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Evaluation of Anti Microbial Activity of *Coriandrum sativum*

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ABSTRACT

To investigate the antimicrobial activity of Ethanol, Methanol, Acetone, Chloroform, Hexane and Petroleum ether extract of *Coriandrum sativum* was tested against infectious disease causing bacterial pathogens such as such as *E.Coli, Pseudomonas aeruginosa, Staphylococcus aureus* and *Klebsiella Pneumonia* fungus like *Aspergillus niger, Candida albicans, Candida kefyr* and *Candida tropicalis* using the Agar Well diffusion method. The Methanol extract of *Coriandrum sativum* showed more activity against *Staphylococcus aureus* zone of diameter 12.17±0.29 and *Klebsiella pneumonia* zone of diameter 12.17±0.15 and the Methanol extract of *Coriandrum sativum* showed more activity against *Candida albicans* zone of diameter 14.20±0.20 and *Aspergillus niger* of diameter 10.10±0.10 , when compared to other solvent extracts . In the present study, both in bacteria and fungi methanol extract showed a varying degree of inhibition to the growth of tested organism than Ethanol, Acetone, Chloroform, Hexane and Petroleum ether. The results confirmed that presence of antibacterial and antifungal activity in the sundried extract of *Coriandrum sativum* against the human pathogenic organisms. The Methanolic extract of sun dried *Coriandrum sativum* showed better activity against the most tested organisms.

KEYWORDS

Coriandrum sativum, Pseudomonas aeruginosa, Staphylococcus aureus, Aspergillus niger and Candida albicans

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INTRODUCTION

Plants have provided a source of inspiration for novel drug compounds as plant derived medicines have made significant contribution towards human health. Plant-based antimicrobials have enormous therapeutic potential as they can serve the purpose with lesser side effects that are often associated with synthetic antimicrobials[1]. There are several indications that new approaches are required to combat emerging infections and the global spread of drug resistant bacterial pathogens. One is the pattern in rates of death from infectious disease has dropped a reduction by a factor to the efficacy of antibiotics[2]. However, from 1980 to 2000 that rate doubled, largely because of HIV but also due to the spread of drug resistant bacterial pathogens, such as Methicillin resistant *Staphylococcus aureus*(MRSA), vancomycin resistant enterococci, multiple drug-resistant gram-negative bacteria, and multiple drug-resistant tuberculosis[3]. In fact, the presence of an antibiotic can accelerate mutation and recombination in bacterial populations and contribute directly to its own obsolescence[4].This is in addition to resistance that may develop outside of the clinical setting, for example, resistance to penicillin had been documented even before its first widespread clinical use[5]. Manipulation of bacterial cell-cell signaling systems has potential use in novel antimicrobial therapies[6,7]. Enhancing growth-promotion signals of the normal microbiota at the expense of non-indigenous species might restore the normal microbial balanced state. Disruption of cell-cell signaling systems might provide novel opportunities for antibiotic therapy[8,9,10]. Furthermore, it is possible that the host recognizes and responds to bacterial signaling molecules[11] and understanding whether and how this occurs could lead to therapies for priming or boosting host defenses. Probiotic strategies aimed at ecological control, rather than at killing bacteria, could have the added benefit of lowering the spread of community acquired drug-resistant bacteria. The spread of MRSA is a major problem in communities of people who come into contact with others who are being aggressively treated for the resistant organism[12,13].

Coriandrum sativum is a annual herb in the family Apiaceae. A study found both the leaves and seed to contain antioxidants, but the leaves were found to have a stronger effect[14]. Chemicals derived from coriander leaves were found to have antibacterial activity against *Salmonella choleraesuis*, and this activity was found to be caused in part by these chemicals acting as nonionic surfactants[15].The Essential oil and its fractions could be used as potential antimicrobial agents to treat or prevent *Candida* yeast infections[16]. Antimicrobial potential of aqueous infusions and aqueous decoctions of *Emblica officinalis* and *Coriandrum sativum* against 186 bacterial isolates belonging to 10 different genera of G +ve bacterial population and 2 isolates of *Candida albicans* isolated from urine specimens[17].Essential oils from *Allium tuberosum, Coriandrum sativum, Cymbopogon martini,*

Cymbopogon winterianus, and *Santolina chamaecyparissus* was evaluated against *Candida spp*. isolates from the oral cavity of patients with periodontal disease[18]. *C.sativum* has been used as a folk medicine for the relief of anxiety and insomnia in Iran. Experiments in mice support its use as an anxiolytic[19]. *C.sativum* has been documented as a traditional treatment for diabetes. *C.sativum* seeds were found in a study on rats to have a significant hypolipidemic effect, resulting in lowering of levels of total cholesterol and triglycerides and increasing levels of high density lipoprotein . This effect appeared to be caused by increasing synthesis of bile by the liver and increasing the breakdown of cholesterol into other compounds[20]. *C.sativum* can produce an allergic reaction in some people[21,22].*Coriandrum sativum* seeds, used to treat hyperglycemia and hyperlipidemia, on endocrine functions and structures[23]. Coriander has been shown to attenuate the development of streptozotocin–induced diabetes in mice[24]. The antihyperglycemic, insulin-releasing, and insulin like activities for coriander were also demonstrated in mice[25]. Enhanced hepatic bile acid synthesis and the increased degradation of cholesterol to fecal bile acids and neutral sterols appeared to account for coriander's hypocholesterolemic effects[26].

MATERIALS AND METHODS

Collection of plant material

Coriandrum sativum were collected from local market from Chennai, Tamilnadu , India and sed for this study. Ach the lab works are done in microlabs, Institute of Research and tech. Arcot,Tamilnadu.

Extraction of plant material

They were washed thoroughly with sterile distilled water in order to remove any dirt or filthy particles present on the surface and were dried in sunlight[27] then made into fine powder, this powdered samples (100g/100ml) in ethanol, methanol, acetone, chloroform, hexane, petroleum ether and ciprofloxacin for over night at room temperature., soxhelt apparatus are used for this extraction[28,29]. The extract from these solvents are soaked and evaporated under pressure.

Test organisms

The bacterial species used for the test were E.Coli, Pseudomonas aeruginosa, Staphylococcus aureus, Klebsiella pneumonia. The fungus species used for the test were Aspergillus niger, Candida albicans, Candida kefyr, Candida tropicalis. All the stock cultures were obtained from Microlabs, Institute of Research and technology, Vellore Tamilnadu, India.

Culture media and inoculums preparation

Nutrient agar broth(Himedia, India) were used as the media for the culturing of bacterial strains. Loops full of all the bacterial cultures were inoculated in the nutrient broth and incubated at 37˚c for 72 hrs and potato dextrose agar and potato dextrose broth (Himedia, India) were used as the media for the culturing strains. Loops full of all the fungus were inoculated in the Potato dextrose broth (PDA) and incubated at room temperature for 72hrs.

Antibacterial activity

The extracts obtained above were screened for their antibacterial activity in comparison with standard antibiotic ciprofloxacin(100mg/ml) in vitro by well diffusion method[30,31]. Lawn culture were used using the test organism on Muller Hinton Agar(MHA). The inoculated plates were kept aside for few minutes using well cutter, four wells were made in those plates at required distance . In each step of well cutting the well cutter was thoroughly wiped with alcohol Using sterilized micropipettes 30ml of different solvents with selected *Coriandrum sativum* extract was added into the well . The plates were incubated at 37˚c for overnight. The activity of the extract was determined by measuring the diameters of zone of inhibition . For each bacterial strains, controls were maintained where pure solvents without extracts were used .

Antifungal activity

The extracts were also screened for their antifungal activity in comparison with standard antibiotic *Ketoconazole* (10mg/ml) invitro by well diffusion method[30,31]. Lawn culture was prepared using the test organism on Sabouraud's Dextrose Agar (SDA). The inoculated plates were kept aside for few minutes using well cutter, four wells were made in those plates at required distance. Using sterilized micropipettes 30ml of different solvents with selected leaf extract was added into the well. The plates with fungi were incubated at room temperature for 48hrs. The activity of the root extract was determined by measuring the diameter of zone on inhibition. For each fungal strains controls were maintained where pure solvents were used.

RESULTS AND DISCUSSION

The efficacy of different extracts of *Coriandrum sativum* is shown in the table1. The Methanol, Acetone, and Ethanol extracts have shown better activity against these pathogenic organisms. Methanol extract was more effective against *Staphylococcus aureus* and *Klebsiella pneumonia*. Acetone extract was more effective against *Staphylococcus aureus* and *Klebsiella pneumonia*. Ethanol

extract was more effective against *Staphylococcus aureus and Escherichia coli*. Chloroform extract was more effective against *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Hexane extract was more effective against *Klebsiella pneumonia* and *E.coli* . Petroleum ether extract was more effective against *Staphylococcus aureus* and *Klebsiella Pneumonia*. Among these 6extracts Methanol, Acetone and Ethanol shows better activity against Chloroform, Hexane and Petroleum ether against the standard drug *Ciprofloxacin*. The results of antibacterial activity is shown in the table 1 and fig1.

Table1. Inhibition zone diameter of extracts against bacteria.
Antibacterial activity of different extracts of *Coriandrum sativum* against different organisms (Mean±SEM) (mm).

ORGANISMS (BACTERIA)	Zone of Inhibition (mm)						
	ETHANOL	METHANOL	ACETONE	CHLOROFORM	HEXANE	PETROLEUM ETHER	*CIPROFLOXACIN*
Escherichia coli	**11.17±0.15**	**9.97±0.06**	**9.90±0.10**	**7.03±0.6**	**6.03±0.06**	**NIL**	**10.07±0.12**
Pseudomonas aeruginosa	**9.97±0.06**	**9.90±0.10**	**9.00±0.00**	**7.00±0.10**	**NIL**	**NIL**	**14.27±0.25**
Staphylococcus aureus	**11.40±3.36**	**12.17±0.29**	**12.30±0.26**	**8.0±0.20**	**6.03±0.6**	**6.03±0.06**	**18.23±0.25**
Klebsiella pneumoniae	***9.37*±0.12**	**12.17±0.15**	**11.17±0.29**	**7.0±0.00**	**7.03±0.06**	**6.03±0.06**	**10.35±3.38**

The results of antifungal activity are given in the table2. Which clearly show that all the extracts have shown antifungal activity against the tested organisms. Methanol, Acetone and Ethanol have shown better activity against against these pathogenic organisms. Methanol extract was more effective against *Candida albicans* and *Aspergillus niger*. Ethanol extract was more effective against *Candida albicans* and *Aspergillus niger* . Acetone extract was more effective against *Candida tropicalis* , and *Aspergillus niger*. Chloroform extract was more effective against *Candida tropicalis* and *Candida aibicans* . Hexane and was less effective only for *Candida tropicalis* and Petroleum ether shows no active.

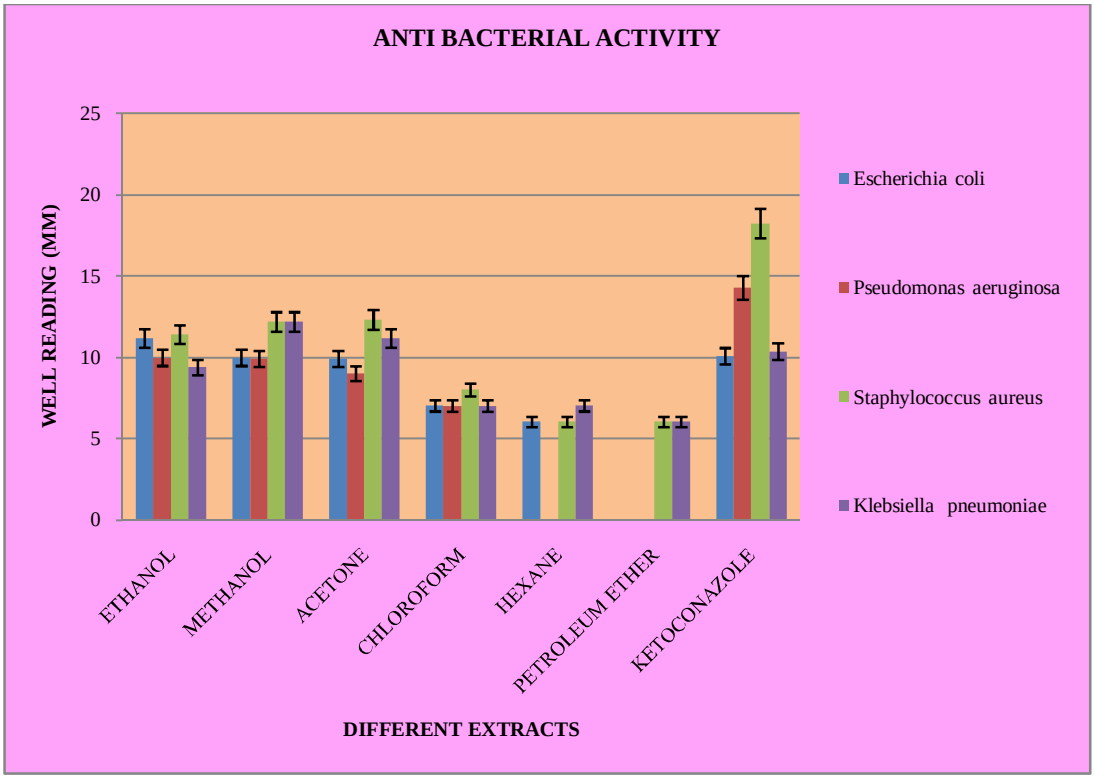

Fig1.Antibacterial activity of different extracts of *Coriandrum sativum* (Apiaceae)against different Organisms.

Table II : Inhibition zone Diameter of extracts Against Fungus
Antifungal activity of different extracts of *Coriandrum sativum(Apiaceae)* of Against different organisms (Mean± SEM) (mm)

ORGANISMS (FUNGUS)	Zone of Inhibition (mm)						
	ETHANOL	METHANOL	ACETONE	CHLOROFORM	HEXANE	PETROLEUM ETHER	*ketoconazole*
Aspergillus niger	11.03±0.15	10.10±0.10	9.17±0.15	NIL	NIL	NIL	11.17±0.29
Candida albicans	12.13±0.23	14.20±0.20	8.90±0.10	6.03±0.06	NIL	NIL	13.30±0.26
Candida kefyr	10.07±0.12	8.10±0.10	7.03±0.15	5.97±0.06	NIL	NIL	10.83±0.29
Candida tropicalis	*9.07*±0.12	9.07±0.12	10.07±0.12	7.07±0.12	5.02±0.02	NIL	10.57±0.49

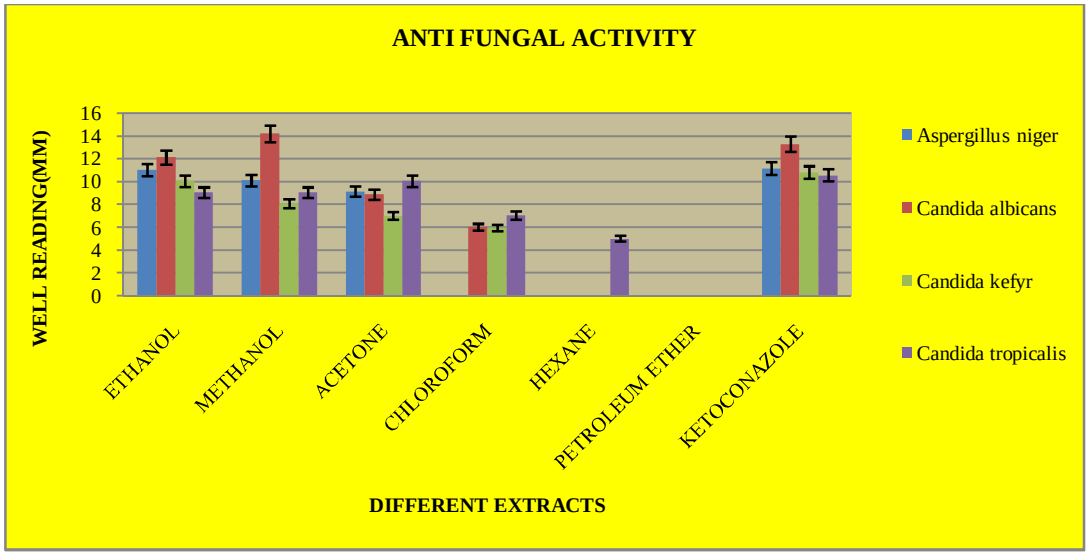

Fig2. Antifungal activity of different extracts of *Coriandrum sativum(Apiaceae*) against different Organisms

DISCUSSIONS

Research also suggests that the volatile oils found in the leaves of *C. sativum* plant may have antimicrobial properties against food borne pathogens such as *Salmonella* species[32]. Aqueous decoction of coriander was found to have no bactericidal activity against *Helicobacter pylori*[33]. In contrast, some workers have found that *C. sativum* has strong antibacterial activity against both Gram positive and Gram negative[34]From this study it can be said that, Methanol, Acetone andEthanol sun dried extract of *C.sativum* showed wide range of Antibacterial and Antifungal activity and can be used and administered in the ethno medical practice. The present study has shown a spectrum of antibacterial activities which provides a support to some tradition uses of these few medicinal plants. But the effective biomolecules which act as antibacterial have to be identified, isolated and subjected to extensive scientific and pharmacological screening that can be used as sources for new drugs.

CONCLUSION

The result of this work suggest that the whole plant extract of *Coriandrum sativum* has number of medicinal properties. From this work it can be said that the sun dried *Coriandrum sativum* extract of Methanol, Acetone and Ethanol has more effective against these pathogenic organisms and can be used for the future references for various other diseases.

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