# *ANTIMICROBIAL ACTIVITY OF CORIANDRUM SATIVUM L.*

**Mohammad Chand Jamali***

Department of Health & Medical Sciences, Khawarizmi International College, Abu Dhabi, United Arab Emirates

## ABSTRACT

They are potential sources of novel nature product for exploitation in medicine, agriculture and industry. Micro organism that resides on living organism are called as Endophytes. There are many kinds of endophytes such as fungi, bacteria and actinomycetes. The aim of this work was to study the antibacterial effect of coriander (Coriandrum sativum). Antibacterial susceptibility was evaluated using classical microbiological techniques. Most of the present anti-bacterials are either semisynthetic modifications of some natural compound or are synthetic chemicals. All of them have acceptable spectrum of action and efficacy but none of them are devoid of side effects. For this reason a new anti-bacterial is needed which should have same acceptable efficacy with better safety

**No: of Figures: 1** **No: of Tables: 1** **No: of References:10**

## 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 (Burdock & Carabin, 2009). Coriander seed oil is one of the 20 major essential oils in the world market (Lawrence, 1993) and it is known to exert antimicrobial activity (Burdock & Carabin, 2009). 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 (Saija, et al., 1995). 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 (Barre et al., 1997). 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 (G. Strobel, and B. Daisy., 2003). Endophytes provide a broad variety of bioactive secondary metabolite were applied in a wide range of areas as agrochemicals, antibiotics, immune suppressants, antiparasitics, antioxidants and anticancer agents (A.A.L. Gunatilaka ., 2006). 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, Bradyrhizobium, Gluconacetobacter, Klebsiella, Burkholderia, Enterobacter, Pseudomonas, and Streptomyces (J.Hollman et al., 1997). Bacillus amylo liquefaciens is a Gram-positive, spore forming bacteria, and is closely related to Bacillus subtilis and other members of the B. subtilis group (A. Arguelles-Arias el., 2009). The genome of the plant-associated B. amyloliquefaciens GA1 contained three gene clusters directing the synthesis of the antibacterial polyketides macrolactin, bacillaene and difficidin. 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 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, Staphyllococcus aureus and Eschirichia coli.

**Material and Methods**

To perform the study of antimicrobial activities of sample medicinal plants Coriandrum sativum the plant samples were collected from Jayanti Kunj Garden, Rewa, M.P. and bacterial strains Pseudomonas aeruginosa, Bacillus amiloliquifaciens, Staphyllococcus aureus and Eschirichia coli were taken from **Department of Applied Microbiology, University of Sagar, M.P.**

**Multiple drug resistance Culture preparation**

120 ml 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 whattman 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 0f 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 petriplates, then it was left for 15-20 minutes to solidify.50 µlitre 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 75 µg) of these drug's are 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 petriplates were kept in an incubator at 37°C for 24 hrs (not in an inverted position). After proper time of incubation growth of microbes was checked in all the Petri plates. After incubation for 24 hrs 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 3 ml 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 40 µl bacterial cultures were added to each test tube and incubated for overnight in shaker. Then after incubation taken optical density in spectrophotometer at 595nm.

**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 Pseudomonas aeruginosa, Bacillus amiloliquifaciens, Staphylococcus aureus and Escherichia coli through standard antibiotics (tetracycline and chloramphenicol). Coriandrum sativum showed good result against pseudomonas aeruginosa.

**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 |

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

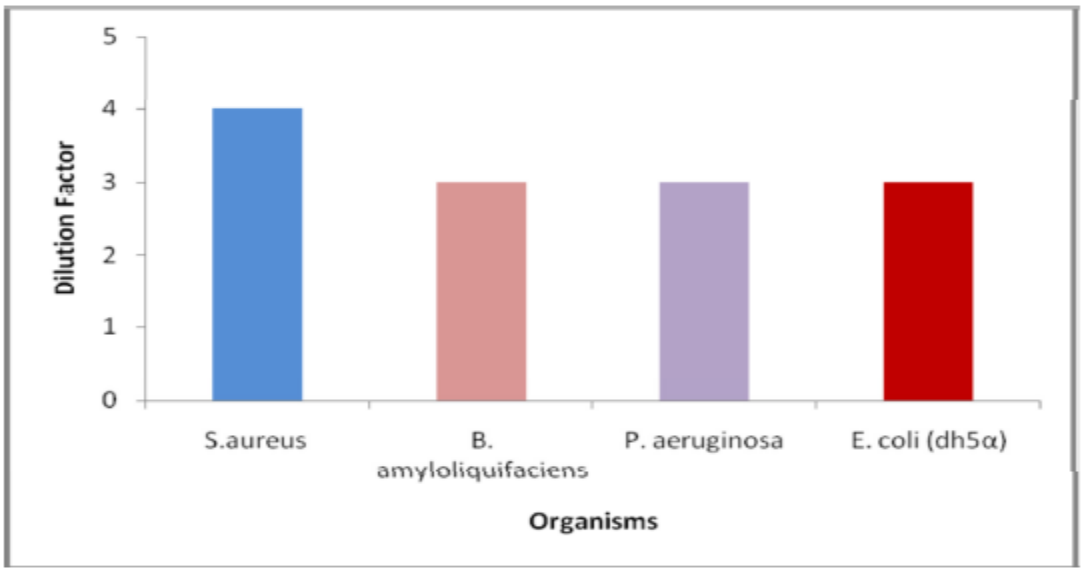


***Figure 1:*** *Minimal Inhibitory Concentration for Dhaniya (Coriandrum sativum)*

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.

Matasyoh JC et al16 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 are 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 petroselinic 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

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