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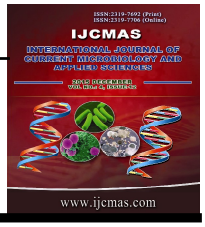

Original Research Article

Efficacy of *Abutilon indicum* L. against Bacterial and Fungal Species

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K e y w o r d s

Abutilon indicum, antibacterial activity, antifungal activity

A B S T R A C T

The present study was carried out to evaluate the antibacterial and antifungal activities of the aqueous and ethanolic extracts of *Abutilon indicum* against bacterial and fungal species. Antibacterial and antifungal activities were assessed by disc diffusion method. Among the two extracts, ethanolic extracts exhibited potent antibacterial and antifungal against all the selected bacterial and fungal species. The results were compared with standard antibiotic drugs chloramphenicol for bacteria and fluconazole for fungi. The extracts exhibited the growth inhibitory activity in a dose dependent manner.

Introduction

Infectious diseases, also known as contagious diseases or transmissible diseases, comprise clinically evident illness resulting from the infectious, presence and growth of pathogenic biological agents in an individual host organism. Infectious diseases are the worlds leading cause of premature death, killing almost 50,000 people everyday. In recent years, drug resistance to human pathogenic bacteria has been commonly reported from all over the world. Thus infectious diseases represent a critical problem to health and they are one of the man causes of morbidity and mortality worldwide. Until recently, research and development (R&D) efforts have provided new drugs in time to treat bacteria that became resistant to older antibiotics. As bacterial antibiotic resistance continues to exhaust the supply of effective antibiotics, a global public health disaster appears likely. Substitutes from the nature to the antibiotics are becoming the prime need of the society in the present and in future.

Escherichia coli is a gram-negative, rod shaped micro-organism, facultative anaerobic, and non-sporulating organism. Some virulent strains of *E.coli* can causes several intestinal and extra intestinal infections, mastitis, septicaemia, gram-negative pneumonia, gastro enteritis, urinary tract infections and neonatal meningitis. In rare cases, virulent strains are also responsible for hemolytic-uremic syndrome (HUS), peritonitis. It is the most common pathogen isolated from patients hospitalized longer than a week and is a common cause

of nosocomial infections such as pneumonia and bacteremia (Prakshanth *et al*., 2006).

Streptococcus pyogenes occurs as a commensal on human skin, particularly the scalp, armpits, and nasopharynx; its primary habitat is the moist squamous epithelium of the anterior nares (Priscila Ikeda Ushimari *et al*., 2007). It may cause a variety of clinical infections with high morbidity rates; these include wound sepsis, septicaemia, osteomylitis, post-surgical toxic shock syndrome and septic arthritis. In infants, *S. pyogenes* can cause a severe disease. *Streptococcal* scaled skin syndrome (SSSS). *Streptococcal* endocarditic (infection of the heart valves) and pneumonia may be fatal (Basile, 1999).

The alarming rates of human fungal infections have increased in the last 20 years, mainly among immunocompromised individuals. Data indicate that the relative proportions of organisms causing nosocomial bloodstream infections have changed over the last decade, with *Candida* species now firmly established as one of the most frequent agents. Candidemia not only is associated with a high mortality but also extends the length of the hospital stay and increases the costs of medical care. Among human gastrointestinal tract isolates, 50-70% of total yeast isolates were identified as *Candida albicans* (Leeja and Thoppil, 2007).

Most infections are caused by *Aspergillus* species, particularly *Aspergillus fumigates* followed by *Aspergillus flavus* and *Aspergillus terreus*, *A.niger* has been associated with otomycosis, cutaneous infections (Dagmar Janovska *et al*., 2003) and pulmonary disease and sometimes causes pneumonia. In three separate case reports, *A. niger* pulmonary infection was fatal; one patient had been on long-term steroid treatment for COPD (Cock, 2008). Nasal carriage occurs in 40-50% of humans. It can cause furuncles (boils,), carbuncles (a collection of furuncles) (Veeramuthu Duraipandiyan *et al*., 2006). Hence the present investigation is to screen the whole plants of *Abutilon indicum* Linn. for *in vitro* antimicrobial activity.

Abutilon indicum belonging to family Malvaceae, *Abutilon indicum* is a perennial shrub, softly tomentose and upto 3 m in height. The flowers are yellow in color, peduncle jointed above the middle. The petioles are 3.8-7.5 cm long; stipules 9 mm long; pedicels often 2.5-5 mm long, axillary solitary, jointed very near to top and the seeds are 3-5 mm, kidney shaped, reniform, tubercled or minutely stellate hairy, black or dark brown (Kirtikar and Basu, 1994; Prajapati *al*., 2003; Nadkarni, 1995). *Abutilon indicum* has been used as antihelmentic, antiemetic,anti-inflammatory, in urinary or uterine discharge, piles, antidote. It is used in treatment of fever, dry cough, bronchitis, gonorrhea and leprosy.

Materials and Methods

Plant Collection and Identification

The plant species namely *Abutilon indicum* Linn. plants were collected in and around Mannargudi, Thiruvarur (Dt), Tamil Nadu.

Preparation of Plant Powder

The plants were air dried under shade for 10-15 days. Then the dried materials was grinded to fine powder using an electric grinder and stored in air tight bottles. The powder matter was used further phytochemical, physico-chemical analysis, *in vitro* anti-inflammatory, antimicrobial activities.

Extraction of Plant Material

Ethanol and aqueous extracts were prepared according to the methodology of Indian pharmacopoeia (Anonymous, 1955). The coarse powder material was subjected to soxhlet extraction separately and successively with ethanol and distilled water. These extract were concentrated to dryness in flash evaporator under reduced pressure controlled at a temperature (40°C-50°C) the ethanol and aqueous extracts put in air tight container stored in refrigerator .

Invitro Antimicrobial Activity

Selection of Microorganism

Microorganism such as *Escherchia coli* , *Streptococcus pyogenes, Candida albicans, Aspergllus nige* were obtained from the Department of Microbiology, S.T.E.T. Women's college, Mannargudi, were used as antibacterial and antifungal test organisms.

Antibacterial Activity

Disc Diffusion Method (NCCLS, 1993; Awoyinka *et al*., 2007)

The antibacterial activity of the leaves extracts were tested against the selected bacterial strains the 20 ml of sterilizes nutrient agar medium are poured into each sterile petri plate and allowed to solidify. The test bacterial cultures were evenly spread over the appropriate media by using a sterile cotton swab. Then a well a 0.5cm was made in the medium using a sterile cork borer 150µl of each ethanol and aqueous. Plant extracts were transferred into separate well after these plants were incubated at 37° C for 24 - 48 hours. After incubation period the result were observed and measure the diameter of incubation zone around the each well. The standard antibiotic like chloramphenicol was used as controls.

Antifungal Activity

Disc Diffusion Method (NCCLS, 1993; Awoyinka et al., 2007)

In the freshly prepared and sterilized potato dextrose agar medium, a pinch amount of streptomycin was added and mixed well. Then these 200ml of medium was poured into each petriplate and allowed to solidify. The test fungal culture were evenly spread over the appropriate media by using sterile cotton swab. Then a well of 0.5cm was made in the medium by using sterile cork borer 150µl of each ethanol, aqueous and plant extract were transferred into separate wells. Then these plates were incubated at 27°C for 48-72 hours. After incubation period the results were observed and measure the diameter of incubation zone around the each well. The standard antibiotic like flucanazole was used as control.

Results and Discussion

The antimicrobial activity of ethanolic and aqueous extracts of *Abutilon indicum* were studied in different concentrations (25mg/ml, 50mg/ml, 75mg/ml, 100mg/ml, 200mg/ml) against two pathogenic bacterial strains (*Escherichia coli, Streptococcus pyogenes*) and two fungal strains (*Candida albicans, Aspergillus niger*). Antibacterial and antifungal potential of ethanolic and aqueous extracts were assessed in terms of zone of inhibition of bacterial growth. The results of the antibacterial activities are presented in Table 1 and 2. The antibacterial and antifungal activity of the extracts increased linearly with increase in concentration of extracts (mg/ml). As compared with standard drug such as chloramphenicol for bacteria and flucanazole for fungi, the results revealed that in the ethanolic extracts for bacterial

activity, *Streptococcus pyogenes* were more sensitive as compared to *Escherichia coli* and for fungal activity *Aspergillus niger* shows good result as compared to *Candida albicans.*

Table.1 Antibacterial Activity of Ethanolic and Aqueous Extracts of *A. indicum* against Bacterial Strains

S. No.	Test Microorganisms	Zone of inhibition in mm					Standard drug Chloromphenicol
		25 mg	**50 mg**	**75 mg**	**100 mg**	**200 mg**	
		Ethanolic extracts					
1.	*Escherichia coli* (mm)	15 ± 0.35	17 ± 0.49	18 ±0.56	20 ± 0.70	22 ± 0.84	23 ± 0.98
2.	*Streptococcus pyogenes* (mm)	14 ± 0.28	16 ± 0.42	17 ±0.49	19 ± 0.56	21 ± 0.77	22 ± 0.19
		Aqueous extracts					
1.	*Escherichia coli* (mm)	14 ± 0.35	16 ±0.49	17± 0.56	19 ± 0.70	21 ±0 .84	22 ± 0.98
2.	*Streptococcus pyogenes* (mm)	14 ±0.28	16 ±0.42	17± 0.49	18 ± 0.56	20 ± 0.77	21 ± 0.19

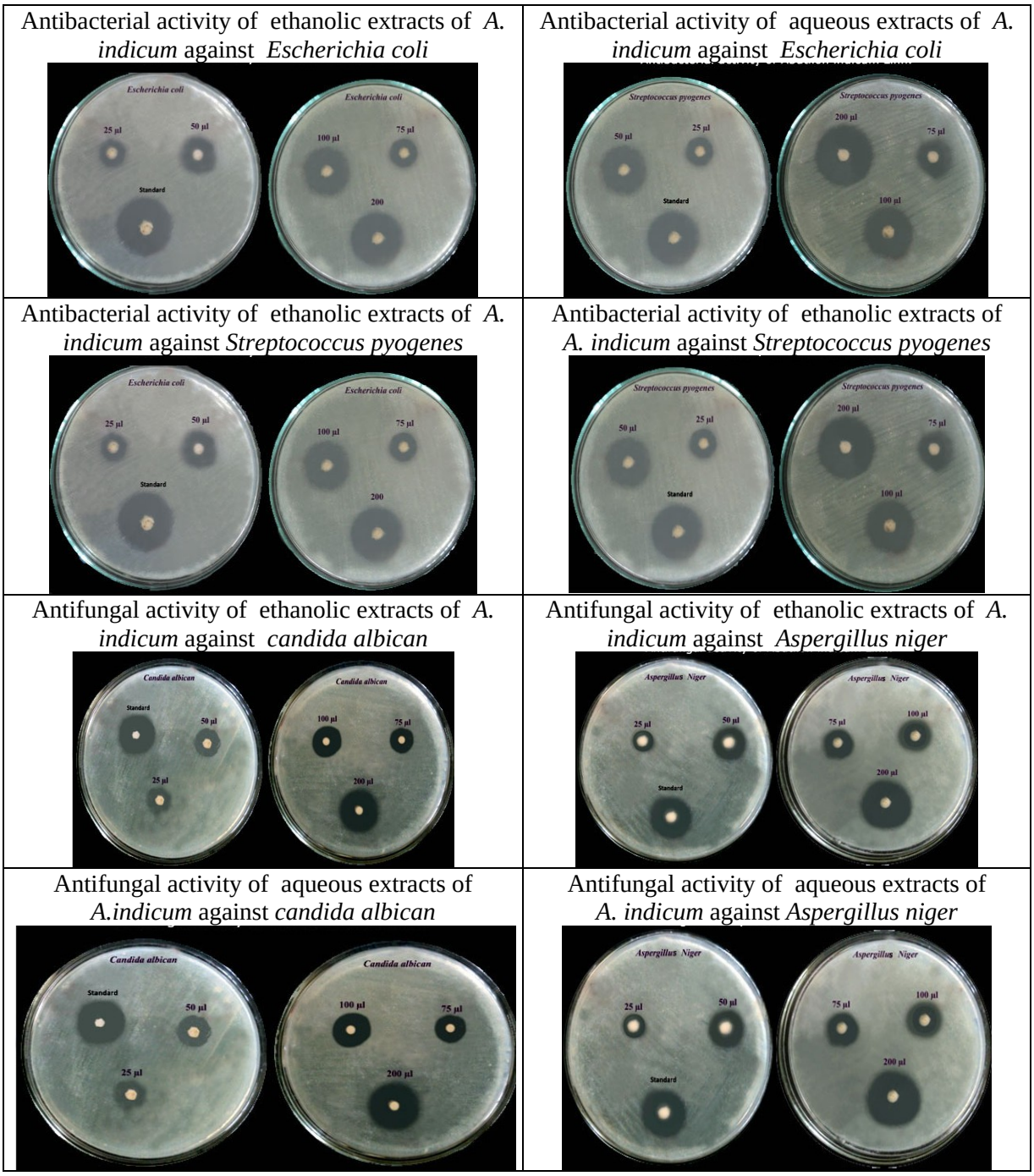
Values were expressed as Mean ± SD

Table.2 Antifungal Activity of Ethanolic and Aqueous Extracts of *A. indicum* against Fungal Strains

S. No.	Test Microorganisms	Zone of inhibition in mm					Standard drug Fluconazole
		25 mg	**50 mg**	**75 mg**	**100 mg**	**200 mg**	
		Ethanolic extracts					
1.	*Candida albican* (mm)	15 ± 0.28	17 ± 0.42	18±0.49	21 ± 0.70	22 ± 0.77	23 ± 0.91
2.	*Aspergillus niger* (mm)	13 ±0.21	16± 0.49	18± 0.63	20 ± 0.77	21 ± 0.84	20 ± 0.98
		Aqueous extracts					
1.	*Candida albican* (mm)	14 ±0.28	16 ± 0.42	17 ± 0.49	20 ± 0.70	21 ± 0.77	20 ± 0.91
2.	*Aspergillus niger* (mm)	13 ±0.21	15 ± 0.49	16 ± 0.63	18 ± 0.77	20 ± 0.84	19 ± 0.98

Values were expressed as Mean ± SD

Plate.1 Antibacterial Activity and Antifungal activity of Ethanolic and Aqueous Extracts of *A. indicum* against *Pathogens*



The growth inhibition zone measured ranged from 21 -22 mm for the tested bacteria and ranged from 3 -14 mm for fungal strains. The inhibitory effect of *Abutilon indicum* plant ethanolic and aqueous extracts showed at 25, 50, 75, 100, 200mg/ml were (15, 17, 18, 20, 22mm) and (14, 16, 17, 18, 20mm) for *Escherichia coli*, (14, 16, 17, 19, 21mm) and (14, 16, 17, 18, 20mm) for *Streptococcus pyogenes* for bacterial strains

and were (15, 17, 18, 21, 22 mm) and (14, 16, 17, 20, 21mm) for *Candida albican*, (13, 16, 18, 20, 21mm) and (13, 15, 17, 18, 20mm) for *Aspergillus niger* for fungal strains respectively (Plate 1).

The results shows that *Abutilon indicum* extracts were found to be more effective against all the microbes tested. The ethanolic extract showed greater zone of inhibition than aqueous extracts. In the present study, ethanolic extracts obtained from *Abutilon indicum* plant shows significant activity against most of the tested bacterial and fungal strains. The results were compared with standard antibiotic drugs Chloramphenicol for bacteria and Fluconazole for fungi. The results of the present study showed that ethanol extracts of *Abutilon indicum* Linn. whole plants has potent anti microbial activities. Thus the ethanolic whole plants of *Abutilon indicum* extracts may be attributed to the presence of phenolic compounds and flavonoids etc., Therefore, further investigation is needed to isolate and identify the active compounds present in the plant extract and its efficacy.

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