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Antimicrobial Activity and Phytochemical Analysis of *Coriander sativum* Against Infectious Diarrhea

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Abstract

The preliminary phytochemical study and *invitro* antimicrobial activity of *Coriander sativum* (Apiaceae) was investigated against some pathogens isolated from patients with infectious diarrhea. The various solvents extract like aqueous, methanol, chloroform, petroleum ether and hexane were screened for antimicrobial activity against Enterotoxigenic *E.coli*, Enteropathogenic *E.coli*,, *Salmonella typhimurium, Salmonella entertidis, Shigella dysentriae, Shigella flexineri, Candida albicans*, *Candida tropicalis* and *Candida krusei* isolated from diarrhoeal patients. The preliminary phytochemical analysis of the methanol extracts of the plant showed the presence of carbohydrates, flavonoids, aminoacids, steroids, sterols, saponins and tannins. The extracts were subjected for antimicrobial activity against at 200mg/ml concentration by disc diffusion method. The results of antimicrobial activity revealed that methanol extract of the plant exhibit good activity compared to chloroform and aqueous extracts to *E.coli, Salmonella* sp and *Shigella* sp. Petroleum ether and hexane extracts did not show any activity. None of extracts exhibits antifungal activity. The antimicrobial activities of extracts were compared with standard antibiotics.

Keywords: *Coriander sativum*, Diarrhoea, Disc diffusion Assay, Medicinal Plants

Introduction

Diarrhoea is an emergent problem in both developing and developed countries world wide and is responsible for high rates of and mortality among infants and children. *Rotavirus, E.coli, Salmonella, Shigella, Vibros* sp, *Candida* sp were the major etiological agents encountered in diarrhoea. Diarrhoeal disease was often treated with antimicrobial drugs, but this treatment is generally ineffective, due to the presence of drug resistance (Cid *et al.*, 1996). Medicinal plants play fundamental role in traditional medicine. According to Cowan 1999, about 25-50% of current pharmaceutical are derived from plants. Plants are rich in a wide variety of secondary metabolites, such as tannins, terpenoids, alkaloids, and flavonoids, which have been found *invitro* to have antimicrobial properties. Thus, screening of essential compounds for developing new antimicrobial drugs is important (Ahmed and Beg, 2001).

Coriander sativum. L belongs to the family Apiaceae. It is commonly known as *Coriander*, is a herb, which is considered both as a medicinal herb and a spice and has many medicinal properties. It has been used for digestive aid and to treat stomach disorders. *Coriander sativum* also, has spasmolytic activity and used as a medication for oral infection and diarrhoea (Chaudhry and Tariq, 2006). *Coriander* seeds have been referred as antidiabetic (Gray and Flatt, 1999). The present study was aimed to carry out the preliminary

phytochemical analysis and to screen *invitro* antimicrobial activity against some major diarrhoeal pathogens.

Materials and Methods

The fresh plant leaves were procured locally and were identified, confirmed and authenticated by the Department of Botany, Annamalai University, Tamilnadu, India. The leaves were washed, shade dried, powdered and extracted with aqueous, methanol, chloroform, petroleum ether and hexane for 48 hours with occasional shaking in a beaker. The extracts were filtered. The filtrate was dried at 50 to 60 ^{o}. The extracts were dried and percentage yield was calculated and subjected to preliminary phytochemical analysis. The *invitro* screening of antimicrobial activity was carried out using Enterotoxigenic *E.coli,* Enteropathogenic *E.coli,, Salmonella typhimurium, Salmonella entertidis, Shigella dysentriae, Shigella flexineri, Candida albicans, Candida tropicalis* and *Candida krusei,* isolated from diarrhoeal patients, attending Rajah Muthiah Medical College and Hospital, Annamalainagar, Tamilnadu, India. The antimicrobial screening of the extracts were carried out by determining the zone of inhibition using disc diffusion method (Sahoo *et al.*, 2006). The strains were grown to logarithmic phase in nutrient broth and the inoculum was prepared by adjusting the turbidity of bacterial suspension to 0.5 McFarland's tube with nutrient broth (Mc Farland *et al*, 1987). The dried extracts were dissolved in 5% dimethyl sulphoxide (DMSO) to the concentration at 200mg/ml and finally sterilized by filtration. The sterile discs (6mm in diameter) were impregnated with 20 µl of the above extracts to achieve desired concentration of 4mg/ml. The extract discs were placed on Muller-Hinton agar plates (Himedia) for bacteria and Sabouraud's dextrose agar (Himedia) for *Candida,* which were previously inoculated with test strains and incubated at 37^{o}C for 24 hours. Amikacin disc (10µg) and fluconazole disc (10µg) were used as positive control for bacteria and *Candida* respectively. 5% DMSO impregnated discs was used as negative control and the zones of inhibition were recorded.

Results and Discussion

Results of antimicrobial assay showed that aqueous, methanol, chloroform extracts exhibited antimicrobial activity against *E.coli, Salmonella* sp and *Shigella* Sp. *Candida* sp. The antibacterial activity in terms of zone of inhibition is shown in Table 1. This study reveals the methanol extract of *Coriander sativum* has potential in the management of microbial infections. The extract seemed to posses antimicrobial effects against *E.coli, Salmonella* sp and *Shigella* sp. Preliminary phytochemical analysis of the showed relatively wide zone of inhibition on the three enteric bacterial pathogen as compared with chloroform and aqueous extracts. Petroleum ether and hexane extract did not exhibit any activity. None of the extract exhibit antifungal activity against methanol extract of the leaves of *Coriander sativum* indicated the presence of carbohydrates, flavonoids, aminoacids, steroids, saponins and tannins. However, further identification and isolation of the single compound was required to determine the type of compound responsible for the antibacterial effects.

Table 1. Zones of inhibition of *Coriander sativum* L.

Solvent extracts	Conc. of disc	*Coriander sativum*								
		ETEC	EPEC	S.t	S.e	Sh.d	Sh.f	C.a	C.t	C.k
Aqueous	4mg/ml	8mm	8mm	10mm	8mm	10mm	10mm	-	-	-
Methanol	4mg/ml	14mm	14mm	14mm	16mm	14mm	14mm	-	-	-

Chloroform	4mg/ml	10mm	10mm	12mm	12mm	10mm	10mm	-	-	-
Petroleum ether	4mg/ml	-	-	-	-	-	-	-	-	-
Hexane	4mg/ml	-	-	-	-	-	-	-	-	-
Amikacin	10 µg	24mm	22mm	20mm	20mm	24mm	24mm	Nt	Nt	Nt
fluconazole	10 µg	Nt	Nt	Nt	Nt	Nt	Nt	-	-	-
DMSO	5%	-	-	-	-	-	-	-	-	-

Above values are the means of three assays. -: no activity, Nt – not tested, ETEC- Enterotoxigenic *E.coli*, EPEC- Enteropathogenic *E.coli*, S.t - *Salmonella typhimurium*, S.e - *Salmonella enteritidis*, Sh.d – *Shigella dysenteria*, Sh.f – *Shigella flexineri*, C.a- *Candida albicans*, C.t- *Candida tropicalis* and C.k- *Candida krusei*

Conclusion

In the present study antibacterial activity of *Coriander sativum* extracts towards enteric bacterial pathogens was observed significant. Further, phytochemical study for identication and elucidation of active constituents in the plant was expected to serve as lead in the development of novel bioactive antimicrobial compounds

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