



Antimicrobial activity of selected medicinal plants cinnamon and clove

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Abstract

The experiments designed to study the antimicrobial activity of alcoholic and aqueous extracts which are prepared from fresh bark of cinnamon zeylanicum and flowers of *Syzygium aromaticum*. The antimicrobial activities of these extracts tested against gram positive and gram negative bacteria using agar well diffusion method. Cinnamon shows antipyretic and analgesic character and the *Syzygium* known for their oil which has great anti pathogen activity or used as anti-cavity agent in teeth. It has been added in several tooth pest.

Keywords: medicinal plant, antibacterial activity, cinnamon zeylanicum, *Syzygium aromaticum*

Introduction

Now in these days the Plants are again in limelight due to their bioactive medicinal compounds. There is high demand of capsules made from plant extracts like liquid or in powdery form. The tenet "Let food be thy medicine and medicine be thy food" advocated by Hippocrates nearly 2500 years ago is receiving renewed interest. In traditional societies nutrition and health care are strongly interconnected and many plants have been consumed both as food and for medicinal purposes [1, 2]. Nearly one thousand species of plants with edible leaves are known. Leafy vegetables most often come from short lived herbaceous plants. India's flora comprises of 6000 species of plants used for consumption of which 0.70 metric tons are green leafy vegetables. Therefore, it is now believed that nutritional security entails not only consumption of a balanced diet to meet the needs of macro and micronutrients but also phytonutrients which may play a major role in promoting health and nutrition [3]. Nowadays re-emerging connection between plants and human health especially depends on their antioxidant activities that may delay or reduce the hazardous effects of free radicals. The major causative for the generation of free radicals in food, drug and living systems is the oxidation process [4]. Plants have a great potential for producing new drugs of great benefit to mankind. There are many approaches to the search for new biologically active principles in higher plants [5]. Many efforts have been done to discover new antimicrobial compounds from various sources such as soil, microorganisms, animals and plants. One of such resources is folk medicine and systemic screening of them may result in the discovery of novel effective compounds [6]. Clove (*Syzygium aromaticum*) constitutes one of the major spices. Cloves are dried unopened floral buds of an evergreen tree, *Syzygium aromaticum* belonging to the family Myrtaceae [7]. Clove is used as flavouring agent and as spice for scenting, chewing tobacco. It is aromatic, carminative & stimulant used for dyspepsia and gastric irritations. Clove buds and their

essential oils have been known to possess various antimicrobial and antioxidant properties [8]. GC-MS analysis of the clove oil extract has shown eugenol acetate, eugenol and caryo-phyllene as the major constituents, the latter two are known to possess antibacterial and antifungal properties [9]. Cinnamomum is called true cinnamon belonging to the family Lauraceae. Its grow in east and south east of Asia to Australia Cinnamon is an evergreen tree reaching about nine meters in high and it is covered with a smooth, pale bark [10]. Cinnamon mainly contains essential oils and important compounds like Cinnamaldehyde, eugenol, cinnamic acid and cinnamate. It has got good anti-inflammatory, anti-microbial, anti-oxidant, anti-ulcer, antidiabetic [11]. It is important to find out the particular micro-organisms for which the herbal extracts are active [12].

Material and Methods

Bark, flower sample and extract preparation

Collection of Bark, Flowers from the native market of Lucknow. Alcoholic extracts were prepared by (Clarks and Biby, 1969) [13]. Washing of material with H₂O. Dried material ground to powder type consideration of fine material (5gm) and preparation it's extract with 100ml of absolute alcohol. The alcoholic mixture was agitated at shaker at room temperature for 8hrs and is placed in dark place for twelve hrs and then the residues were added with 100ml of distilled water at 80c. Alcohol extract prepared.

Microorganisms for Test

Gram-positive *Listeria Monocytogenus*, *staphylococcus Epidermidis* and *Staphylococcus aureus* and Gram negative (*Escherichia coli*, *Pseudomonas aeruginosa*) pathogenic bacteria using inhibition zone method for the essential oils were used for evaluation of antimicrobial activity.

The bacterial stock cultures were incubated in nutrient agar for 24hrs at 37c.

Determination of antimicrobial activity

Antimicrobial activity was determined by Agar well diffusion method by Arora and Kaur, 1999 [14].

Results

The anti-bacterial activity of the *Cinnamomum zeylanicum* and *Syzygium aromaticum* bark and flower extracts were studied against five bacterial species is summarized in Table 1. The results revealed that the selected extracts showed antibacterial activity with varying values. The zone of inhibition above 7 mm in diameter was taken as positive result.

Cinnamon extract showed significant inhibitory effect against (*Staphylococcus epidermidis*, *Staphylococcus aureus* and *Escherichia coli* with zone inhibition (30 mm), while (*Pseudomonas aeruginosa* (28mm) and *Listeria monocytogenes* (29mm).

Clove extract showed Significant inhibitory effect against *Staphylococcus aureus* (20 mm), *Staphylococcus epidermidis* (23mm) and *Escherichia coli* (25mm), *Pseudomonas aeruginosa*(17mm), *Listeria monocytogenes* (21mm), comparison with positive control Cefotaxime *Staphylococcus aureus* (10mm), *Staphylococcus epidermidis* (10mm) and (*Escherichia coli* (9mm), *Pseudomonas aeruginosa* (10mm), *Listeria monocytogenes* (8mm).

Table no.2 indicates the MIC results of the *Cinnamomum zeylanicum*, *Syzygium aromaticum*, extracts were indicates that antibacterial activities in lower concentrations 1/127 on *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Listeria monocytogenes*, *Pseudomonas aeruginosa* and 1/257 on *Escherichia coli*.

Table 1: Zone of Inhibition Cinnamon Zeylanicum and *Syzygium aromaticum* on Bacterial strains

Bacterial strains	Zone of Inhibition in (mm)		
	Cinnamon zeylanicum	<i>Syzygium aromaticum</i>	Cefotaxime
<i>Listeria monocytogenes</i>	29mm	21mm	8mm
<i>Staphylococcus epidermidis</i>	30mm	23mm	10mm
<i>Staphylococcus aureus</i>	30mm	20mm	10mm
<i>Escherichia coli</i>	30mm	25mm	9mm
<i>Pseudomonas aeruginosa</i>	28mm	17mm	10mm

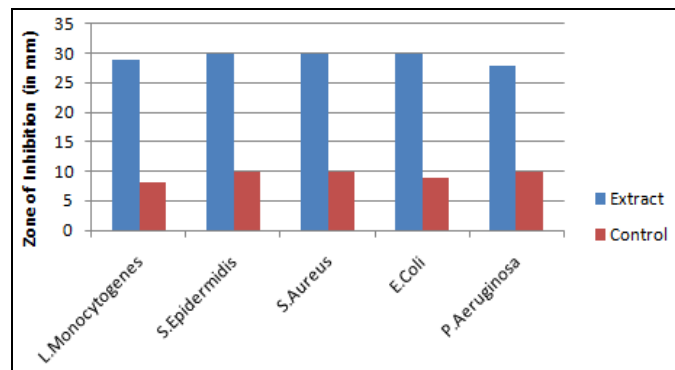


Fig 1: Antimicrobial activity of Cinnamon Extract

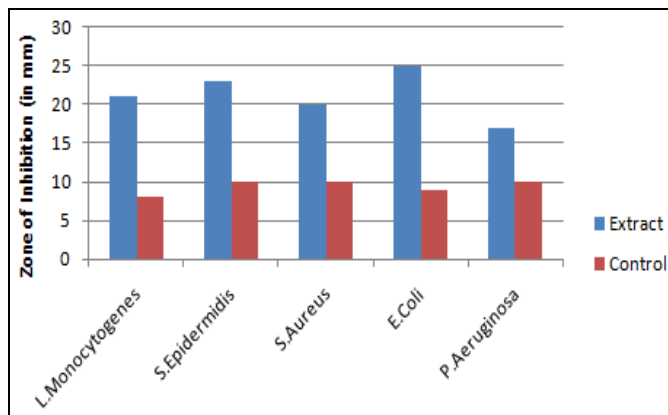


Fig 2: Antimicrobial activity of Syzygium Extract

Table 2: MIC Results of Cinnamon Zeylanicum and *Syzygium aromaticum*

MIC Results		
Bacterial strains	Cinnamon zeylanicum	<i>Syzygium aromaticum</i>
<i>Listeria monocytogenes</i>	1/127	1/65
<i>Staphylococcus epidermidis</i>	1/127	1/65
<i>Staphylococcus aureus</i>	1/127	1/66
<i>Escherichia coli</i>	1/257	1/127
<i>Pseudomonas aeruginosa</i>	1/257	1/127

Discussion

The results of this study are showed that *Cinnamomum zeylanicum*, *Syzygium aromaticum* extract had higher inhibitory effect on gram positive and negative bacteria. Nine constituents representing 99.24% of the extract were identified by GC-MS techniques .The major compounds in the extract were (E)-cinnamaldehyde (68.95%), benzaldehyde (9.94%) and (E)-cinnamyl acetate (7.44%) [15]. The antibacterial activity has been attributed to the presence of some active constituents in the extracts, the antibacterial activity of cinnamon was probably due to their major component, cinnamaldehyde and their constituents is also known to inhibits bacterial acetyl-CoA carboxylase and responsible for major antibacterial activity [16, 17]. Trans-cinnamaldehyde one of properties could be multiple. Cinnamaldehyde is a natural antioxidant and the animal studies suggest that an extract of cinnamon bark taken orally may help prevent stomach ulcer [18]. The anti-microbial action is considered to arise mainly from the potential of hydrophobic essential oils to obstruct the bacterial cell membrane and its structures which leads to ion leakage. Antibacterial assays of the column chromatography fractions were indicated that cinnamaldehyde is the primary compound .It has been proposed that eugenol and cinnamaldehyde inhibit production of an essential enzyme by the bacteria and/or cause damage to the cell wall of bacteria [19]. This could be explained by their hydrophobicity, an important characteristic that exists in EO and their fractions [20], and may allow them to partition the lipids of the bacterial cell membrane, turning them more permeable and leading to leakage of ions and other cell constituents [21].

Conclusion

This study revealed the importance of medicinal plants as herbal medicine used as resistant against many bacterial diseases and it is suitable to make herbal drugs in pharmaceutical industries.

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