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Research Article

Fluorescence Analysis, Phytochemical Screening and Anti-lice Activity of *Lagerstroemia speciosa* L. Bark

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ABSTRACT

Background: *Lagerstroemia speciosa* L., commonly known as Banaba, is a medicinal plant belonging to the family Lythraceae and has been traditionally used for the treatment of diabetes, inflammation, infections, and other health disorders. The plant is known to contain various bioactive constituents responsible for its therapeutic properties. **Objectives:** The present study aimed to perform pharmacognostic evaluation through fluorescence analysis, preliminary phytochemical screening, and biological assessment of the bark of Lagerstroemia speciosa L. **Materials and Methods:** The bark of *Lagerstroemia speciosa* L. was collected, authenticated, dried, and powdered for further analysis. Fluorescence analysis of the powdered bark was carried out using different chemical reagents under visible and ultraviolet light to establish its diagnostic characteristics. A hydroalcoholic extract (70:30 v/v) was prepared using ultrasonic-assisted extraction and subjected to preliminary phytochemical screening for the identification of various phytoconstituents. The biological activity of the extract was evaluated using an *in vitro* method, and the activity was compared with the standard drug benzyl benzoate. **Results:** Fluorescence analysis revealed characteristic colour changes with different chemical reagents, supporting the identification and standardization of the crude drug. Phytochemical screening demonstrated the presence of important bioactive constituents in the hydroalcoholic bark extract. The extract exhibited notable biological activity in comparison with the standard drug, indicating its pharmacological potential. **Conclusion:** The present study confirms the presence of valuable phytoconstituents and biological activity in the bark of *Lagerstroemia speciosa* L. The findings support its traditional medicinal applications and emphasize the significance of fluorescence analysis and phytochemical evaluation as important approaches for the standardization, quality control, and therapeutic exploration of herbal drugs.

Keywords: Anti-lice Activity, Fluorescence Analysis, Hydroalcoholic Extract, *Lagerstroemia speciosa*, Phytochemical Screening.

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INTRODUCTION

Lagerstroemia speciosa commonly known as Banaba or Queen's crape myrtle, belongs to the family Lythraceae and is widely distributed in tropical and subtropical regions including India, Philippines, Malaysia, and Southeast Asia. The plant has been extensively used in traditional systems of medicine for the management of diabetes, kidney disorders, obesity, diarrhoea, inflammation, and various skin diseases (Judy *et al*., 2003). Different parts of the plant such as leaves, bark, flowers, and roots possess several pharmacological activities due to the presence of diverse phytoconstituents including alkaloids, flavonoids, tannins, glycosides, terpenoids, and phenolic compounds (Klein *et al*., 2007).

Medicinal plants have gained considerable attention in recent years because of their therapeutic potential and reduced adverse effects compared to synthetic drugs. Pharmacognostic standardization and phytochemical investigation are essential steps in the identification, authentication, and quality control of crude herbal drugs (Kokate, 2008a). Fluorescence analysis is one of the important pharmacognostic evaluation parameters used for determining the purity and quality of powdered crude drugs. Many plant constituents exhibit fluorescence under visible and ultraviolet light after treatment with specific chemical reagents, thereby serving as a useful diagnostic tool for plant identification and adulteration detection (Chase and Pratt, 1949).

Phytochemical screening plays a significant role in the discovery of bioactive compounds responsible for therapeutic activities. Preliminary phytochemical analysis helps in identifying the major classes of secondary metabolites present in medicinal plants, which may contribute to biological properties such as antimicrobial, antioxidant, anti-inflammatory, and antiparasitic activities (Harborne, 1998). The bark of *Lagerstroemia speciosa* is reported to contain tannins, flavonoids, triterpenoids, saponins,

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and phenolic compounds that may exhibit potent medicinal properties (Ragasa *et al.*, 2014).

Pediculosis, commonly known as lice infestation, is a widespread parasitic condition affecting millions of people worldwide, especially school-aged children. Head lice infestation causes irritation, itching, secondary infections, and social discomfort (Burgess, 1995). Synthetic pediculicides such as permethrin and benzyl benzoate are commonly used for treatment; however, continuous usage has resulted in resistance development, skin irritation, and other adverse effects (Mumcuoglu, 1999). Hence, there is an increasing demand for safer and effective herbal alternatives with anti-lice potential.

Natural products derived from medicinal plants have emerged as promising sources for antiparasitic agents because of their bioactive phytoconstituents and comparatively lower toxicity (Pavela, 2015). Several plant extracts rich in phenolics, tannins, and terpenoids have demonstrated significant pediculicidal activity by affecting the nervous system and respiratory functions of lice (Yang *et al.*, 2004). Considering the traditional medicinal importance and phytochemical richness of *L. speciosa* bark, the present study was undertaken to evaluate the fluorescence characteristics, preliminary phytochemical constituents, and anti-lice activity of the hydroalcoholic extract of bark.

MATERIALS AND METHODS

Collection and authentication of plant material

The barks of the plant *Lagerstroemia speciosa* (L.) were collected from the Kodad regions of Suryapet Dist. T.S, and were authenticated by Dr. K. Srinivasa Reddy, M. Sc., Ph.D., Asst. Professor, Dept. of Botany, Govt. Degree College for Women, Nalgonda, Telangana State. The barks were cleaned and dried under standard shade conditions. Then it was ground to obtain coarse powder of standard size suitable for extraction. The powder was subjected to extraction.

Preparation of extract

100 g of dried powdered material of *L. speciosa* barks were mixed with 1000 mL of hydroalcoholic solvent in a 1:10 ratio in a conical flask. The mixture was subjected to sonication using an ultrasonic bath at 20-40 kHz for 30 min at room temperature. After sonication, the extract was filtered through Whatman No.1 filter paper. The filtrate was concentrated using a rotary evaporator or water bath below 50°C to obtain the crude extract. The obtained extract was dried and stored in an airtight container for further studies. The percentage yield, colour, and consistency were determined (Sudhakar *et al.*, 2024a).

Phytochemical screening

The extract was subjected to preliminary phytochemical screening in order to detect the presence of various groups of phytoconstituents by using standard phytochemical procedures (Khandelwal, 2002; Kokate, 2008b).

Fluorescence analysis

When various chemicals and solvents are applied to plant material, the chemical components present display a phenomenon called fluorescence. The current work investigated the fluorescence of powdered *L. speciosa* (L.) barks under UV and visible light/daylight settings following treatment with different agents and solvents. A little amount of dried and finely powdered material was treated with a variety of solvents, solutions, and freshly prepared acids. The powder sample was treated with acids such as concentrated HNO_3, HCl and H_2SO_4, and acetic acid in addition to alkaline solutions such as 10% aqueous NaOH and different solvents such as ammonia, distilled water, 5% FeCl3, iodine, methanol, and ethanol. Their fluorescence in visible and ultraviolet light was studied (Kommu and Sivakumar, 2026).

Evaluation of anti-lice activity

Preparation of Test Samples

With slight modification Sudhakar *et al.* method was used for evaluation of anti-lice activity of the hydroalcoholic extract of *Lagerstroemia speciosa* barks. Different concentrations of the extract were prepared using hydroalcoholic solvent.

- **2.5% solution:** From 10% stock solution take 2.5 mL solution and add 7.5 mL of hydroalcoholic solvent.
- **5% solution:** From 10% stock solution take 5 mL solution and add 5mL of hydroalcoholic solvent.
- **10% solution:** 1 g extract dissolved and volume made up to 10 mL with hydroalcoholic solvent (stock solution).

Standard Sample Preparation

A 5% solution of Benzyl benzoate was used as the standard drug.

Control

Hydroalcoholic solvent without extract was used as the control.

Collection of Lice

Live head lice (*Pediculus humanus capitis)* were collected from infected individuals using a fine comb and transferred carefully into clean petri dishes lined with filter paper. Active and healthy lice were selected for the study.

Experimental Procedure

Clean and dry petri dishes were taken and labelled as:

- Control.
- Standard (5% Benzyl benzoate).
- 2.5% extract.

- 5% extract.
- 10% extract.

Whatman filter paper was placed inside each petri dish. About 5 live lice were transferred into each petri dish using forceps. Approximately 1.5 mL of respective test solution was added uniformly onto the filter paper of each dish. Petri dishes were covered and maintained at room temperature. The lice were observed continuously for paralysis and death at regular intervals. The time required for complete mortality of lice in each group was recorded in minutes. Lice showing no movement even after gentle probing with forceps were considered dead. The experiment was carried out in triplicate and the average mortality time was calculated (Sudhakar *et al.*, 2024b).

RESULTS AND DISCUSSION

The authenticated *L. speciosa* (L.) barks were taken up for the present study. The photograph of the plant is shown in Figure 1. The observation and results of hydro alcoholic extract of *L. speciosa* (L.) barks were given in Table 1 and Figure 2.

The preliminary phytochemical studies were explored as per the procedure discussed previously. The extract was tested for different phytoconstituents like glycosides, tannins and phenolic compounds, steroids, flavonoids, saponins etc., and the results are as shown in Table 2.

The fluorescence analysis of the bark powder revealed characteristic colour changes under visible light, 254 nm, and 365 nm UV light after treatment with different chemical reagents. These fluorescence variations indicate the presence of different phytochemical constituents in the bark material and serve as an important pharmacognostic parameter for identification and authentication of the crude drug.

The untreated bark powder showed light brown colour in visible light, greenish brown fluorescence at 254 nm, and greenish yellow fluorescence at 365 nm, indicating the natural fluorescence of plant pigments and phenolic constituents. Treatment with distilled water produced dark green fluorescence under 365 nm, suggesting the presence of water-soluble phytoconstituents such as tannins and glycosides.

Ferric chloride treatment produced blackish to dark black fluorescence under UV light, indicating the probable presence of phenolic compounds and tannins due to complex formation with $FeCl_3$. Acetic acid treatment showed orange brown fluorescence at 365 nm, suggesting the presence of flavonoids and related phenolic compounds. Concentrated nitric acid produced orange brown colour in visible light and dark green fluorescence under UV light, indicating oxidation reactions of phytochemicals.

Ammonia treatment resulted in dark green and blackish fluorescence, which may be due to alkaloids and phenolic compounds. Ethanol and methanol treatments showed light green and bright green fluorescence at 254 nm respectively, indicating the presence of alcohol-soluble constituents such as flavonoids, glycosides, and phenolics. Chloroform and petroleum ether treatments produced orange brown and greenish brown fluorescence, suggesting the presence of non-polar compounds including steroids, terpenoids, fixed oils, and resinous substances.

Treatment with aqueous sodium hydroxide produced reddish brown colour in visible light and dark green/black fluorescence under UV light, indicating the presence of phenolic and tannin compounds. Sulphuric acid treatment showed blackish fluorescence in all observations, suggesting charring or strong reaction with organic constituents. Hydrochloric acid treatment produced dark green/black fluorescence at 365 nm, further supporting the presence of phytoconstituents sensitive to acidic conditions.

Overall, the fluorescence behaviour of the bark powder with different reagents demonstrated the presence of important phytoconstituents such as tannins, flavonoids, phenolics, alkaloids, steroids, terpenoids, and glycosides and the results are as shown in the Table 3. The study confirms that fluorescence analysis can be effectively used as a simple and reliable method for the standardization and quality control of the bark crude drug.

The hydroalcoholic plant extract exhibited significant anti-lice activity in a concentration-dependent manner. The standard drug, 5% benzyl benzoate, produced 100% mortality within the shortest duration (11.47 min), indicating superior pediculicidal

Table 1: Organoleptic results of hydro alcoholic extract of bark.

Sl. No.	Properties	Hydroalcoholic extract
1.	Colour	Reddish brown
2.	Odour	Characteristic
3.	Consistency	Semi solid, sticky mass
4.	% Yield	15%

Table 2: Phytochemical screening of hydro alcoholic extract of bark.

Sl. No.	Chemical constituents	Hydroalcoholic extract
1.	Carbohydrates	Detected
2.	Proteins	Not Detected
3.	Amino acids	Not Detected
4.	Tannins & Phenolic compounds	Detected
5.	Glycosides	Detected
6.	Alkaloids	Not Detected
7.	Flavonoids	Not Detected
8.	Steroids & Triterpenods	Detected
9.	Saponins	Not Detected

Table 3: **Fluorescence analysis of *Lagerstroemia speciosa* bark.**

Sl. No.	Treatment	Visible	254 nm	365 nm
1.	Powder	Light brown	Greenish brown	Greenish yellow
2.	Powder +Distilled water	Brown	Greenish brown	Dark green
3.	Powder+5% $FeCl_3$	Blackish	Dark black	Dark black
4.	Powder +Acetic acid	Brown	Light green	Orange brown
5.	Powder+Con.HNO_3	Orange brown	Green	Dark green
6.	Powder+Ammonia	Brown	Dark green	Black green/black
7.	Powder+Ethanol	Brown	Light green	Reddish brown
8.	Powder+Methanol	Brown	Bright green	Brown
9.	Powder+CHCl 3	Brown	Green	Orange brown
10.	Powder+Pet. ether	Brown	Green	Greenish brown
11.	Powder+10% aq. NaOH	Reddish brown	Blackish	Dark green/black
12.	Powder+H_2SO_4	Blackish	Dark blackish	Blackish
13.	Powder+HCl	Brown	Green	Dark green/black

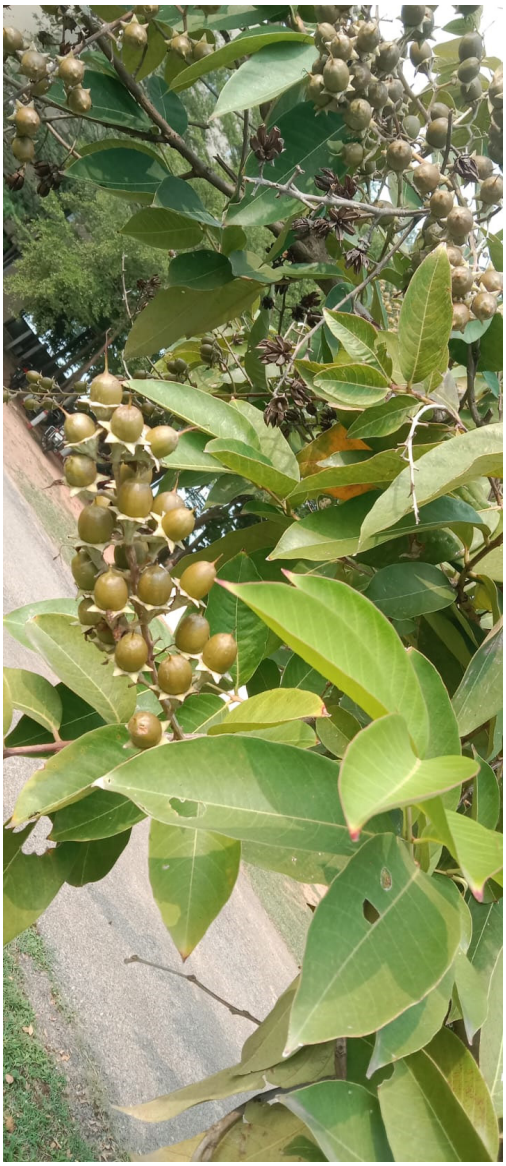


Figure 1: *Lagerstroemia speciosa* (L.) whole plant.



Figure 2: Hydro alcoholic extract of *Lagerstroemia speciosa* (L.) bark.

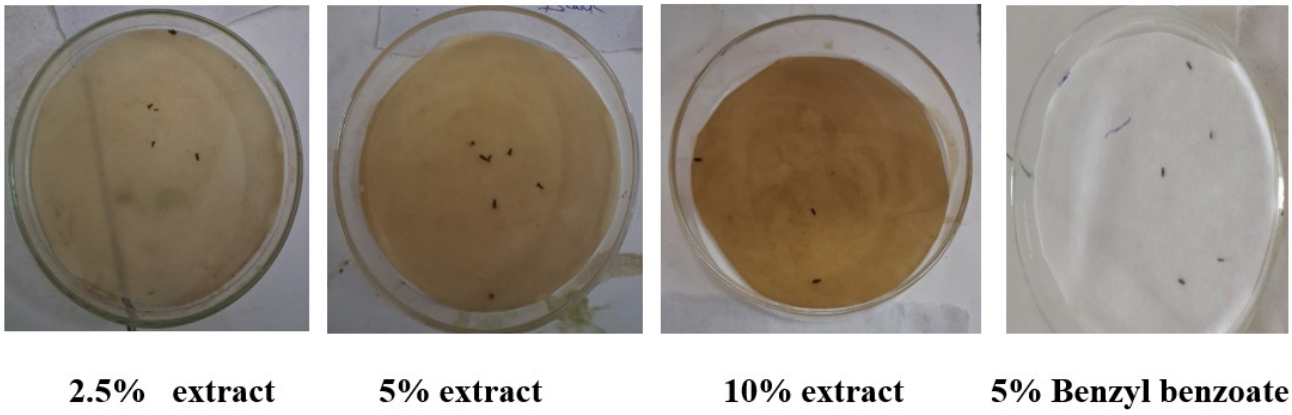


Figure 3: Antilice activity of hydro alcoholic extract of *Lagerstroemia speciosa* (L.) bark.

Table 4: Anti-Lice Activity of *Lagerstroemia speciosa* leaves hydro alcoholic extract against head lice.

Sl. No.	Treatment	Concentration (%)	Mean time taken for death (min)	Average mortality rate (%)
1.	Control (Hydroalcoholic solvent)	----------	----------	----------
2.	Benzyl benzoate	5%	11.47+ 0.38	100
3.	Hydro alcoholic extract	2.5% 5% 10%	19.50+ 0.27 17.18+ 0.42 15.11+0.21	60 73 86

activity. Among the test samples, the 10% extract showed the highest mortality rate (86%) with reduced death time compared to lower concentrations. The 2.5% extract showed moderate activity, whereas the 5% extract demonstrated improved efficacy. No mortality was observed in the water-treated control group. These findings suggest that the bark extract possesses notable pediculicidal potential, which may be attributed to the presence of phytoconstituents such as flavonoids, tannins, saponins, and terpenoids, and the results are as shown in Table 4 and Figure 3.

CONCLUSION

The present investigation revealed that the hydroalcoholic bark extract of *L. speciosa* possesses considerable anti-lice activity against head lice. The extract showed concentration-dependent pediculicidal activity, with increased concentrations producing

higher mortality rates and shorter death times. Among the tested concentrations, the 10% bark extract exhibited the maximum activity with significant mortality against lice, although its efficacy was lower than the standard drug, 5% benzyl benzoate.

The anti-lice activity of the bark extract may be due to the presence of bioactive phytoconstituents such as flavonoids, tannins, phenolics, saponins, and terpenoids. These findings indicate that the hydroalcoholic bark extract of *L. speciosa* could serve as a potential natural pediculicidal agent and may be useful for the development of herbal formulations for the treatment of pediculosis.

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ABBREVIATIONS

L. speciosa: *Lagerstroemia speciosa*; **v/v:** Volume per volume; **UV:** Ultraviolet; **HNO_3:** Nitric acid; **HCl**: Hydrochloric acid; **H_2SO_4:** Sulphuric acid; **NaOH:** Sodium hydroxide; **$FeCl_3$:** Ferric chloride; **$CHCl_3$:** Chloroform; **Pet. ether:** Petroleum ether; **nm:** Nanometers; **aq.:** Aqueous; **con.:** Concentrated; **g:** Gram; **mL:** Milliliter; **min:** Minutes; **kHz:** Kilohertz; **^oC:** Degrees Celsius.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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