



(RESEARCH ARTICLE)



Exploration of anthelmintic potency of *Pisonia alba*

S. Sangameswaran, S. Kameshwaran *, J. Jeyashree, R. Kalimuthu and S. Karthikeyan

Department of Pharmacology, SSM College of Pharmacy, Jambai, Bhavani Taluk, Erode District, Tamilnadu-638 312, India.

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Abstract

Helminthiasis or worm infestation is one of the most prevalent disease and one of the most serious problems in the world. *Pisonia alba* (*Ceodeus Grandis*) plant was selected for exploration of anthelmintic activity because Nyctaginaceae family plants such as *Boerhavia diffusa*, *Bougainvillea glabra*, and *Mirabilis jalapa L.*, already tested for the anthelmintic activity and they have potent anthelmintic activity. The Phytochemical test performed in this ethanolic extract of *Pisonia alba*. This study indicated that the crude ethanol extract produces anthelmintic activity against the Indian earthworm *Pheretima Posthuma*. Ethanolic extract of *Pisonia alba* [20, 40, 60 mg/ml] compared with standard drug (Albendazole). The extract showed significant potency when compared with standard drug Albendazole. The plant explored significant anthelmintic activity at 60 mg/ml concentration in time taken for paralyse /death of the earthworms The current investigation indicates the leaves of *Pisonia alba* have potent anthelmintic activity the further study is needed to explore its full potential.

Keywords: *Pisonia alba*; *Pheretima posthuma*; Anthelmintic activity; Albendazole

1. Introduction

Medicinal plants have been used in healthcare since time immemorial. Medicinal plants play vital roles in disease prevention and their promotion and use fit into all existing prevention strategies. The research and utilization of plants in the treatment of diseases increase every day. Medicinal plants provide a major source of molecules with medicinal properties due to the presence of natural compounds. Medicinal plants are useful for curing human diseases and play an important role in healing due to the presence of phytochemical constituents. Medicinal plants are considered rich resources of ingredients that can be used in drug development of pharmacopoeial, non-pharmacopoeial, or synthetic drugs. Apart from that, these plants play a critical role in the development of human cultures around the whole world. Moreover, some plants are considered an important source of nutrition and as a result of that they are recommended for their therapeutic values. The Plant is an important source of medicine and plays a key role in world health [1]. The use of medicinal plants is increasing worldwide, because of the tremendous expansion of traditional medicine and a growing interest in herbal treatments. Plants are used in medicine to maintain and augment physical, mental, and spiritual health and treat specific conditions and ailments. In industrialized countries, an adaptation of traditional medicines is termed “complementary” or “alternative” medicine. Traditional medicine has maintained its popularity in all regions of the developing world and its use is rapidly spreading in industrialized countries. [2][3] Chemically prepared drugs may act quickly, but they have side effects that affect the human body negatively in the long run, whereas, medicinal plants work in an integrated or pro-biotic with little or no adverse effects on the body [4]. World Health Organization (WHO) reported that 80% of the earth’s population relies on traditional medicine for their primary healthcare needs, and most of this therapy involves the use of plant extracts and their active components [5]. In the past, our ancient ancestors were using plants and herbs to preserve and flavor food, reduce pain, treat headaches, and even prevent diseases including epidemics. Active compounds produced during secondary metabolism are usually

* Corresponding author: S. Kameshwaran

responsible for the biological properties of plant species used throughout the globe for various purposes, including the treatment of infectious diseases. [6] Up to date, there are more than a hundred thousand plants globally that are either undiscovered, or their medical activities are not investigated and analyzed yet [7].

The term “medicinal plant” include various types of plants used in herbalism (“herbology” or “herbal medicine”). It is the use of plants for medicinal purposes and the study of such uses. The word “herb” has been derived from the Latin word, “*herba*” and an old French word “*herbe*”. Nowadays, herb refers to any part of the plant like fruit, seed, stem, bark, flower, leaf, stigma, or root, as well as a non-woody plant. Earlier, the term “herb” was only applied to non-woody plants, including those that come from trees and shrubs. These medicinal plants are also used as food, flavonoid, medicine, or perfume and also in certain spiritual activities [8].

Helminthology is the branch of science that deals with the study and function of worm infection with its manifestation and treatment. Helminthology includes two phyla, they are Platyhelminthes and Nematelminths. [9] Parasitic worms, also known as helminths [10]. The word helminthosis derived from the Greek word helmins meaning worm. It is a macroscopic, multicellular organism, having, excretory, reproductive, and nervous systems. Adults can generally be seen with the naked eye. All helminths are invertebrates Many helminths are intestinal worms that are soil-transmitted and infect the gastrointestinal tract. Other parasitic worms such as schistosomes reside in blood vessels. Parasitic worms live in and feed on living hosts. They receive nourishment and protection while disrupting their hosts' ability to absorb nutrients. This can cause weakness and disease in the host and pose a global health and economic problem. [11] All helminths are relatively large (> 1 mm long); some are very large (> 1 m long). All have well-developed organ systems and most are active feeders. The body is either flattened and covered with the plasma membrane (flatworms) or cylindrical and covered with cuticles (roundworms). Some helminths are hermaphrodites; others have separate sexes. [12]. The aim of the present study is to evaluate the anthelmintic activity of *Pisonia alba* and performing the preliminary phytochemical tests.

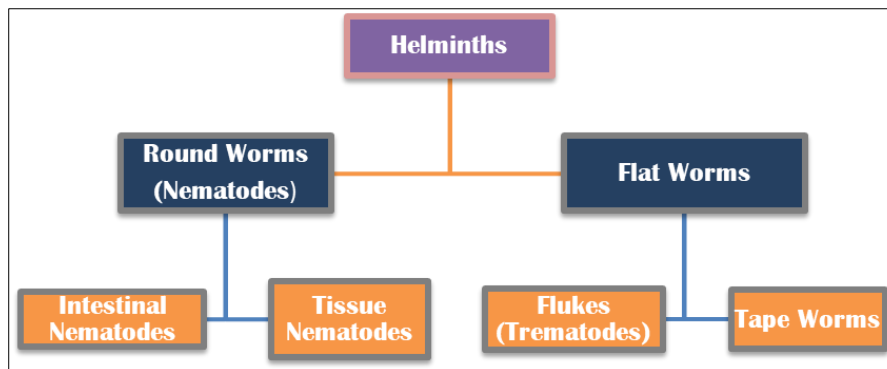


Figure 1 Classification of Helminths

2. Material and methods

2.1. Selection of Plant

Nyctaginaceae family plants show anthelmintic activity such as *Boerhavia diffusa*, *Bougainvillea glabra*, and *Mirabilis jalapa L.*, For this reason here *Pisonia alba span (ceodes Grandis)* is selected for the anthelmintic activity. *Pisonia alba* is widely distributed in India [Andaman & Nicobar Islands, Kerala, Maharastra, Tamilnadu], Australia, China, Laccadives, Madagascar, and Maldives Islands.

2.2. Collection and Authentication of the Plant

A Whole fresh plant of *Pisonia alba* was collected from the field of Thanthondrimalai near Karur and authenticated by DR. M. U. SHARIEF, SCIENTIST 'F' & HEAD OFFICE, Botanical Survey of India, T.N.A.U. Campus, Coimbatore-641 003. The plant material was identified as *Pisonia alba span (Ceodes Grandis)* belonging to the family of Nyctaginaceae. The leaves of *Pisonia alba* were dried and then crushed into fine powder by using an electrical sieve shaker for further use.

2.3. Collection and Authentication of the Worms

Worm namely *Pheretima Posthuma* was an Indian adult earthworm, they are collected from vidhurangoshala's vermicompost, Karur district, Tamilnadu. The worms are washed with normal saline to remove all fecal matter and

were used for the anthelmintic activity. The earthworms of 3-5cm in length and 0.1-0.2cm in width were used for all the experimental protocols. Four groups were made as given each containing six adult earthworms and it must be approximately equal in size.

2.4. Preparation of Plant Extract

The leaves of *Pisonia alba* were dried under shade and crushed in an electrical blender to form a coarse powder. The coarse powder was passed through sieve no: 40 and subjected to Soxhlet extraction (Continuous hot extraction) by using ethanol as solvent. The mixture was evaporated to dryness in a hot plate and stored in a desiccator. The condensed extract was used for the preliminary screening of phytochemicals and testing of anthelmintic activity.

2.5. Evaluation of Anthelmintic Activity

Anthelmintic activity was carried out on Indian adult earthworms *Pheretima Posthuma* collected (due to anatomical and physiological resemblance with the intestinal roundworm parasites of human beings) for performing the anthelmintic activity. Indian adult earthworms were collected from moist soil and washed with normal saline to remove all fecal matter and were used for anthelmintic activity. The earthworms of 4-6 cm in length and 0.2-0.3 cm in width were used for all the experimental protocols. The total 24 earthworms of *Pheretima Posthuma* were divided into four groups. Each group contains six adult earthworms and they must be approximately equal in size. The albendazole oral suspension I.P.200 mg/5 ml is diluted in water and gets 20 mg/ml. Groups of earthworms were released in 20 mg/ml of Albendazole which is considered standard drug. The 1g crude extract of *Pisonia alba* was diluted in 100 ml of distilled water, and from this 10 ml solution was diluted in 100 ml of Water. From this solutions of ethanolic extract were made in the concentration of 20 mg/ml, 40 mg/ml, and 60 mg/ml as Group II, Group III, and Group IV respectively. The observations were made for the time taken to cause paralysis and death of individual worms. Time for paralysis was noted when no movement of any sort could be observed except when the worms were shaken vigorously. Death was considered when the worms lost their motility when dipped in warm water (50 °C) followed by fading away of their body colors. Finally, the observed results of the standard drug (Albendazole) were compared with different concentrations of ethanolic solutions of *Pisonia alba*. The time of death and Parslysis of each worm were calculated by Stopwatch. The result of this study was plotted as a chart using Excel Software.

3. Results

3.1. Preliminary Phytochemical Analysis

The phytochemical testing of Ethanolic extract of *Pisonia alba* showed the presence of Alkaloids, Saponins, Tannins, Flavonoids, Steroids, and Coumarins.

Table 1 Phytochemical screening of *Pisonia alba*

S.No	Phytoconstituents	Ethanolic extract
1	Alkaloids	+
2	Saponins	++
3	Glycosides	-
4	Tannins	+
5	Flavonoids	++
6	Steroids	+
7	Coumarins	++
8	Quinones	-

++: Double Positive, +: Positive, -: Negative

3.2. Evaluation of anthelmintic activity

From the results of this study, the 60 mg/ml ethanolic extract of the *Pisonia alba* (36.52 ± 0.03) shows activity similar to the standard drug albendazole 20 mg/ml (35.12 ± 0.03). Further research of this study provides a Potent drug for Anthelmintic activity.



Figure 2 Albendazole 20 mg/ml – standard



Figure 3 20 mg/ml of Extract of *Pisonia alba*



Figure 4 40 mg/ml of Extract of *Pisonia alba*



Figure 5 60 mg/ml of Extract of *Pisonia alba*

Table 2 Mean of Anthelmintic activity produced by Standard and Test (*Pisonia alba*)

Effect of herbal extracts in different concentrations		TIME OF PARALYSIS (minutes)	TIME OF DEATH (minutes)
Albendazole (standard) (20 mg/ml)		16.12 ± 0.02	35.12 ± 0.03
Ethanollic extract of <i>Pisonia alba</i>	20 mg/ml	25.57 ± 0.02	48.00 ± 0.03
	40 mg/ml	21.59 ± 0.02	43.39 ± 0.03
	60 mg/ml	18.20 ± 0.02	36.52 ± 0.03

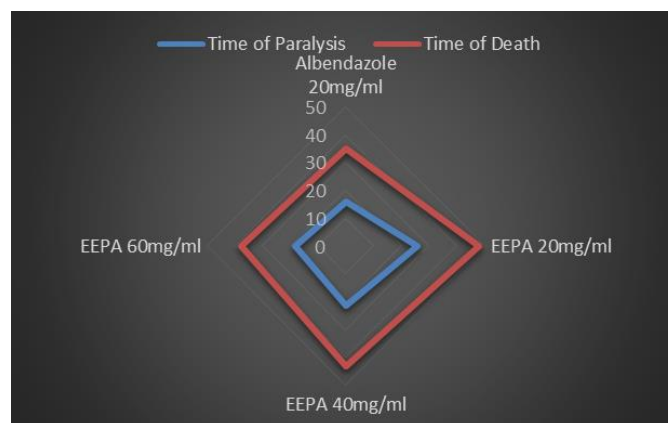


Figure 6 Evaluation of Anthelmintic potency

4. Discussion

The study of natural products has had several rewards. It has led to the discovery of useful drugs for the treatment of diverse ailments and contributed to the development of science and technology, spectroscopic methods of structure

elucidation, and synthetic methodologies that now make up the basics of analytical organic chemistry. Natural plant products often serve as chemical models or prototypes for the design and total synthesis of new drug entities. The Helminths infection induces severe morbidity by affecting the population in the region with chief economic and social consequences. Numerous studies documented the extracts of natural products exhibited anthelmintic activity. Hence for the present study, the earthworm *Pheritima Posthuma* was selected as a model for the anthelmintic activity. The biological activities of the medicinal plant are due to the presence of secondary metabolites. The production of novel therapeutic drugs from plants is based on phytoconstituents. The secondary metabolites demonstrated various health benefits like antidiabetic, anticancer, anthelmintic, antibacterial, CNS depressant, etc. Tannins and alkaloids have strong antioxidants, which scavenged the free radicals and inhibitors lipid peroxidation. Hence Tannins and alkaloids have the chief role in the therapeutic efficacy of medicinal plants, and researchers are more focused to explore their biological activities. The findings of phytochemical studies demonstrate the presence of flavonoids, Tannins, and Saponins along with other chemical constituents. Researchers are giving more attention to medicinal plants for the development of anthelmintic drugs because they give new bioactive compounds with no or little side effects and are easily accessible to the people of developing countries. Moreover, medicinal plants have the best compatibility with human physiology than allopathic medicines. The anthelmintic activity of extraction of *Pisonia alba* was evaluated by perceiving the time required for paralysis and death of each worm. The standard drug Albendazole showed anthelmintic activity due to inhibitory action on the microtubular function of earthworms. Albendazole appears to be the microtubular protein 'β-tubulin' of the parasite. It binds to β-tubulin of susceptible worms with high affinity and inhibits its polymerization. Intracellular microtubules in the cells of the worm are gradually lost. In addition, it blocks glucose uptake in the parasite, inhibits some mitochondrial enzymes, and depletes its glycogen stores. The presence of alkaloids, flavonoids, tannins, and saponins in plants may be responsible for anthelmintic activity. The alkaloids induce paralysis in earthworms by their inhibitory action on the central nervous system. Consequently, tannins selectively bind to free proteins present in the gastrointestinal tract of the host-parasite or glycoprotein on the cuticle of the parasite. In addition, these chemical constituents meddle with energy generation by uncoupling the oxidative phosphorylation which meddles with the glycoprotein of the cell surface prompting parasite demise.

5. Conclusion

Pisonia alba (*Ceodeus Grandis*) plant was selected for exploration of anthelmintic activity because Nyctaginaceae family plants such as *Boerhavia diffusa*, *Bougainvillea glabra*, and *Mirabilis jalapa L.*, already tested for the anthelmintic activity and they have potent anthelmintic activity. The *Pisonia alba* plant was selected for testing anthelmintic activity and it was collected from the field of Thanthondrimalai near Karur it was authenticated by Dr. M. U. Sharief, scientist 'f' & head office, botanical survey of India. The ethanolic extract of *Pisonia alba* leaves was prepared by using the soxhlet apparatus. This extract was used for the phytochemical screening & evaluation of the anthelmintic potency of *Pisonia alba* leaves. This study indicated that the crude ethanol extract produces anthelmintic activity against the Indian earthworm *Pheretima Posthuma*. Ethanolic extract of *Pisonia alba* compared with standard drug (Albendazole). This shows significant potency when compared with Albendazole suspension. The plant possesses significant anthelmintic activity at 60 mg/ml concentration measured by the time taken for paralyse/death of the earthworms. The current investigation leads to the conclusion that the leaves of *Pisonia alba* have potent anthelmintic activity of the conventionally used drug. This study might be efficacious against other species of helminths. Further studies using in vivo models and isolating active constituents from extract are required to carry out and established the effectiveness and pharmacological rationale for the use of *Pisonia alba* as an anthelmintic drug.

Compliance with ethical standards

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Disclosure of conflict of interest

All authors have declared no conflict of interest.

Statement of ethical approval

The present research work does not contain any studies performed on animals/humans subjects by any of the authors'.

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