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Phytochemical studies and antibacterial activity of *Aegle marmelos* stem bark extracts in different solvents

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Abstract

The antibacterial activity of various solvent extracts of *Aegle marmelos* against *Escherichia coli, Staphylococcus aureus*, and *Pseudomonas aeruginosa* was tested using the agar diffusion technique in this study. *Aegle marmelos* various solvent extracts were put through a qualitative test for phytochemical analysis. The hexane extract of *Aegle marmelos* exhibited the greatest antibacterial activity against all of the organisms tested, and early phytochemicals analysis revealed that it included all of the components. Various solvent extracts of *Aegle marmelos* were tested for antibacterial activity against *Escherichia coli, Staphylococcus aureus*, and *Pseudomonas aeruginosa* using the agar diffusion method. *Aegle marmelos* hexane and methanol were tested qualitatively for phytochemical analysis. The ethanolic extract of *Aegle marmelos* demonstrated the greatest antibacterial activity against all of the species tested, and a preliminary phytochemical investigation revealed the presence of phytoconstituents.

Keywords: *Aegle marmelos*, stem bark, antibacterial activity, agar diffusion method, Phytochemical analysis

1. Introduction

Bacterial infectious diseases are still a major public health problem across the world. Antibiotics were produced by a number of pharmaceutical companies, however, they were discovered to be resistant to a variety of microorganisms. Alternative phytomedicine is desperately required to combat medication resistance. A variety of secondary metabolites found in medicinal plants have the capacity to prevent harmful

bacteria from reproducing and developing. Plant-based medicine is more effective than manufactured drugs across the world, and it accounts for more than half of all medications [1]. Phytotherapy has very few side effects and has proven significant inhibitory efficiency against hazardous microbes.

2. Materials and Method

Plant material and preparation of plant extracts:

The plant *Aegle marmelos* had been taken from the Bhokar area, Dist. Nanded, Maharashtra, was identified and certified by a taxonomist from Yeshwant Mahavidyalaya, Nanded-431602, Maharashtra.

The stem bark of the *Aegle marmelos* was obtained and dry in the shadow. A mixture grinder was used to crush the dried stem bark into a fine powder. The plant's fine powder was extracted using the Soxhlet equipment and in a variety of solvents such as hexane, methanol, and chloroform. Finally, the filtered extract was concentrated and kept in a refrigerator to use for a variety of biological activities.

Phytochemical test:

Phytochemical analysis was performed on various solvent stem bark extracts of *Aegle marmelos* using a standard technique [2].

Test microorganisms:

The test microorganisms used in this study (*Escherichia coli, Staphylococcus aureus, and Pseudomonas aeruginosa*) were obtained from the S. R. T. M. University's culture collection center in Nanded, Maharashtra. The collected bacterial cultures were repeatedly subcultured in nutrient broth and incubated at 37°C for 24 hours.

Antimicrobial activity:

The disc agar diffusion method was used to test the antibacterial activity of various solvent extracts of *Aegle marmelos*. A subcultured bacterial suspension made in nutrient broth is used to distribute over agar media. 1 mg, 2 mg, and 5 mg of concentrated various extracts were employed on a sterile paper disc to test the antibacterial activity of the selected plant [3]. The plates were left for an hour after adding the sample to enable the extract to disperse. The inhibitory zone was measured in millimeters after the plates were incubated for 24 hours at 37°C in an incubator (mm). A reference of gentamycin 5 mg/ml was used for comparison.

3. Results and Discussion

Preliminary phytochemical analysis of *Aegle marmelos* extracts in hexane, and methanol revealed the presence of saponins, phenols, tannins, glycosides, saponins, terpenoids, flavonoids, alkaloids, and coumarins, while

Table 1. Preliminary phytochemical analysis of stem bark extract of *Aegle marmelos*

Sr. No.	Phytochemical Test	Root extract of *Aegle marmelos*		
		Hexane Extract	Methanol extract	Chloroform extract
1	Saponins	+ +	+ +	-
2	Phenols	+ +	+ +	+
3	Tannins	+ +	+ +	-
4	Glycosides	+ +	+ +	-
5	Terpenoids	+ +	+ +	+
6	Flavonoids	+ +	+ +	+
7	Alkaloids	+ +	+ +	+
8	Coumarins	+ +	+ +	-

Table 2. Antibacterial activity of stem bark extract of *Aegle marmelos*

Sr. No.	Microorganisms	Zone of Inhibition (mm)			
		Root extract of *Aegle marmelos*			
		Hexane extract	Methanol extract	Chloroform extract	Gentamycin (5 mg/ml)
1	*Escherichia coli*	7	5	3	11
2	*Staphylococcus aureus*	9	8	4	12
3	*Pseudomonas aeruginosa*	9	5	4	14

chloroform extract revealed the absence of saponins, tannins, glycosides, saponins, terpenoids, flavonoids, alkaloids, and the results of the phytochemical analysis are shown in Table 1. When a plant has a high concentration of phytochemicals, it has a higher degree of biological activity. The bactericidal activity of different solvent extracts of *Aegle marmelos* is shown in Table 2.

The hexane extract of *Aegle marmelos* showed the greatest antibacterial activity when compared to Gentamycin, whereas the methanolic extract and chloroform extract had moderate activity. Several scientific reports state that a considerable inhibitory zone might be caused by the presence of several phytochemicals. Flavonoids, alkaloids, terpenoids, phenols, saponins, and coumarins all have antibacterial properties [4, 5]. The presence of significant amounts of phytochemicals and bioactive compounds indicates that the treatment has a stronger potential for suppressing a range of hazardous microorganisms.

4. Conclusion

Based on the obtained results, the hexane extract has the maximum activity, which might be due to the existence of antibacterial chemical elements as well as the fact that the majority of the compounds are soluble in organic solvents. To identify and purify compounds from *Aegle marmelos* stem bark extract, further study is required. This research might be utilized as a substitute to commercially available conventional drugs.

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Conflict of interest

No conflict of interest influenced in this research.

5. References

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