

Antibacterial Activity of Different Extracts of Black Pepper

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Abstract— It has been well known since ancient times that medicinal plants have antimicrobial activity due to the presence of bioactive constituents; therefore they become important sources of drugs formulation. The antibacterial activity of seed extracts of Black pepper was evaluated by well diffusion method. Acetone, methanol and benzene solvents were used for the extraction. During the analysis *Pseudomonas aeruginosa* and *Staphylococcus aureus* both were found most sensitive to the benzene extract and inhibition zone measured as 16mm for both bacteria at 100µg/ml. Minimum activity was shown by both acetone and methanol extracts. The study concluded that antimicrobial activity of extracts increases as the concentration increases.

Keywords— Antimicrobial activity, black pepper, minimum inhibitory concentration, zone of inhibition.

I. INTRODUCTION

Plant-derived medicines have been part of traditional healthcare in most parts of the world since ancient times and there is increasing interest in plants as sources of antimicrobial agents [1]. Given the alarming incidence of antibiotic resistance in bacteria of medical importance, there is a constant need for new and effective therapeutic agents [2, 3]. However, there has also been a rising interest for natural products from plants for the discovery of new antimicrobial and antioxidant agents in the last three decades and in recent times. More so, many of these plants have been known to synthesize active secondary metabolites such as phenolic compound found in essential oils with established potent insecticidal and antimicrobial activities, which indeed has formed the basis for their applications in some pharmaceuticals, alternative medicines and natural therapies [4]. Natural plant products, including medicinal plant extracts, are increasingly being used as agrochemicals for controlling diseases due to their non-phytotoxicity and easy biodegradation [5]. Black pepper (*Piper nigrum* L.) is well-known cooking herb and the extracts have been reported in various natural medicines. Black pepper is produced from the still-green, unripe drupes of the pepper plant which have a bitter, hot, sharp taste, tonic to the liver, stomachic, abortifacient, aphrodisiac and digestive. Black pepper is known to inhibit the growth of various microbes such as *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Alternaria alternata*, *Aspergillus niger*, *Aspergillus flavus* and *Fusarium oxysporum*. Black pepper (*Piper Nigrum* L.) is an important healthy food owing to its antioxidant, antimicrobial potential and gastro-protective role. The present investigation was undertaken to test the antimicrobial activity of seed extract of black pepper against selected pathogens.

II. MATERIALS AND METHODS

Plant Material

The seeds of spice black pepper used for the present study were collected from the local market of Shahjahanpur, Uttar Pradesh (India).

Bacterial Cultures

Staphylococcus aureus (NCIM-2079), *Bacillus subtilis* (NCIM-2124), *Escherichia coli* (NCIM-2064) and *Pseudomonas aeruginosa* (NCIM-5210).

Solvents and Media

Methanol, Benzene and Acetone solvents for extraction, Nutreint Agar

Preparation of extract

1. 10 gms of Black pepper was ground finely and used for solvent extraction via Soxhlet apparatus following standard protocol [6]. After the complete process, the collected extracts were subjected for evaporation at room temperature. The dried extracts were stored at 4°C for future analysis.

Minimum inhibitory concentration (MIC) Well diffusion method

Extracts were tested for the anti-bacterial potential by Agar well diffusion method [7]. Initially, autoclaved nutrient media were poured in the Petri plates under laminar air flow and after solidification of media the bacterial suspension (24 hrs old) swab over the media. The wells were prepared using cork borer. Test sample was dissolved in DMSO in different concentrations such as 25, 50, 100 µg/ml and 40 µl dissolved test sample from each concentration was loaded to the wells and incubated for 24 hrs at 37°C. DMSO (Di Methyl Sulfoxide) used as a negative control whereas antibiotic amoxicillin disc having amoxicillin 10µg concentration used as positive control.

III. RESULTS AND DISCUSSION

In present study antimicrobial activity of Black pepper was carried out. Table I shown the antimicrobial activity of spice extracted in acetone, methanol and benzene solvents against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Pseudomonas aeruginosa*. The maximum zone of inhibition was observed against *Pseudomonas aeruginosa* (16mm) and *Staphylococcus aureus* (16mm) at 100 µg/ml of benzene extract followed by 50 µg/ml benzene extract (15mm) against both the bacteria. 100µg/ml acetone extract showed 15mm

zone of inhibition followed by 50 µg/ml against *Staphylococcus aureus*. 100µg/ml methanol extract showed 14mm zone of inhibition against *Pseudomonas aeruginosa*. The results suggest that black pepper produced significant antimicrobial activity. In the present study of black pepper, antimicrobial activity against *Pseudomonas aeruginosa* and *Staphylococcus aureus* was found significantly maximum by benzene extract. Both acetone and methanol extracts shown

minimum antibacterial activity. Antimicrobial activity of extracts increases as the concentration increases. The observation revealed that among all the test organisms *E. coli* and *Bacillus subtilis* were least sensitive for all three extracts. The data supports the hypothesis that black pepper has an inhibitory effect on the growth of certain pathogens and may be used effectively against various microbial infections.

TABLE I. Effect of pepper extract on growth of bacteria *in vitro*.

Bacteria	Concentrations of Plant Extracts(µg/ml)									DMSO (Negative control)	Amoxycillin (Positive control)
	Benzene			Methanol			Acetone				
	25	50	100	25	50	100	25	50	100		
<i>Staphylococcus aureus</i>	6	11	16	-	-	8	5	14	15	-	18
<i>Pseudomonas aeruginosa</i>	7	15	16	4	8	14	-	-	7	-	20
<i>Escherechia coli</i>	-	7	9	-	-	8	-	6	8	-	6
<i>Bacillus subtilis</i>	-	11	12	-	-	9	-	-	8	-	22

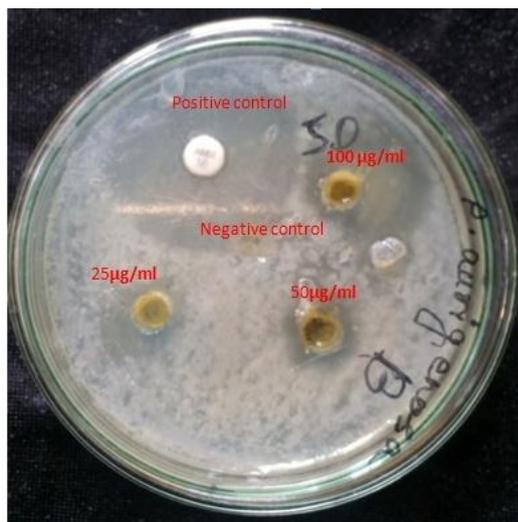


Fig. 1. Inhibition zone photographs of *Pseudomonas aeruginosa* for benzene extract of Black pepper.

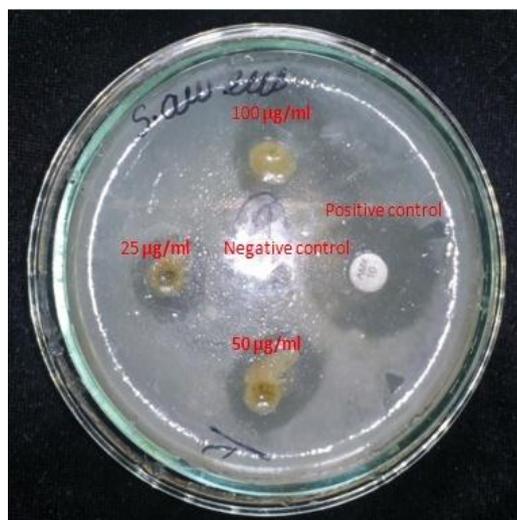


Fig. 2. Inhibition zone photographs of *Staphylococcus aureus* for benzene extract of Black pepper.

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