Research Article

PHYTOCHEMICAL SCREENING AND ANTIMICROBIAL EFFECTS OF MUSA ACUMINATA BRACT
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ABSTRACT
Phytomedicines are used in mankind to treat various diseases in the line of medicine. The aim of the present study is to evaluate the phytochemical composition of Musa Acuminata bract and to assess the antibacterial activities by in vitro screening methods. The bract of Musa Acuminata were collected from the market and identified. Phytochemical analysis of methanolic extract of bracts of Musa Acuminata revealed the presence alkaloids, flavonoids, tannins, saponins, polyphenol and coumarin. The antibacterial effect was carried out on Gram-positive (Staphylococcus aureus) and Gram-negative (E-coli) bacterial species using agar well diffusion method. The study results revealed that the methanolic extract of Musa Acuminata bract is effective against Gram-positive (Staphylococcus aureus) and Gram-negative (E-coli) bacterial species. The study results concluded that the methanolic extract of Musa Acuminata bract can be used for the treatment of infections caused by bacteria.

Keywords: Musa Acuminata bract, secondary metabolites, antibacterial activity, solid waste management, phytoconstituents

INTRODUCTION
Globally, infectious diseases become the world’s leading cause and kill thousands of people every day. Development of unscrupulous diseases due to various microorganisms has led to decrease in the survival rate of patients drastically. Antimicrobial agents in the market have become inefficient to control infectious diseases. The existing problem is largely due to the multi-drug resistance of these agents against microorganisms. In order to overcome this, detection of new prototype antimicrobial compound is necessary. Problems associated with the antimicrobial agents include serious adverse effects and severe allergic reactions. Phytomedicines derived from herbal plants are widely used in many parts of the world due to the presence of diverse bioactive compounds. According to World Health Organization (WHO) estimated, nearly 75–80% of the world population utilizes medicinal plants for their primary health care needs. This dragged the attention of the researchers to identify and develop new antimicrobial agents derived from medicinal plants in order to fulfill the current therapeutic problem. India is a hub of medicinal plants and use traditional medicines like Siddha, Ayurveda and Unani for treating various diseases. Phytoconstituents from plant extracts are considered as secondary metabolites to cure various human diseases.

Banana is the common name for herbaceous plants of the genus Musa. Binomial nomenclature of banana plant is Musa acuminata which belongs to family Musaceae. It is a tropical plant grown all over the world as a source of food and income for the cultivators. Banana is available in various colors when ripe which includes yellow, red, green and purple with different size and it can be cultivatable throughout the year. Banana is the fourth most important global food after rice, wheat and maize. Naturally, banana fruit has slight radioactive property due to its potassium content and small amount of isotope potassium. Various parts of banana plant are also used as medicine from the ancient time onwards. Traditionally, all parts of the banana plant such as fruit, stem juice and flowers were used for treating various diseases such as diarrhoea, antioxidant, dysentery, menorrhagia, antidiabetes, antilithiatic, antitumoral, antimatagenic, antibacterial, antifungal, heptatoprotective, hypocholesterolaemic, antihelminthic, antihelminthic, antiulcerogenic, hair growth promoter, wound healing, and inflammation, pain and snakebite. The bract of Musa acuminata is often ignored and considered as waste for possible utilisation as livestock feeds. Literature reviews indicated that there are no reports available for antibacterial activities from Musa acuminata bract. This study was conducted due to lack of scientific data especially on the phytochemical compositions and antibacterial effects of Musa acuminata bract.

MATERIALS AND METHODS

Plant Materials
The specimen (Bract of Musa acuminata (Musaceae) for the proposed study was collected and confirmed by Dr. S. John Britto, Director, The Director- The Rapinat Herbarium and Centre for Molecular Systematics, St. Joseph’s College, Tiruchirappalli. Voucher specimens can be assessed as JJP001, Dept. of Botany, St. Joseph’s College, Tiruchirappalli.

Chemicals
Chemicals were obtained from Ranchem Laboratory Chemicals Pvt. Ltd., Himedia Laboratories Pvt. Ltd. and Loba Chemie, Mumbai.
Preparation of extract

The bracts of *Musa acuminate* were washed in water to make them free from dust and foreign material, air dried under shade at room temperature. The air dried plant materials were coarse powdered and subjected to methanol extraction separately using soxhlet apparatus by reflux for 6 h at 60 °C. A grey colored semisolid mass was obtained which was dried under vacuum and stored in desiccators.

Phytochemical analysis

Methanol extract was analyzed for its phytoconstituents such as alkaloids, carbohydrate, glycoside, saponins, phyto steroids, polyphenol, tannins, flavonoids, proteins and amino acids.

Antibacterial Activity

Preparation of inoculum

Uniform suspension of microorganism was obtained by suspending 24 h fresh culture of gram positive bacteria (*S. aureus*) and gram negative bacteria (*E. coli*) in an amount of 15 mL of the sterile water.

Determination of zone of inhibition

Antibacterial activity of the extract was performed by agar well diffusion method. About 20 mL of liquefied agar medium previously inoculated with 0.1 mL bacteria was transferred into the sterile petri dish having an internal diameter of 8.5 cm and allowed the medium to form uniform thickness. After complete solidification of liquefied inoculated medium, cork bore having 6 mm diameter was used to make wells. After suitable dilution, specific quantity of the extract was added carefully into the well and kept the plates for 30 min for pre-diffusion. After pre-diffusion, the petri plates were incubated at 37 °C for 24 h in the incubator and the zone of inhibition for its antibacterial activity was measured.

Table 1: Phytochemical screening of methanolic extract of *Musa acuminate* bract

<table>
<thead>
<tr>
<th>S. No</th>
<th>Test</th>
<th>Procedure</th>
<th>Observation</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td>Extract + Mayer’s test</td>
<td>Yellow color ppt.</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extract + Wagner’s test</td>
<td>Brownish color ppt.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extract + Dragendorff’s test</td>
<td>Red color ppt.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extract + Hager’s test</td>
<td>Yellow color ppt.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Carbohydrate</td>
<td>Extract + Molish’s test</td>
<td>Violet ring</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extract + Benedict’s test</td>
<td>Orange red color ppt.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extract + Fehling’s test</td>
<td>Red color ppt.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Glycoside</td>
<td>Extract + Modified borntrager’s test</td>
<td>No rose-pink color in the Ammonical layer</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Saponins</td>
<td>Extract + Froth test</td>
<td>Formation of foam.</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extract + Foam test</td>
<td>Formation of foam and persist for 10 min.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Phytosterols</td>
<td>Extract + Salkowski’s reagent</td>
<td>Appearance of golden yellow color</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extract + Libermann burchard’s reagent</td>
<td>Formation of brown ring</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Phenols</td>
<td>Extract + Ferric chloride test</td>
<td>Bluish black color</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Tannins</td>
<td>Extract + Gelatin test</td>
<td>White ppt</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>Flavonoids</td>
<td>Extract + lead acetate</td>
<td>Yellow color ppt.</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>Proteins and amino acids</td>
<td>Extract + Xanthoproteic reagent</td>
<td>No Yellow color</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extract + Ninhydrin reagent</td>
<td>No blue color</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Antibacterial activity (*Escherichia coli*)

<table>
<thead>
<tr>
<th>Compound</th>
<th>40 (µl) (mm)</th>
<th>60 (µl) (mm)</th>
<th>80(µl) (mm)</th>
<th>100(µl) (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol extract of <em>Musa acuminate</em> bract (20%)</td>
<td>2.00±0.04</td>
<td>3.00±0.05</td>
<td>3.80±0.10</td>
<td>5.00±0.11</td>
</tr>
</tbody>
</table>

Table 3: Antibacterial activity (*Staphylococcus aureus*)

<table>
<thead>
<tr>
<th>Compound</th>
<th>100 (µl) (mm)</th>
<th>200 (µl) (mm)</th>
<th>300(µl) (mm)</th>
<th>400(µl) (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol extract of <em>Musa acuminate</em> bract (20%)</td>
<td>2.00±0.06</td>
<td>2.70±0.06</td>
<td>3.50±0.08</td>
<td>5.00±0.10</td>
</tr>
</tbody>
</table>
The study against the gram positive (S. aureus) and gram negative (E. coli) showed antibacterial activity in a dose dependent manner. The results concluded that the methanolic extract of Musa acuminate bract can be used for treating bacterial infections and its utilisation for this purpose should be encouraged, thereby enhancing solid wastes management and reducing environmental pollution. However, further research is needed to identify and determine the phytochemicals responsible for antibacterial activity.

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REFERENCES


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