Antibacterial Activity of *Acacia Catechu* Seed Against Urinary Tract Pathogens

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Abstract

Aim: The aim of the study is to investigate the antibacterial efficacy of the *Acacia catechu seed* extract against selected Urinary tract pathogens

Background :*Acacia catechu* is known as Cutch tree.This plant has following medicinal properties: Astringent, Bactericidal, Refrigerant, Stimulant, Masticator, Expectorant. Acacia catechu seeds are flat, dark brown and measure 5-8 mm in diameter. The seeds are edible and the extract is useful in the treatment of many medical conditions in the Ayurveda.

Reason: Urinary tract infections are most common infection caused in woman, hence this study can determine the antibacterial effectiveness among the pathogens causing urinary tract infections.

***Key words**: Acacia catechu, Medicinal, Urinary tract infection, Antibacterial.*

Introduction

The acknowledgment of traditional medicine as an elective type of health insurance and the in-efficiency and other ill-effects of accessible anti-microbials has driven researchers to investigate the capability of therapeutic plants which are a rich wellspring of antimicrobial agents and effective medication[1]. The development of bacterial resistance from by and by accessible antibiotics has required the search for new antibacterial agents[2]. The gram positive bacterium, for example, Staphylococcus aureus is predominantly in charge of post operative wound contaminations, endo-carditis, toxic shock syndrome, osteomyelitis and sustenance harming[3]. Bacillus subtilis are rod shaped aerobic microorganisms and are accounted for to have some pathogenic part[4] . The gram negative bacterium, for example, Escherichia coli is available in human Intestine and bring down lower urinary tract contamination, coleocystis or septicemia[5] . Pseudomonas predominantly causes urinary tract contamination, wound or burn infection, chronic otitis media, septicemia and so forth in people[6] . Work has been done which go for knowing the diverse antimicrobial and phyto-chemical constituents of medicinal plants and utilizing them for the treatment of microbial contaminations as conceivable adjust locals to chemically manufactured medications to which numerous irresistible microorganisms have turned out to be resistant[7]

Acacia catechu is a moderate size deciduous, thorny tree common to Southern Asia and widely distributed in India.It is commonly known as “khair” and its various parts have been used since ancient times in Ayurvedic medicine[8,24,26] .In Ayurveda, is used in the treatment of cough, dysentery, throat infections, chronic ulcers and wounds[9,25] . Catechu is also reported for its anti-inflammatory,antimicrobial immunomodulatory, antipyretic, antidiarrhoeal and hypoglycemic[10-13] properties. Urinary tract infections occur when bacteria enter the urinary tract through the urethra and begin to multiply in the bladder[14.] The bark of this plant is strong antioxidant, anti-inflammatory, anti-bacterial, astringent and antifungal in nature. The extract of this plant is used

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to treat diarrhoea and sore throats, also useful in high blood pressure, bronchial asthma, cough, leucorrhoea, dysentery, colitis, gastric problems, and leprosy. It is used as mouthwash for sore throat, gingivitis, mouth, gum, dental and oral infections. The heartwood is used to yield concentrated aqueous extract i.e. cutch which is cooling, astringent and digestive. It is useful in boils, cough, ulcers and eruptions of the skin. Decoction of the bark is given internally in case of leprosy. Acacia spp. produces gum exudates, traditionally called gum Arabic or gum Acacia, which are widely used in the food industry such as adhesives, stabilizers, emul- sifiers, and in chronic renal failure[15-16] . Main chemical constituents of Acacia catechu are catechin, (-) epicatechin, lupeol, procyanidin AC, kaempferol, epigallocatechin, acid, quercetin, poriferasterol glucosides, poriferasterol acyglucosides, lupenone, epicatechin gallate, epigallocatechin gallete rocatechin, phloroglucin, protocatechuic, dihydrokaemferol, taxifolin, (+)-afzelchin gum and mineral[17-23] . The chief phytoconstituents of the heartwood are catechin and epicatechin.

Urinary tract infections (UTIs) are the most common conditions requiring medical treatment with 6-10% of all young females demonstrating bacteriuria[27-28] . The incidence of UTI's increases with age and 25-50% of females aged 80 or more have bacteriuria[29] . Urinary tract infection are a continuous issue overall which are caused by microbial invasion to different tissues of the urinary tract. Urine is normally sterile, that is, free of microscopic organisms, infections, and parasites[30] . A urinary tract disease is a condition in which at least one sections or more of the urinary framework (the kidneys, ureters, bladder, and urethra) become contaminated. UTIs are a standout amongst the most widely recognized bacterial contaminations in all general population , with an expected general rate of 18 for every 1000 person per year. It is the most regular bacterial disease recorded in older people[31] . Moreover, UTIs are a noteworthy reason for clinic affirmations and are related with significant morbidity and mortality and additionally a high financial burden[32] . The financial burden of using the emergency department for the treatment of UTIs is evaluated to be $2 billion US dollars every year [33] . UTIs can show in a wide clinical range from bacteriuria with restricted clinical indications to sepsis[34] . The primary essential hazard factors for the advancement of UTI include: age, presence of catheter, diminished mental status, chronic comorbidities, neurogenic bladder, urinary incontinence, diabetes, male prostatic hypertrophy, being female, gynecological disorders etc. Secondary hazard factors incorporate other contamination, dehydration, immobility, colonization with resistant organism, and poor individual cleanliness. Older adults, particularly ladies, are at increased risk of secondary disease after the advancement of a urinary tract contamination[32] . UTIs are classified into three groups, depending on the factors that trigger the infections such as complicated and uncomplicated, depending on whether the infection is occurring they are classified as Primary or recurrent, based on signs and symptoms they are classified as asymptomatic and symptomatic[34]. Most of the urinary tract infections are caused by gram-negative bacteria like Escherichia coli, Klebsiella sp., Pseudomonas aeruginosa. The treatment mainly involves use of antibiotics but the pathogenic bacteria are becoming increasingly resistant to antibiotics[35-36] . Diarrhoea is a syndrome that can be caused by different bacterial, viral and parasitic pathogens. Accurate understanding of the cause of diarrhoea in a given setting is an onerous task that requires systematic monitoring of the various pathogens. The availability of a well equipped clinical microbiology laboratory is a prerequisite to undertake such studies. Clinical studies conducted at the National Institute of Cholera and Enteric Diseases (NICED), which includes hospital and community, based surveillance for diarrhoea was focused on common enteric pathogens using conventional assay[37-39] . The present study aimed at antibacterial potential of Acacia catechu seeds.

Materials and Method

Plant Material:

Acacia seed is obtained from Green chem Herbal extract and formulations, Bengaluru .

Antibacterial activity:

Microorganisms tested

1. S. a – *Staphylococcus aureus* MTCC3381
2. E. c – *Escherichia coli* MTCC739
3. K. p – *Klebsiella pneumonia* MTCC432
4. P. a – *Pseudomonas aeruginosa* MTCC424

Minimum Inhibitory Concentration (MIC)

The minimum inhibitory concentration (MIC), which is considered as the least concentration of the

sample which inhibits the visible growth of a microbe was determined by the broth dilution method.

Preparation of inocula

Organisms were subcultured on nutrient agar, followed by incubation for 24h at 37°C. Inocula were prepared by transferring several colonies of microorganisms to sterile nutrient broth. The suspensions were mixed for 15sec and incubated for 24h at 37 °C. Required volume of suspension culture was diluted to match the turbidity of 0.5 McFarland standard (1.5x108 CFU/mL).

Preparation of sample

Samples were prepared in dimethylsulphoxide (DMSO) at the concentration of 2 mg/ml.

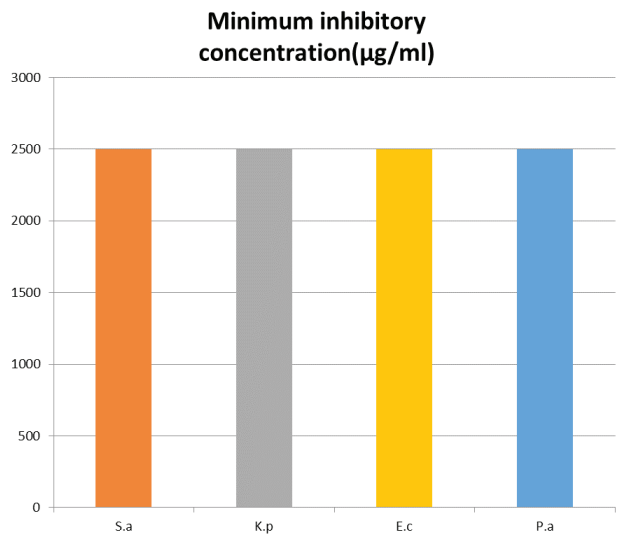
Broth dilution assay

A series of 15 tubes were filled with 0.5 ml sterilized nutrient broth. Sequentially, test tubes 2□14 received an additional 0.5 ml of the Sample serially diluted to create a concentration sequence from 5000 □ 1.2.µg. The first tube served as the control. All the tubes received 0.5ml of inoculum. The tubes were vortexed well and incubated for 24h at 37°C. The resulting turbidity was observed, and after 24 h MIC was determined to be where growth was no longer visible by assessment of turbidity by optical density readings at 600nm.

Result and Discussion

Acacia catechu seed was tested against *Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumoniae which are* the major pathogen that commonly causes urinary tract infection. Microbroth dilution was performed Which revealed no growth from the concentration at 2500mg/ml. The values recorded are means of three independent analysis ± Standard Deviation (n=3). Different research have been led on antimicrobial action of A.catechu extract, and exhibited good to excellent action contingent upon the organism included. An aqueous extract of A.catechu displays direct movement against a numerous drug resistant Salmonella typhi which was conducted by rani et al[40] Patel et al demonstrated that an aqueous extract of A.catechu resin from heartwood displayed excellent action against Bacillus subtilis, while a petroleum ether extract gave amazing activity against Pseudomonas aeruginosa, and a chloroform remove was dynamic against Staphylo-coccus aureus. No recognizable proof of dynamic constituents was led[41] .

Joshi et al conducted a study based on An ethyl acetic acid derivation concentrate of heartwood which displayed antimicrobial action against B. subtilis, S. aureus, Klebsiella pneumonia, and Shigella species[42] . A methanol extract of A.catechu was appeared to have antimicrobial activities against B. subtilis, S. aureus, Sal.typhi, Escherichia coli, P.aeruginosa, and Candida albicans studied by Negi and Dave in 2010[43] . Voravuthikunchai et al states that Aqueous and ethanol concentrates of A. catechu showed direct action against hospital isolates of methicillin-resistant S. aureus[44] . Lakshmi et al have additionally exhibited that ethanol concentrates of A. catechu exhibit inhibitory movement against different organisms[45] .



Conclusion

The study reveals that *Acacia catechu* could be useful in the management of Urinary tract infection. Rotavirus and cholera vaccines are now available as prescription product in India for the first time after a hiatus of 30 years. Not much progress has, however, been made with a Shigella vaccine. It would be interesting to see how these vaccines would ameliorate the burden of enteric infections in settings of diarrhoea in endemic areas all over India[46] .

Ethical Clearance- Research department, Saveetha dental college

Source of Funding- Self

Conflict of Interest - Nil

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