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**ASSESSMENT OF ANTI-BACTERIAL AND ANTHELMINTIC ACTIVITIES
FOR SEED EXTRACT OF *SAPINDUS TRIFOLIATUS* – AN *IN VITRO*
APPROACH**

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ABSTRACT

Medicinal plants have curative properties due to the presence of various complex chemical substances of different composition, which are found as secondary plant metabolites in one or more parts of these plants. *Sapindus trifoliatus*, commonly known as soap nut, has been traditionally utilized for various medicinal purposes. This study investigates the *in vitro* anti-bacterial and anti-helminthic activities of *Sapindus trifoliatus* seed extract. The extraction process was carried out using methanol solvent. The anti-bacterial potential of the extract was evaluated against a panel of pathogenic microorganisms, bacteria and using standard microbiological assays. The findings reveal significant inhibitory effects, suggesting a promising role for *Sapindus trifoliatus* seed extract in combating microbial infections. Furthermore, the extract exhibited noteworthy anti-helminthic activity against common parasitic worms, as evidenced by *in vitro* assays. The study elucidates the possible mechanisms underlying the observed activities, shedding light on the phytochemical composition responsible for the extract's efficacy. In conclusion, *Sapindus trifoliatus* seed extract emerges as a potential source of natural compounds with anti-bacterial and anti-helminthic properties. This research contributes valuable insights into the therapeutic applications of *Sapindus*

trifoliatus, paving the way for further exploration and development of novel pharmacological agents derived from this plant species.

Keywords: *Sapindus trifoliatus*, anti-bacterial activity, anthelmintic activity, *Pheretima posthuma*

INTRODUCTION

Plants and organisms are used in a variety of ways in the production of conventional and alternative medicines. The beneficial active ingredient can be found anywhere within the physical structure of plant. In plant the active ingredient might be inert in its usual physical form, so chemical reactions and modifications are performed to get its active form. The active ingredient is extracted directly from the plant, but on other occasions the active ingredient can be produced via synthesis by creating a compound that behaves similarly to the plant extract [1, 2].

Anti-bacterial activity refers to the ability of a substance to inhibit the growth or kill bacteria or stops them from growing and causing disease is called an antibacterial agent. The rich diversity of plant and animal sources in traditional medicine has long been recognized for their potent therapeutic properties, particularly in terms of antibacterial activity, often with fewer associated side effects compared to synthetic drugs. Examples such as neem plants and turmeric rhizomes stand out as natural reservoirs of compounds with pronounced anti-bacterial efficacy [3, 4].

Anti-helminthic activity evaluations are usually carried out in lab environments. *In vitro* investigations entail subjecting helminths to the test material and evaluating the motility or vitality of the organisms. Animal models are used in *in vivo* research to assess the safety and effectiveness of anti-helminthic medications. A variety of approaches is used for studying anti-helminthic activity, taking into account natural sources, bioactive substances, mechanisms of action, laboratory testing, conventional medicine, difficulties, and potential future research areas. The development of practical and affordable therapeutics for helminthic infections necessitates a coordinated effort integrating conventional knowledge with cutting-edge scientific approaches [5, 6].

Sapindus trifoliatus is a species belonging to the *Sapindus* genus within the Sapindaceae family. Typically found in tropical and subtropical regions, this plant is characterized by its trifoliate leaves. Like other members of the *Sapindus* genus, *Sapindus trifoliatus* is known for its saponin-rich fruits. The saponins present in the fruits have natural soap-like properties, and the plant has been traditionally utilized

for its cleansing properties. The seeds or fruits, when processed, have been employed as a natural detergent in various cultures. Above all these *Sapindus trifoliatus* have medicinal value, with extracts of different

parts of the plant which potentially exhibit anti-inflammatory, anthelmintic, anti-diabetic, anti-oxidant and anti-microbial properties [7-9].



Figure 1: *Sapindus trifoliatus* plant

The aim of the present work is to screen the *in vitro* anti-bacterial and anthelmintic activity of *Sapindus trifoliatus* Linn. seed methanolic extract.

MATERIALS AND METHODS

Chemicals and requirements

The solvent used for extraction are methanol, distilled water. Nutrient agar, albendazole, streptomycin, normal saline and other reagents were used of laboratory grade and analytical grade obtained from various other commercial sources. And Soxhlet apparatus, heating mantle, refrigerator, china dishes, petri plates, micropipette, autoclave, incubator, hot air oven, and digital balance was used in the research work.

Collection and preparation of the plant material and solvent extraction [10-12]

Seeds of *Sapindus trifoliatus* were collected and identified. The seeds were removed from the fruit collected from the plant *Sapindus trifoliatus*. Then the seeds were crushed into smaller particles followed by it is subjected to prepare coarse powder with the help of a pulverizer or electric grinder. The 100g of seed powder of *Sapindus trifoliatus* individually was subjected to Soxhlet extraction using solvents methanol at their boiling point for 2 continuous days. The collected extract was subjected to evaporation to get semisolid form of extract considered as concentrated form of extract stored in well closed container which can be used for the further analysis and study.



Figure 2: *Sapindus trifoliatus* seeds and powder



Figure 3: Soxhlet extraction using methanol

Microorganisms

The anti-bacterial activity of the seed extract of *Sapindus trifoliatus* was evaluated against two strains of gram-positive bacteria such as *Staphylococcus aureus*, *Bacillus subtilis* and two strains of gram - negative bacteria such as *Escherichia coli*, *pseudomonas aeruginosa*.

Earth worms

Earthworms (*Pheretima Posthuma*) of about 5-7 cm long were collected from local area of Venkatapur, Ghatkesar, Hyderabad used for the present research.

In vitro pharmacological screening

Anti-bacterial activity by agar diffusion method [13-15]

Preparation of test sample: The stock solution (1000 μ g/ml) of seed extract was prepared by using DMSO.

The anti-bacterial activity of the seed extract of *Sapindus trifoliatus* against different bacterial strains was screened by agar well diffusion method. Nutrient agar medium was prepared and sterilized by autoclave and poured in to sterile petri plates. After solidification of nutrient agar medium, the bacteria were spread separately on agar plate by cotton swab, wells were punched on the surface of agar medium by using sterile borer and filled with sample solutions of seed extract. The plates were incubated at 37°C for 24 to 48 h. Anti-

bacterial activity was determined by measuring the diameter of zone of inhibition in mm. Streptomycin (2µg/ml) was used as the standard anti-microbial agent for anti-bacterial activity research.

Anthelmintic activity against Indian earthworms [1, 14]

- 10-12 Earth worms (*Pheretima posthuma*) of nearly equal size (6 cm ± 1) were selected randomly for the present study. The worms were acclimatized to the laboratory conditions before experimentation.
- The methanolic seed extract of *Sapindus trifoliatus* was dissolved in DMSO (Dimethyl sulfoxide) and adjusted the volume up to 10ml with normal saline to get different concentrations considered as test solutions.
- The earth worms were divided into groups containing six earthworms each.
- Albendazole served as a standard and poured into petri dishes. The test extract was prepared in different concentrations.
- Normal saline served as control. Six earthworms nearly equal size 6 cm ± 1 were taken for each concentration and placed in petri dishes at room temperature.
- The time taken for complete paralysis and death was recorded.

The time taken for the worms to become motionless was noted as paralysis time and to ascertain death.

- Paralysis was said to occur when the worms were not able to move in the sample extract.
- Death was concluded when the worms lost their motility followed by fading away of their body colour.
- Albendazole was used as the standard to compare the test compounds.

RESULTS AND DISCUSSION

Anti-bacterial activity

The result of the anti-bacterial activity of seed extract of *Sapindus trifoliatus* were present in below Table and Figures. Seed extract showed strong inhibitory activity against *Escherichia coli* and *Bacillus subtilis*. The extract did not show any anti-bacterial activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa* (Figure 1-6).

Therefore, our extract shows anti-bacterial activity against both gram positive and gram-negative bacteria.

Anthelmintic activity

The methanol seed extract of *Sapindus trifoliatus* were evaluated by the time taken for complete paralysis and death of earthworms. The mean lethal time for each test compound was recorded and compared with standard drug. The time taken by worms to become motionless was noted as

paralysis time. To certain the death of the motionless worms was frequently applied with external stimuli, which stimulate and induce movement in the worms, if alive. The mean lethal time and paralysis time and death time of the earthworms for methanol seed extract (compound) and standard drug (Figure 7A-C, Figure 8, 9; Table 2).

Therefore, the anti-helminthic activity - paralysis time (min) and death time (min) is seen more in 200 µg/ml test compounds for methanolic seed extract of *Sapindus trifoliatus* compared with albendazole as standard drug.



Figure 4: Methanol extract of *Sapindus trifoliatus* seeds

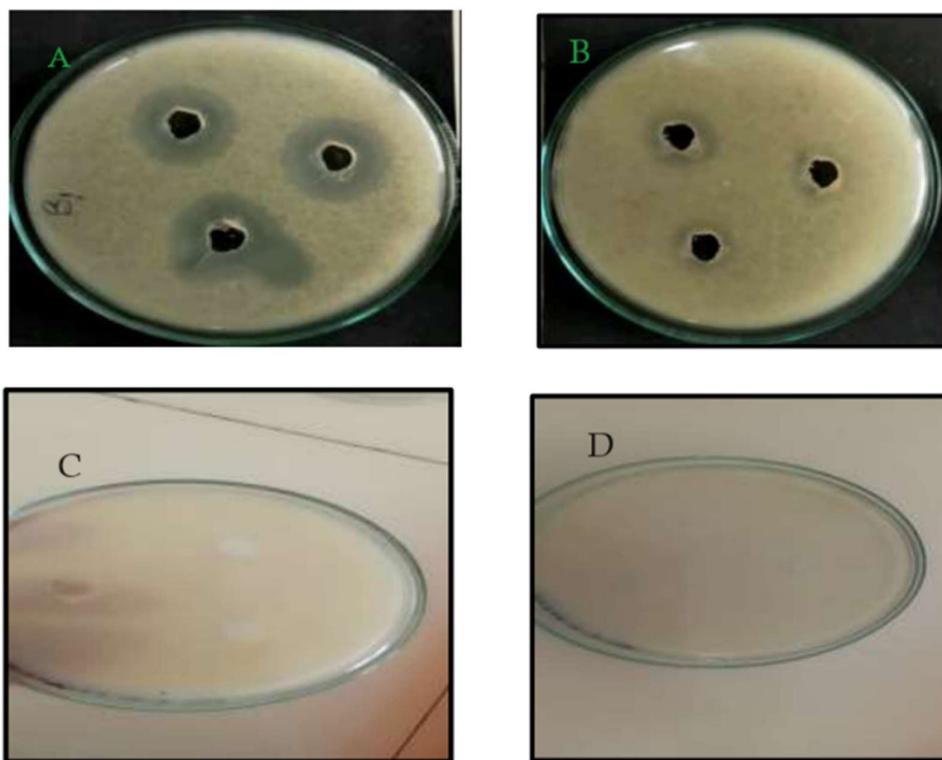


Figure 5: Zone of inhibition in *Sapindus trifoliatus* methanolic seed extract against A) *Escherichia coli* B) *Bacillus subtilis* C) *Staphylococcus aureus* D) *Pseudomonas aeruginosa*



Figure 6: Zone of inhibition of streptomycin

Table 1: Antibacterial activity of methanolic seed extract of *Sapindus trifoliatus*

S. No.	Microorganism	Diameter of zone of inhibition (mm)
1	<i>Escherichia coli</i>	2.5
2	<i>Bacillus subtilis</i>	2.3

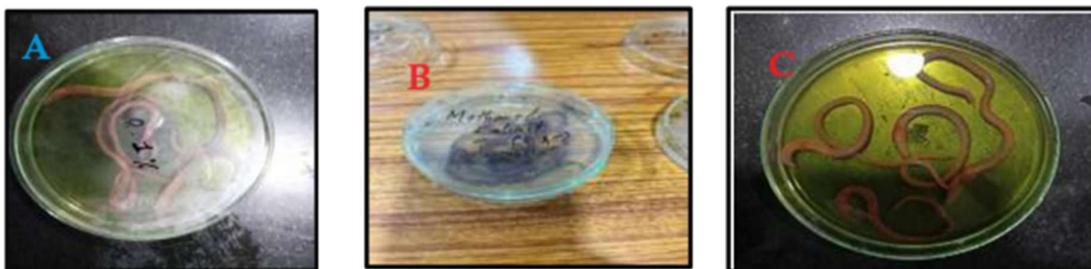


Figure 7: A) Death of earthworms at 0.1% B) Death of earthworms at 0.5% C) Death of earthworms at standard solution

Table 2: Anthelmintic activity of methanolic seed extract of *Sapindus trifoliatus*

S. No.	Concentration	Time in minutes					
		For paralysis % conc.			For death % conc.		
		0.1	0.2	0.5	0.1	0.2	0.5
1	100 µg/ml	2	20	13	50	42	38
2	200 µg/ml	18	16	10	46	38	29
3	Albendazole	15	12	8	44	34	26
4	Control	-	-	-	-	-	-

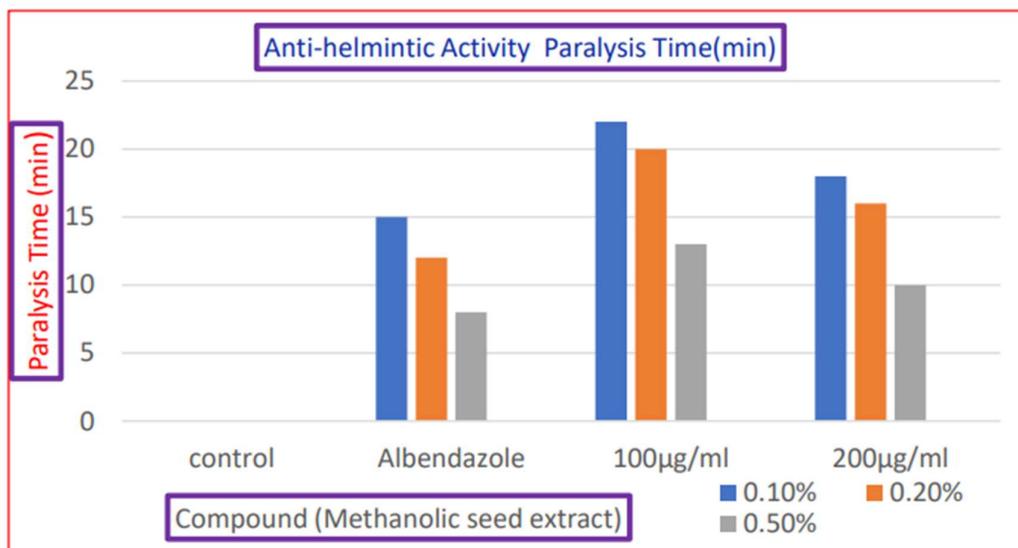


Figure 8: Anthelmintic activity of methanolic seed extract of *Sapindus trifoliatus* - paralysis time (min)

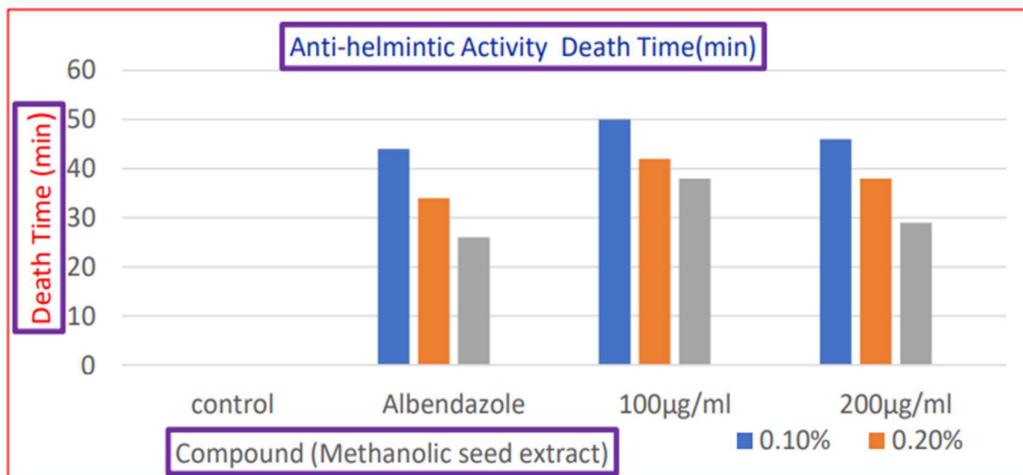


Figure 9: Anthelmintic activity of methanolic seed extract of *Sapindus trifoliatus* - Death time (min)

CONCLUSION

The anti-bacterial activity showed a significant zone of inhibition in both gram-positive and gram-negative bacteria when compared with standard drug streptomycin. The results revealed the seed extract was potentially effective in suppressing microbial growth of bacteria with variable potency. The present study suggests that the seed of *Sapindus trifoliatus* contain a considerable amount of phytochemicals

like saponins, alkaloids, tannins, and flavonoids which are responsible for anti-bacterial activities. The evidence showed that the methanolic seed extract of *Sapindus trifoliatus* required least time for paralysis as well as the death of earthworms. Hence it was observed that the seed of the plant *Sapindus trifoliatus*, have 80-90% significant anthelmintic activity when compared with standard drug albendazole. Further more research is required to found

the mechanism of action of anti-bacterial and anthelmintic activity for the plant and toxicity.

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Author contributions

All authors contributed to experimental work, data collection, drafting or revising the article, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work.

Competing interest statement

All authors declare that there is no conflict of interests regarding publication of this paper.

Ethical approval

Not required.

REFERENCES

- [1] Jorgensen JH, Ferraro MJ. Antimicrobial susceptibility testing: a review of general principles and contemporary practices. Clin. Infect. Dis. 2009; 49:1749–1755.
- [2] Narender Boggula, Swetha Reddy Naram Reddy, Teja Sri Alla, Azmath Farhana, Jainendra Battineni, Vasudha Bakshi. Phytochemical evaluation and *in vitro* anti bacterial activity of dried seeds of *Abrus precatorius*. International Journal of

- Pharmaceutical Sciences Review and Research. 2017; 44(1):101-107.
- [3] Sultan Supriya, Nikhil Kumar Lagisetty, Krishna Mohan Chinnala, Vamshi Sharathnath Kaveti, Hari Prasad Pasunuri, Narender Boggula. Preliminary Phytochemical Investigation and *in vitro* Anti bacterial Activity of Aerial Roots of *Ficus Benghalensis* Linn. J. Global Trends Pharm Sci. 2017; 8(4):4311-4319.
- [4] Bibi George, S Shanmugam. Photochemical screening and antimicrobial activity of fruit extract of *Sapindus mukorossi*. International journal of current microbiology and applied sciences. 2014; 3(10):604-611.
- [5] Mali RG, Mehta A. A Review on Anthelmintic Plants. Natural Product Radiance. 2008; 7(5):446-475.
- [6] Arul B, Kothai R, Jacob P, Sangameswaran B, Sureshkumar K. Anti-inflammatory activity of *Sapindus trifoliatus* Linn. J Herb Pharmacother. 2004; 4(4):43-50.
- [7] Pradhan D. Pharmacological effect of some fractions obtained from *Sapindus trifoliatus* acting as an antioxidant and against mammary cell proliferation. African Journal of

- Pharmacy and Pharmacology. 2014; 8(17):455-463.
- [8] Sravanthi KC, Sarvani M, Srilakshmi S. Anthelmintic activity of *Sapindus trifoliatus* seed extract. Int. J Pharm. Technol. 2011; 3(1):1603-1608.
- [9] Arulmozhi DK, Sridhar N, Bodhankar SL, Veeranjanyulu A, Arora SK. *In vitro* pharmacological investigations of *Sapindus trifoliatus* in various migraine targets. J Ethnopharmacol. 2004; 95(2-3):239-245.
- [10] ERHSS Ediriweera, WMSA Premakeerthi, MHY Perera. A Literary Review on *Sapindus trifoliatus* (Gaspenela) and its Medicinal Values. International Journal of Ayurveda and Pharma Research. 2021; 9(2):51-55.
- [11] Manish Adithya G, Pravalika K, Bhavani K, Thanuja K, Vasudha B, Narender B, Mohammed S. Assessment of Anthelmintic Activity of Ethanolic Extract of *Musa sapientum* Stem: An *in-vitro* Approach. Journal of Drug Delivery and Therapeutics. 2019; 9(3):319-324.
- [12] Jayasree T, Naveen A, Chandrasekhar N, Sunil M, Kishan PV, Rao NJ. Evaluation of muscle relaxant activity of aqueous extract of *Sapindus trifoliatus* (pericarp) in Swiss albino mice. Journal of Chemical and Pharmaceutical Research. 2012; 4(4):1960-1964.
- [13] Kumar CN, Shridhar NB, Das A, Nephrotoxic activity of methanolic extract of *Sapindus laurifolius* in rats. Indian Journal of Animal Research. 2014; 48(1):50-54.
- [14] Mohammed Sayeed, Dr. Vasudha Bakshi, Narender Boggula. Phytochemical and Anthelmintic Screening of *Moringa Oleifera* Stem Ethanolic Extract. Indo American Journal of Pharmaceutical Research. 2017; 7(12):981-991.
- [15] Emine Sen, Tugce Ogut, Abdullah Olgun, Ozgul Kisa. Anthelmintic Activity of *Nigella sativa* against *Caenorhabditis elegans*. Advances in Pharmacology and Pharmacy. 2021; 9(4):117-126.