

## ANTIMICROBIAL ACTIVITY OF RHIZOMES OF TURMERIC VARIETIES FROM TELANGANA STATE

N Prashanth<sup>1\*</sup> and N Lakshmi Bhavani<sup>1</sup>

<sup>1</sup>Plant Tissue Culture and Plant Molecular Genetics Lab, Department of Botany, University College of Science, Saifabad, Osmania University, Hyderabad 500004 (TS), India.

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**\*Correspondence for  
Author**

**Nuguru Prashanth**

Plant Tissue Culture and Plant  
Molecular Genetics Lab,  
Department of Botany,  
University College of Science,  
Saifabad, Osmania University,  
Hyderabad 500004 (TS), India

### ABSTRACT

Antibacterial and Antifungal activity of rhizome extracts of turmeric was investigated. The present study aimed at comparing the Antimicrobial activity of four turmeric varieties i.e. Prathiba, ErraGunturu, TellaGunturu, ManaPasupu from Andhra Pradesh. Three Gram positive and Gram negative bacteria namely Staphylococcus aureus, Escherichia coli, Bacillus subtilis were subjected to test the antimicrobial activity along with fungi namely Aspergillus niger, Aspergillus flavus, Pencillium crysoginum, Fusarium oxysporium. The ethanolic extracts of rhizomes were subjected to microbial susceptibility assays using agar well diffusion method. Among all four varieties, Prathiba and ErraGunturu varieties had the most inhibitory effect on the growth of all bacterial strains tested as compared to Tella Gunturu and ManaPasupu varieties. Of the four varieties, Prathiba variety had the most inhibitory effect on the growth of all fungi strains. Among the four varieties tested, the Prathiba variety was found to be superior for its antimicrobial potential.

**KEY WORDS:** Antimicrobial, rhizome, Agar wells.

### INTRODUCTION

Plants are being widely used in ethno medicine around the world, and are a source of many potent and (Thomson, 1978; Stockwell, 1988) powerful drugs (Srivastava et al., 1996). Drugs derived from natural sources play a significant role in the prevention and treatment of human diseases. In many developing countries, traditional medicine is one of the primary healthcare systems (Farnsworth, 1993). Antimicrobial properties of medicinal plants are being increasingly reported from different parts of the world. India is a varietal emporium of

medicinal plants and is one of the richest countries in the world with regard to genetic resources of medicinal plants. It exhibits a wide range in topography and climate, which has a bearing on its vegetation and floristic composition. Moreover, the agro-climatic conditions are conducive for introducing and domesticating new exotic plant varieties (Martins et al., 2001).

*Curcuma longa* (turmeric) of family Zingiberaceae is an important plant valued by the entire world as a spice and also for its medicinal properties (Roses, 1999). India is the largest producer and exporter of turmeric in the world and accounts for more than 50 percent of the world trade (Philip, 1983). The world health organization has recommended the use of this spice (Vavilova, 1990). Turmeric also demonstrated anti-fungal properties (Afaq et al., 2002). Turmeric has been reported to possess anti-inflammatory, hepatoprotective, antitumor, antiviral (Ammon and Wahl, 1991) and anti cancer activities (Polasaet al, 1991). Rhizome was used for gastric ulcer (Kositchaiwat et al, 1983) and dyspeptic (Thanlikitkul et al., 1989). The Gram positive and Gram-negative bacteria can be inhibited by antibiotics, either by blocking the protein synthesis or peptidoglycan synthesis in bacterial cell wall. The Gram-positive bacteria such as *Staphylococcus aureus* are mainly responsible for postoperative shock syndrome wound infection, toxic and food poisoning. The Gram-negative bacterium such as *E. coli* is present in human intestine and causes lower urinary tract infection, coleocystis or septicemia

## **MATERIALS AND METHODS**

### **Collection of plant material**

Four varieties of *curcuma longa* Prathiba, Erra Gunturu, Tella Gunturu, Mana Pasupu were obtained from Turmeric research center, kammerpally, nizamabad. Telangana State, India.

### **Extraction procedure**

Thoroughly washed and dried in shade for three days and then powdered rhizomes of four varieties, Prathiba, Erra Gunturu, Tella Gunturu, and Mana Pasupu were used to study the antimicrobial property. Ten grams of each rhizome sample were taken in separate containers and 10 ml of 95% ethanol solvent was added and kept in a rotary shaker for 24 hours. The extract was filtered using a Whatman no 1 filter paper and the extract was stored at 4°C until use.

### **Test organisms**

Microbial cultures obtained from the department of Microbiology, University College of science, Osmania University, Hyderabad, India. The Gram positive and Gram negative bacterial species, *Staphylococcus aureus*, *Escherichia coli* and *Bacillus subtilis* were used to test the anti bacterial activity. The fungal species used included *Aspergillus niger*, *Aspergillus flavus*, *Penicillium crysoginum*, *Fusarium oxysporium* sp. All the organisms were carefully identified using standard microbiological methods. All the bacterial and fungal species were maintained at 4<sup>o</sup>c nutrient agar and Potato Dextrose agar slants respectively.

### **Antibacterial activity**

Nutrient agar medium is used for the antibacterial screening test. The nutrient agar medium plates were prepared by pouring 15ml of nutrient agar media into sterile Petri plates. Twenty four hours old cultures of the organisms to be tested were used. The plates were inoculated with test organisms. Various concentrations of the rhizome extracts were transferred into the sterile filter paper disc and the plates were allowed to stand for one hour for pre-diffusion of extracts to occur in agar disc diffusion method. The plates were then incubated at 37<sup>o</sup>C for 24 hours

### **Antifungal activity**

The extracts of rhizomes were screened for antifungal activity by agar disc diffusion method. 48 hours old cultures grown on potato dextrose agar (PDA) were used for inoculation of fungal strain on PDA plates. An aliquot (0.02ml) of inoculum was introduced to molten PDA and poured in to a petri dish by pour plate technique. In agar disc diffusion method different concentrations of extracts were introduced in to the medium. Incubation period of 24-48 hours was maintained for observation of antifungal activity of plant extracts. The antifungal activity was evaluated by measuring zones of inhibition.

### **Preparation of concentrations**

Ethanollic extracts of rhizomes of turmeric were prepared as different concentrations (50µg/ml, 100µg/ml) to get the final drug concentration of 15µg/ml, 25µg/ml, respectively, control (DMSO) and standard streptomycin 10µg/ml for bacteria and ketocnozole 10µg/ml for fungi were used. Concentrations of extracts were prepared by disc diffusion method, discs with 9mm diameter were prepared using No1 whatman filter paper and sterilized by autoclaving. Then, the discs had been impregnated with different concentrations of extracts

## RESULTS AND DISCUSSION

**Table -1: Antibacterial activity of rhizomes of turmeric varieties tested by the agar well diffusion assay Zone of inhibition (mm)**

s.no	Variety name	Con. ( $\mu$ l)							
		Prathiba		Erra Gunturu		Tella Gunturu		Mana Pasupu	
	Bacterial sp.	50 $\mu$ l	100 $\mu$ l	50 $\mu$ l	100 $\mu$ l	50 $\mu$ l	100 $\mu$ l	50 $\mu$ l	100 $\mu$ l
1	Staphylococcus aureus	4.3 mm	6.7mm	3.8 mm	6.1 mm	5.7 mm	8.8 mm	5.4 mm	8.9 mm
2	Escherichia coli	3.3 mm	5.7 mm	3.2 mm	6.1 mm	5.2 mm	8.2 mm	5.2 mm	9.0 mm
3	Bacillus subtilis	5.3 mm	5.8 mm	5.9 mm	6.4 mm	5.9 mm	9.0 mm	5.9 mm	9.0 mm
4	control*	6.0 mm	8.8mm	6.2 mm	9.0mm	6.1 mm	9.0 mm	6.0 mm	9.0 mm

mm = Millimeters;  $\mu$ l = microliters. \*Added Streptomycin 10  $\mu$ g/ml in control.

**Table -2: Antifungal activity of rhizomes of turmeric varieties tested by the agar well diffusion assay Zone of inhibition (mm)**

s.no	Variety name	Con. ( $\mu$ l)							
		Prathiba		Erra Gunturu		Tella Gunturu		Mana Pasupu	
	Fungal sp	50 $\mu$ l	100 $\mu$ l	50 $\mu$ l	100 $\mu$ l	50 $\mu$ l	100 $\mu$ l	50 $\mu$ l	100 $\mu$ l
1	Aspergillus niger	3.1 mm	5.2mm	4.6 mm	5.9mm	4.4 mm	6 mm	4.3 mm	7.3 mm
2	Aspergillus flavus	3.3 mm	4.4mm	5.7 mm	6.4mm	5.5mm	7.1 mm	5.6 mm	7.4 mm
3	Penicillium crysoginum	4.5mm	5.2mm	5.7 mm	6.8mm	5.3mm	5.2 mm	4 mm	5.2 mm
4	Fusarium oxysporium	4.3mm	5.0 mm	4.5mm	5.1mm	6.2 mm	7.5 mm	5.3 mm	7.1mm
5	control*	5.2 mm	7.2 mm	5.8 mm	7.8 mm	5.6 mm	7.7 mm	5.7 mm	8.2 mm

mm = Millimeters;  $\mu$ l = microliters. \*Added Ketocazole 10 $\mu$ g/ml in control

In the present study, turmeric rhizome showed significant antimicrobial activity against all the tested organisms. Previous studies showed that *C. longa* inhibited the growth and activity of some bacteria and fungi. However, the antimicrobial efficacy results strictly depended on concentration, microbial species, and essential oil fraction and especially on modality of extraction used.

Table-1 shows antibacterial activity against all tested organisms had large inhibition against *B. subtilis*. Turmeric varieties had low activity against *E.coli*. The ethanolic extracts of rhizomes were subjected to microbial susceptibility assays using agar well diffusion method. Among all four varieties Prathiba, ErraGunturu varieties had the most inhibitory effect on the growth of all bacterial strains tested as compared to TellaGunturu and ManaPasupu varieties.

Table-2: shows Turmeric varieties with significant antifungal activity against *Aspergillus flavus*, *Aspergillus niger*, *Fusarium oxysporum* and *Penicillium chrysogenum*. Among all the four varieties Prathiba variety had the most inhibitory effect on the growth of all fungal strains.

Presence of varied nature of phytochemicals in two high yielding turmeric varieties of Prathiba and Erragunturu were also reported by Prashanth and Lakshmi Bhavani (2013). They also reported that Presence of more bioactive compounds in Prathiba may be correlated to its resistance power than Erragunturu, since these compounds are known to have curative activity against disease producing pathogens. The present study confirms the presence of more bioactive compounds in Prathiba as reported earlier with its more biological inhibitory activity against the test organisms compared to other varieties studied.

Among the four varieties tested, the Prathiba variety was found superior in its antimicrobial potential. The results showed different degrees of growth inhibition, depending on the microbial strains. Manimegalai et al., (2011) have reported antifungal, antibacterial and anti-inflammatory activity for species such as *C.longa*, *C.zedoria*, *C.aromatica* and *C.amada*. The results of different studies provide evidence that some medicinal plants might indeed be potential sources of new antibacterial agents even against some antibiotic-resistant strains.

## CONCLUSION

The use of medicinal plants to cure diseases has been extensively applied by people. Turmeric is a spice, which is a natural ingredient of our daily food. Thus it was confirmed that Turmeric, a natural ingredient of our daily food can provide protection to a certain extent against our natural enemies like bacterial pathogens. So as a result it could be estimated that the plant chosen for study has a wide range of activity against various pathogens. The varying degrees of sensitivity of the bacterial test organisms may be due to the intrinsic tolerance of microorganisms. From this study it can be concluded that the extracts of Turmeric varieties possess antimicrobial activity. It can be concluded that among the varieties tested for antimicrobial activity, the high yielding variety Prathiba is a potent antimicrobial agent.

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