International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 13 Issue: 01 | Jan 2026 www.irjet.net p-ISSN: 2395-0072

COMPARATIVE ANALYSIS OF IN VITRO ANTI-BACTERIAL ACTIVITY (BACILLUS CEREUS AND ESCHERICHIA COLI) OF ABUTILON INDICUM LEAF EXTRACTS WITH AMOXICILLIN CAPSULE

M. Kavitha[1], B. Gokul[2], G. Gopika[3], M. Gowtham[4]

[1] Assistant Professor, Sri Vijay Vidyalaya College of Pharmacy, Dharmapuri, Tamil Nadu (India)
[2, 3, 4] B. Pharm Students, Sri Vijay Vidyalaya College of Pharmacy, Dharmapuri, Tamil Nadu (India)

---***---

Abstract- *The aim of the study is a comparative analysis of in vitro antibacterial activity (Bacillus cereus and Escherichia coli) of Abutilon indicum (L.) Sweet leaf extracts with amoxicillin capsules.*

Method: *Fresh leaves of Abutilon indicum (L.) Sweet were collected, shade dried, and coarsely powdered. The powdered plant material was subjected to the cold maceration extraction method using ethanol and acetone as solvents. The further extract was determined by preliminary phytochemical and comparative in vitro antibacterial activity.*

Conclusion: *The Abutilon indicum (L.) Sweet shows antibacterial activity against pathogenic microorganisms like Bacillus cereus and Escherichia coli. The given ethanol shows good antibacterial activity against Bacillus cereus and Escherichia coli compared with the acetone extract.*

Key words: Abutilon indicum (L.) Sweet Leaf, Antibacterial Activity, Amoxicillin Capsule.

I. INTRODUCTION

Abutilon indicum (L.) Sweet, belonging to the family Malvaceae, is a medicinal plant traditionally used for the treatment of fever, wounds, inflammation, and microbial infections [1].

Phytochemical investigations of A. indicum leaves have revealed the presence of bioactive constituents such as flavonoids, phenolic compounds, tannins, alkaloids, and saponins, which are known to contribute to its antimicrobial potential [2].

Several experimental studies have demonstrated that leaf extracts of Abutilon indicum exhibit significant antibacterial activity against both Gram-positive and Gram-negative bacteria, including Escherichia coli and Bacillus species [1,3].

The antibacterial efficacy of A. indicum has been reported to vary depending on the type of solvent used for extraction, as solvent polarity influences the extraction of active phytochemicals [3,4].

Fig: 01 Abutilon Indicum

Taxonomical classification:

Taxonomy: Abutilon indicium

Kingdom: Plantae

Division: Magno liophyta

Class: Magnoliopsida

Subclass: Dilleniidae

Order: Malvales

Family: Malvaceae

Genus: Abutilon

Species: Abutilon indicum

Vernacular Name:

English: Indian mallow, Country Mallow, Indian Abutilon,

Tamil: Thutthi, Tutti,

Telugu: Tutturi Benda, Adavibenda, Botla benda, Dudi

Malayalam: Velluram, Katturam, Tutti, Uram

II. MATERIALS AND METHODS

Leaves and materials:

The Abutilon indicium leaves used in the study were collected from the Collectorate area, Dharmapuri. The collected samples were carefully cleaned and rinsed two to three times with distilled water to remove dust and adhering impurities. The leaves were then shade-dried under ambient conditions for seven days. The dried leaves were coarsely ground using a mechanical grinder to obtain a coarse powder, which was used for further extraction studies.

Materials:

- Conical flask
- Solvent (ethanol, acetone as used)
- Sample (coarse powder)
- Whatman No. 1 filter paper
- Magnetic stirrer or shaker

preparation of extracts:

The preparation of extracts from the powdered leaves of Abutilon indicum is done by using the following solvent:

1. Ethanol extract
2. Acetone extract

Ethanol extract

The shade-dried coarse powder of Abutilon indicum leaves (50 g) was transferred into a clean conical flask and subjected to cold maceration using 250 mL of solvent. The mixture was kept on a magnetic stirrer at room temperature with intermittent stirring for 48 hours. After maceration, the extract was filtered using Whatman No. 1 filter paper. The filtrate was concentrated by evaporation at room temperature to remove the solvent completely. The obtained extract was dried and stored in a desiccator until further use. The dried extract was weighed, and the percentage yield was calculated with respect to the air-dried crude drug.

Acetone extract

The shade-dried coarse powder of Abutilon indicum leaves (50 g) was taken in a clean conical flask and subjected to cold maceration with 250 mL of acetone. The mixture was kept on a magnetic stirrer at room temperature with occasional stirring for 48 hours. The macerated extract was then filtered using Whatman No. 1 filter paper. The filtrate was allowed to evaporate at room temperature to remove the solvent completely. The dried extract was stored in a desiccator until further use. The extract was weighed, and the percentage yield was calculated based on the air-dried crude drug.

III. PHYTOCHEMICAL ANALYSIS OF ABUTILON INDICUM

Test for Alkaloids:

Dragendorff's test:

An aliquot (1 mL) of the plant extract was treated with Dragendorff's reagent. The appearance of an orange-collared precipitate confirmed the presence of alkaloids.

Test for Glycosides:

Preparation of test solution:

The extract was dissolved in alcohol to obtain the test solution.

Keller–Killiani test:

A few drops of ferric chloride were added to the test solution, followed by careful addition of concentrated sulfuric acid. The development of two layers, with a reddish-brown lower layer and a bluish-green upper layer, indicated glycosides.

Test for Carbohydrates:

Molisch test:

The test solution (2–3 mL) was mixed with Molisch reagent, and concentrated sulphuric acid was gently added along the sides of the test tube. The formation of a violet ring at the interface suggested the presence of carbohydrates.

Test for Terpenoids:

One millilitre of the extract was mixed with chloroform, followed by the addition of concentrated sulfuric acid. The formation of a reddish-brown coloration at the junction of the two layers confirmed terpenoids.

Test for Flavonoids:

The extract was treated with lead acetate solution. A yellow precipitate indicated the presence of flavonoids.

Test for Tannins:

Preparation of test solution:

The extract was dissolved in a hydro-alcoholic mixture.

Ferric chloride test:

Addition of ferric chloride to the extract produced a dark blue or greenish-black color, indicating tannins.

Test for Saponins:

Foam test:

The aqueous extract was vigorously shaken with water. The absence of stable froth indicated that saponins were not present.

Test for Proteins:

Biuret test:

The extract solution was treated with sodium hydroxide followed by copper sulfate solution. The appearance of a blue coloration indicated proteins.

Test for Fats:

Solubility test:

The extract was tested for solubility in various solvents. Solubility in chloroform and ether with insolubility in water indicated the presence of fats.

Test for Cholesterol:

The extract dissolved in chloroform was treated with acetic anhydride and concentrated sulphuric acid. The absence of red coloration indicated cholesterol was not present.

Test for Steroids:

The extract was mixed with chloroform and concentrated sulphuric acid. Formation of a reddish-brown ring at the interface suggested the presence of steroids.

TABLE 01: Phyto constituents of ethanol and acetone of dried leaves of Abutilon indicum.

S.NO	PHYTOCONSTITUNT	ETHANOL	ACETONE
1	ALKALOIDS	+	+
2	GLYCOSIDE	+	+
3	CARBOHYDRATES	+	+
4	TERPENOIDS	+	+
5	FLAVONOIDS	+	+
6	TANNINS	+	-
7	SAPONINS	+	-
8	PROTEINS	+	+
9	FATS	-	+
10	CHOLESTEROL	-	+

IV. ANTI MICROBIAL ACTIVITY OF ABUTILON INDICUM TEST MICROORGANISMS:

Totally Two bacterial strains were used throughout investigation. All the bacterial cultures were obtained from the Microbial Type Culture Collection (MTCC), Institute of Microbial Technology, Chandigarh, India. The bacteria used were Bacillus cereus and Escherichia coli.

ANTIBACTERIAL ASSAY:

i. PREPARATION OF INOCULUMS

Stock cultures were maintained at 4°C on slopes of nutrient agar. Active cultures of the experiment were prepared by transferring a loopful of cells from the stock cultures to a test tube of Muller-Hinton broth (MHB) for bacteria that were incubated without agitation for 24 hrs at 37°C. The cultures were diluted with fresh Muller-Hinton broth to achieve optical densities corresponding to 2.0 X 10^6 colony-forming units (CFU/ml) for bacteria (Smith & Doe 2018).

ii. PREPARATION OF STERILE SWABS

A cotton wool swab on wood or plastic was prepared and sterilized by autoclaving or by dry heat (only for the wooden swabs). It was sterilized by packing the swabs in culture tubes, papers, or tins, etc.

iii. STERILIZATION OF FORCEPS

Forceps can be sterilized by dipping them in alcohol and burning off the alcohol.

ANTIBACTERIAL ASSAY USING AGAR WELL DIFFUSION METHOD

The well diffusion method was used to screen the antimicrobial activity. *In vitro* antimicrobial activity was screened by using Muller Hinton Agar (MHA) obtained from Hi media (Mumbai). The MHA plates were prepared by pouring 15 ml of molten media into sterile petri plates. The plates could solidify for 5 minutes, and a 0.1% inoculum suspension was swabbed uniformly, and the inoculum could dry for 5 minutes. Wells were cut, and 20 µl of the different concentrations of test drug were added. The plates were then incubated at 37°C for 24 hours. The antibacterial activity was assayed by measuring the diameter of the inhibition zone formed around the well (NCCLS, 1993). An amoxicillin disc was used as a positive control.

ETHANOL:

S. NO	MICRO ORGANISMS	ZONE OF INHIBITION (MM)				
		25µL	50 µL	75 µL	100 µL	+ ve control
Gram positive bacteria						
1	Bacillus cereus	09	12	14	17	25
Gram-negative bacteria						
2	Escherichia coli	10	13	17	21	27

ACETONE:

S. NO	MICRO ORGANISMS	ZONE OF INHIBITION (MM)				
		25µL	50µL	75µL	100µL	+ ve control
Gram positive bacteria						
1	Bacillus cereus	08	11	13	16	23
Gram negative bacteria						
2	Escherichia coli	11	14	16	19	26

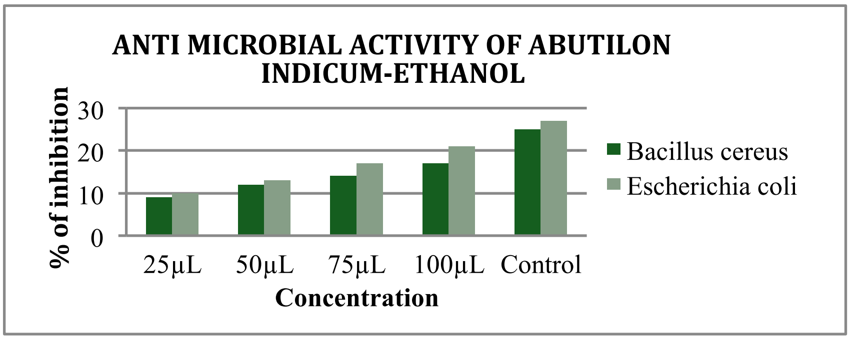

Fig. 02: Concentration vs. Inhibition

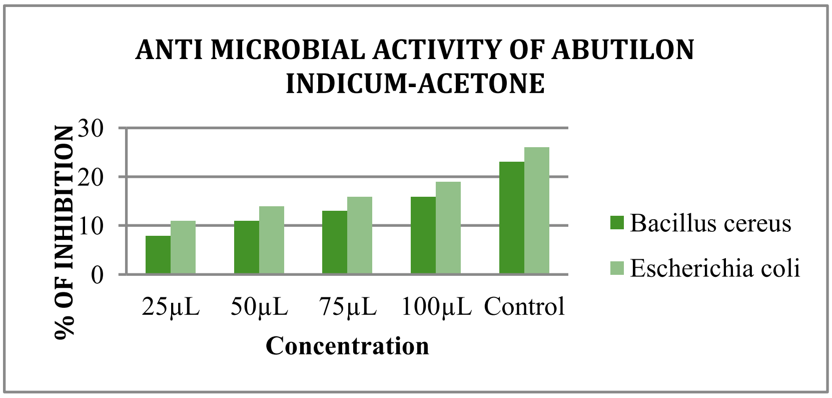

Fig. 03 Concentration vs Inhibition

ZONE OF INHIBITION

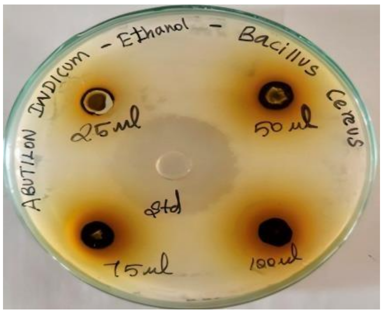

Fig. 04 *Bacillus cereus (ethanol and amoxicillin)*

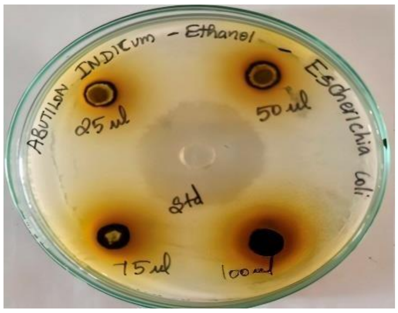

Fig. 04 *Bacillus cereus (ethanol and amoxicillin)*

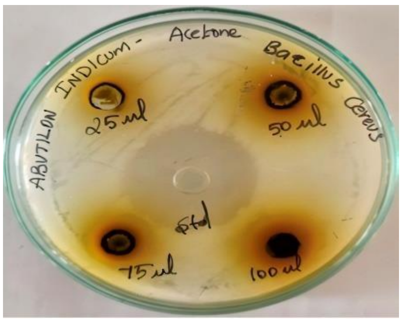

Fig. 05 *Escherichia (acetone and amoxicillin)*

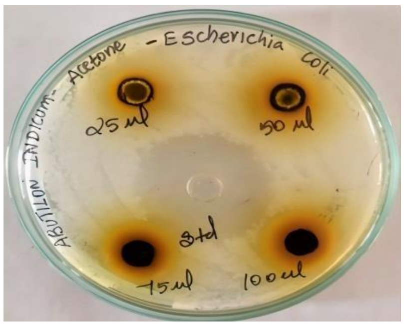

Fig. 05 *Escherichia coli (acetone and amoxicillin)*

V. CONCLUSION

It can be concluded that the presence of secondary metabolites such as alkaloids, flavonoids, tannins, terpenoids, glycosides, proteins, and steroids in the leaf extracts of Abutilon indicum (L.) Sweet contributes to its antibacterial activity. The Abutilon indicum leaf extracts showed effective antibacterial activity against the pathogenic microorganisms Bacillus cereus and Escherichia coli. Among the solvents used, the ethanol extract showed better antibacterial activity compared to the acetone extract. The antibacterial effect was found to increase with an increase in concentration of the extracts. When compared with the plant extracts, the standard drug amoxicillin showed higher antibacterial activity against both bacterial strains. Hence, Abutilon indicum leaves possess potential antibacterial properties.

REFERENCES

[1] Poonkothai M. Antibacterial activity of leaf extract of Abutilon indicum. Ancient Sci Life. 2006.

[2] Saranya D, Sekar J, Adaikala Raj G. Phytochemical analyses, antibacterial and antifungal activity of leaves from Abutilon indicum (L.) Sweet. J Chem Pharm Res. 2015

[3] Raut RR, Sawant AR. Antibacterial activity of Abutilon indicum leaf extracts. World J Pharm Res. 2016.

[4] Suriya J, Bharathi RS, Sekar V, Rajasekaran R. Antimicrobial activity of methanolic extract of Abutilon indicum. Int J Pharm Sci Res, 2012.

[5] Smith, J. A., & Doe, R. B. Evaluation of the antimicrobial activity of herbal extracts against clinical pathogens. Journal of Microbial Research, 2018.

[6] National Committee for Clinical Laboratory Standards (NCCLS). (1993). Methods for dilution antimicrobial susceptibility tests for bacteria that grow aerobically (3rd ed.). NCCLS.