Research Article

Antimicrobial Activity of *Cucumis sativas* (Cucumber) Flowers

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ABSTRACT

The present study was conducted to investigate the antimicrobial activities of *Cucumis sativus* medicinal plants. The cucumber (*Cucumis sativus*) is a widely cultivated plant in the gourd family Cucurbitaceae. It is a creeping vine which bears cylindrical edible fruit when ripe. Cucumbers actually come in a wide variety of colors, sizes, shapes and textures. The compound isolated from the ethyl acetate fractions of the *Cucumis sativus* flowers has a significant antimicrobial activity against bacteria and fungi. Four bacterial strains such as S. typhi, E. coli, E. faecalis and B. cereus and two fungal strains such as C.lunata and C.albicans were tested by using disc diffusion method. The anti-bacterial activity of the compound isolated from the ethyl acetate fractions of the *Cucumis sativus* flowers are almost comparable with the standard Chloramphenicol and the anti-fungal activity of the compound isolated from the ethyl acetate fractions of the *Cucumis sativus* flowers are almost comparable with the standard Fluconazole. These drugs are from *Cucumis sativus* flowers either destroy or inhibit the growth of bacteria and fungi. It has also the ability to prevent or treat bacterial and fungal infections. Further studies are highly needed for future drug development. The present research aims to compile medicinal values of *Cucumis sativus* flowers generated through the research activity using modern scientific approaches and innovative scientific tools.

Keywords: *Cucumis sativus* flowers, Antibacterial activity, Antifungal activity, Diffusion method, Chloramphenicol, Fluconazole etc.

INTRODUCTION

Cucumissativas (Cucumber) is a widely cultivated plant of gourd family which is eaten in the unripe, green form. Its fruit extract has shown free radical scavenging and analgesic activities in mice, carminative and antacid property (Sharma)[1]. Studies have shown the antioxidant and anti-ulcer effect of *Cucumis sativus* on rats. (Abiodun & Adeleke, 2010)[2] reported that the seeds of the plant served as good source of protein, fat, minerals and calcium. The use of biological agents in controlling the plant pathogens which cause serious disasters on Agricultural crops has turned great scope for biologists in exploring the active agents which have the potential to control such disease causing organisms. Cucumber, *Cucumis sativus*, is a warm season, vining, and annual plant in the family Cucurbitaceae grown for its edible cucumber fruit. It is widely cultivated in India, particularly in the southern states. Many different varieties of the plant are traded in the global market. In South India especially in Tamilnadu *Cucumis sativus* species is widely cultivated and is known for its economical and medicinal values.

The fruits contain Vitamin B1 and C, ascorbic acid, proteolytic enzyme, rutin, oxidase, succinic, maleic dehydrogenises and so on. Several investigations revealed antidiabetic[3], antiulcer[4], moisturizing[5], antioxidant and analgesic property[6] of the fruit extracts. The seed extracts were found effective on controlling the loss of body weight in diabetic rats[7] and against tapeworms[8]. Cytotoxic, antifungal[9] and antibacterial activity,[10] activities have been reported from leaves and stems extracts. Now a days, Natural sources, has been extensively investigated either for isolating pure compounds to develop new therapeutic agents or[11,12] screening of antioxidant and antibacterial extracts. These investigations could be used to tackle physiological disorder, pathogenic infections or to develop functional food[13,14]. The real importance of the plants is reflected by their antioxidant and antibacterial potential[15,16].

The aim of this study was to elucidate the antibacterial and anti-fungal activity of *Cucumis sativus* using the compound isolated from ethyl acetate fraction.

MATERIALS AND METHODS

Extraction and fractionation

Fresh flowers (1kg) of *Cucumis sativus* were collected at O. Koothur village, Ariyalur district, during the month of August and identified by Dr. John Britto, Director, Rabinat Herbarium and Center for Molecular Systematics, St.Joseph's College (Campus), Trichirappalli-2, Tamilnadu, India. The flowers were extracted with 90% ethanol (5x500ml). The combined alcoholic extract was concentrated in vacuo and the aqueous extract was successively fractionated with petroleum ether (60-80°C) (6x250ml), Peroxide free diethyl ether (4x250ml) and ethyl acetate (8x250ml).

Petroleum ether fraction and diethyl ether fraction did not yield any isolable material. Ethyl acetate fraction was taken for screening anti-microbial activities.

Antimicrobial Procedure

Screening of Antibacterial Activity

Bacteria tested

Four bacterial strains such as S. typhi, E. coli, E. faecalis and B. cereus were used throughout this investigation. All the bacterial cultures were obtained from Microbial Type Culture Collection (MTCC), Institute of Microbial Technology, Chandigarh, India. The young bacterial broth cultures were prepared before the screening procedure.

Preparation of inoculums

Stock cultures were maintained at 4°C on slopes of nutrient agar. Active cultures of experiment were prepared by transferring a loop full of cells from the stock cultures to test tube of Muller-Hinton Broth (MHB) that was incubated without agitation for 24 hrs at 37°C. The cultures were diluted with fresh Muller-Hinton broth to achieve optical densities corresponding to $2.0x10^6$ colony forming units (CFU/ml).

Antibacterial susceptibility test

The disc diffusion method was used to screen the antibacterial activity. *In-vitro* antibacterial activity was screened by using Muller Hinton Agar (MHA) obtained from Himedia (Mumbai). The MHA plates were prepared by pouring 15 ml of molten media into sterile petriplates. The plates were allowed to solidify for 5 minutes and 0.1% inoculum suspension was swabbed uniformly and the inoculums were allowed to dry for 5 minutes. The test sample of concentration 10mg/ml, 20mg/ml, 30mg/ml, 40mg/ml was loaded on 6 mm sterile disc. The loaded disc was placed on the surface of medium and the extract was allowed to diffuse for 5 minutes and the plates were kept for incubation at 37°C for 24 hrs.

At the end of incubation, inhibition zones formed around the disc were measured with transparent ruler in millimeter. Standard antibiotic Chloramphenicol of concentration 1mg/ml was used as positive control.

Screening of Antifungal Activity

Culture Media

The media used for antifungal test was Sabouraud's dextrose agar/broth of Hi media Pvt. Bombay, India.

Inoculum

The fungal strains were inoculated separately in Sabouraud's dextrose broth for 6 h and the suspensions were checked to provide approximately 105 CFU/ml.

Determination of antifungal activity

The agar well diffusion method (Perez, 1993) was modified. Sabouraud's dextrose agar (SDA) was used for fungal cultures. The culture medium was inoculated with the fungal strains separately suspended in Sabourauds dextrose broth. A total of 8 mm diameter wells were punched into the agar and filled with the test sample. Standard antibiotic (Fluconazole, concentration 1 mg/ml) was used as positive control and fungal plates were incubated at 37°C for 72 hrs. The diameters of zone of inhibition were observed and measured.

RESULTS AND DISCUSSION

The compound isolated from ethyl acetate fraction of Cucumis sativa flowers exhibited significant antimicrobial activity when compared with standard drug. It is evident from the data presented in Table I that the sample possesses antibacterial activity. The disc diffusion method result showed the zone of inhibition for 10 mg/ml as 0 mm, 7 mm, 6 mm and 0 mm, for 20 mg/ml as 7 mm, 9 mm, 8 mm and 7 mm, for 30 mg/ml showing 10 mm, 11 mm, 10 mm and 10 mm and for 40 mg/ml as 16 mm, 13 mm, 14 mm and 15 mm, against S. typhi, E. coli, E. faecalis and B.cereus respectively for the test sample when compared with standard drug Chloramphenicol showing 19 mm, 21 mm, 22 mm and 21 mm zone of inhibition respectively. Then it is evident from the data presented in Table II that the sample possesses antifungal activity. The disc diffusion method result showed the zone of inhibition for 10 mg/ml as 0 mm and 0 mm, for 20 mg/ml as 0 mm and 8 mm, for 30 mg/ml as 9 mm and 11 mm and for 40 mg/ml as 13 mm and 13 mm against C.lunata, and C.albicans respectively for the test sample when compared with standard drug Fluconazole showing 21mm and 19 mm of inhibition respectively. The above result shows that the activity of the compound isolated from ethyl acetate fraction of *Cucumis sativus* flowers shows significant antibacterial and antifungal activities and also the possession of antimicrobial activities against a number of microorganisms.

Table 1: Antibacterial activity of the compound isolated from ethyl acetate fraction of *Cucumis sativus* flowers in different strains

S. No.	Name Of Organisms	Zone of inhibition (mm)				
		Standard (Chloramphenicol)	Sample Concentration (mg/ml)			
			10	20	30	40
1.	*S.typhi*	19	0	7	10	16
2.	*E.coli*	21	7	9	11	13
3.	*E.faecalis*	22	6	8	10	14
4.	*B.cereus*	21	0	7	10	15

Table 2: Anti-fungal activity of the compound isolated from ethyl acetate fraction of Cucumissativas flowers in different strains

S. No.	Name Of Organisms	Zone of inhibition(mm)				
		Standard (Fluconazole)	Sample Concentration (mg/ml)			
			10	20	30	40
1.	*C.lunata*	21	0	0	9	13
2.	*C.albicans*	19	0	8	11	13

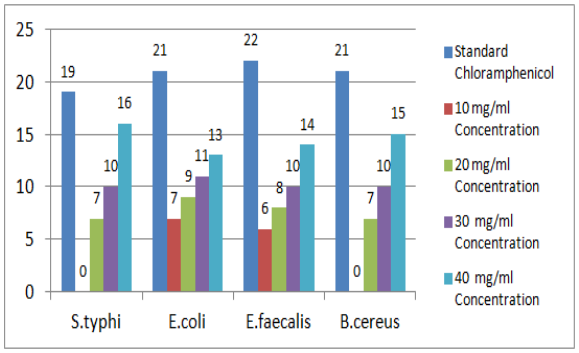
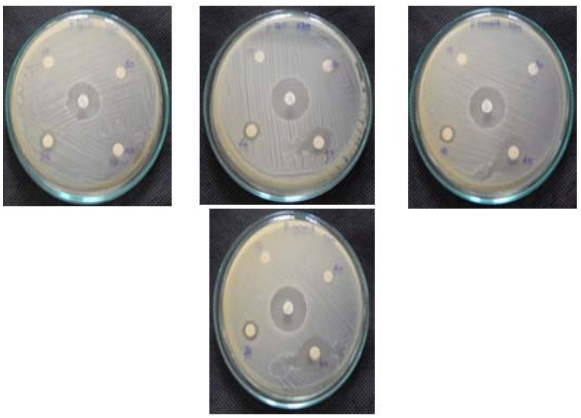


Figure 1: Graphical representation of anti-bacterial activity of the compound isolated from ethyl acetate fraction of *Cucumis sativus* flowers. (Standard: Chloramphenicol, concentration 1mg/ml)



S.typhi E.coli E.faecalis B.cereus

Figure 2: Inhibition of bacterial growth of the compound isolated from ethyl acetate fraction of *Cucumis sativus* flowers by Disc diffusion method.

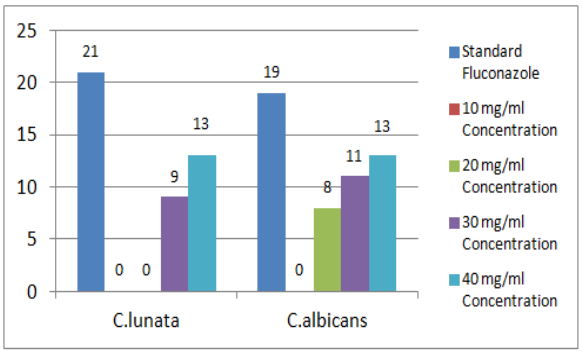
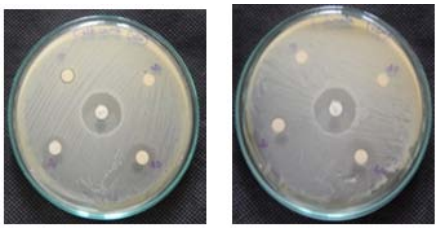


Figure 3: Graphical representations of anti-fungal activity of the compound isolated from ethyl acetate fraction of *Cucumis sativus* flowers. (Standard: Fluconazole, concentration 1 mg/ml)



C.lunata C.albicans

Figure 4: Inhibition of fungal growth of the compound isolated from ethyl acetate fraction of *Cucumis sativus* flowers by Disc diffusion method.

CONCLUSION

Based on the result of the above study on the *Cucumis sativus* we conclude that *Cucumis sativus* shows higher antibacterial and antifungal activity against following microorganisms like S.typhi, E.coli, E.faecalis, B.cereus and C.lunata, C.albicans. Also it justifies the claimed uses of flowers parts of the *Cucumis sativus* in the traditional system of medicine to treat various infectious disease caused by the microbes. Antimicrobial activities are aggravated by increasing the quantity of this compound, which can be used as an alternative for antibiotics. Therefore, it is necessary to characterize their active compounds for better understanding of its safety, efficacy and properties.

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