Int.J.Curr.Microbiol.App.Sci (2024) *13*(09): 9-18

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 13 Number 9 (2024)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2024.1309.002

Phytochemical Profiling, Quantitative Assessment, and Antimicrobial Potential of *Premna tomentosa* Leaf Extract

G. Pravalika[1]*, A. Sabitha Rani[1], S. Babu[2] and E. Shravya Puri[3]

[1]Department of Botany, University College of Science, Osmania University, Hyderabad-500007, Telangana, India
[2]J.V.R.Government Degree College, Sathupalli, Khammam-507 303, Telangana, India
[3]Department of Botany, University College of Sciences, Mahatma Gandhi University, Nalgonda- 508254, Telangana, India

**Corresponding author*

Keywords

Phytochemical Profiling, Quantitative Assessment, Antimicrobial Potential, *Premna tomentosa*, Leaf Extracts

Article Info

Received:
20 July 2024
Accepted:
30 August 2024
Available Online:
10 September 2024

A B S T R A C T

The present study explores the phytochemical composition and antimicrobial properties of *Premna tomentosa* leaf extracts using different solvents: methanol, chloroform, ethyl acetate, and petroleum ether. The phytochemical analysis revealed that methanol was the most effective solvent, extracting the highest concentrations of alkaloids (450 mg/g equivalent), flavonoids (650 mg/g equivalent), phenols (550 mg/g equivalent), and tannins (500 mg/g equivalent). Chloroform also showed considerable efficacy, particularly in extracting flavonoids (650 mg/g equivalent) and alkaloids (400 mg/g equivalent). The antimicrobial activity of the extracts was tested against four bacterial strains (*Pseudomonas fluorescens*, *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus subtilis*) and three fungal strains (*Fusarium oxysporum*, *Sclerotium rolfsii*, and *Phytophthora infestans*). The methanol extract exhibited the highest antibacterial activity, with zones of inhibition measuring 12 mm against *Pseudomonas fluorescens*, 9 mm against *E. coli*, 6 mm against *Staphylococcus aureus*, and 5 mm against *Bacillus subtilis*. The chloroform extract also showed significant antibacterial effects, with inhibition zones ranging from 5 mm to 7 mm across different bacterial strains. For antifungal activity, the methanol extract again demonstrated the highest efficacy, with 60% inhibition against both *Fusarium oxysporum* and *Phytophthora infestans*, and 50% inhibition against *Sclerotium rolfsii*. Chloroform and ethyl acetate extracts showed moderate antifungal activity, while petroleum ether extract was the least effective. The study underscores the potential of *Premna tomentosa* for developing natural antimicrobial agents and highlights the importance of solvent selection in maximizing the extraction of these compounds.

Introduction

Medicinal plants have long played a crucial role in traditional healing practices, offering a reservoir of bioactive compounds that have been utilized for the treatment of various ailments. In recent years, there has been a resurgence in the interest in these natural resources, driven by the global challenge of antibiotic

resistance and the pursuit of sustainable healthcare alternatives. As conventional antibiotics increasingly lose their efficacy against resistant pathogens, the search for new, effective treatments has turned towards the rich pharmacopoeia of plant-based medicines. *Premna tomentosa*, a member of the Lamiaceae family, has garnered significant attention due to its extensive use in ethnomedicine across various cultures. Traditionally, this plant has been used to treat a myriad of conditions, including fever, respiratory disorders, and inflammatory diseases. The therapeutic potential of *Premna tomentosa* is largely attributed to its rich phytochemical composition, which includes a variety of bioactive compounds such as alkaloids, flavonoids, tannins, saponins, and glycosides (Hajdú *et al.,* 2021; Hameed *et al.,* 2021).

Phytochemical screening serves as a foundation for discovering bioactive compounds that can be developed into new drugs. The leaves of *Premna tomentosa* have been found to be rich in a variety of phytochemicals, including alkaloids, flavonoids, tannins, saponins, and glycosides (Saxena *et al.,* 2023; Hajdú *et al.,* 2021). These compounds are known for their diverse pharmacological properties, such as antimicrobial, antioxidant, and anti-inflammatory activities (Hameed *et al.,* 2021; Saxena *et al.,* 2023). The presence of these bioactive constituents underpins the traditional use of *Premna tomentosa* and highlights its potential as a source of natural therapeutic agents. The antimicrobial activity of plant extracts is a crucial area of research, especially in the context of the rising threat of antibiotic-resistant pathogens. *Premna tomentosa* leaf extracts have demonstrated significant antimicrobial effects against a broad spectrum of microorganisms, including both gram-positive and gram-negative bacteria, as well as various fungal species (Chikezie *et al.,* 2020). The mechanisms through which these phytochemicals exert their antimicrobial effects include disruption of microbial cell membranes, inhibition of nucleic acid synthesis, and interference with protein synthesis (Ventola, 2020).

Quantitative analysis of these bioactive compounds is essential not only for understanding their pharmacological potential but also for ensuring consistency and efficacy in therapeutic applications. Recent studies have employed advanced chromatographic and spectrometric techniques to quantify the concentrations of these phytochemicals in *Premna tomentosa* extracts, providing valuable data for standardizing herbal preparations (Hajdú *et al.,* 2021; Hameed *et al.,* 2021). This study aims to build upon existing knowledge by conducting comprehensive phytochemical screening, quantitative analysis, and antimicrobial activity assessment of *Premna tomentosa* leaf extracts, providing a foundation for future research and potential therapeutic applications.

Materials and Methods

The *Premna tomentosa* plants were collected from Aleru Forest, located in Nellikudur (M), Mahbubabad District. The leaves of the plants were carefully harvested and subsequently shade-dried at room temperature to preserve their phytochemical integrity. Once dried, the plant material was ground into a fine powder to facilitate the extraction process. For the preparation of the plant extracts, a Soxhlet apparatus was employed, utilizing a systematic extraction process. The powdered plant material was subjected to successive extractions using four different solvents: petroleum ether, ethyl acetate, chloroform, and methanol. These solvents were selected for their varying polarities, which allow for the comprehensive extraction of a wide range of phytochemicals. The extraction process was conducted at temperatures corresponding to the boiling points of each solvent, ensuring maximum extraction efficiency. After the extraction process was complete, the extracts were allowed to cool to room temperature. Then filtered using Whatman No. 1 filter papers to remove any remaining plant debris. The filtered crude extracts were collected and stored in a refrigerator when not in use to maintain their stability and prevent any potential degradation of the bioactive compounds (Redfern *et al.,* 2014).

Phytochemical Screening of *Premna tomentosa* Leaf Extract

The qualitative phytochemical screening of *Premna tomentosa* leaf extract was conducted using standard methods. Alkaloids were detected by treating the filtrate with Dragendorff's reagent, resulting in a yellow precipitate indicative of alkaloid presence. Flavonoids were identified by adding 10% sodium hydroxide to the extract; the appearance of an intense yellow color that turns colourless upon the addition of dilute acid confirmed their presence. Tannins were tested by adding ferric chloride to an aqueous extract, which produced a bluish-black color, indicating tannins. Steroids were identified using the Liebermann-Burchardt test, where the reaction of the extract with chloroform, acetic anhydride, and sulfuric acid produced a dark green color.

Saponins were confirmed by boiling the powdered leaf material in water, filtering, and shaking the filtrate; persistent frothing indicated the presence of saponins. Glycosides were detected by treating the extract with 2% sodium picrate, where a yellow to orange color change was noted. Finally, total phenolic compounds were assessed by mixing the extract with ferric chloride, with any resulting color change indicating the presence of phenols (Harborne, 1998).

Quantitative Phytochemical Analysis of *Premna tomentosa* Leaf Extracts

Total Alkaloid Content

To determine the total alkaloid content in the *Premna tomentosa* leaf extracts, 1 mg of the extract was dissolved in dimethyl sulfoxide (DMSO) and mixed with 1 ml of 2N HCl. The mixture was filtered, and the resulting solution was transferred to a separating funnel. To this, 5 ml of bromocresol green and 5 ml of phosphate buffer were added. The mixture was then shaken with 1-4 ml of chloroform. The chloroform layers were combined and diluted to 10 ml with chloroform. Reference solutions of atropine, ranging from 20-100 µg/ml, were prepared in a similar manner. The absorbance of the resulting solutions was measured at 470 nm using a UV-Visible spectrophotometer. The alkaloid content was quantified and expressed as milligrams of alkaloids per gram of leaf extract, based on the standard curve generated from atropine (Shamsa *et al.,* 2008).

Total Flavonoid Content

The total flavonoid content in the *Premna tomentosa* leaf extracts was determined using a colorimetric method. A 1 ml aliquot of the extract was mixed with 4 ml of distilled water in a flask. To this, 0.30 ml of 5% sodium nitrite was added, followed by 0.30 ml of 10% aluminium chloride after 5 minutes. After another 5 minutes, 2 ml of 1M NaOH was added, and the final volume was diluted to 10 ml with distilled water.

Standard quercetin solutions, ranging from 20-100 µg/ml, were prepared similarly. The absorbance of the solutions was measured at 510 nm using a UV-Visible spectrophotometer. Flavonoid content was expressed as milligrams of quercetin equivalents per gram of leaf extract, calculated from the standard curve of quercetin (Chang *et al.,* 2002).

Total Tannin Content

The total tannin content in the *Premna tomentosa* leaf extracts was measured using the Folin-Ciocalteu method. A 0.1 ml aliquot of the extract was added to a 10 ml flask containing 7.5 ml of distilled water, followed by the addition of 0.5 ml of Folin-Ciocalteu reagent and 1 ml of 35% sodium carbonate (Na2CO3) solution. The mixture was diluted to 10 ml with distilled water, shaken, and incubated at 30°C for 30 minutes. Gallic acid standards, ranging from 20-100 µg/ml, were prepared similarly. Absorbance was measured at 725 nm using a UV-Visible spectrophotometer. The tannin content was expressed as milligrams of gallic acid equivalents per gram of leaf extract, calculated from the standard curve of gallic acid (Makkar *et al.,* 1993).

Total Phenolic Content

The total phenolic content in the *Premna tomentosa* leaf extracts was determined using the Folin-Ciocalteu reagent. A 1 ml aliquot of the extract was mixed with 9 ml of distilled water, followed by the addition of 1 ml of Folin-Ciocalteu reagent. The solution was shaken and allowed to stand for 5 minutes before adding 10 ml of 7% sodium carbonate (Na2CO3) solution. The mixture was then diluted to a final volume of 25 ml with distilled water and incubated at 30°C for 90 minutes. Gallic acid standards, ranging from 20-100 µg/ml, were prepared similarly. Absorbance was measured at 550 nm using a UV-Visible spectrophotometer. The total phenolic content was expressed as milligrams of gallic acid equivalents per gram of leaf extract, calculated from the standard curve of gallic acid (Singleton *et al.,* 1999).

Antibacterial Activity of *Premna tomentosa* Leaf Extract

The antibacterial activity of *Premna tomentosa* leaf extract was assessed using the paper dip method. Nutrient agar plates were prepared and inoculated with pathogenic bacterial laboratory cultures, including *Pseudomonas fluorescens* (MTCC 9768), *Escherichia coli* (MTCC 424), *Staphylococcus aureus* (MTCC 96), and *Bacillus subtilis* (MTCC 3053). Following inoculation, various concentrations of the leaf extract were applied to the paper discs, which were then placed on the surface of the agar plates. The plates were incubated at 37°C for 24 hours to allow bacterial growth. After the incubation period, zones of inhibition around

the paper discs were observed, indicating the antibacterial activity of the extract. The diameters of these zones were measured and recorded to quantify the effectiveness of the leaf extract against the different bacterial strains (Ghalem & Mohamed, 2008).

Antifungal Activity of *Premna tomentosa* Leaf Extract

The antifungal activity of *Premna tomentosa* leaf extract was evaluated using the dual culture method. Fungal strains, including *Fusarium oxysporum* (NCIM 1008), *Sclerotium rolfsii* (NCIM 1084), and *Phytophthora infestans* (MTCC 8707), were cultured on potato dextrose agar (PDA) medium. Small agar blocks (5 mm in diameter) from actively growing fungal cultures (96 hours old) were placed in the center of fresh PDA medium plates. Paper discs soaked in various concentrations of the *Premna tomentosa* leaf extract were then positioned at different locations on 90 mm diameter Petri plates. The plates were incubated at 30 ± 2°C for 5 days to allow for fungal growth and interaction with the extract. After the incubation period, the zones of inhibition between the fungal colonies and the paper discs were measured to assess the antifungal activity. Fluconazole, a standard fungicide, was used as a positive control for comparison. The percentage of inhibition was calculated using the formula (Singh *et al.,* 2012):

$$I\,\% = \frac{(C\text{-}T) \times 100}{C}$$

Results and Discussion

The results of the phytochemical analysis of *Premna tomentosa* leaf extracts demonstrate the significant influence of solvent polarity on the extraction of bioactive compounds. Methanol, being a highly polar solvent, was the most effective in extracting a wide range of phytochemicals, including alkaloids, flavonoids, saponins, steroids, terpenoids, phenols, tannins, glycosides, cardiac glycosides, anthraquinones, quinones, and resins (Figure. 1). This aligns with previous studies that highlight methanol's efficacy in extracting polar compounds from plant materials (Harborne, 1998; Shamsa *et al.,* 2008). Chloroform, a medium-polarity solvent, also extracted a substantial number of compounds, particularly flavonoids, steroids, terpenoids, phenols, tannins, and glycosides. The presence of these compounds in chloroform extracts suggests their moderate polarity, which allows for effective extraction using a solvent like chloroform. This is consistent with findings from other phytochemical studies where chloroform was used to extract similar classes of compounds (Ghasemzadeh & Ghasemzadeh, 2011).

Ethyl acetate, which has intermediate polarity between chloroform and methanol, was effective in extracting compounds such as flavonoids, steroids, terpenoids, and cardiac glycosides. This suggests that these compounds have an affinity for solvents with moderate polarity, which allows for their extraction from plant matrices. Similar observations have been made in studies exploring the extraction of flavonoids and glycosides using ethyl acetate (Chang *et al.,* 2002). Petroleum ether, the least polar solvent used in this study, was less effective in extracting the majority of the phytochemicals, except for anthraquinones, quinones, and resins.

These findings indicate that non-polar or slightly polar compounds are more likely to be extracted with petroleum ether. The limited extraction capability of petroleum ether compared to more polar solvents is consistent with other studies, where it is typically used to extract non-polar substances like lipids and certain terpenoids (Gaurav *et al.,* 2011).

These results underscore the importance of selecting appropriate solvents based on the target phytochemicals for effective extraction (Table.1). The diverse phytochemical profile of *Premna tomentosa* leaf extracts across different solvents suggests its potential as a source of various bioactive compounds, which could be further explored for their therapeutic applications. The presence of multiple classes of phytochemicals, including alkaloids, flavonoids, and phenolic compounds, points to the plant's potential antioxidant, antimicrobial, and anti-inflammatory properties, as reported in previous studies (Pandey & Tripathi, 2011).

Quantification of phytochemical content from *Premna tomentosa* Leaf extract

The quantitative analysis of *Premna tomentosa* leaf extracts demonstrated that solvent polarity significantly impacts the efficiency of phytochemical extraction. Methanol, a highly polar solvent, was the most effective in extracting alkaloids, flavonoids, phenols, and tannins, with concentrations of approximately 450 mg/g, 650 mg/g, 550 mg/g, and 500 mg/g equivalent, respectively.

These findings align with existing literature, which highlights the effectiveness of methanol in extracting polar compounds from plant materials (Harborne, 1998) (Fig. 2).

Alkaloids were extracted in the highest concentration by methanol (450 mg/g equivalent), followed closely by chloroform (400 mg/g equivalent). This suggests that alkaloids in *Premna tomentosa* are predominantly polar, aligning with previous studies that reported similar findings for alkaloid extraction using polar solvents (Shamsa *et al.,* 2008). In contrast, ethyl acetate and petroleum ether, which are less polar, extracted significantly lower amounts of alkaloids (around 250 mg/g equivalent each), indicating a lesser affinity for these solvents.

Flavonoids were found in high concentrations in chloroform and methanol extracts, each yielding approximately 650 mg/g equivalent. The significant flavonoid content in these extracts reflects the moderate polarity of flavonoids, which allows for effective extraction by both methanol and chloroform (Chang *et al.,* 2002; Ghasemzadeh & Ghasemzadeh, 2011). Ethyl acetate, a solvent with intermediate polarity, extracted about 550 mg/g equivalent of flavonoids, while petroleum ether, the least polar solvent, extracted the lowest concentration at approximately 300 mg/g equivalent.

Phenolic compounds were most effectively extracted by methanol, with a concentration of approximately 550 mg/g equivalent. Chloroform also demonstrated a strong extraction capability, with around 450 mg/g equivalent. Ethyl acetate and petroleum ether, however, were less effective, each extracting about 300 mg/g equivalent. The high extraction efficiency of methanol for phenolic compounds is well-documented and can be attributed to its high polarity, which is well-matched to the polar nature of phenolics (Singleton *et al.,* 1999). Tannins exhibited a similar extraction pattern, with methanol extracting the highest concentration (approximately 500 mg/g equivalent), followed by chloroform at 400 mg/g equivalent.

Ethyl acetate and petroleum ether were less effective, extracting 250 mg/g and 200 mg/g equivalent, respectively. The superior extraction of tannins by methanol and chloroform further emphasizes the importance of solvent polarity in the extraction of polar compounds like tannins (Makkar *et al.,* 1993).

Antibacterial activity of *P. tomentosa leaf* extract

The results of the present study demonstrate the varying antibacterial activity of *Premna tomentosa* leaf extracts depending on the solvent used for extraction. The methanol extract showed the highest antibacterial activity across all tested bacterial strains, with zones of inhibition measuring 12 mm against *Pseudomonas fluorescens*, 9 mm against *E. coli*, 6 mm against *Staphylococcus aureus*, and 5 mm against *Bacillus subtilis* (Fig. 3 & Table. 2).

This finding suggests that methanol is particularly effective in extracting polar phytochemicals with strong antibacterial properties, such as phenolics and flavonoids, which have been widely reported in the literature for their antimicrobial efficacy (Cowan, 1999; Eloff, 1998).

The chloroform extract also displayed notable antibacterial activity, especially against *Pseudomonas fluorescens* (7 mm) and *Staphylococcus aureus* (7 mm). The presence of moderate zones of inhibition indicates that chloroform is capable of extracting bioactive compounds like terpenoids and alkaloids, which are known for their antibacterial properties (Rabe & Van Staden, 1997). However, the overall lower efficacy compared to methanol suggests that the bioactive compounds in *Premna tomentosa* are predominantly polar.

The ethyl acetate and petroleum ether extracts exhibited relatively lower antibacterial activity, with inhibition zones ranging from 3 mm to 6 mm across the bacterial strains tested. The lower activity of the ethyl acetate extract can be attributed to its intermediate polarity, which may not effectively extract highly potent antibacterial compounds. Similarly, the petroleum ether extract's limited antibacterial activity is consistent with its non-polar nature, which is more suited for extracting lipophilic compounds that may not have strong antibacterial effects (Nostro *et al.,* 2000). In comparison to the standard antibiotic Ampicillin, which showed zones of inhibition ranging from 8 mm to 15 mm, the antibacterial activity of *Premna tomentosa* extracts is lower but still significant. These findings highlight the potential of *Premna tomentosa* as a natural source of antibacterial agents, particularly when extracted with polar solvents like methanol. The study supports the growing body of evidence suggesting that plant extracts can serve as alternative or complementary treatments to synthetic antibiotics, particularly in the context of rising antibiotic resistance (Parekh *et al.,* 2005).

Table.1 Solubility Profile of Phytochemicals in leaf Extracts of *Premna tomentosa*

Sr.No.	Name	Pet. ether	Chloroform	Ethyl acetate	Methanol
1.	Alkaloids	-	++	-	+++
2.	Flavonoids	-	+++	++	+++
3.	Saponins	-	-	-	+++
4.	Steroids& Terpenoids	-	++	+++	+++
5.	Phenols	-	++	-	+++
6.	Tannins	-	++	-	+++
7.	Glycosides	-	+++	-	+++
8.	Cardio glycosides	-	-	+++	+++
9.	Coumarins	-	++	++	-
10.	Anthraquinones	+	-	++	+++
11.	Quinones	+	+	-	+++
12.	Resins	++	+++	-	+++
13.	Gums & mucilages	-	-	-	-

Table.2 Antibacterial activity of *P. tomentosa leaf* extract

S. No	Leaf extract with various solvents	*Pseudomonas fluorescens* (MTCC 9768)	*E. coli* (MTCC 424)	*Staphylococcus aureus* (MTCC 96)	*Bacillus subtilis* (MTCC 3053)
		Zone of inhibition in mm			
1.	Methanol extract	12	09	06	05
2.	Chloroform extract	07	05	07	06
3.	Ethyl acetate extract	06	06	03	04
4.	Petroleum ether extract	05	06	06	04
5.	Antibiotic (Standard Ampicillin)	15	12	13	08

Table.3 Antifungal activity of *P. tomentosa leaf* extract

S. No	*Premna tomentosa* leaf extract	*Fussarium oxysporum NCIM1008*	*Sclerotium rolfsii NCIM 1084*	*Phytophthera infestans MTCC 8707*
	Percentage of inhibition (%)			
1.	Methanol	60%	50%	60%
2.	Chloroform	58%	40%	52%
3.	Ethyl acetate	58%	42%	40%
4.	Petroleum ether	50%	30%	40%
5.	Fungicide (Fluconazole)	50%	25%	50%

Figure.1 Qualitative phytochemical analysis of leaf extracts of *Premna tomentosa*

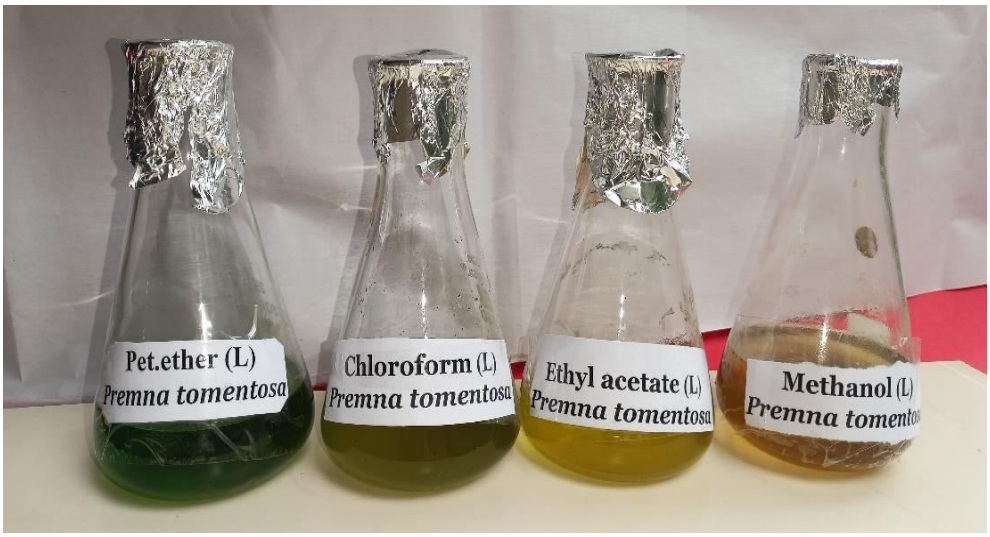


Figure.2 Quantification of phytochemical content from *Premna tomentosa* Leaf extract

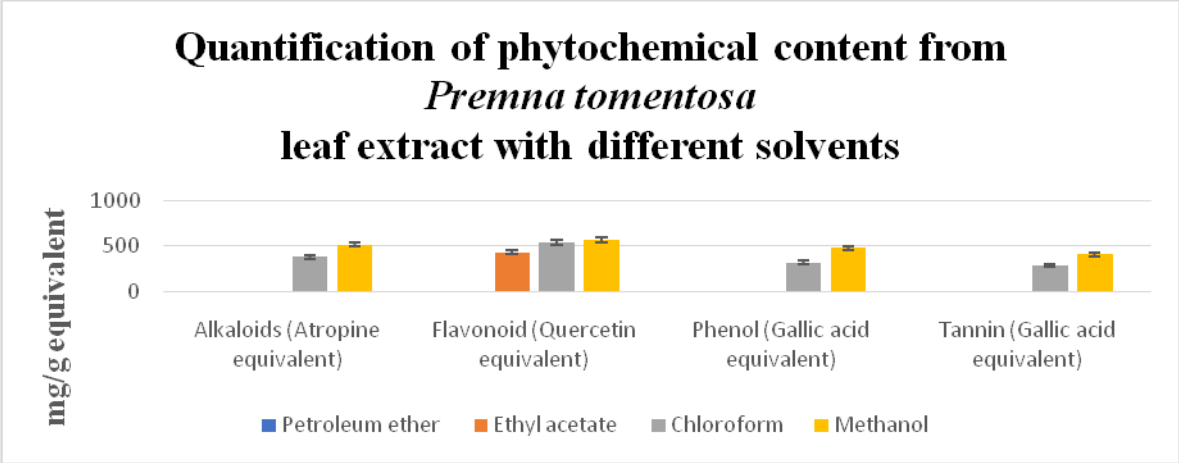
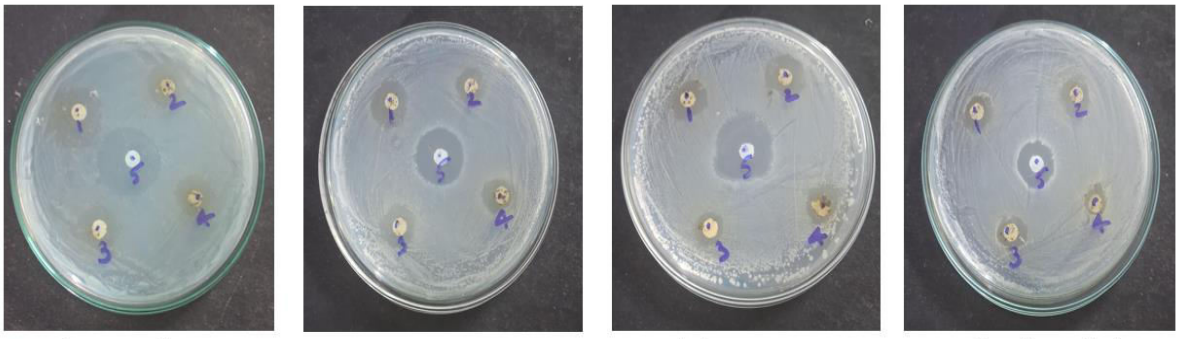


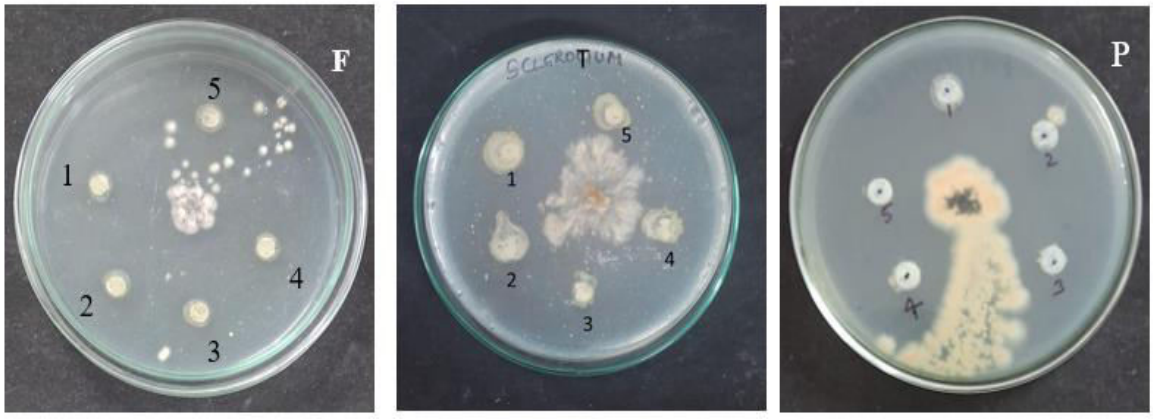
Figure.3 Antibacterial activity of *P. tomentosa leaf* extract



Pseudomonas fluorescens *E. coli* *Staphylococcus aureus* *Bacillus subtilis*

Well No 1: *P.tomentosa* leaf extract with methanol. 2. Chloroform 3: ethyl acetate 4: petroleum ether and 5 indicate Antibiotic (Ampicillin)

Figure.4 Antifungal activity of *P. tomentosa leaf* extract



Fussarium oxysporum *Sclerotium rolfsii* *Phytophthera infestans*

(Inhibition zone measured after 5 days of cultures. Fluconazole served as the positive control for comparison. Well 1: *Premna tomentosa* leaf extract with methanol, 2: *Premna tomentosa* leaf extract with chloroform, 3: *Premna tomentosa* leaf extract with ethyl acetate, 4: *Premna tomentosa* leaf extract with petroleum ether and 5: Fungicide (Fluconazole- standard)

Antifungal activity of *P. tomentosa leaf* extract

The antifungal activity of *Premna tomentosa* leaf extracts was evaluated against *Fusarium oxysporum*, *Sclerotium rolfsii*, and *Phytophthora infestans*, showing promising results with varying degrees of inhibition depending on the solvent used. The methanol extract exhibited the highest antifungal activity, with 60% inhibition against both *Fusarium oxysporum* and *Phytophthora infestans*, and 50% inhibition against *Sclerotium rolfsii*. These results suggest that methanol, as a highly polar solvent, is effective in extracting antifungal compounds, possibly including phenolic compounds and flavonoids, which are known for their antifungal properties (Nithya *et al.,* 2021; Salazar-Aranda *et al.,* 2020). Chloroform extract also showed significant antifungal activity, particularly with 58% inhibition against *Fusarium oxysporum* and 52% against *Phytophthora infestans*. The ability of chloroform to extract moderately polar compounds, such as terpenoids and alkaloids, may explain its effectiveness against these fungal strains (Wang *et al.,* 2021). Ethyl acetate, with 58% inhibition against *Fusarium oxysporum* and lower activity against the other two fungi, likely extracts compounds with intermediate polarity, which are less effective against these specific fungi (Fig. 4 & Table. 3).

Interestingly, the petroleum ether extract, which is non-polar, exhibited the lowest antifungal activity, with a maximum of 50% inhibition against *Fusarium oxysporum* and 40% against *Phytophthora infestans*. This result is consistent with the nature of non-polar solvents, which are typically less effective in extracting antifungal compounds, especially those with high polarity (Riaz *et al.,* 2021). The comparison with the standard fungicide Fluconazole, which showed 50% inhibition against *Fusarium oxysporum* and *Phytophthora infestans* but only 25% against *Sclerotium rolfsii*, highlights the potential of *Premna tomentosa* extracts as natural alternatives. The fact that the plant extracts, particularly those from methanol and chloroform, showed comparable or even better inhibition percentages suggests that *Premna tomentosa* contains potent antifungal compounds that could be further investigated for their mechanisms of action and potential applications in agriculture and medicine (Sharma *et al.,* 2022). These findings align with recent studies that have identified the efficacy of plant-based extracts in managing fungal pathogens, often showing broad-spectrum activity that rivals synthetic fungicides. Moreover, the use of natural plant extracts is increasingly being explored as a sustainable and environmentally friendly alternative to synthetic chemicals (Sivakumar & Bautista-Baños, 2020).

The comprehensive study of *Premna tomentosa* leaf extracts has provided valuable insights into the plant's phytochemical composition and antimicrobial properties. The phytochemical screening revealed that methanol and chloroform are particularly effective solvents for

extracting a wide range of bioactive compounds, including alkaloids, flavonoids, phenols, and tannins. These compounds are known for their therapeutic properties, such as antioxidant, antibacterial, and antifungal activities. In terms of antimicrobial efficacy, the methanol extract demonstrated the highest activity against both bacterial and fungal strains, outperforming other solvent extracts and showing comparable effectiveness to standard antibiotics and fungicides. The chloroform extract also showed significant antimicrobial activity, indicating its potential as a solvent for extracting bioactive compounds with moderate polarity.

The study's findings underscore the importance of solvent selection in phytochemical extraction and suggest that *Premna tomentosa* is a potent source of natural antimicrobial agents. The ability of its extracts to inhibit the growth of common pathogens suggests potential applications in medicine, agriculture, and food preservation. These results pave the way for further research to isolate and characterize the specific bioactive compounds responsible for the antimicrobial effects observed. Such studies could lead to the development of new, sustainable antimicrobial products derived from *Premna tomentosa*, offering natural alternatives to conventional synthetic treatments in an era of increasing resistance to antibiotics and fungicides. Overall, *Premna tomentosa* holds significant promise as a medicinal plant with broad-spectrum antimicrobial properties, warranting continued exploration and validation in future studies.

Author Contributions

G. Pravalika: Investigation, formal analysis, writing—original draft. A. Sabitha Rani: Validation, methodology, writing—reviewing. S. Babu:—Formal analysis, writing—review and editing. E. Shravya Puri: Investigation, writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of interest: The authors were declare no conflict of interest to report regarding this research work.

References

Chang, C., Yang, M., Wen, H., & Chern, J. (2002). Estimation of total flavonoid content in propolis by two complementary colorimetric methods. *Journal of Food and Drug Analysis, 10*(3), 178-182.

Chikezie, P. C., Ibegbulem, C. O., & Mbagwu, F. N. (2020). Bioactive principles from medicinal plants. *Research Journal of Phytochemistry*, 9, 88-115. https://doi.org/10.3923/rjphyto.2015.88.115

Cowan, M. M. (1999). Plant products as antimicrobial agents. *Clinical Microbiology Reviews*, 12(4), 564-582. https://doi.org/10.1128/cmr.12.4.564

Eloff, J. N. (1998). Which extractant should be used for the screening and isolation of antimicrobial components from plants? *Journal of Ethnopharmacology*, 60(1), 1-8. https://doi.org/10.1016/s0378-8741(97)00123-2

Gaurav, K., Saklani, S., & Rani, R. (2011). Phytochemical screening and GC-MS analysis of the methanolic fruit extract of *Momordica charantia*. *Journal of Chemical and Pharmaceutical Research, 3*(2), 104-112.

Ghalem, B. R., & Mohamed, B. (2008). Antibacterial activity of leaf extract of *Eucalyptus globulus* (Myrtaceae) against *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli*, and *Bacillus cereus*. *Asian Pacific Journal of Tropical Biomedicine, 1*(3), 73-76.

Ghasemzadeh, A., & Ghasemzadeh, N. (2011). Flavonoids and phenolic acids: Role and biochemical activity in plants and human. *Journal of Medicinal Plants Research, 5*(31), 6697-6703. https://doi.org/10.5897/JMPR11.1404

Hajdú, Z., Hohmann, J., Forgo, P., Martinek, T., Dervarics, M., Zupkó, I. (2021). Phytochemical screening and antioxidant and antimicrobial activities of selected mangrove species. *Archives of Microbiology*, 21(4), 391–394.

Hameed, A., Hussain, S. A., Yang, J., Ijaz, M. U., Liu, Q., Suleria, H. A. R., & Song, Y. (2021). Antioxidants potential of filamentous fungi: a review. *Nutrients*, 13(2), 110.

Harborne, J. B. (1998). *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis* (3rd ed.). Springer Science & Business Media.

Makkar, H. P. S., Blümmel, M., & Becker, K. (1993). Gravimetric determination of tannins and their correlations with chemical and protein precipitation methods. *Journal of the Science of Food and Agriculture, 61*(2), 161-165. https://doi.org/10.1002/jsfa.2740610205

Nithya, V., Sangeetha, S., & Dhanalakshmi, D. (2021). Antimicrobial and antioxidant activities of bioactive compounds derived from *Premna tomentosa* leaves. *Journal of Herbal Medicine*, 28, 100437.

Nostro, A., Germano, M. P., D'Angelo, V., Marino, A., & Cannatelli, M. A. (2000). Extraction methods and bioautography for evaluation of medicinal plant antimicrobial activity. *Letters in Applied Microbiology*, 30(5), 379-384. https://doi.org/10.1046/j.1472-765x.2000.00731.x

Pandey, A. K., & Tripathi, N. N. (2011). Antifungal properties of some selected plant extracts against *Fusarium oxysporum* f. sp. ciceri. *Asian Journal of Plant Science and Research*, 1(4), 22-27.

Parekh, J., Jadeja, D., & Chanda, S. (2005). Efficacy of aqueous and methanol extracts of some medicinal plants for potential antibacterial activity. *Turkish Journal of Biology*, 29(4), 203-210.

Rabe, T., & Van Staden, J. (1997). Antibacterial activity of South African plants used for medicinal purposes. *Journal of Ethnopharmacology*, 56(1), 81-87. https://doi.org/10.1016/s0378-8741(96)01515-2.

Redfern, J., Kinninmonth, M., Burdass, D., & Verran, J. (2014). Using Soxhlet ethanol extraction to produce and test plant material (Essential Oils) for their antimicrobial properties. *Journal of Microbiology & Biology Education*, 15(1), 45-46. https://doi.org/10.1128/jmbe.v15i1.656

Riaz, T., Abbasi, M. A., Aziz-ur-Rehman, Shahzadi, S., & Malik, S. A. (2021). Phytochemical, antioxidant and antimicrobial activity studies of different extracts and their fractions from a native plant of Pakistan: Quercus baloot. *Natural Product Research*, 35(20), 3771-3775.

Salazar-Aranda, R., Pérez-López, L. A., López-Arroyo, J., & Waksman de Torres, N. (2020). Antifungal activity of selected plant polyphenols against *Fusarium oxysporum* and *Aspergillus niger*. *Phytotherapy Research*, 34(5), 1127-1132.

Saxena, M., Saxena, J., Nema, R., Singh, D., & Gupta, A. (2023). Phytochemistry of medicinal plants. *Journal of Pharmacognosy and Phytochemistry*, 15(1), 168-182.

Shamsa, F., Monsef, H., Ghamooshi, R., & Verdian-rizi, M. (2008). Spectrophotometric determination of total alkaloids in some Iranian medicinal plants. *Thai Journal of Pharmaceutical Sciences, 32*(1), 17-20.

Sharma, P., Sharma, R., & Jain, R. (2022). Antifungal and antioxidant activity of aqueous extract of selected plants against phytopathogens. *Journal of Plant Pathology*, 104(2), 347-356.

Singh, P., Kumar, V., & Sharma, R. (2012). In vitro evaluation of antifungal activity of neem and garlic extracts against *Fusarium oxysporum* f. sp. ciceri. *Journal of Agricultural Technology*, 8(1), 209-218.

Singleton, V. L., Orthofer, R., & Lamuela-Raventós, R. M. (1999). Analysis of total phenols and other oxidation substrates and antioxidants by means of Folin-Ciocalteu reagent. *Methods in Enzymology, 299*, 152-178 https://doi.org/10.1016/S0076-6879(99)99017-1

Sivakumar, D., & Bautista-Baños, S. (2020). A review on the use of essential oils for postharvest decay control and maintenance of fruit quality during storage. *Crop Protection*, 134, 104831.

Ventola, C. L. (2020). The antibiotic resistance crisis: part 1: causes and threats. *Pharmacy and Therapeutics*, 45(4), 277-283.

Wang, X., Shen, Y., Zhang, C., Zeng, J., Li, Y., Wang, S, & Wang, Y. (2021). Terpenoids: natural products for controlling plant pathogens. *Plant Disease*, 105(6), 1707-1716.

How to cite this article:

Pravalika, G., A. Sabitha Rani, S. Babu and Shravya Puri, E. 2024. Phytochemical Profiling, Quantitative Assessment, and Antimicrobial Potential of *Premna tomentosa* Leaf Extract. *Int.J.Curr.Microbiol.App.Sci.* 13(9): 9-18. **doi:** https://doi.org/10.20546/ijcmas.2024.1309.002