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ANTIBACTERIAL SCREENING OF *CUCUMIS SATIVUS* LINN AGAINST THE BACTERIAL PATHOGENS BY USING DIFFERENT SOLVENTS

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ABSTRACT

Cucumber (*Cucumis sativus* L.) is a popular vegetable crop used in Indian traditional medicine since ancient times, which is widely cultivated creeping vine plant in the cucurbitaceae family that bears usually cylindrical fruits, which are used as culinary vegetables. The fruit, seed, and stem are used in medicine.The antibacterial activity of *Cucumis sativus* by using petroleum ether, ethanol, acetone and aqueous extract were examined against the bacterium *Staphylococcus aureus*, *Klebsiella pneumoniae*, *E. coli* and *Bacillus subtilis*. Antibacterial activity was investigated by Disc diffusion method. The *Cucumis sativus* showed effective zone of inhibition against the four bacterial pathogens. Therefore the *Cucumis sativus* can be considered to be the promising source of antibacterial compounds.The obtained results provide a support for the use of this plant in therapeutic medicine. The plant studies can be a potential source of biologically active compounds as antibacterial, antifungal and anticancer agent.

Keywords : Vegetables, *Cucumis sativus*, Antibacterial activity.

Introduction

Cucumber (*Cucumis sativus* L.) is one of the monoecious annual crops in the Cucurbitaceae family that has been cultivated for over 3, 000 years (Okonmah, 2011). Cucurbitaceae is a plant family, also known as gourd family, which includes crops like cucumbers, squashes, luffas and melons. Cucurbits form an important and a big group of vegetables crops cultivated extensively in the subtropical and tropical countries. The family consists of about 118 genera and 825 species (Roopashree *et al*., 2008). Plants of this family have many medicinal and nutritional benefits (Gill and Bali, 2011.). With respect to economic importance, it ranks fourth in Asia (Eifediyi and Remison, 2010).

In India plants are widely used by all sections of people either directly as folk remedies or in different Indigenous systems of medicine or indirectly in the pharmaceutical preparations of modern medicines. Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources (Kubra Karakoca *et al.,* 2013).

Materials and Methods

The *Cucumis sativus* fruits were collected from the home garden. The fruits were dried under shade condition and cut into small pieces, pulverized in a grinder and store in sterile container for further use.

Test Organisms

The test microorganisms used for antimicrobial analysis Gram positive *Staphylococcus aureus* (MTCC 6571), *Bacillus subtilis* (MTCC 1133) gram negative *E.coli* (MTCC 15223), *Klebsiella pneumoniae* (MTCC 33495) werecollected from Microbial Type Culture Collection and Gene Bank (MTCC) Chandigarh. The bacterial strains were maintained on Nutrient Agar (NA).

Nutrient Broth Preparation

Pure culture from the plates were inoculated into Nutrient Agar plate and sub cultured at 37ºC for 24 hours. Inoculum was prepared by aseptically adding the fresh culture into 2 ml of sterile 0.145 mol/L saline tube and the cell density was adjusted to 0.5 McFarland turbidity standard to yield a bacterial suspension of 1.5×108 cfu/ml. Standardized inoculum was used for antimicrobial test.

Antibacterial Test

Antibacterial activity was carried out by using disc diffusion method (Bauer *et al*., 1996). The medium was prepared by dissolving 38 g of Mueller-Hinton Agar Medium (Hi Media) in 1000 ml of distilled water. The dissolved medium was autoclaved at 15 Lbs pressure at 121 ºC for 15 minutes (pH 7.3).

The autoclaved medium was cooled, mixed well and poured into Petri plates (25 ml/plate). The plates were swabbed with pathogenic bacterial culture *Escherichia coli, Klebsiella pneumoniae, Bacillus subtilis* and *Staphylococcus aureus*. The Sample loaded disc was then placed on the surface of Mueller-Hinton Agar medium. The standard drug streptomycin 30 mcg concentration disc was used for positive control and empty sterile disc was used for negative control.

The plates were kept for incubation at 37°C for 24 hours. At the end of incubation, inhibition zones were examined around the disc and measured with transparent ruler in millimetres. The size of the zone of inhibition (including disc) was measured in millimetres. The absence of zone inhibition was interpreted as the absence of activity (Kohner *et al.,* 1994; Mathabe *et al.*, 2006). The experiment was repeated triplicates.

Results

The antibacterial activity of *Cucumis sativus* using Petroleum ether, Acetone, Ethanol, and Aqueous extract against bacterial pathogens gram positive *Staphylococcus aureus, Bacillus subtilis* and gram negative *E. coli* and *Klebsiella pneumoniae* were studied.

The result obtained from antibacterial activity of *Cucumis sativus*by using petroleum ether, acetone, ethanol, and aqueous extract were presented in Table-I, Plate-I and Figure-I.

Table I : Antibacterial activity of *Cucumis sativus* against bacterial pathogens.

Sl.No	Bacterial Pathogens	Zone of Inhibition (mm)				
		Streptomycin	Petroleum ether	Acetone	Ethanol	Aqueous
1	*Staphylococcus aureus*	24.66 ± 0.47	13.00±0.81	12.66±0.47	11.66±0.47	NZ
2	*Bacillus subtilis*	21.33 ± 0.47	12.66±0.47	12.00±0.81	11.33±0.47	NZ
3	*Klebsiella pneumoniae*	19.00 ± 0.81	13.33±0.47	16.33±0.94	14.66±0.94	NZ
4	*Escherchia coli*	23.33 ± 0.94	13.00±0.81	12.33±0.94	12.00±0.81	NZ

*Each value is a mean of three data *NZ- No zone *mm- millimeter

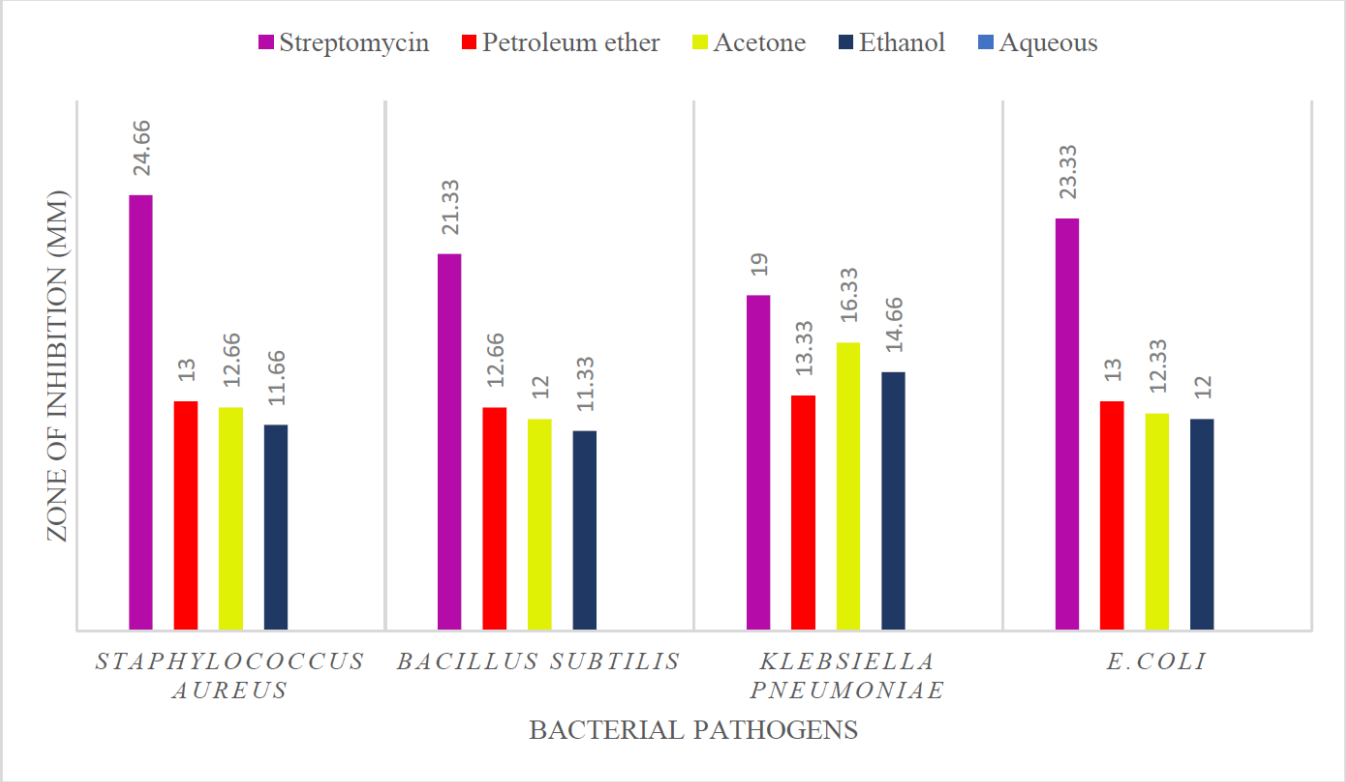
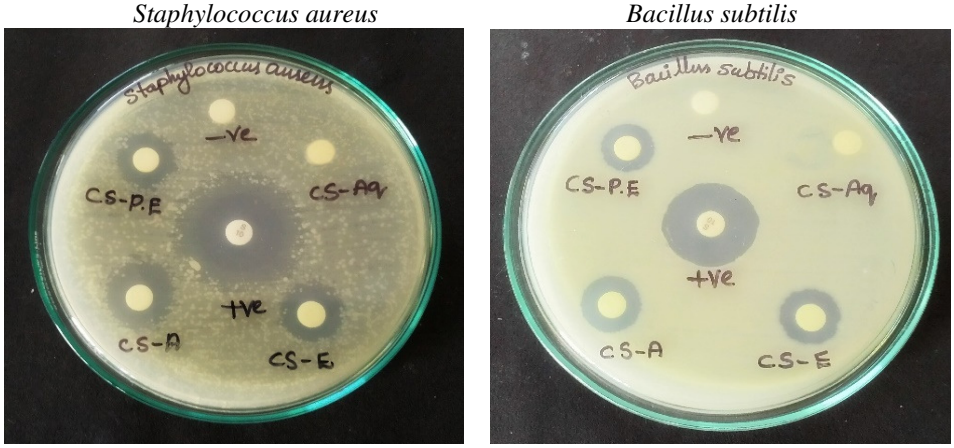


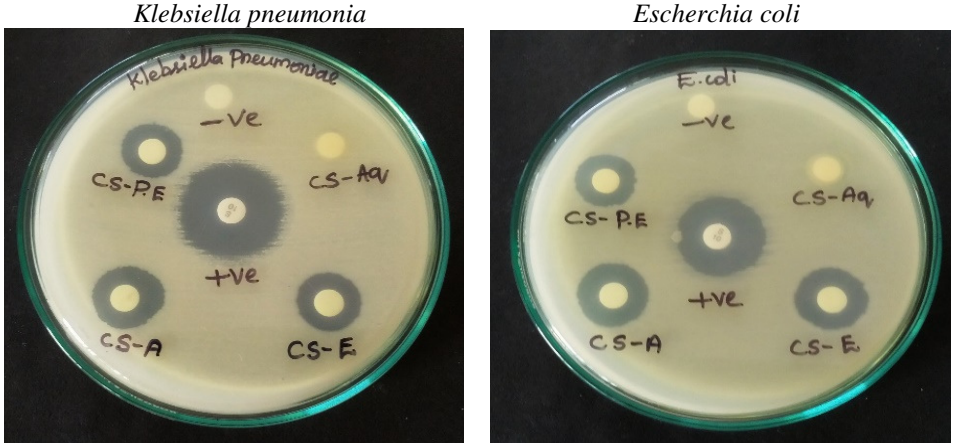
Fig. 1 : Antibacterial activity of *Cucumis sativus* against bacterial pathogens.

The petroleum ether extract of *Cucumis sativus* showed maximum activity against the pathogen *Klebsiella pneumoniae* (13.33±0.47) followed by *Staphylococcus aureus* (13.00±0.81) *E. coli* (13.00±0.81),and lowest zone of inhibition against the pathogen *Bacillus subtilis* (12.66±0.47). The acetone extract of *Cucumis sativus* showed highest zone of inhibition against the pathogen *Klebsiella pneumoniae* (16.33±0.94) followed by *Staphylococcus aureus* (12.66±0.47) and *E.coli* (12.33±0.94) and lowest zone of inhibition against the pathogen *Bacillus subtilis* (12.00±0.81). The ethanol extract of *Cucumis sativus* showed maximum against the pathogen *Klebsiella pneumoniae* (14.66±0.94) followed by *E.coli* (12.00±0.81) *Staphylococcus aureus* (11.66±0.47) and lowest zone of inhibition against the pathogen *Bacillus subtilis* (11.33±0.47). In the aqueous extract of *Cucumis sativus* no zone of inhibition in four bacterial pathogens.

Staphylococcus aureus *Bacillus subtilis*



Klebsiella pneumonia *Escherchia coli*



*Cs – *Cucumis sativus*, +ve – Streptomycin, P.E - Petroleum ether, E- Ethanol, A- Acetone, Aq-Aqueous

Plate I : Antibacterial activity of *Cucumis sativus* against bacterial pathogens.

Discussion

Many infection disease have been known to be treated with herbal remedies throughout the history of mankind. Natural products either as pure compounds or as standardized plant extract, provide unlimited opportunities for new drug leads because of the unmatched availability of chemical diversity. (Bandow *et al*., 2003).

The antibacterial assay showed that the aqueous extracts were inactive against *Staphylococcus aureus, Escherichia coli* and *Klebsiella pneumoniae* the microorganisms tested. These results are well predicted as the extracts from organic solvents exhibit more significant antimicrobial activities compared to the aqueous extracts (Fiona How Ni Foong *et al*., 2015).

The results related to the claims of the extract of *Cucumis sativus* were active against *Staphylococcus aureus* this emphasized on the presence of saponins, which contributed higher degree of antibacterial activities (Maatalah *et al.,* 2012). It is interesting to note that the pulp extract showed activity against gram-negative bacteria *Klebsiella pneumonia* (Ates *et al.,* 2003).

Conclusion

The results obtained from this study considering the bacterial activity using assay of different solvent extracts from the vegetable *Cucumis sativus*. It clearly revealed significant antibacterial activity against all the tested human pathogenic bacteria and it should be thoroughly being investigated for natural antibiotic properties.

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