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Antimicrobial potential of Hydroalcoholic extract of *Terminalia chebula* Retz. fruit against uropathogens

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Abstract

In Tibet, *Terminalia chebula* Retz. is known as the "King of Medicine." Because of its amazing therapeutic properties, it is constantly at the top of the "Ayurvedic Materia Medica" list. The goal of this investigation was to see if solvent extracts of *T. chebula* fruit have any antibacterial activity in vitro against *E. coli* and *Pseudomonas* uropathogens. In this investigation, uropathogenic microorganisms were employed. For antibacterial susceptibility testing, several extractions of *T. chebula* fruits were done using solvents of Agar well diffusion techniques were utilized. The hydroalcoholic extract of *T. chebula* fruits was shown to have the best antibacterial activity against both UTI bacteria in the test isolates. give support for the use of *Terminalia chebula* fruit in folk medicine to treat a variety of infectious disorders, and might aid in the development of alternative or complementary therapy for uropathogens.

Infectious disorders produced by harmful microorganisms are still a severe hazard to public health globally, despite considerable advancements in medical science[1]. Antimicrobial resistance among microbial pathogens causing nosocomial and community-acquired illnesses has become one of the more concerning current developments in infectious diseases. As a result of the effective pressure of antimicrobial use, several kinds of antimicrobial drugs have grown less effective[2]. This problem of resistance encourages researchers to look for novel antimicrobial agents from other sources to treat infections and overcome resistance and adverse effects associated with presently existing antimicrobials.

Crude extracts of medicinal plants stand out as viable sources of possible resistance modifying agents, and the Indian biosphere, with its many plant species, offers to be a potential source of such chemicals. Urinary tract infections (UTIs) are the second most prevalent form of infection in the body, causing morbidity and death in people of all ages, from newborns to the elderly. In uropathogenic bacteria, particularly Escherichia coli, the principal aetiological cause of UTIs, a high degree of antibiotic resistance is critically important. It has evolved resistance to antibiotics that are commonly used, including as extended-spectrum cephalosporins, fluoroquinolones, and carbapenems[3,4]. *E. coli*, *Klebsiella pneumoniae*,

Pseudomonas aeruginosa, Staphylococcus aureus, and other bacteria are widely detected microorganisms that cause urinary tract infections. *Terminalia chebula* is a medicinal plant[5] with a wide range of health benefits due to its amazing healing power[6-8]. Although various research has demonstrated antibacterial activity of *T. chebula* fruit extracts against a variety of microorganisms[9-12], comprehensive and methodical examinations of *T. chebula* fruit extracts antimicrobial potential against multidrug-resistant uropathogens appears to be questionable. The goal of this study is to see antibacterial activity with the help *T. chebula* fruit extracts in against UTI pathogens Escherichia coli and Pseudomonas, which causes most UTIs.

Collection, identification and processing of plant material :

The fresh matured fruits of *T. chebula* were collected from local market (Bhopal, Madhya Pradesh, India) and were identified and authenticated by a Botanist, Prof. plants identification done by Dr. Suman Mishra Consultant Taxonomist from an xcellventure Bhopal (M.P.) ISO 9001:2008; ISO 14001: 2004; OHSAS 18001: 2007 Company. The fruits were washed thoroughly in tap water, dried and seeds were separated. The pericarp of fruits were then milled to fine powder.

Preparation of crude extracts :

60 gr. dried plant bark powder was extracted with 500 ml organic solution of ethanol and D.W. in Soxhlet export. Extraction was performed at 45°C over 72 h. And the extract was evaporated at 45°C to form a paste. The extract was further concentrated by recovering the excess solvents in the coarse raw material on a rotary evaporator at low pressure. The extracts were stored in airtight plastic vials at Room temperature for further study.

Test microorganisms :

For antimicrobial test first collected were Urine samples in different pathology labs in Bhopal. and then isolated and Biochemical test was done in the research laboratory for confirmation of *E. coli* and *Pseudomonas*.

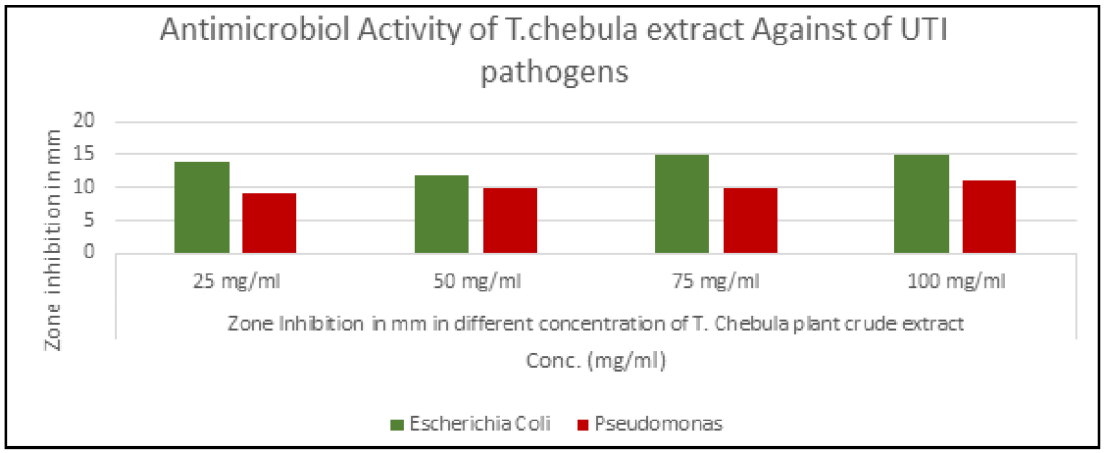
Disc Diffusion Method :

Isolates were tested for antimicrobial susceptibility testing by the standard Kirby-Bauer disc diffusion method according to Bauer *et al*.[13] Mueller-Hinton agar plates were incubated for 24 h after inoculation with organisms and placement of discs. After 24 h the inhibition zones were measured. The T. chebula plant Hydro alcoholic Extract discs for the isolates were used; extract (25,50,75 and 100 mg/ml), Antibiotic discs were obtained from HiMedia Laboratories, Mumbai, India.

The results of the antibacterial activity of the extracts of *T. chebula* fruits assessed by agar well diffusion method is shown in Table-1. The tested extracts demonstrated varying degrees of strain specific antibacterial activity against the test isolates. The inhibition zone diameter against isolates, *T. Chebula* Hydroalcoholic extract was found to be most effective in E. coli which was15.66 ±0.12 mm at 75 mg/ml. while Pseudomonas microbiol activity was 11.46±0.1 mm at 100 mg/ml as shown in Graph 1.

Table-1. Table showing the results of the antimicrobial assay of *T. chebula fruit extract*

Bacteria Name	Zone Inhibition in mm in different concentration of *T. Chebula* plant crude extract			
	25 mg/ml	50 mg/ml	75 mg/ml	100 mg/ml
Escherichia Coli	14.13±0.24	12±0.82	15.66±0.12	15±0.16
Pseudomonas	9.66±0.28	10±0.43	10±0.05	11.46±0.11



Graph1: Antibacterial activity of *T. chebula* extract against *E. coli* and *Pseudomonas*

With the rise in microorganism resistance to presently employed antibiotics and the expensive expense of synthetic compound manufacturing, new antimicrobials from other sources are needed to combat infections resistant to existing medicines[14]. Medicinal herbs might be one of those options because they are generally safe, inexpensive, and impact a wide spectrum of antibiotic-resistant bacteria. Plants have a great chemical variety that has yet to be fully investigated as a potential source of antibiotic resistance modifying or modulating chemicals[15,16].

Calculation of IC50 :

Various concentrations of hydroalcoholic extract were taken for the study and IC50 values which shows 50% inhibition was calculated using regression analysis in MS excel.

The antimicrobial susceptibility testing of *T. chebula* fruit extracts against uropathogens revealed that the extract had varied degrees of strain-specific antibacterial activity against the test isolates, as previously reported. To see if our data back up the traditional usage of *Terminalia chebula* fruits for infection prevention and resistance modification against *E. coli* and Pseudomonas aeruginosa. This might pave the way for the development of an efficient alternative antibacterial agent derived from plants in the near future. More research is needed to determine the medicinal value of

this plant material. This optimistic research might be a first step in this direction.

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