InSight Bulletin: A Multidisciplinary Interlink International Research Journal
Peer Reviewed International, Open Access Journal.
ISSN : 3065-7857 / Website: https://ibrj.us / Volume-3, Issue-4 / April - 2026

Original Article

Phytochemical Screening and Antibacterial Activity of Leaf Extracts of Selected Medicinal Plants

Prajwalatha Yandrapati
JL in Botany, MJP APBCWR School & College, Dhone, Nandyal (Dt)

Manuscript ID:
IBMIIRJ -2026-030402

Submitted: 08 Mar. 2026

Revised: 15 Mar. 2026

Accepted: 06 Apr. 2026

Published: 30 Apr. 2026

ISSN: 3065-7857

Volume-3

Issue-4

Pp. 5-9

April 2026

Correspondence Address:
Prajwalatha Yandrapati
JL in Botany, MJP APBCWR School &College, Dhone, Nandyal (Dt)
Email: jwala3337773@gmail.com

OPEN ACCESS

Quick Response Code:

Web. https://ibrj.us

DOI: 10.5281/zenodo.20664725

DOI Link:
https://doi.org/10.5281/zenodo.20664725

Creative Commons

Abstract

Medicinal plants function as natural sources of therapeutic agents because they contain numerous phytochemical compounds which exhibit antimicrobial effects. The present study aimed to evaluate the phytochemical constituents and antibacterial activity of selected medicinal plants, namely Azadirachta indica (Neem), Ocimum sanctum (Tulsi), and Psidium guajava (Guava). Leaf extracts were prepared using ethanol extraction, and qualitative phytochemical screening to detect the presence of bioactive compounds which included alkaloids and flavonoids and tannins and saponins and phenols and glycosides and terpenoids. The agar well diffusion method to assess how effective the plant extracts were against both Escherichia coli and Staphylococcus aureus. The results showed that all plant extracts exhibited antibacterial activity. Neem demonstrated the highest activity with zones of inhibition of 18 mm against E. coli and 20 mm against S. aureus, followed by Guava (15 mm and 16 mm) and Tulsi (12 mm and 14 mm), respectively. The study concludes that Neem possesses the strongest antibacterial potential among the selected plants, highlighting the importance of medicinal plants as effective and eco-friendly alternatives to synthetic antibiotics.

Keywords: *Medicinal plants, Phytochemical screening, Antibacterial activity, Neem, Tulsi, Guava, Agar well diffusion, Zone of inhibition*

Introduction

People throughout history have relied on medicinal plants as their main source of therapeutic solutions to treat various medical conditions. The current rise in antibiotic-resistant pathogenic microorganisms has led to increased interest in plant-based compounds which scientists explore as potential solutions to this problem. Researchers investigate medicinal plants as potential sources of antimicrobial agents because many traditional antibiotics now show decreasing effectiveness (Atef et al., 2019). Plants contain multiple bioactive substances called phytochemicals which include alkaloids and flavonoids and tannins and saponins and phenolic compounds to create substances that stop microorganisms from growing.

The compounds exhibit multiple pharmacological functions which include antibacterial and antifungal and antioxidant and anti-inflammatory properties (Dubale et al., 2023). People use three medicinal plants Azadirachta indica (Neem) and Ocimum sanctum (Tulsi) and Psidium guajava (Guava) as their therapeutic properties drive their use in multiple traditional medical systems. The plants contain high levels of phytochemicals which demonstrate effective antibacterial properties against multiple pathogenic bacteria including Escherichia coli and Staphylococcus aureus (Ratnakaran et al., 2020).

Literaturre Review

The research team needs to compare different medicinal plants because existing studies only examine single plant species to investigate their phytochemical makeup and their ability to fight pathogens. The study intends to examine the phytochemical components and antibacterial properties of chosen medicinal plant extracts.

1. Medicinal Plants and Antimicrobial Resistance

Countries throughout the world are facing a serious health crisis because of the rising number of multidrug-resistant pathogens. The accelerated development of resistance mechanisms has caused previously effective antibiotics to become less powerful. The healthcare field is currently conducting research on medicinal plants as potential sources for developing new antimicrobial medications. Studies have demonstrated that plant extracts can effectively stop the growth of both antibiotic-sensitive and resistant bacterial strains (Atef et al., 2019).

How to cite this article:
Yandrapati, P. (2026). Phytochemical Screening and Antibacterial Activity of Leaf Extracts of Selected Medicinal Plants. InSight Bulletin: A Multidisciplinary Interlink International Research Journal, 3(4), 5–9. https://doi.org/10.5281/zenodo.20664725

Medicinal plants contain numerous secondary metabolites which include flavonoids and alkaloids and phenolic compounds that create their antimicrobial effects. The compounds in these substances destroy microbial cell membranes and block enzyme functions and stop pathogen development (Dubale et al., 2023).

2. **Phytochemical Properties of Medicinal**

Plants Phytochemical screening is an important step in identifying the bioactive compounds present in plant extracts. Research has demonstrated that medicinal plants contain multiple phytochemicals which include flavonoids and saponins and tannins and glycosides and terpenoids that produce their medicinal effects (Ratnakaran et al., 2020).

The phytochemicals show antimicrobial properties because they disrupt the metabolic functions of microorganisms. Tannins block enzyme function while flavonoids damage microbial membranes and alkaloids prevent bacterial growth through their impact on DNA replication.

3. **Antimicrobial Activity of Neem (Azadirachta indica)**

Research studies show that neem is the most studied medicinal plant because it possesses strong antibacterial effects. The studies show that neem leaf extracts can effectively kill bacteria which includes E. coli Staphylococcus aureus and Pseudomonas aeruginosa. The antibacterial activity of neem is attributed to the presence of bioactive compounds such as alkaloids, flavonoids, tannins, and terpenoids (Mohammed & Omer, 2015). The antibacterial effects of neem extracts increase as their concentration levels rise which shows they work better at higher doses.

4. **Antimicrobial Activity of Tulsi (Ocimum sanctum)**

Tulsi is a valuable medicinal plant that has both antimicrobial and antioxidant effects. The tulsi extracts contain phytochemicals which include alkaloids and terpenoids and carbohydrates that provide the herb with its medicinal properties according to research studies. Researchers use the agar well diffusion method to test tulsi antibacterial activity, which reveals its effectiveness against different bacterial strains through measurement of inhibition zones (Xia et al., 2018). Although some studies showed that tulsi extract had moderate antibacterial effects, the plant remains vital for traditional medicine because it provides numerous medical benefits.

5. **Antimicrobial Activity of Guava (*Psidium guajava*)**

Traditional medicine practitioners use guava leaves because of their ability to fight against harmful microorganisms. The phytochemical analysis discovered that guava leaf extracts contained five different chemical compounds which include flavonoids saponins phenols glycosides and terpenoids. The compounds present in the sample show antimicrobial activity because they stop E. coli and Staphylococcus aureus bacteria from growing (Ratnakaran et al., 2020).

Researchers use agar well diffusion and MIC determination methods to assess guava's antimicrobial properties, which demonstrated that guava extracts can kill both Gram-positive and Gram-negative bacteria.

Materials And Methods

The research assessed how different medicinal plants contained phytochemicals and showed antibacterial properties. The entire experiment was conducted using standard laboratory procedures.

Study Area

The research team collected plant samples from various sites throughout Andhra Pradesh, India. The laboratory work occurred in environments with regulated temperature and humidity levels.

Plant Collection

The research team collected fresh and healthy leaves of Azadirachta indica (Neem) and Ocimum sanctum (Tulsi) and Psidium guajava (Guava) from the field. The researchers washed the collected leaves with distilled water to eliminate all dust and impurities. The materials were air-dried at room temperature until they reached complete dryness which took several days before they were transformed into fine powder through grinder processing.

Preparation of Extract

Extracts were prepared from powdered plant material. The dried powder weighed 10 grams which was combined with 100 milliliters of either ethanol or methanol. The solution was left to develop for a period of 24 to 48 hours while being shaken at various intervals. The solution was extracted through a filtration process that used filter paper. The clean containers needed for further analysis were used to gather and store the filtrate.

Phytochemical Tests

The researchers conducted qualitative phytochemical testing on plant extracts to determine which bioactive compounds were contained within them. The standard tests were carried out to determine the following compounds:

- Alkaloids
- Flavonoids
- Tannins
- Saponins
- Phenols
- Glycosides

The testing process proved the existence of these compounds through both color change and precipitate formation.

Antibacterial Testing Method

The researchers assessed the plant extracts for antibacterial properties through the agar well diffusion technique. The researchers prepared nutrient agar plates which they then inoculated with bacterial strains that included Escherichia coli and Staphylococcus

aureus. The researchers used a sterile cork borer to create wells in the agar before adding plant extracts into those wells. The incubation process for the plates occurred at a temperature of 37°C for 24 hours. The researchers measured the zone of inhibition in millimeters which formed around each well to determine the antibacterial effectiveness.

Results

The results of the study are presented using tables for clarity.

Table 1: Phytochemical Screening

Table 1: Phytochemical Screening of Selected Medicinal Plants

Phytochemical Compounds	Neem (*Azadirachta indica*)	Tulsi (*Ocimum sanctum*)	Guava (*Psidium guajava*)
Alkaloids	+	+	+
Flavonoids	+	+	+
Tannins	+	–	+
Saponins	+	–	+
Phenols	+	+	+
Glycosides	+	+	+
Terpenoids	+	+	+

Note: (+) = Present, (–) = Absent

Table 2: Antibacterial Activity of Plant Extracts (Zone of Inhibition in mm)

S. No.	Plant Name	*E. coli* (mm)	*S. aureus* (mm)
1	Neem	18	20
2	Tulsi	12	14
3	Guava	15	16

Note: Higher zone of inhibition indicates stronger antibacterial activity.

Table 3: Details of Selected Medicinal Plants

S. No.	Plant Name	Scientific Name	Family	Part Used
1	Neem	*Azadirachta indica*	Meliaceae	Leaves
2	Tulsi	*Ocimum sanctum*	Lamiaceae	Leaves
3	Guava	*Psidium guajava*	Myrtaceae	Leaves

Figure:

Figure 1: Antibacterial activity of plant extracts using agar well diffusion method

The above figure shows the antibacterial activity of plant extracts using the agar well diffusion method. The bacterial growth testing showed results through the clear zones which formed around the wells. The plant extracts showed their antibacterial strength through the wider zones which blocked bacterial growth.

Discussion

The researchers studied the plant Neem which has the scientific name Azadirachta indica and the plant Tulsi with the scientific name Ocimum sanctum and the plant Guava which is known as Psidium guajava to determine their medicinal properties. The phytochemical screening process detected all the main bioactive compounds which include alkaloids and flavonoids and tannins and saponins and phenols in all plant extracts. The compounds display their active antibacterial effects which help to block the growth of bacteria.The antibacterial test results showed Neem displayed the strongest antibacterial effects against Escherichia coli and Staphylococcus aureus because it produced the largest zones which blocked bacterial growth. The strong antibacterial effect exists because the phytochemical content includes flavonoids and tannins

which disrupt bacterial cell wall structures and bacterial cell metabolic processes. Mohammed and Omer (2015) showed through their research that neem leaf extracts kill various pathogenic bacteria through their significant antibacterial properties.

Guava showed moderate antibacterial activity which may result from its phenolic compounds and flavonoids. The compounds damage bacterial cell membranes while they also stop enzymes from working. The previous studies confirm the current results which show Psidium guajava leaf extracts have strong antimicrobial effects against both Gram-positive and Gram-negative bacteria (Ratnakaran et al., 2020). Tulsi exhibited lower antibacterial activity compared to Neem and Guava. The extract of Tulsi proves effective for its alkaloids and terpenoids and other phytochemicals which require specific extraction methods and experimental conditions to obtain desired results. Xia et al. (2018) observed that Tulsi exhibits antibacterial properties which depend on the concentration and method of testing used in the study. The antibacterial activity differences among the plants result from different phytochemical compositions and extraction techniques and varying amounts of active substances. The study results confirm previous studies which demonstrate that medicinal plants function as natural antimicrobial agents.

Conclusion

The present study explored the chemical makeup and antibacterial properties of three chosen medicinal plants which include Neem, Tulsi, and Guava. The results showed that all plant extracts contain essential bioactive compounds which include alkaloids and flavonoids and tannins and phenols that give the plants their medicinal abilities. The study found that Neem showed better antibacterial activity against Escherichia coli and Staphylococcus aureus than Guava and Tulsi. The results show that Neem provides the highest antibacterial protection from the tested plant samples. The research shows that medicinal plants serve as safe and effective natural treatments which can replace synthetic antibiotics. Researchers need to study plant-based natural antimicrobial substances because antibiotic resistance has become an increasing global health issue. The use of medicinal plants provides an affordable and environmentally friendly method for treating bacterial infections. Researchers can isolate active compounds from these plants to study their clinical effectiveness in future studies. The research can expand to include other plant species and microorganisms to create new plant-derived pharmaceutical treatments.

Phenotypic Antibiotic Resistance Profiles of Clinical Bacterial Isolates: An Observational Study

Acknowledgment

I would like to express my sincere gratitude to all those who contributed to the successful completion of this study entitled "Phytochemical Screening and Antibacterial Activity of Leaf Extracts of Selected Medicinal Plants."

I am deeply thankful to my guide, teachers, and laboratory staff for their valuable guidance, constant encouragement, and technical support throughout the research work

Financial support and sponsorship

Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

References

1. Ali, S., Ali, K., Hussain, Z., Khan, M. S., Khan, W. M., Wali, S., & Shuaib, M. (2017). Phytochemical screening and antimicrobial activity of selected medicinal plant species. *Pure and Applied Biology*, *6*(2), 418–425.
2. Atef, N. M., Shanab, S. M., Negm, S. I., & Abbas, Y. A. (2019).
3. Evaluation of antimicrobial activity of some plant extracts against antibiotic susceptible and resistant bacterial strains causing wound infection. *Bulletin of the National Research Centre*, *43*(144). https://doi.org/10.1186/s42269-019-0184-9
4. Dubale, S., Kebebe, D., Zeynudin, A., Abdissa, N., & Suleman, S. (2023).
5. Phytochemical screening and antimicrobial activity evaluation of selected medicinal plants in Ethiopia. *Journal of Experimental Pharmacology*, *15*, 51–62. https://doi.org/10.2147/JEP.S379805
6. Harichandan, S. S. P., Sahu, A. K., Gautam, S., & Nemani, R. (2019).
7. Phytochemical screening and antioxidant activity of methanolic extract of *Ocimum sanctum* Linn. leaves. *GSC Biological and Pharmaceutical Sciences*, *8*(2), 022–033.
8. Hemeg, H. A., Moussa, I. M., Ibrahim, S., Dawoud, T. M., Alhaji, J. H., Mubarak, A. S., Kabli, S. A., Alsubki, R. A., Tawfik, A. M., & Marouf, S. A. (2020).
9. Antimicrobial effect of different herbal plant extracts against different microbial population. *Saudi Journal of Biological Sciences*, *27*, 3221–3227.
10. Kebede, T., Gadisa, E., & Tufa, A. (2021).
11. Antimicrobial activities evaluation and phytochemical screening of some selected medicinal plants: A possible alternative in the treatment of multidrug-resistant microbes. *PLoS ONE*, *16*(3), e0249253.
12. Mohammed, H. A., & Omer, A. F. A. (2015).

13. Antibacterial activity of *Azadirachta indica* (Neem) leaf extract against bacterial pathogens in Sudan. *American Journal of Research Communication*, *3*(5), 246–251.
14. Ratnakaran, P., Barve, A. A., Patnekar, K. A., Patil, N. C., Udmale, N. M., Ramchandran, S., & Durve-Gupta, A. (2020). Phytochemical and antimicrobial activities of leaf extract of guava (*Psidium guajava* L.). *International Journal of Applied Research*, *6*(5), 106–110.
15. Sahrawat, A., Sharma, J., Rahul, S. N., Tiwari, S., Joshi, M. D., Pundhir, A., Kumar, R., Akansha, Radhika, Bhavya, Shivani, Sharib, N., & Govind, N. (2018).
16. Phytochemical analysis and antibacterial properties of *Azadirachta indica* (Neem) leaves extract against *E. coli*. *Journal of Pharmacognosy and Phytochemistry*, *7*(4), 1368–1371.
17. Xia, K. Z., Perveen, N., & Khan, N. H. (2018).
18. Phytochemical analysis, antibacterial and antioxidant activity determination of *Ocimum sanctum*. *Pharmacy & Pharmacology International Journal*, *6*(6), 490–497.