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Research Article

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To Study the Role of Phytochemical Analysis and Antimicrobial Properties of *Coriandrum Sativum L*

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Abstract

Natural products continue to play an important role in the discovery and development of new pharmaceuticals. Several chemical compounds have been extracted and identified from its species known as Coriandrum sativum L. The present study was designed for phytochemical analysis and extraction of bioactive compound by HPLC. This also included the antimicrobial activity of the bio active compound obtained by crude extract and the column extract. it was showing antimicrobial activity against *E. coli, P. aeruginosa, B. subtilis and E. faecalis*, crude (6.8 to 8.1mm) and column (4.0 to 6.2mm) zone of inhibition.

Introduction

Coriander (*Coriandrum sativum L*) is a well-known herb widely used as a spice, in folk medicine and in the pharmacy and food industries [1]. Coriander seed oil is one of the 20 major essential oils in the world market [2] and it is known to exert antimicrobial activity [1]. Coriander is a valuable herb in treating digestive disorders. One or two teaspoons of coriander juice, added to fresh buttermilk, is highly beneficial in treating indigestion, nausea, dysentery, hepatitis and ulcerative colitis. It is also helpful in typhoid fever [3]. It has got diverse healing properties. It has also been proved to be effective in reducing cholesterol levels. Having anti-bacterial and anti-parasitic properties makes it suitable for combating infectious diseases of various types. Natural products continue to play an important role in the discovery and development of new pharmaceuticals. Several chemical compounds have been extracted and identified from its species. In addition, other secondary metabolites such as alkaloids, terpenoids, and phenolics could be held partially responsible for some of these biological activities [4]. Due to recent advances in the exploration of C. sativum as a potential therapeutic agent against a number of diseases afflicting humans, comprehensive research on its properties has been encouraged. Endophytes are microorganisms that reside in the tissues of living plants. They are potential sources of novel nature product for exploitation in medicine, agriculture and industry [5]. Endophytes provide a broad variety of bioactive secondary metabolite were applied in a wide range of areas as agrochemicals, antibiotics, immune suppressants, antiparasitic, antioxidants and anticancer agents [6]. There are many kinds of endophytes such as fungi, bacteria and actinomycetes. To date, many strains of endophytic bacteria have been reported such as *Azorhizobium, Bacillus, Brady rhizobium, Gluconacetobacter, Klebsiella, Burkholder, Enterobacter, Pseudomonas, and Streptomyces* [7]. *Bacillus amyloliquefaciens* is a Gram-positive, spore forming bacteria, and is closely related to Bacillus subtilis and other members of the B. subtilis group [8]. The genome of the plant-associated B amyloliquefaciens GA1 contained three gene clusters directing the synthesis of the antibacterial polyketides macrolactam, bacillaemia and deification. Endophytic bacteria from the medical plant of Andrographis paniculata showed activity against both Gram-positive and Gram-negative bacteria pathogens. It is the lowest concentration of an antimicrobial that will inhibit the visible growth of a microorganism after overnight incubation. Minimum inhibitory concentrations are important in diagnostic laboratories to confirm resistance of microorganisms to an antimicrobial agent and also to monitor the activity of new antimicrobial agents. Agar

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diffusion techniques are used widely to assay plant extracts for antimicrobial activity. Factors affecting MIC are variation in incubation time, variation in temperature, variation in pH of broth etc. In the present work we are concentrating the effect of plant extract on human pathogens such as *Pseudomonas aeruginosa, Bacillus amiloliquifaciens, Staphylococcus aureus and Escherichia coli*.

Material and Methods

To perform the study of antimicrobial activities of sample medicinal plants Coriandrum sativum the plant samples were collected and bacterial strains *Pseudomonas aeruginosa, Bacillus amiloliquifaciens, Staphylococcus aureus and Escherichia coli* were taken.

Multiple Drug Resistance Culture Preparation

120ml of nutrient broth was prepared and poured in each conical flask. The broth was then autoclaved and after autoclaving they were left to cool at room temperature in laminar air flow chamber. 100µl each of Pseudomonas aeruginosa, Bacillus amyloliquifaciens, Staphylococcus aureus and Escherichia coli were inoculated into the four flasks. The inoculated culture was then kept in shaker overnight for growth.

Plant Extract Preparation

Washing and drying of all the sample plants leaves were washed with distilled water and dried in hot air oven for 1-2 days to reduce the moisture content. Each of dried plant samples were weighed 4.00gm, and then crushed in 70% ethanol in the ratio of 1:8 in the mortar pestle and grinded properly then crushed samples were filtered through Whatman filter topic 1 in a flask/beaker. Filtrates were placed in hot air oven at 40°C in a flask/beaker till it completely dry for 2-4 days. Dried filtrate was dissolved in 5ml of 1X tris saline buffer and stored in refrigerator.

Preparation of Agar Plates

Nutrient Agar media was prepared and autoclaved then it was poured in autoclaved Petri plates, then it was left for 15-20minutes to solidify. 50µlitre of culture (*Pseudomonas aeruginosa, Bacillus amiloliquifaciens, Staphylococcus aureus and Escherichia coli*) were spread it into nutrient agar plates respectively.

MDR with Standard Drugs

Here, to get the standard reference values, the tetracycline, chloramphenicol drugs were taken. Different concentration (25, 50 and 75µg) of these drug's is poured into the wells of *Pseudomonas aeruginosa, Bacillus amiloliquifaciens, Staphylococcus aureus and Escherichia coli* plates respectively.

Testing with Plant Sample

In order to check the antimicrobial activity against selected microbes (*Pseudomonas aeruginosa, Bacillus amiloliquifaciens, Staphylococcus aureus and Escherichia coli*), three wells were made in each of the culture plates by 1000ml tip of micropipette and were filled with 25, 50, 75µl of each plant extract. All the Petri plates were kept in an incubator at 37°C for 24hrs (not in an inverted position). After proper time of incubation growth of microbes was checked in all the Petri plates. After incubation for 24hrs the plates were observed for zone of inhibition, the zone of inhibition was measured with scale and the observation was recorded on table.

Minimum Inhibitory Concentration (MIC)

To perform the MIC experiment, we took six test tubes, washed and dried them. Poured 3ml nutrient broth to each test tube and autoclaved them. 1ml plant extract was added to the first test tube, mixed it properly then 1ml mixture of this tube was added to the next (second) test tube. Likewise taken 1ml from second test tube and added it to the third test tube. Repeated the procedure till the sixth test tube. Discarded 1ml from the last test tube then 40µl bacterial cultures were added to each test tube and incubated for overnight in shaker. Then after incubation taken optical density in spectrophotometer at 595nm (Figure 1).

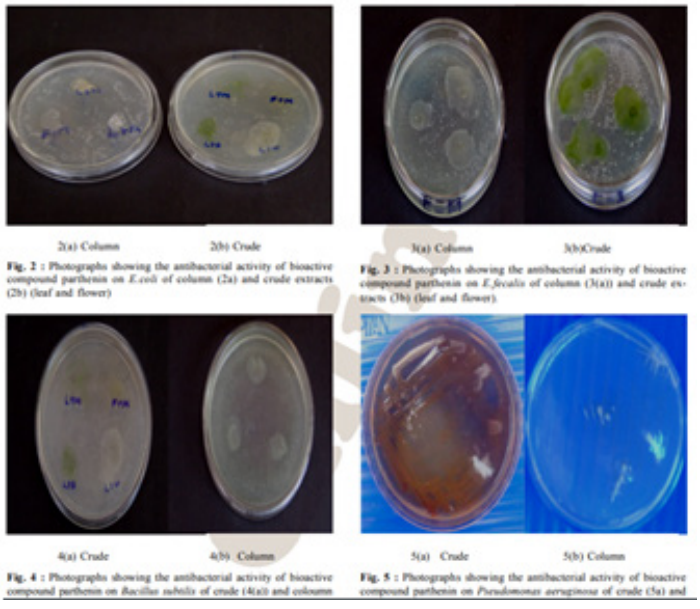

Figure 1:

Result and Discussion

Multiple Drug Resistance

Different chemical compounds present in the plant extract are mainly responsible for the antimicrobial activity. These compounds are diffused through the agar medium and depending on their concentration form the zone of inhibition (inhibition ring) and inhibit the growth of microorganism. Zone of inhibition can be known by measuring the diameter of inhibition ring in mm.

MDR with Standard Drugs

The results of zone of inhibition of sample ethanolic plant extract Coriandrum sativum for four bacterial species P*seudomonas aeruginosa, Bacillus amiloliquifaciens, Staphylococcus aureus* and *Escherichia coli* through standard antibiotics (tetracycline and chloramphenicol). Coriandrum sativum showed good result against pseudomonas aeruginosa Table 1, Figure 2. Medicinal plants, since times immemorial, have been used virtually in all cultures as a source of medicine. Medicinal plants play a key role in world health care systems. Since the last decade, the rise in the failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity. Most of today's antibacterials are either semisynthetic modifications of various natural compounds or are manufactured chemicals. All of them have acceptable spectrum of action, acceptable efficacy but none of them are devoid of adverse effects. Some antibacterials have so severe side effects that risk: benefit ratio needs to be evaluated before administering. As a result, there is need for newer anti-bacterial which should have at least same efficacy as the current drugs and better safety profile. Coriander (*Coriandrum sativum L*) is a well-known herb widely used as a spice, in folk medicine, pharmaceutical and food industries. Coriander seed oil is one of the 20 major essential oils in the world market and it is known to exert antimicrobial activity however, its mechanism of action is still unclear. [9]. explained that the antibacterial activity exhibited by the C. sativum leaf oil can be attributed to the synergic effect of the antimicrobial agents present in the oil. The leaf oil contains 44 compounds mostly of aromatic acids of which the major is 2-decenoic acid, E-11-tetradecenoic acid, capric acid, undecyl alcohol and tridecanoic acid. The high concentration of 2-decenoic acid in leaf oil makes it potentially useful in medicines and perfumes. Rajeshwari and Andallu17 reported that Coriander seeds contain Petroselinum acid, linoleic acid, oleic acid and palmitic acid. Major components of essential oil are linalool, a-pinene, camphor and geraniol. They have demonstrated that these contents of coriander (also called cilantro) have some anti-bacterial action against Salmonella which is a frequent and at times lethal cause of food poisoning and the activity of these compounds is comparable with gentamicin [10].

Table 1: Multiple Drug Resistance with Standard Drugs.

Antibiotic Conc. (µg)	25				50				75			
Diameter of Zone of Inhibition in mm												
Antibiotic/Microorganism	S	B	P	E	S	B	P	E	S	B	P	E
Tetracycline	21	11	14	18	26	16	2	24	3	23	22	23
Chloramphenicol	32	-	-	32	34	-	15	36	36	-	25	38

Note*: S=*Staphylococcus aureus,* B=*Bacillus amyloliquifaciens,* P=*Pseudomonas aeruginosa* and E=*Escherichia Coli*

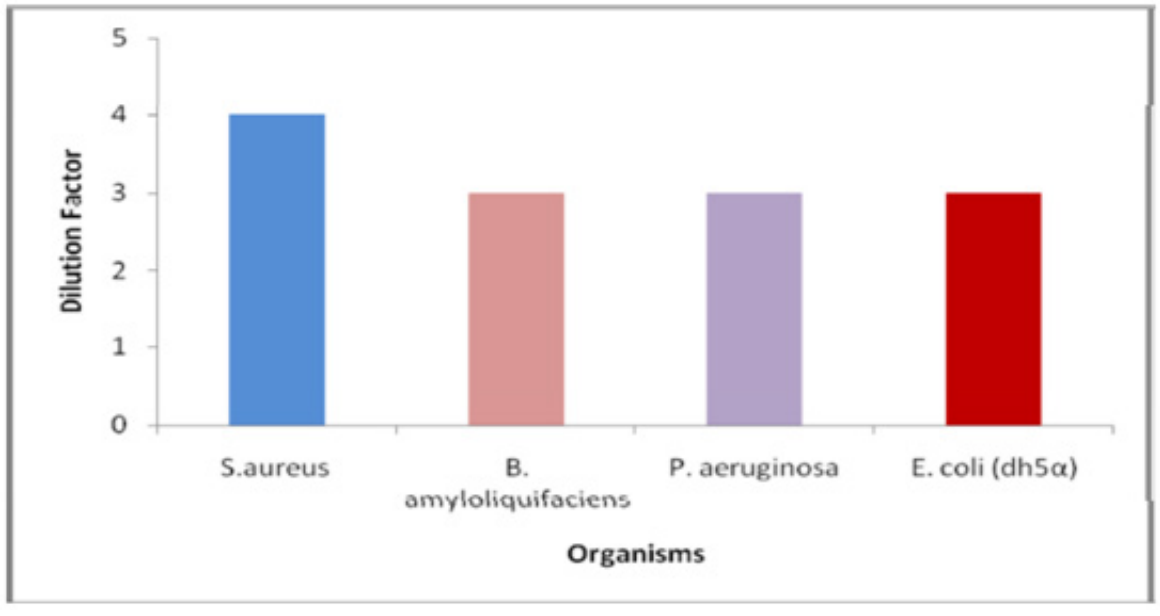

Figure 2: Minimal Inhibitory Concentration for Dhaniya (*Coriandrum sativum*).

Acknowledgement

None.

Conflict of Interest

None.

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