

Antibacterial Activity of *Citrullus Colocynthis* against different types of bacteria

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Abstract

In the present study, antibacterial efficiency of *Citrullus colocynthis* (L.) schrad was studied on seven types of pathogenic bacteria isolated from different sites of infection, *Escherichia coli*, *Klebsiella pneumonia*, *Proteus mirabilis*, *Streptococcus pneumonia*, *Streptococcus agalactia*, *Streptococcus mutans* and *Staphylococcus aureus*. Water and ethanol extract were used for antibacterial assay. The inhibitory effects of these extracts were compared with standard antibiotics, cefotaxime. The ethanolic extract showed inhibitory activity against *Escherichia coli*, *Proteus mirabilis*, *Staphylococcus aureus*, *Streptococcus agalactia*. Water extract exhibited less or no activity against all types of bacteria. Results indicated that ethanolic extract has a similar inhibitory effect with cefotaxime.

Keywords: *Citrullus colocynthis*, ethanol extracts, cefotaxime, antibacterial activity

1. Introduction:

Traditional medicine is an important source of potentially useful compounds for the development of phototherapeutic agents (Lwu *et al.*, 1999). The search for agents to cure infectious diseases began long before people were aware of the existence of microbes. These early attempts used natural substances, usually nature plants or their extracts and many of these herbal remedies proved successful (Arora and Kaur, 1999). Medicinal plants have been curing various disorders in humans from the time immemorial and considered an intermittently associated and integral part of the Indian traditional medical system, better known as the Ayurvedic system of medicine (Bausu, 2002). The spread of anti-drug resistant strains of microorganisms necessitates the discovery of new classes of antibacterial compounds that inhibit these resistance mechanisms. Natural products continue to play a major role as active substances, model molecules for the discovery, and validation of drug targets. Medicinal plants continue to be an important therapeutic aid for alleviating ailments of human kind and there is an ever increasing demand for more and more drugs from plant sources (Nair *et al.*, 2008). *Citrullus colocynthis* L. belongs to the melon family of cucurbitaceae and it produces bitter flavored fruits about the size of cantaloupe and seeds rich in oil and protein. It is a long lived perennial and grows wild in sandy soil under xerophytic conditions, young fruits are fleshy, mottled with dark green and usually turn yellow when ripe, the fruit of *Citrullus colocynthis* has been used medicinally since ancient times. Traditionally, fruit of *Citrullus colocynthis* was used for the treatment of diabetes, microbial disease, ulcer, inflammation, jaundice and urinary disease in Asian and African countries (Rajamanickan *et al.*, 2010). Cefotaxime the third generation of cephalosporin is a strong predictor of the presence of multi drug resistance. Retreatment of bacteria with this antibiotic may result in cefotaxime resistant and production of refractory strains.

Aims of study: The present study aimed to determine the antibacterial potential of *Citrullus colocynthis* against different types of pathogenic bacteria.

2. Material and methods:

2.1 Plant material:

Aerial parts and fruits of *Citrullus colocynthis* were collected in early September 2012 during the flowering and fruiting stage in Sulaimaniah Iraq. Mature seed was separated manually from the pulp of the plant and the seeds were separated manually from the pulp of the plant and then the pulp was dried in shadow and ground in a grinder into a coarse powder and prepared for analysis.

2.2 Preparation of extract:

Powder(10 gm) was used for extraction. Extracts were prepared separately with different solvent namely water and ethanol. The mixtures were filtered through whatman no.1 filter paper and kept it in incubator at 37°C till ethanol had completely evaporated from mixture. The dried extracts were dissolved in freshly prepared normal saline (0.9%), and used for the assay of antimicrobial activity (Rose *et al.*, 2008).

2.3 Test organism:

Both gram negative and gram positive microorganisms were used for the test. The gram negative bacteria include *Escherichia coli*, *Klebsiella pneumonia* and *Proteus mirabilis* and gram positive organisms include *Staphylococcus aureus* *Streptococcus agalactia* , *Streptococcus pneumonia* and *Streptococcus mutans*. All bacterial strains were maintained on freshly prepared blood agar. The bacterial strains were isolated from different site of infection procured from department of microbiology-College of Medicine-Babylon University.

2.4 Antibacterial activity:

The agar diffusion method (Bauer *et al.*, 1966) was followed for the antibacterial susceptibility test. A loopful bacteria was taken from the stock culture and dissolved in 0.1 ml of saline. All the tests were done by placing the disk (6mm diameter) impregnated with (200ml) extracts on the Mueller Hinton agar surface previously inoculated with 10 ml of MHA liquid medium with gram negative and gram positive bacteria.

3. Results:

3.1 Antimicrobial assays:

In the present study investigation antibacterial effects of *citrullus colocynthis* (L.) schrad against seven microbial species were recorded. Table (1) summarizes the microbial growth inhibitory by (water, ethanol) extract of *citrullus colocynthis*. Ethanol extract showed maximum inhibition against *Escherichia coli* (20cm) followed by *Proteus mirabilis* (16 cm) and *Staphylococcus aureus* (12cm). There was a least effect on *Streptococcus agalactia* (8 cm), there was no effect on *Streptococcus pneumoniae* and *Klebsiella pneumonia*. Water extracts present with no effect in all bacterial species, Figure (1). Table (2) summarizes the antibacterial effect of cefotaxime against different types of tested pathogenic bacteria. Results shown that bacterial isolates isolated from different site of infection were resistance to antibacterial cefotaxime. *Escherichia coli* inhabit in intestine, normally harmless, but certain strains bind to epithelial wall causes release of toxin that adversely affect the intestine may be gastroenteritis as well (Gurdeeban *et al.*, 2011). Since ancient time has been dependent on plants for food, drink, shelter, equipments, dental care and medicines for many diseases (Idu *et al.*, 2007). The preliminary qualitative phytochemical investigation carried out on *C. colocynthis* showed it consist of secondary metabolites such as saponins, tannins, alkaloids, glycosides and flavonoids (Najafi *et al.*, 2010). The antimicrobial study by agar disc diffusion method shows that the plant has an antimicrobial activity comparable to that of commercial antibiotic cefotaxime. Result shown that some species of isolated were resistance to antibacterial activity cefotaxime and sensitive to *citrullus colocynthis* ethanol extract. Tannis have been reported to prevent the development of microorganisms by precipitating microbial protein and making nutritional proteins unavailable for them (Sadipo *et al.*, 1991). Rose Mary e al., (2008) and Ayana Ravi *et al.*, (2008) screened antimicrobial activity of *citrullus colocynthis* against *Bacillus Subtilis*, *Escherichia. Coli*, *Staphylococcus aureus*, *pseudomonas aeruginosa*, *proteus vilgaris* and *Klebsiella pneumonia*. Among these bacteria, *Escherichia. coli*, *proteus vilgaris* and *Staphylococcus aureus* were shown high inhibition zone. More of less similar results were found in this study. Flavonoids of *citrullus colocynthis* considered as microbial inhibitor which are resistant to antibiotics (Linuma *et al.*, 1994). It was found that alkaloids were present in the ethanolic extracts. Herbal medicine represents one of the most important fields of traditional medicine all over the world (Hamil *et al.*, 2003). To promote the proper use of herbal medicine and to determine their potential as sources for new drugs, it is essential to study medicinal plants, which folklore reputation in amore intensified way (Cragy *et al.*, 1997). Results of this investigation offer a scientific basis or the use of *citrullus colocynthis* ehthanolic extracts to prevention of different types of infections and solved drug resistance problem.

4. Discussion:

Citrullus colocynthis is a valuable plant source of medicinally useful compound that has been traditionally used for several applications. The plant aerial parts and fruit extracts were being good source for the bioactive compounds that exhibited good antimicrobial properties. However, detailed study is required to find out the specific bioactive compounds responsible for antimicrobial property through various advanced techniques.

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Table (1) antibacterial activity of water/ ethanol extracts of citrullus colocynthis

Microorganisms	Water extract inhibition zone (mm)	Ethanol extract inhibition zone (mm)
<i>Escherichia. coli</i>	No effect	20
<i>Klebsiella pneumonia</i>	No effect	No effect
<i>Proteus mirabilis</i>	No effect	16
<i>Streptococcus pneumoniae</i>	No effect	No effect
<i>Streptococcus agalactia</i>	No effect	8
<i>Streptococcus mutans</i>	No effect	No effect
<i>Staphylococcus aureus</i>	No effect	12

Table (2) antimicrobial activity of cefotaxime against the pathogenic test isolates

Microorganisms	Cefotaxime
<i>Escherichia. coli</i>	Resistance
<i>Klebsiella pneumonia</i>	Sensitive 19mm
<i>Proteus mirabilis</i>	Sensitive 18mm
<i>Streptococcus pneumoniae</i>	Resistance
<i>Streptococcus agalactia</i>	Sensitive 16mm
<i>Streptococcus mutans</i>	Resistance
<i>Staphylococcus aureus</i>	Resistance

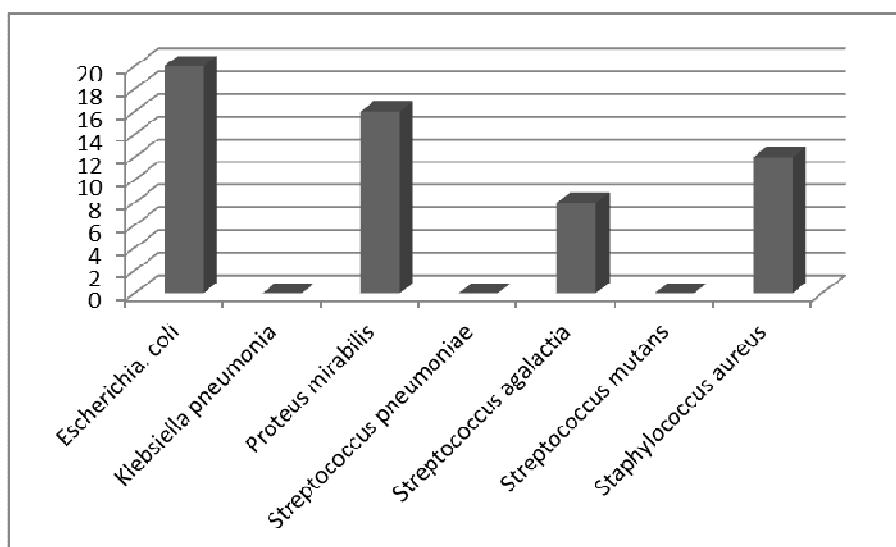


Figure (1) showed the effect of ethanol extract on different types of pathogenic bacteria

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