

Effect of Anthelmintic Activity in *Butea Monosperma* (Lam) on Earthworms

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ABSTRACT: The preliminary phytochemical screening was carried out on the extracts of the seeds of *Butea Monosperma* Lam along with death rate and paralysis time on the powdered drug. The crude extracts were investigated for their anthelmintic activity against earthworms (*Pheretima posthuma*). Five concentrations (1, 1.5, 2, 2.5 and 3 mg/mL) of each extract were studied in activity, which involved the determination of time of paralysis and time of death of the worm. Ethanolic extracts exhibited significant anthelmintic activity at highest concentration of 3 mg/mL. Albendazole in same concentration as those of extracts was included as standard. The anthelmintic activity of Ethanolic extracts of seeds of *Butea Monosperma* has therefore been demonstrated for the first time.

KEYWORDS: Anthelmintic activity, *butea monosperma* seeds, ethanolic extraction, soxhlet apparatus, earthworms, phytochemical activity, helminthiasis, positive effect.

1. INTRODUCTION

Anthelmintic is the term used to describe a drug used to treat infections of animals with parasitic worms. This includes both flat worms, e.g., flukes (trematodes) and tapeworms (cestodes) as well as round worms (nematodes). The parasites are of huge importance for human tropical medicine and for veterinary medicine.

Helminth is a general term meaning worm. The helminths are invertebrates characterized by elongated, flat or round bodies. In medically oriented schemes the flatworms or platyhelminths (platy from the Greek root meaning "flat") include flukes and tapeworms. Roundworms are nematodes (Nemato from the Greek root meaning "thread"). These groups are subdivided for convenience according to the host organ in which they reside, e.g., lung flukes, extraintestinal tapeworms, and intestinal roundworms. This

chapter deals with the structure and development of the three major groups of helminths.

Helminths develop through egg, larval (juvenile), and adult stages. It gives the names applied to various larval helminths. Knowledge of the different stages in relation to their growth and development is the basis for understanding the epidemiology and pathogenesis of helminth diseases, as well as for the diagnosis and treatment of patients harboring these parasites.

Helminthes infections are among the widest spread infections in humans, distressing a huge population of the world. The gastro-intestinal helminthes becomes resistant to currently available anthelmintic drugs therefore there is a foremost problem in treatment of helminthes diseases. Despite the prevalence of parasitic worms, anthelmintic drug discovery is the poor relation of the pharmaceutical industry. The simple reason is that the nations which suffer most from these tropical diseases have little money to invest in drug discovery or therapy. It comes as no surprise therefore that the drugs available for human treatment were first developed as veterinary medicines.

***Butea monosperma* (Palas)**, is a medium-sized deciduous tree belonging to family Leguminosae-**Papilionaceae**. This tree is also called 'Flame of the Forest' and Bastard Teak. It grows throughout the Indian sub-continent, especially in Indo-Gangetic plains. It is said that the tree is a form of Agnidev, God of Fire. It was a punishment given to Him by Goddess Parvati for disturbing her and Lord Shiva's privacy. This tree gets up to 50 ft high, with stunning flower clusters. It loses its leaves as the flowers develop, January - March. The trunk becomes twisted and gnarled by the wind, making it a conversation piece.

Butea monosperma (BM) is a well-known medicinal plant which is a moderate sized deciduous tree and widely distributed in India, Ceylon and Burma. It has been used in traditional

medicine practice from ancient time. BM contains phytoconstituents such as alkaloids, flavonoids, phenolic compounds, amino acids, glycosides, steroids etc. The pharmacological activity is mainly shown by flowers, seeds, barks, fruits, leaves etc. The current review focused on following pharmacological actions like hepatoprotective, antifertility, antiparasitic, anti-diabetic, antiviral, anthelmintic, anticonvulsant, antifungal, antimicrobial, antiestrogenic, anticancer, anti-inflammatory, antioxidant, antiulcer, wound healing, anti-diarrhoeal, anti-implantation, antidopaminergic, antimycobacterial, osteogenic and osteoprotective activity. These medicinal properties may provide potential active principles with higher efficacy and minimum side effects as compared to available synthetic drugs.

In this research we discuss about the anthelmintic activity in *Butea monosperma* seeds use of earth worms. By using different solvent extracts like ethanol extraction, aqueous extraction and Soxhlet method extraction and compare to the standard drug like albendazole.

II. PLANT PROFILE

1. DESCRIPTION:

Butea monosperma (Lam.) is an erect, slow growing, deciduous tree reaching 5 to 8 m with a crooked trunk and irregular branches. It attains a diameter of about 20 to 40 cm when it matures at the age of about 50 years (Rana et al., 2012). The leaves are large, stipulate and 3-foliate. Leaflets are obtuse, glabrous above, finely silky and conspicuously reticulately veined beneath with cuneate or deltoid base. Flowers are large, bright crimson orange colour and 2 to 4 cm in diameter. It starts appearing in February and stays on nearly up to the end of April. Pods are stalked 12.5-20 by 2.5-5 cm, thickened at the sutures, reticulately veined argenteo-canescens: stalk 2 cm long (Burlia et al., 2007). The seeds are flat, kidney shaped, 25 to 40 mm long, 1 to 3 mm wide, and 1.5 to 2 mm thick. It is dark reddish-brown in colour, thin, glossy; hilum clear, situated near middle of seed; odour, faint; taste, slightly acrid and bitter (The Ayurvedic Pharmacopoeia).

2. SYNONYM:

- Butea monosperma* (Lam.) Kuntze,
- Butea frondosa* Poxb. Ex Willd,
- Erythrina monosperma* Lam,
- Plasmonosperma* (Lam).

3. COMMON NAMES:

- Flame of the forest,

- Bastard teak,
- Palasa,
- Butea gum tree

4. VERNACULAR NAMES:

Sanskrit	: Palash
Hindi	: Dhak, Palas, Chalcha
English	: Bastard teak, Parrot tree
Bengali	: Palas, Polashi
Tamil	: Parasa
Telugu	: Mooduga, palasamu
Malayalam	: Brahmavriksham, kimshukam

5. TAXONOMICAL CLASSIFICATION:

Kingdom:	Plantae
Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Fabales
Family:	Fabaceae (Papilionaceae)
Sub family:	Faboideae
Genus:	<i>Butea</i>
Species:	<i>monosperma</i>

a. Habit:

- ❖ An erect deciduous tree with young parts hairy.

b. Bark:



- ❖ Fibrous and bluish-gray to light brown in color.
- ❖ When injured, it exudes a kind of red juice known as 'Butea gum' or 'Bengal kino'.

c. Leaves:

- ❖ Compound with three leaflets, obliquely ovate and broadly elliptic.
- ❖ The size varies from 15 cm to 20 cm by 10 cm x 15 cm.
- ❖ The leaves fall off by December and reappear during.



d. Flowers:



- ❖ The size is nearly 2 to 4 cm in diameter.
- ❖ The flowers form a gorgeous canopy on the upper portion of the tree wears a kind of exquisite orange and red colour.
- ❖ Flowers start appearing in February and stay on the end of April.
- ❖ Calyx campanulate, silky hairy outside, velvety inside, petals equal, silky hairy, keel semicircular, beaked. Stamens 10, diadelphous.
- ❖ Ovary stalked, style incurved.

e. Fruit:



- ❖ Pods thin, downy bright 1-2 seeded.
- ❖ Flat legumes, pods are stalked 12.5-20 by 2.5-5cm, thickened at the sutures.
- ❖ Young pods have a lot of hair, a velvety cover.

f. ROOTS:

- ❖ Taproot is thick and long, lateral roots are numerous and well-developed.



g. SEEDS:



h. Flowering and Fruiting Time:

- ❖ February-March

Significance:

- 1) Used for road-side plantation.
- 2) Leaves serve as plates for domestic purposes.
- 3) Flowers yield a yellow dye and hence are also used in the festival of Holi.
- 4) A gum exudates from the tree and is used in medicine as powerful astringent that is given in diarrhea and dysentery.
- 5) Seeds are antihelminthic.

6. CHEMISTRY: Butea monosperma flowers are known to contain flavonoids and glucosides. Butin, isobutrin and butein are main phytoconstituents of flowers. Chalcones, aurones, isobutyne, palasitrin, coreopsin, isocoreopsin (butin 7-glucoside), monospermoside and triterpene steroids are the other phytoconstituents present in the flower (Basu et al., 1999; Mishra et al., 2000). It also contains myricyl alcohol, stearic, palmitic, arachidic, lignoceric acids, glucose, fructose, phenylalanine, aspartic acid, alanine and histidine (Sindhia et al., 2010). Roots contain glucose, glucosides, glycine, and aromatic compounds (Parashar et al.) The seed oil contains proteolytic and lypolytic enzymes, plant proteinase and polypeptidase. Seeds also contain butin, monospermoside, α -Amyrin, β -sitosterol and β -sitosterol- β D-glucoside (Bhargava, 1986). Bark contains various tannins like Kino-tannic acid, pyrocatechin. It also contains gallic acid, butolic acid, palasitrin, butrin, alanind, allophanic acid, cyanidin, histidine, lupenone, lupeol, miroestrol, medicarpin, shellolic acid and

palasimide (Nadkarni, 1976). Leaves contain glucoside, linoleic acid.

7.CULTIVATION:

Butea Monosperma prefers a sunny position, though they also thrive with some shade. Heavy shade depresses growth. They require moderate watering. These plants can tolerate some frost, though they are usually defoliated by it. They grow best on old alluvial soils and weathered red basalts. However, it succeeds on a wide variety of soils including shallow, gravelly sites, black cotton soil, clay loams, and even saline or waterlogged soils where few other trees will grow.

8.MEDICINAL PROPERTIES:

Flower is bitter, aphrodisiac, expectorant, tonic, emmenagogue, diuretic, and good in biliousness,

TonicAphrodisiac

Diuretics Astringent

9.MEDICINAL USES:

1] Leaf shoots, Gum and Bark:

- Spermatorrhoea
- Tenuity of semen
- Premature ejaculation
- Leukorrhoea

2] Flowers:

- Astringent to bowel,
- In heal "Kapha",
- Leprosy,
- Strangury,
- Gout,
- Skin diseases,
- Thirst sensation,
- Eye diseases,
- Diminish swelling and to regularize menstrual cycle,
- Diarrhea,
- To treat males urinogenital tracts diseases.

3] Roots:

- Round worm disease
- Rubifacient
- Quartan and Malarial fever

III.TYPES OF WORMS IN THE HUMAN BODY:

Worms are a parasite we don't typically associate with humans in this day and age. While we almost expect our dogs, horses and cats to suffer from them, the fact remains that people are animals too and there are a wide variety of worms that would love to make their home inside the human body.

Three Main Types of Parasitic Worms:

1. Flukes such as Blood Flukes
2. Flatworms such as Tape worms
3. Roundworms such as Threadworms or Pinworms

FLUKES (TREMATODES):

The structure of flukes is summarized. A dorsoventrally flattened body, bilateral symmetry, and a definite anterior end are features of platyhelminths in general and of trematodes specifically. Flukes are leaf-shaped, ranging in length from a few millimeters to 7 to 8 cm. The tegument is morphologically and physiologically complex. Flukes possess an oral sucker around the mouth and a ventral sucker or acetabulum that can be used to adhere to host tissues. A body cavity is lacking. Organs are embedded in specialized connective tissue or parenchyma. Layers of somatic muscle permeate the parenchyma and attach to the tegument.

- Liver flukes make their home in the human body where they attack the liver and make holes.
- They can survive for decades.
- There is a wide variety of methods of becoming infected by a liver fluke, including eating contaminated food, or drinking contaminated water.
- Parasites always live in or on their host. They eat the food supplies of their host and cause a wide range of conditions and symptoms that range from mild to severe.

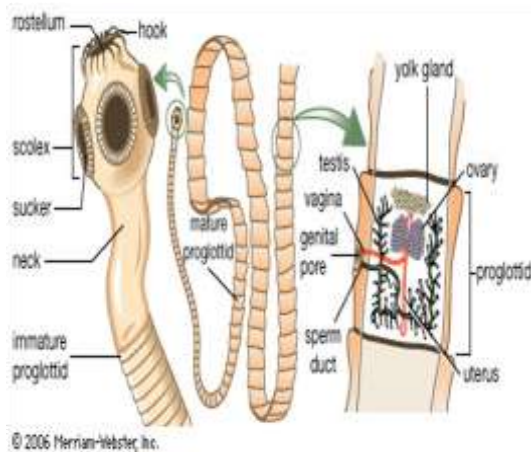


Flukes have a well-developed alimentary canal with a muscular pharynx and esophagus. The intestine is usually a branched tube (secondary and tertiary branches may be present) consisting of a single layer of epithelial cells.

TAPEWORMS (CESTODES):

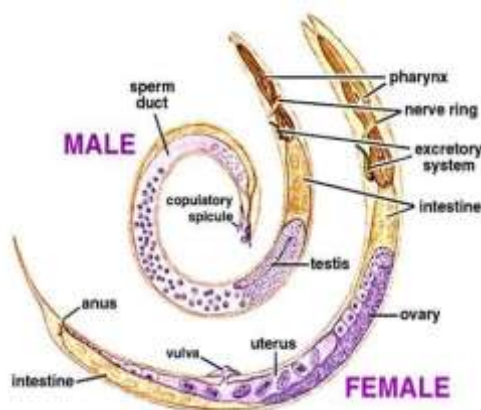
As members of the platyhelminths, the cestodes, or tapeworms, possess many basic structural characteristics of flukes, but also show striking differences. shows the general features of the structure and development of tapeworms.

Whereas flukes are flattened and generally leaf-shaped, adult tapeworms are flattened, elongated, and consist of segments called proglottids. Tapeworms vary in length from 2 to 3 mm to 10 m, and may have three to several thousand segments.



ROUNDWORMS (NEMATODES):

The structure of nematodes, In contrast to platyhelminths, nematodes are cylindrical rather than flattened; hence the common name roundworm. The body wall is composed of an outer cuticle that has a noncellular, chemically complex structure, a thin hypodermis, and musculature. The cuticle in some species has longitudinal ridges called alae. The bursa, a flaplike extension of the cuticle on the posterior end of some species of male nematodes, is used to grasp the female during copulation.



1.PINWORMS

- The most common form of worm that can be found in the human body is the pinworm.
- Pinworms live inside the colon but leave to lay their eggs on the outside of the host's body, typically at night in a location the host will reflexively scratch, thus transporting the eggs to infect a new person, or re-infect the host.

2.HOOKWORMS

- Hookworms are a particularly nasty parasite that actually has teeth, Infection can be caused by consuming compromised fruit or water, or by coming into contact with soil or water where the worms reside.
- This parasite lives in the intestine.

IV.SYMPTOMS OF WORMS IN HUMANS:

Intestinal parasites, including tape worms, round worms and pin worms, are much more common than most people would like to acknowledge

1. Weight Loss:

- Most Americans can stand to lose a little weight, so some people ignore unintentional weight loss instead of promptly addressing the cause.
- Unexplained weight loss is often the first sign that a person is sharing his food with a colony of worm.

2. Itching:

- Itching of the anus or vagina can be a sign that intestinal parasites are squirming about and causing local skin irritation.
- Eczema-like skin rashes else whereon the body may appear.

3. Stomach Pain:

- Gassy stomach pain can be a sign of worm infestation, although there are many other causes, including irritable bowel syndrome, ulcers and food intolerance.
- Pain from worms can appear anywhere in the abdomen.

4. Diarrhoea or Constipation:

- Intestinal parasites are likely to cause intermittent episodes of constipation or severe diarrhoea, and bowel movements may be foul smelling.
- These symptoms may resemble another condition and be misdiagnosed.

5. Worms or Eggs in Stool:

It should go without saying, but many people still fail to recognize symptoms of intestinal parasites even when they pass worms or worm eggs in their faces (Juniper Russo).

V. STANDARD ANTHELMINTIC DRUGS:

The most commonly used anthelmintic drugs are:

- **Nematicidal agents:**

Benzimidazoles (FABANTEL)

Diethylcarbamazine (CETREZOL-D)

Ivermectin (IVERMECT-12mg, VERMIN-9mg, TIVOMAC-50ml)

Pyrantelpamoate (WOKCHART-250mg, MEBEX PLUS-150mg)

- **Trematocidal and cestodicidal agents:**

Praziquantel (PRAZISAN-600mg, CYSTICIDE-500mg)

Niclosamide (discontinued in the United States) (NICLOSAN-500mg)

Benzimidazoles

Albendazole (ABAN-400&200mg, WORMIX-400mg, ZENTEL-400mg, ABD-400mg)

Mebendazole (MEBAN-100mg, VERMOX-500mg, MEBENCARE-100mg)

Triclabendazole (TRILEV-VET 900mg, LESAXYS-500mg, FASINEX BOLUS-900mg)

VI. METHODOLOGY

1. COLLECTION OF THE PLANT:

The seeds of *Butea Monosperma* collected from flipkart(online) . The seeds was authenticated by Dr. Ravi.,M.Sc.,Ph.D.

Associate professor & head

PG & Research department of botany,

Government Arts College For Men, Krishnagirai district.

The material was identified as *Butea Monosperma* belonging to the family Fabaceae.

2. SELECTION OF WORMS:

Indian adult earthworms (*Pheretima posthuma*) were used to carry out the anthelmintic evaluation. The earthworms were collected from the moist soil of near Thirupattur, TN. Worms were washed with saline water to remove the fecal matter, due to its ready availability, anatomical and physiological

resemblance with the intestinal round or pin worm parasites of human beings.

Earthworms (*Pheretima posthuma*) made it to be used initially for in vitro evaluation of anthelmintic activity (Qureshie et al., 2010).

3. PREPARATION OF PLANT EXTRACT:

AQUEOUS EXTRACTION OF BUTEA MONOSPERMA:

The crude aqueous extract of the ground seeds of *Butea Monosperma* was prepared according to the cold maceration method. The dried powdered of plant (20gm) were macerated with 100ml of water. The drug was macerated for 72 hours. After that filtered the extract. The filtrate of aqueous extract was 80ml. The extract stored at 4⁰ C until further use.

SOLVENT EXTRACTION OF BUTEA MONOSPERMA:

A weighed quantity of dried powdered flowers of plant (40 gm) subjected to hot solvent extraction in a soxhlet apparatus using 500ml of ethanol(95%), at a temperature range of 40⁰ C. The filtrate was evaporated to dryness under reduced pressure in a rotary vacuum evaporator. The percentage yield of ethanolic extract was 5% w/w. The extract thus obtained was used directly for the assessment of anthelmintic activity. These extract were stored at 4⁰ C until use.

VII. PHYTOCHEMICAL INVESTIGATION:

The phytochemical tests were carried out to find the presence of Phytoconstituents such as alkaloids, flavonoids, phenolic compounds, amino acids, glycosides, steroids etc using the standard procedures.



PHYTOCHEMICAL TEST



Phytochemical analysis of ethanolic extract of Butea Monosperma

	PHYTOCONSTITUENTS	AQUEOUS EXTRACT
1	Alkaloids	+
2	Carbohydrates	+
3	Glycosides	+
4	Flavonoids	+
5	Protiens	+
6	Saponins	+
7	Sterols	+
8	Tannins	+
9	Triterpenes	+
10	Phenolic compounds	+

(+)Positive (-) Negative

Ethanolic extract of Butea Monosperma seeds were subjected to qualitative phytochemical tests for different phytochemical constituent. From the phytochemical analysis, the plant extract shown the presence of shown alkaloids, carbohydrates, glycoside, flavonoids, proteins, tannins, and triterpenoids.

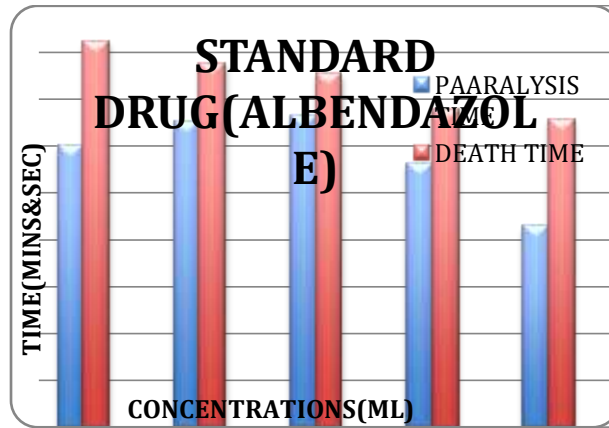
VIII. ANTHELMINTIC ACTIVITY OF BUTEA MONOSPERMA

EVALUATION OF ANTHELMINTIC ACTIVITY:

Anthelmintic activity was carried out on adult Indian earthworm (Pheretima posthuma) of nearly equal size, six in each group. Various

concentration of crude, extract of Butea Monosperma in the concentration ranging from 1ml, 1.5ml, 2ml, 2.5ml and 3ml in distilled water were prepared. Albendazole (ALBENDAL-10ml) was used as reference standard while water served as a control. Worms were placed in petridishes containing 5ml of sample solution. Time for paralysis was noted either when any movement could not be observed except when the worms were shaken vigorously. Death was included when the worms lost their motility followed with white secretion and fading away of their body.

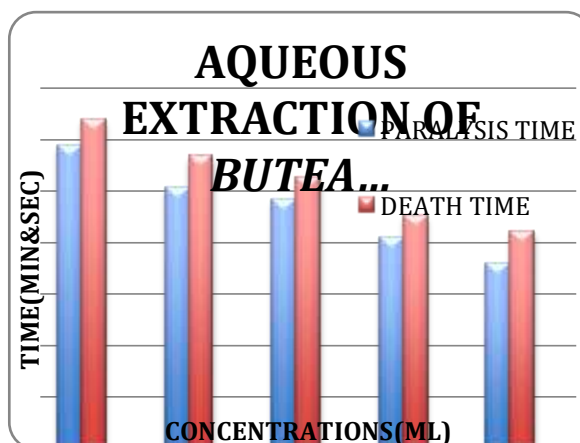
1. ANTHELMINTIC ACTIVITY OF STANDARD DRUG (ALBENDAZOLE) :



2. ANTHELMINTIC ACTIVITY OF AQUEOUS EXTRACT OF BUTEA MONOSPERMA IN DIFFERENT CONCENTRATION 1ML, 1.5ML, 2ML, 2.5ML, 3 ML:

Aqueous extract of BUTEA MONOSPERMA showed better anthelmintic activity in dose

dependent manner as shown in table 2, when compared with the standard drug. Paralysis and death time of BUTEA MONOSPERMA 3ml nearly equal to the Paralysis and death time of standard drug Albendazole.

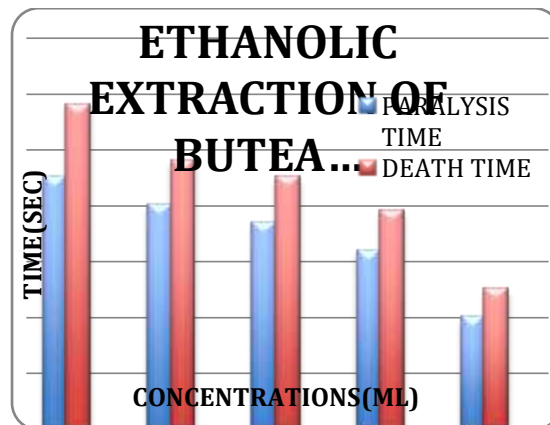




3. ANTHELMINTIC ACTIVITY OF ETHANOLIC EXTRACT OF BUTEA MONOSPERMA IN DIFFERENT CONCENTRATIONS 1ML, 1.5ML, 2ML, 2.5ML, 3 ML:

Ethanollic extract of butea monosperma showed better anthelmintic activity in dose

dependent manner as shown in table 2, when compared with the standard drug. Paralysis and death time of BUTEA MONOSPERMA 3ml nearly equal to the Paralysis and death time of standard drug Albendazole.





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