



A Comparative Study of Antimicrobial Activity of Ethanolic Extract of *Tecoma stans* and *Abutilon indicum* Leaves: An *In vitro* Study

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Authors' contributions

This work was carried out in collaboration among all authors. Author MB did the literature search, data collection, analysis and manuscript drafting. Data verification and manuscript drafting done by authors RGD, JS and AJP. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i47B33161

Editor(s):

(1) Dr. S. Prabhu, Sri Venkateswara College of Engineering, India.

Reviewers:

(1) Yennata Saputra, Hasanuddin University, Indonesia.

(2) Usman Bello, Abubakar Tafawa Balewa University, Nigeria.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/74401>

Original Research Article

Received 02 August 2021

Accepted 07 October 2021

Published 04 November 2021

ABSTRACT

Tecoma stans is a flowering plant belonging to the family Bignoniaceae. It is the floral emblem of the Bahamas. *Abutilon indicum* belongs to the family Malvaceae. It is also called Indian Mallow. *Tecoma stans* and *Abutilon indicum* have antimicrobial activity and can be used in producing antibiotics. There is an urgent need to produce new antibiotics as there is an increase in the development of pathogen resistant drugs. The aim of this study was to compare the antimicrobial activity of ethanolic extract of *Tecoma stans* and *Abutilon indicum* leaves. *E. faecalis* bacteria were maintained in nutrient agar slopes. The powder of the two herbs, were subjected to extraction by Soxhlet extractor and was concentrated to dry residue by Agar well diffusion method. The nutrient broth was inoculated with bacterial strains. The culture was adjusted to 0.5McFarland turbidity standard. Lawn culture was done in Muller-Hinton agar plate and then the plates were dried. A 6

mm diameter well is bored for different concentrations. The extracts were introduced into the well and allowed to stand for 24 hrs. The antibacterial activity was determined by measuring the zone of inhibition. The present finding on the antimicrobial potential of *Abutilon indicum* and *Tecoma stans* showed that the two plants have growth inhibitory activity against oral pathogen *E. faecalis*. *Abutilon indicum* has a zone of inhibition greater than *Tecoma stans*. *Abutilon indicum* exhibited better activity compared to *Tecoma stans*.

Keywords: *Abutilon indicum*; *Tecoma stans*; antimicrobial; ethanolic extract; Innovative technique.

1. INTRODUCTION

One of the major causes of morbidity and mortality around the world, infectious illnesses are a major public health concern due to inefficient use of drugs and microbial resistance. The emergence of harmful bacteria resistant to antibiotics has exacerbated the problem of bacterial resistance in recent years. Medicinal herbs are a large source of natural substances, which are frequently utilised in pharmaceuticals, cosmetics, and paintings, all of which are essential in everyday life [1]. Antioxidants play a great role in protecting the body from damage by free radicals. The discovery of various bioactive compounds in plants has led to the production of new drugs that have efficient protection against various disease-causing pathogens.

Tecoma stans belong to the family Bignoniaceae with 16 species are present in the genus *Tecoma* are present in tropical and subtropical areas [2]. It is a perennial shrub and grows to a height of about 2 to 4 meters. In early April, flowering starts and then it continues to fall [3]. It is the floral emblem of the Bahamas. The compounds present in the fruit and flower of *Tecoma stans* have antioxidant and antiproliferative activity. The chemical compound present in root has anthranilic acid which acts as an antidiabetic agent [4]. The leaves of *Tecoma stans* inhibit the yeast growth. The plant leaves contain phytochemicals such as flavonoids, tannins, alkaloids, resin, and volatile oil etc. *Tecomine* separated from *T.stans* has hypoglycemic effects and play a great role in folk medicine. It is used for an anti-diabetic remedy [5,6]. According to recent studies, the intake of flavonoid decreases the risk of cancer and mainly its functions is to inhibit different stages of carcinogenesis [7,8]. Our team has extensive knowledge and research experience that has translate into high quality publications [9–13].

Abutilon indicum also called Country Mallow, belongs to the family Malvaceae which grows in tropical and subtropical countries. The

phytochemicals present in *Abutilon indicum* are alkaloids, flavonoids, saponins and essential oil [14]. The seeds are used to treat coughs and the bark is used as an anthelmintic [15,16]. The leaves are used for treating tender gums, bleeding piles and toothache. It has anthelmintic and anti-inflammatory activity. It has CNS depressant activity [17,18]. It is used as ethanolic medicine by tribal people [19,20,21]. It has anti-diarrheal and anticonvulsant properties [22,23,24,25]. However, there is the need to explore the use of *Tecoma stans* and *Abutilon indicum* plants extracts as antimicrobial agents owing to their potency. Due to lack of research studies on *Tecoma stans* and *Abutilon indicum* leaves extracts as antimicrobial agents, this study is to compare the efficacies of *Tecoma stans* and *Abutilon indicum* leaves.

2. MATERIALS AND METHODS

Test Microorganism: The bacterial strain *Enterococcus faecali* obtained from the Department of microbiology, Saveetha dental College, Saveetha University, Chennai. It was maintained in a nutrient agar slope at 40°C.

Collection of plant powder: The plants *Tecoma stans* and *Abutilon indicum* leaves were obtained in powdered form from a registered pharmacy in Arumbakkam, Chennai, India.

Preparation of extract: Dry leaf powders extraction using a soxhlet extractor were taken in bottle and mixed with ethanol, then the mixture was shaken occasionally for 72 hours. Then the extract was filtered. The extracts were kept in a desiccator after being concentrated to dry residue on a water bath assessment of antimicrobial activity by a Agar well diffusion method. The Agar Well diffusion method was used for assessing the antimicrobial activity of the extract of *Tecoma stans* and *Abutilon indicum*. The nutrient broth was inoculated with bacterial strains *E. faecalis*. The broth was incubated at 37°C overnight. The culture was then adjusted to 0.5McFarland turbidity standard.

Muller-Hinton agar plates [MHA-HiMedia M1084] were used for the culture of the test organism. This was done with the help of sterile cotton q tips the place were then kept for drying. Then, 6 mm diameter well was bored by a sterile cork for different concentrations of the extract (25, 50, 75, 100µg/ml). The extracts were introduced into the well with the help of micropipettes. The culture plates were allowed to stand on the working bench for 30 minutes for pre-diffusion and then incubated in an upright position for 24 hours and 37°C. After 24 hours, antibacterial activity was determined by measuring the diameter of the zone of inhibition in millimeters (mm). All the tests were carried out thrice, to minimize error.

3. RESULT

The present finding on the antimicrobial potential of *Abutilon indicum* and *Tecoma stans* showed that the two plants have growth inhibitory activity against oral pathogen *E. faecalis* (Fig. 1). As the concentration of extract increases, its antimicrobial activity also increases. The ethanolic extract of both herbs has good antimicrobial activity. But for a particular concentration *Abutilon indicum* has higher

antimicrobial activity when compared to *Tecoma stans* (Table 1). This result clearly indicates that the plant extract may be considered as an antimicrobial agent for oral diseases. In view of these findings other parts of these plants have been shown to reduce the growth of the various pathogenic microorganisms.

From Table 1 we can infer that as the concentration of extract increases its antimicrobial activity also increases, thus the extract of both herbs shown an antimicrobial activity. However, for each particular concentration, *Abutilon indicum* exhibited higher antimicrobial activity compared to *Tecoma stans*.

4. DISCUSSION

The antibacterial properties of ethanolic extracts of *Abutilon indicum* and *T. stans* against bacterial species were investigated in this study. Extracts of *Abutilon indicum* and *Tecoma stans* were found to be effective against *E. faecalis*. In a dose-dependent manner, the extracts inhibited the development of the bacteria. *Abutilon indicum* extracts were found to be more effective in the study.

Table 1. Antibacterial activity against *E. faecalis*

Extract	25µg/ml	50µg/ml	75µg/ml	100µg/ml
<i>Tecoma stans</i>	13	14	16	17
<i>Abutilon indicum</i>	16	17	18	19

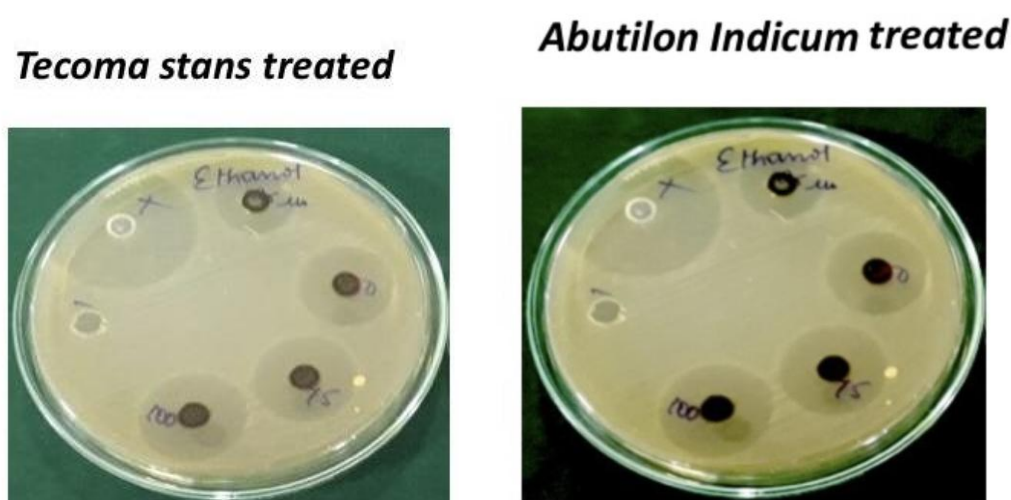


Fig. 1. Culture of *E. faecalis* treated with *Tecoma stans* and *Abutilon indicum*

Studies on the ethanolic and chloroform extract of *Abutilon indicum* has potent antimicrobial activity against *Bacillus subtilis*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Salmonella typhi* (21). According to previous study, the ethanolic extract of *Abutilon indicum* showed better antibacterial activity compared to chloroform extract [26]. Few studies reported, aqueous extract of *Abutilon indicum* has less effective antibacterial activity [17,27]. Sneha Satpathy et al, reported *Tecoma stans* have significant antifungal and antibacterial activity of ethanolic leaf extract displayed an inhibition zone of 18 mm for *P. aeruginosa* and 16 mm for *A. niger* [5,28,29]. Deepti Jawa Singh et al., concluded that the extract of zinc oxide with tulsi can be used as an alternative to zinc oxide eugenol as an obturating material for primary teeth. Zinc oxide with aloe vera has no antibacterial efficacy against *E. faecalis*. Zinc oxide eugenol has higher antibacterial efficacy against *E. faecalis* [30,31,32]. The methanol, ethanol, chloroform extract showed antibacterial activity against all gram positive and gram negative bacteria. Antibacterial activity is due to phytochemical and bioactive components present in plants. Intan Nirwana et al., concluded that 50% concentration of leaf extract of fig tree has better antibacterial activity against *E. faecalis* [33,34,35]. The leaf extract of *A. muricata* has good antibacterial activity against *E. faecalis* and this extract can be used as an effective root canal irritant [36,37]. Moreover, Muhammed et al., and Mustafa, (2016), concluded that leaf extract of neem can be used as an alternative in root canal disinfection [38,39] whereas, the leaf extract of *Pluchea indica* also has antibacterial activity against *E. faecalis* [40,41].

5. CONCLUSION

Based on this study, *Abutilon indicum* has higher antimicrobial activity than *Tecoma stans* against *E. faecalis*.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our

area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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