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Antibacterial activity of various solvent extracts of *Butea monosperma* flowers

Dhole NA

Department of Botany, Digambarrao Bindu Mahavidyalaya, Tamsa road, Bhokar-431801, Nanded, Maharashtra state, India.

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Abstract

The agar diffusion method was used to test the antibacterial activity of several solvent extracts of *Butea monosperma* flowers against *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*. The qualitative phytochemical study of the Butea monosperma flowers was done using different solvent extracts. The chloroform extract of *Butea monosperma* flowers demonstrated substantial antibacterial efficacy against *Escherichia coli* (101 µg/ml) and *Staphylococcus aureus* (106 µg/ml) at the minimum inhibitory concentration (MIC). The antibacterial activity of the ethanol extract against *Pseudomonas aeruginosa* was (124 µg/ml). The toluene extract of *Butea monosperma* flowers has the lowest bactericidal activity against *Escherichia coli* (322 µg/ml) and *Pseudomonas aeruginosa* (237 µg/ml). When qualitatively examined, the majority of the floral extracts include all phytochemicals.

Keywords: *Butea monosperma*, antibacterial activity, Phytochemical analysis

1. Introduction

In recent years, both in industrialised countries and a number of other countries, the popularity of herbal products has increased. 80 percent of people, according to the World Health Organization, currently use herbal medicine for various sorts of basic healthcare [1]. In ethnomedicine, a wide variety of ailments are treated with a variety of plants. Antimicrobial agents either halt the growth of pathogens or eradicate them. Antibacterial medications known as disinfectants are applied to inanimate objects or exterior body parts.

Microorganisms play a key role in the synthesis of bioactive small molecules from natural sources for the treatment of different diseases and the synthesis of powerful medications.

The development of bacterial resistance to a range of medications creates a substantial therapeutic problem in the management of infectious diseases. Because commercially available antimicrobials are routinely used to treat illnesses, the overuse of these drugs led to the development of the bacteria's resistance. [2]. In order to find novel antibacterial chemicals from medicinal plants, researchers were compelled to go into alternate sources, notably herbal resources.

2. Experimentation

Plant material:
A taxonomist from Yeshwant Mahavidyalaya, Nanded-431602, Maharashtra, acknowledged and verified the Butea monosperma plant whose blooms were collected from the Bhokar area of the District of Nanded.

Preparation of Plant extracts:
Flowers from *Butea monosperma* were collected and allowed to dry in the shade. A mixer grinder was used to make the dried flowers into a fine powder. Using the Soxhlet apparatus and a variety of solvents, including ethanol, chloroform, ethyl acetate, and toluene, the plant extract was separated from the fine powder. After extraction, the obtained extract was concentrated and used in several experiments.

Preliminary Phytochemical analysis:
In a systematic approach, many solvent extracts were used to analyse the phytochemistry of Butea monosperma flower extracts. [3]

Test microorganisms:
Escherichia coli (MTCC-739), *Pseudomonas aeruginosa* (MTCC-2453), and *Staphylococcus aureus* (MTCC-96) were used as test organisms in the current experiment. They got it from the cultural collecting facilities centre at the School of Life Sciences, S. R. T. M. University, Nanded, Maharashtra. For the present experiment, subcultures of the acquired cultures were consistently used.

Antimicrobial activity by agar diffusion method:
The antibacterial efficacy of several solvent extracts from Butea monosperma flowers was assessed using the agar diffusion method. To distribute agar medium, a subcultured microbial suspension (100 µl) was prepared. A variety of concentrated extracts were used to measure antibacterial activity [4]. The sample was added to the plates, and it was left there for an hour to allow the extract to diffuse. Following 24 hours at 37°C in an incubator, the plates' inhibitory zone was measured in millimetres (mm). The results are compared to those of conventional antibacterial drugs.

3. Results and Discussion

A preliminary phytochemical analysis revealed that the Butea monosperma flower extracts all contained saponin, phenols, tannins, glycosides, terpenoids, flavonoids, alkaloids, and coumarins. With the exception of the chloroform extract's lack of glycosides, ethyl acetate extract's lack of tannins. The *Butea monosperma* flower's toluene extract was absent of saponin, glycosides, and coumarins. Table 1 presents the findings of the phytochemical investigation. The plant's high content of phytochemicals results in a higher level of biological activity. Table 2 lists the antibacterial activities of several solvent-based extracts of *Butea monosperma* flowers. The chloroform extract of *Butea monosperma* flower had the highest antibacterial activity showed MIC (101 µg/ml) against the *Escherichia coli*, ethanol extract (124 µg/ml) against the *Pseudomonas aeruginosa*, and chloroform extract (106 µg/ml) against the *Staphylococcus aureus*. The various extracts of *Butea monosperma* flowers tested against *Escherichia coli* and showed considerable MIC results in ethyl acetate extract (108 µg/ml). The results were compared with standard Cephalosporins as reference compounds with MIC (43 µg/ml). The different extracts of *Butea monosperma* flowers were checked against the *Pseudomonas*

Table 1. Preliminary phytochemical analysis of *Butea monosperma* flower extracts

Sr. No.	Phytochemical Test	flower extracts of *Butea monosperma*			
		Ethanol Extract	chloroform extract	Ethyl acetate extract	Toluene extract
1	Saponins	+	+	+	-
2	Phenols	+	+	+	+
3	Tannins	+	+	-	+
4	Glycosides	+	-	+	-
5	Terpenoids	+	+	+	+
6	Flavonoids	+	+	+	+
7	Alkaloids	+	+	+	+
8	Coumarins	+	+	+	-

Table 2. Antibacterial activity of *Butea monosperma* flowers

Sr. No.	Microorganism	Minimum inhibitory concentration (MIC) Flower extracts of *Butea monosperma* (µg/ml)					
		Ethanol extract	Chloroform extract	Ethyl acetate extract	Toluene extract	Gentamicin (µg/ml)	Cephalosporins (µg/ml)
1	*Escherichia coli*	157	101	108	222	ND	43
2	*Pseudomonas aeruginosa*	124	204	163	237	ND	47
3	*Staphylococcus aureus*	163	106	145	177	34	ND

The results summarized are the mean values of two parallel experiments. ND- Not determined

aeruginosa and exhibited significant MIC values in chloroform extract (204 µg/ml). The obtained results were compared with Cephalosporins with MIC (47 µg/ml). The different solvent extract of *Butea monosperma* flower was evaluated against *Staphylococcus aureus* and found impressive MIC values in chloroform extract (106 µg/ml), ethyl acetate extract (145 µg/ml), toluene extract (177 µg/ml). The gentamicin (34 µg/ml) was used as a standard compound.

A significant inhibitory zone may also be produced by the variety of phytochemicals present in the extract. Numerous flavonoids, alkaloids, terpenoids, phenols, saponins, and coumarins have bactericidal properties. Numerous scientific studies have shown that phytochemicals and bioactive substances in high concentrations have a stronger potential for treating a variety of harmful bacteria. [5]. Many chronic disorders caused by various bacteria may be prevented and treated with plant-based remedies. Many cultures continue to employ ethnomedicines to treat illnesses and overcome obstacles without suffering any negative health effects. Plant-based medicines have a lot lesser side effects than commercial antibiotics when used excessively. To prevent deadly infections brought on by various microorganisms, the researchers are using plant-based remedies to create a replacement for commercial antibiotics.

4. Conclusion

The results indicate that the extract in chloroform and ethyl acetate has the highest potential, which may be

due to the fact that it includes the largest amount of phytochemical components and bioactive compounds with antibacterial activity. In order to identify and purify chemicals that could be used as natural medications in substitute of synthetic pharmaceutical treatments, more research on *Butea monosperma* flower extract is required.

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Conflicts of Interest: The authors declare no conflict of interest.

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