterize their relative effects.

Potential contribution of phytochemical constituents: Previous investigations have demonstrated phytochemical diversity in *Cordia myxa* fruit. Al-Musawi et al. reported the characterization of compounds in an ethanolic fruit extract and evaluated its antimicrobial properties [2]. Tak et al. reviewed the bioactive constituents and reported biological properties of Lasoda, including phenolic compounds, flavonoids and other classes of natural products [3]. Oza and Kulkarni also reviewed the traditional uses and pharmacological properties of medicinal species belonging to the genus *Cordia* [4].

Certain tannins and saponins have been investigated for their interactions with proteins and biological membranes, while flavonoids and other phenolic compounds are associated with diverse biological properties. These observations provide a rationale for investigating plant extracts in preliminary pharmacological screening.

However, the present experimental findings do not identify the constituents responsible for the observed response. The contribution of individual phytochemicals cannot be confirmed without documented screening results, chemical characterization and further testing of isolated compounds or standardized fractions.

Conclusion: The present study indicates that *Cordia myxa* fruit extract possesses preliminary *in vitro* activity against adult *Eisenia fetida* earthworms. A concentration-dependent response was observed, with paralysis time decreasing from 40 to 22 minutes and death time decreasing from 48 to 32 minutes as the extract concentration increased from 20 to 60 mg/mL.

Albendazole at 20 mg/mL produced paralysis and death times of 15 and 27 minutes, respectively, demonstrating a faster response than the extract under the reported experimental conditions. Although the extract exhibited promising preliminary activity, these findings do not establish equivalence to albendazole or efficacy against human intestinal helminths.

The results support further investigation of *Cordia myxa* fruit as a potential source of plant-derived bioactive agents. Standardized extraction, phytochemical characterization, reproducible experiments, appropriate statistical validation and safety assessment are necessary to establish its pharmacological relevance.

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