

## Antibacterial activity of some common species used in indian kitchen and effect of it in combination

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### Abstract

Identification of traditional remedies used in Indian household as antibacterial agent. A study was undertaken to document antibacterial activity of Curcumin. It is the most abundant polyphenol present in the dietary spice turmeric. Turmeric powder, derived from the rhizome of *Curcuma longa*, which is associated to the Zingiberiaceae family, and the antibacterial activity and medicinal properties of ginger extracts derived from *Zingiber officinale* were studied by agar diffusion method and then the combined effect of both this herbal drug in various concentration was studied against gram positive and gram negative organisms.

**Keywords:** Antibacterial activity; *Curcuma longa*; *Zingiber officinalis*; Agar diffusion method

### 1. Introduction

The growing population concern about health problems has recently led to the development of natural antimicrobials to control microbial diseases. Medicinal plants and spices are one of the most commonly used natural antimicrobial agents in foods and have been used traditionally for thousands of years by many cultures for controlling common health complications. Natural plant product based antimicrobials drug discovery attained paramount importance as newly discovered drugs are likely to be effective against multi drug resistant microbes. Increasing popularity of traditional medicine has led researchers to investigate the antibacterial compounds in plants. *Curcuma longa* is a medicinal plant that botanically is related to Zingiberaceae family (Chattopadhyay et al., 2004). *C. longa*, commonly known a 'turmeric', is widely used as a spice and coloring agent, and is well known for its medicinal properties (Luthra et al., 2001). Components of turmeric are named curcuminoids, which include mainly curcumin (diferuloyl methane), demethoxycurcumin, and bisdemethoxycurcumin (Chainani-Wu, 2003). Curcumin is the most important fraction which is responsible for the biological activities of turmeric. The melting point of curcumin, C<sub>2</sub>H<sub>2</sub>O<sub>6</sub>, is 184 °C. It is soluble in ethanol and acetone, but insoluble in water (Joe et al., 2004) Curcumin 95%, a potent antioxidant is believed to be the most bioactive and soothing portion of the herb turmeric and possess the properties like anti-bacterial antioxidant, anti-inflammatory and cholesterol lowering activity [1]

Ginger rhizome is one of the most common and popular spices or flavoring agents around the world. Ginger belongs to *Zingiberaceae* family. The Zingiberaceous plants have strong aromatic and medicinal properties and are characterized by their tuberous or non-tuberous rhizomes it has been used as herbal remedy for centuries in Ayurveda, Tibb-Unani, Chinese and Islamic herbal medicines Ailments, which have been treated with ginger, include colds, arthritis, nausea, hypertension, migraines, and many more. [2]

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## 2. Material and methods

### 2.1. Collection of Plant Material

Curcumin c3 complex was obtained from Sami labs Bangalore, Dried ginger powder was obtained from market and various solubility parameters were studied using different solvents like water, alcohol ethyl acetate and it was decided to use alcohol as the solvent, quantitative identification was carried out using thin layer chromatography.

### 2.2. Alcoholic extract preparation

Various concentration of curcumin and ginger were prepared in alcohol and zone of inhibition was observed using agar diffusion method, after performing no's of experiments it was concluded that 10mg/ml concentration of the solution gives good readable zone of inhibition<sup>[3]</sup>

### 2.3. Selection of bacterial strains

Medicinally important two-gram negative and two-gram positive organism were used, *Escherichia coli* and *Pseudomonas aeruginosa*, *Staphylococcus Aureus* and *Bacillus subtilis* were procured from Microbiology department, Bharti vidyapeeth college of pharmacy, Navi Mumbai, India. These were sub cultured for further use. The bacterial cultures were maintained on nutrient agar<sup>[4]</sup>.

### 2.4. Test Organisms

Bacterial cultures viz, *Escherichia coli* and *Pseudomonas aeruginosa*, *Staphylococcus Aureus* and *Bacillus subtilis* were maintained on Nutrient Agar (NA) slants at 4°C, for further study, cultures were grown on Nutrient slants for 24 hours as overnight cultures<sup>[5]</sup>.

### 2.5. Preparation of inoculums

The pure cultures of bacteria were grown on nutrient agar slants and incubated at 37°C for 24 hours. Nutrient broth and slants were stored at 4°C and maintained in active state by regular sub culturing for further used<sup>[5]</sup>

### 2.6. Standard reference Antibiotic

Ciprofloxacin was used as standard reference antibiotic, different concentration of ciprofloxacin were prepared in alcohol

### 2.7. Drugs and Chemicals

Ciprofloxacin, Nutrient agar, ethyl alcohol were used in the experiment

### 2.8. Antimicrobial activity

Generally, the antibacterial activity of a compound is expressed in terms of its ability to inhibit the growth of bacteria in nutrient broth or agar, the bacterial inhibition can be measured by two methods: one is the serial dilution method and the other is agar diffusion method, the serial dilution method is very much useful for the determination of the antibacterial activity, but it is not useful for qualitative test therefor in these research work agar diffusion method was used, further the agar diffusion method are of three different type (1) Cup plate method i.e the disc method (ii) Filter paper strip method, and (iii) Gradient plate method. The specific method adopted in this work was Cup plate method involving standard antibiotic dilution and the test dilution were introduced into the disc and the diameters of the zones of inhibition were measured<sup>[6]</sup>

In microbiology McFarland standards are used as a reference to adjust the turbidity of bacterial suspension so that the number of bacteria will be within a given range to standardize microbial testing. Original McFarland standard was made by mixing specified amounts of barium chloride and Sulphuric acid together. Mixing the two compounds forms a barium sulphate precipitate, which causes turbidity in the solution. A 0.5 McFarland standard is prepared by mixing 0.05 mL of 1.175% barium chloride dihydrate ( $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ ), with 9.95 mL of 1% sulfuric acid ( $\text{H}_2\text{SO}_4$ ). And was compared with the turbidity produced by diluting the loopful of culture in 10ml of saline solution<sup>[7]</sup>

The selected microorganisms were cultured on nutrient agar by using spread plate technique and a well of 6mm diameter was made at the four corners of petri dish, each well was loaded with the (1) blank (2) standard solution (3) curcumin solution of known concentration (4) Ginger solution of known concentration the test was carried out in

triplicate Simultaneously the different dilutions of combined curcumin and ginger solution were taken and the zone of inhibition was studied<sup>[8]</sup>

### 3. Results

It was observed that curcumin and ginger have antibacterial activity but curcumin and ginger does not show any activity against *pseudomonas aeruginosa* and combination of ginger and curcumin extract in equal ratio also did not have activity on *pseudomonas aeruginosa*. When the ratio of curcumin and ginger were taken in the proportion of 2:1 and when the ratio of curcumin and ginger were taken in ratio of 1:2 it did not show any significant increase in activity i.e. zone of inhibition was comparatively less than zone of inhibition seen with equal ratio of curcumin and ginger extract.

**Table 1** Zone of inhibition against the pathogens

Compound	Concentration of solutions	<i>E-coli</i> Mean zone of inhibition in mm	<i>B. subtilis</i> Mean zone of inhibition in mm	<i>S. aureas</i> Mean zone of inhibition in mm	<i>P aeruginosa</i> Mean zone of inhibition in mm
Ciprofloxacin	0.5mg/ml	40	38	40	40
Curcumin	10mg/ml	18	32	38	-
Ginger	10mg/ml	17	11	18	-
Curcumin+Ginger Ratio 1:1	Ratio 1:1 of the above solution	20	22	15	-
Curcumin+Ginger Ratio 2:1	Ratio 2:1 of the above solution	15	16	-	20
Curcumin+Ginger Ratio 1:2	Ratio 2:1 of the above solution	14	13	18	16



**Figure 1** Zone of inhibition using equal concentration of curcumin and ginger

### 4. Discussion

In the present investigation Alcoholic extract of both the drugs tested individually and in combination showed some antibacterial activity, from the above table it is very clear that the antibacterial activity is maximum when ginger and curcumin are taken in equal proportion, but they fail to show antibacterial activity against *pseudomonas aeruginosa* there is no significance change in antibacterial activity when curcumin and ginger are taken in different ratio, but in different ratios they do show some activity against *pseudomonas aeruginosa*.

## 5. Conclusion

Traditional remedies used in Indian household such as turmeric and ginger have antibacterial activity against some gram positive and gram negative organisms and also when used in combination in various proportions also show antibacterial activity.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

There are no conflict of interest.

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