Antimicrobial Activity of Some of the South-Indian Spices and Herbals Against Food Pathogens

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Abstract: Antimicrobial activity of 25, 50, 75 and 100% alcohol extract of *Piper nigrum* (Black Pepper), *Psidium guajava* (Guava), *Amomum cardamom* (Cardamom) and *Cynodon dactylon* (Bermuda grass) has been evaluated against *Pseudomonas lundensis*, *Bacillus cereus*, *Aspergillus niger* and *Aspergillus flavus*. *Psidium guajava* extract showed excellent antimicrobial activity against all the test organisms. In 25% concentration, *Psidium guajava* showed the highest 11mm antimicrobial zone against *Pseudomonas lundensis*, *Aspergillus niger* and *Aspergillus flavus*. In 50% concentration, *Amomum cardamom* showed the highest 16mm antimicrobial zone against *Aspergillus niger*. In 75 and 100% concentration, *Psidium guajava* showed the highest 14mm, 19mm antimicrobial zone respectively against *Pseudomonas lundensis*. Among all the results obtained, the maximum antimicrobial zone formation with minimal concentration was recorded in *Psidium guajava* with 11mm of antimicrobial zone against *Pseudomonas lundensis*, *Aspergillus niger* and *Aspergillus flavus*.

Key words: Spices extract • Antimicrobial activity • *Pseudomonas lundensis* • *Bacillus cereus* • *Aspergillus niger* and *Aspergillus flavus*

INTRODUCTION

Food borne pathogens such as *Pseudomonas lundensis*, *Bacillus cereus*, *Aspergillus niger* and *Aspergillus flavus* are widely distributed in nature, causing considerable mortality and morbidity in the population. It is well known that pseudomonads are ubiquitous bacteria in nature. Due to their ability to utilize a wide range of organic compounds, they occupy an important ecological position in the carbon cycle. Therefore, the ecology of pseudomonads in the biosphere has been a matter of interest.

*Bacillus cereus* has been recognized as an agent of food poisoning since 1955. Between 1972 and 1986, 52 outbreaks of food-borne disease associated with *B. cereus* were reported [1]. Bacillus food poisoning strains from 39 outbreaks were identified. *B. cereus* in 23 outbreaks, *B. thuringiensis* in 4, *B. mycoides* in 1 and mixed strains of Bacillus in 11 outbreaks [2]. *A. flavus* produce aflatoxin, which can cause acute hepatitis, immunosuppression and hepatocellular carcinoma [3]. The absence of any regulation of screening for the fungus also have a high prevalence of viral hepatitis, highly increases the risk of hepatocellular carcinoma [4].

*Aspergillus niger*, if inhaled with large amounts of spores, causes a serious lung disease, aspergillosis. *A. niger* is one of the most common causes of otomycosis (fungal ear infections), which can cause pain, temporary hearing loss and, in severe cases, damage to the ear canal and tympanic membrane.

These bacteria have broad host range and have often been isolated from humans with diarrhea [5]. Since the introduction of antibiotics there has been tremendous increase in the resistance of diverse bacterial pathogens [6, 7]. This shift in susceptibility greatly affects our ability to successfully treat patients empirically. Plant derived products have been used for medicinal purposes for centuries. At present, it is estimated that about 80% of the world population rely on botanical preparations as medicines to meet their health needs. Herbs and spices are generally considered safe and proved to be effective against certain ailments [8]. They are also extensively used, particularly, in many Asian, African and other countries. In recent years, in view of their beneficial effects, use of spices or herbs has been gradually increasing in developed countries also.

In the present study, we have evaluated the antibacterial effect of the extracts of two widely used
Table 1: Antibacterial activity of different concentrations of Spices’ Extract:

<table>
<thead>
<tr>
<th>Pathogenic Organisms</th>
<th>P. nigrum (mm)</th>
<th>P. guajava (mm)</th>
<th>C. dactylon (mm)</th>
<th>A. cardamom (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>25%</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
</tr>
<tr>
<td>Bacillus cereus</td>
<td>-</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Pseudomonas lundensis</td>
<td>-</td>
<td>10</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Aspergillus niger</td>
<td>-</td>
<td>10</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Aspergillus flavus</td>
<td>-</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

spices in South India, such as *Piper nigrum* (Black Pepper), *Amomum cardamom* (Cardamom) and two widely used herbas in South India, such as *Psidium guajava* (Guava) and *Cynodon dactylon* (Bermuda grass) against two bacterial food borne pathogens such as *Pseudomonas lundensis*, *Bacillus cereus* and two fungal food borne pathogens such as *Aspergillus niger* and *Aspergillus flavus* and the results are discussed.

**MATERIALS AND METHODS**

**Microorganisms:** *Pseudomonas lundensis*, *Bacillus cereus*, *Aspergillus niger* and *Aspergillus flavus* were the pathogenic microorganisms included in the study. All the cultures were obtained in pure form from the culture collection of Institute of Microbial Technology (IMTECH), Chandigarh, India.

**Preparation of Spices and Herbal Extracts:** The fresh spices and herbs were obtained from the local market. The spices were cleaned, descaled when necessary and washed in sterile distilled water. In order to obtain the spice’s extracts, about 100g of washed spice were crushed with mortar and pestle. The extracts were sieved through a fine mesh cloth and sterilized using membrane filter (0.45-micron sterile filter). This extract was considered as the 100% concentration of the extract.

The concentrations, 75, 50 and 25% were made by diluting the concentrated extract with appropriate volumes of sterile distilled water.

**Antibacterial sensitivity testing using filter paper method:** Filter paper discs of 7mm diameter were prepared and sterilized. Using an ethanol dipped and flamed forceps, these discs were aseptically placed over nutrient agar plates seeded with the respective test organisms [9]. One hundred microlitres of the various spices’ extract (100, 75, 50, 25%) were aseptically transferred to these discs. The plates were incubated in an upright position at 37°C for 24 hours. The diameter of inhibition zones were measured in mm and the results were recorded. Inhibition zones with diameter less than 12mm were considered as having no antimicrobial activity. Diameters between 12 and 16mm were considered moderately active and these with >16mm were considered highly active.

All the media used in the present investigation were obtained from Hi-Media Laboratories Ltd., Mumbai, India.

**RESULTS AND DISCUSSION**

Among the four spices and herbas tested, all the four showed antibacterial activity. The result of the antibacterial activity against the tested pathogens are given in the Table 1.

In 25% concentration, *Psidium guajava* showed the highest 11mm antimicrobial zone against *Pseudomonas lundensis*, *Aspergillus niger* and *Aspergillus flavus*. In 50% concentration, *Amomum cardamom* showed the highest 16mm antimicrobial zone against *Aspergillus niger*. In 75% and 100% concentration, *Psidium guajava* showed the highest 14mm, 19mm antimicrobial zone respectively against *Pseudomonas lundensis*. Among all the results obtained, the maximum antimicrobial zone formation with minimal concentration was recorded in *Psidium guajava* with 11mm of antimicrobial zone against *Pseudomonas lundensis*, *Aspergillus niger* and *Aspergillus flavus*.

**REFERENCES**


