



## BIOLOGICAL STUDY OF *CORIANDRUM SATIVUM* AGAINST GRAM NEGATIVE URINARY BACTERIA

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### ABSTRACT

Present investigation is focused on antibacterial potential of aqueous infusions and aqueous decoctions of *Coriandrum sativum* (coriander) against 248 bacterial isolates belonging to 6 different genera of Gram negative bacterial population isolated from urine specimens by employing well diffusion technique. Aqueous infusion and decoction of *Coriandrum sativum* exhibited light potent antibacterial activity against *Escherichia coli* (190), which gradually increase with *S. marcescens* (1), *K. pneumoniae* (40), *K. ozaenae* (3), *S. paratyphi* B (1), *P. mirabilis* (5), and higher *S. paratyphi* A against gram negative urinary pathogens.

**Key words:** *Coriandrum sativum*, Well diffusion technique, Antibacterial activity, Gram negative bacteria.

### INTRODUCTION

Urinary tract infections are the most commonly observed infections in clinical practice they also contribute the most common nosocomial infection in many hospitals, and accounts for approximately 38% of all hospital acquired infections<sup>1</sup>. The enterobacteriaceae were the most common pathogen detected, causing 84.3% of the urinary tract infections<sup>2</sup>. *Escherichia coli* causes about 85% of community acquired urinary tract infections and more than 80% of cases of uncomplicated pyelonephritis. The medically equally important *Klebsiella* accounts for 6-17% of all nosocomial urinary tract infections. Proteus is also a common cause of urinary tract infection in individuals with complicated urinary tract infections<sup>3</sup>.

Multiple microbial resistance among Gram-negative organisms has been a long term and well-recognized problem with urinary tract infections. Resistance has been observed in multiple genera including *Escherichia*, *Enterobacter*, *Klebsiella*, *Proteus*, *Salmonella*,

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*Serratia* and *Pseudomonas*<sup>3</sup>. Recently there has been a renewed interest in improving health and fitness through the use of natural products. Herbs and spices are the most important part of human diet. In addition to boosting flavor, herbs and spices are also known for their preservative and medicinal value<sup>4</sup>, which forms one of the oldest sciences. Yet it is only in recent years that modern science has started paying attention to the properties of spices<sup>5</sup>.

*Coriandrum sativum* (coriander) is considered both as an herb and a spice. Both its leaves and seeds are used as seasoning condiment. Coriander seeds have health-supporting reputation that is high on the list of healing spices. It has traditionally been referred to as antidiabetic<sup>6</sup>, anti-inflammatory and cholesterol lowering<sup>7</sup>. In addition, it is also used as carminative, diuretic, stimulant, stomachic, refrigerent, aphrodisiac<sup>5</sup>, analgesic and hypoglycemic<sup>8</sup>.

The seeds of *C. sativum* contain 0.5-1% essential oil and are rich in beneficial phytonutrients including carvone, geraniol, limonene, borneol, camphor, elemol, and linalool. Coriander's flavonoides include quercetin, kaempferol, rhamnetin and epigenin. It also contains active phenolic acid compounds including caffeic and chlorogenic acid. 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<sup>9</sup>.

In view of the above the present study, we conducted to evaluate the antibacterial potential of aqueous infusions and decoctions of *C. sativum* against 248 different isolates belonging to 6 genera of gram negative bacilli isolated from urine specimens, viz., *Escherichia coli* (190), *Klebsiella pneumoniae* (40), *K. zaenae* (3), *Proteus mirabilis* (5), *Pseudomonas aeruginosa* (5), *Salmonella typhi* (1), *S. paratyphi* A (2), *S. paratyphi* B (1) and *Serratia marcescens* (1).

## EXPERIMENTAL

### Materials and methods

#### Maintenance of isolates

A total of 248 isolates belonging to 6 different species of Gram negative bacilli isolated from urine specimens were maintained on tryptone soy agar (TSA) (Oxoid).

#### Preparation of aqueous infusions

Aqueous infusions of *C. sativum* were prepared by steeping 20 g in 100 mL sterile distilled water in separate sterile flasks. The flasks were kept for two days with occasional shaking and the contents were filtered.

### **Preparation of aqueous decoctions**

Aqueous decoctions of *C. sativum* were prepared by boiling 20 g in 100 mL sterile distilled water for 15 minutes. The flasks were then plugged and removed from heat and allowed to cool and then filtered.

### **Screening of antibacterial activity**

#### **Media**

Mueller-Hinton agar (MHA) (Merck) was used as base medium for screening of antibacterial activity and Mueller-Hinton broth (MHB) (Merck) for preparation of inoculum.

### **Preparation of McFarland Nephelometer standard**

McFarland tube number 0.5 was prepared by mixing 9.95 mL 1% sulphuric acid in MHB and 0.05 mL 1% barium chloride in distilled water in order to estimate bacterial density<sup>10</sup>. The tube was sealed and used for comparison of bacterial suspension with standard whenever required.

### **Preparation and standardization of inoculum**

Four to five colonies from pure growth of each test organism were transferred to 5 mL of MHB. The broth was incubated at 35-37°C for 18-24 hours. The turbidity of the culture was compared to 0.5 McFarland Nephelometer standard to get  $150 \times 10^6$  CFU/mL, the standardized inoculum suspension was inoculated within 15-20 minutes.

### **Well diffusion technique**

Screening of antibacterial activity was performed by well diffusion technique<sup>11</sup>, the MHA plates were seeded with 0.1 mL of the standardized inoculum of each test organism. The inoculum was spread evenly over plate with loop or sterile glass spreader. A standard cork borer of 8 mm diameter was used to cut uniform wells on the surface of the MHA and 100  $\mu$ L of each infusion and decoction of *C. sativum* was introduced in the well.

### **Incubation**

The inoculated plates were incubated at 35-37°C for 24 hours and zone of inhibition was measured to the nearest millimeter (mm).

### **Statistical analysis**

Mean zone of inhibition and standard deviations were calculated.

## RESULTS AND DISCUSSION

Two hundred forty eight urinary pathogens belonging to 6 different genera of gram negative bacteria isolated from urine specimens, viz., *Escherichia coli* (190), *Klebsiella pneumoniae* (40), *K. zaenae* (3), *Proteus mirabilis* (5), *Pseudomonas aeruginosa* (5), *Salmonella typhi* (1), *S. paratyphi* A (2), *S. paratyphi* B (1) and *Serratia marcescens* (1) were used in the present study. The results of *in vitro* antibacterial activity of aqueous infusions and decoctions of *C. sativum* are presented in Table 1. The diameter of inhibitory zones recorded includes the size of filter paper discs (6 mm in diameter).

**Table 1: Antibacterial activities of aqueous infusion and decoction of *Coriandrum sativum***

S. No.	Organisms	No. of isolates	Mean zone of inhibition $\pm$ Standard deviation	
			<i>Coriandrum sativum</i>	
			Infusion	Decoction
1	<i>E. coli</i>	190	0.12 $\pm$ 0.01	0.19 $\pm$ 0.03
2	<i>K. pneumoniae</i>	40	1.31 $\pm$ 0.12	0.93 $\pm$ 0.21
3	<i>K. ozaenae</i>	3	1.52 $\pm$ 0.81	1.83 $\pm$ 0.28
4	<i>P. mirabilis</i>	5	0	0
5	<i>P. aeruginosa</i>	5	2.53 $\pm$ 0.53	2.93 $\pm$ 0.69
6	<i>S. typhi</i>	1	0	0
7	<i>S. paratyphi</i> A	2	4.39 $\pm$ 0.15	5.01 $\pm$ 0.17
8	<i>S. paratyphi</i> B	1	2.15	3.56
9	<i>S. marcescens</i>	1	0.95 $\pm$ 0.35	1.03 $\pm$ 0.39

Present study indicated great variation in antimicrobial activities of selected spices. The results showed that the aqueous infusion and decoction of *C. sativum* exhibited maximum activity against *S. typhi* with 5.16 mm and 21.15 mm mean zone of inhibition, respectively and also exhibited potent antibacterial activities against all bacterial isolates tested. The minimum activities of aqueous infusion and decoction were found against *E. coli* with 0.12  $\pm$  0.01 and 0.19  $\pm$  0.03 respectively in term of mean zone of inhibition  $\pm$  standard deviation.

In the present study, the antibacterial activities of aqueous infusion and decoction of *C. sativum* were also evaluated. All tested isolates were found resistant to aqueous infusion and decoction of *C. sativum*. These findings are in fair correlation with the study carried out by Chaudhry and Tariq<sup>5</sup>, who found that decoction of *C. sativum* not show weak antibacterial potential against Gram positive and Gram negative bacteria. Similarly, some workers have also found that *C. sativum* does not has antibacterial activity against *P. mirabilis*, *S. typhi*<sup>12</sup>.

The present study has revealed the importance of natural products to control antibiotic resistant bacteria, which are being a threat to human health. This scientific study can serve as an important platform for the development of inexpensive, safe and effective medicines.

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