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Research Article

PHYTOCHEMICAL SCREENING AND ANTIMICROBIAL EFFECTS OF *MUSA ACUMINATA* BRACT

A. Umamaheswari *, A. Puratchikody, S. Lakshmana Prabu, T. Jayapriya
Department of Pharmaceutical Technology, University College of Engineering (BIT Campus), Anna University, Tiruchirappalli, India
*Corresponding Author Email: umapharmaaut@gmail.com

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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[1-3]. 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[4-5]. 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[6]. 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[7]. Phytoconstituents from plant extracts are considered as secondary metabolites to cure various human diseases[8].

Banana is the common name for herbaceous plants of the genus Musa. Binomial nomenclature of banana plant is *Musa acuminate* 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[9]. Banana is available in various colors when ripen which includes yellow, red, green and purple with different size and it can be cultivatable throughout the year[10]. Banana is the fourth most important global food after rice, wheat and maize[11]. Naturally, banana fruit has slight radioactive property due to its potassium content and small amount of isotope potassium 40[12-13]. 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 antidiarrhoea, antioxidant, dysentery, menorrhagia, antidiabetes, antilithiatic, antitumoral, antimutagenic, antibacterial, antifungal, heptatoprotective, hypocholesterolaemic, antimenoorrhagic, antihelminthic, antiulcerogenic, hair growth promotor, wound healing, and inflammation, pain and snakebite[14-20]. The bract of *Musa acuminate* 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 acuminate* bract. This study was conducted due to lack of scientific data especially on the phytochemical compositions and antibacterial effects of *Musa acuminate* bract.

MATERIALS AND METHODS

Plant Materials

The specimen (Bract of *Musa acuminate (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[21-22].

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

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

Table 2: Antibacterial activity (*Escherichia coli*)

Compound	40 (µl) (mm)	60 (µl) (mm)	80(µl) (mm)	100(µl) (mm)
Methanol extract of *Musa acuminate* bract (20%)	2.00±0.04	3.00±0.05	3.80±0.10	5.00±0.11

Table 3: Antibacterial activity (*Staphylococcus aureus*)

Compound	100 (µl) (mm)	200 (µl) (mm)	300(µl) (mm)	400(µl) (mm)
Methanol extract of *Musa acuminate* bract (20%)	2.00±0.06	2.70±0.06	3.50±0.08	5.00±0.10

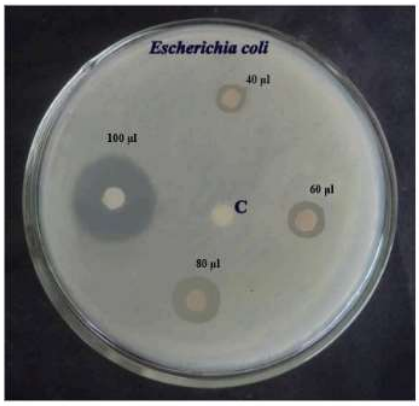


Figure 1: Gram negative bacteria (*E. coli*) of concentrations 40µl, 60µl, 80µl, 100µl

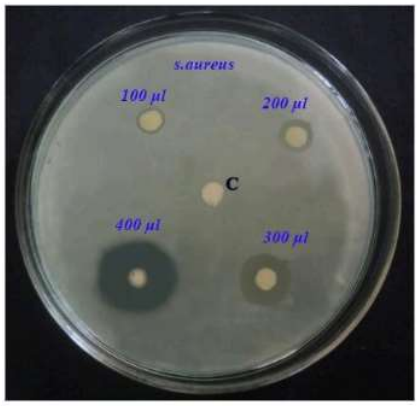


Figure 2: Gram positive bacteria (*S. aureus*) of concentrations 100µl, 200µl, 300µl, 400µl

RESULT AND DISCUSSION

For the past few decades, extracts derived from various parts of plants such as roots, stems, leaves, barks and fruits are investigated for its various pharmacological activities due to its widespread, cost, nontoxic, easy availability and affordability. India has been considered as medicinal garden and having a very old traditional knowledge and folk medicine. Frequency of intake of antibiotics can increase the expensiveness as well as its side effects which make the scientist to focus on herbal drugs. The present study was undertaken to explore the phytochemicals and antibacterial activity from *Musa acuminate* bract.

Evaluation of extracts

The color of the extracts was found to be dark brown color. The extract was tested for the phytoconstituents such as alkaloids, carbohydrate, glycoside, saponins, phyto steroids, polyphenol, tannins, flavonoids, proteins and amino acids. The phytochemical screening showed the presence of secondary metabolites and the results are shown in table 1.

Antibacterial activity

The results of antibacterial study showed that the methanol extract of *Musa acuminate* bract showed good pharmacological activity against gram-positive (*S.aureus*) and gram-negative (*E.coli*) bacterial species in a dose dependent manner. The zone of inhibition was found to be 2 mm, 3 mm, 3.8 mm and 5 mm for 40 µl, 60 µl, 80 µl and 100 µl respectively for gram negative bacteria (*E.coli*) whereas zone of inhibition for gram positive bacteria (*S.aureus*) was found to be 2 mm, 2.7 mm, 3.5 mm and 5 mm for 100 µl, 200 µl , 300 µl and 400 µl respectively. The results of antibacterial activity are shown in tables 2 - 3 and figures 1 - 2. On comparison, it was observed that the methanol extract of *Musa acuminate* bract showed greater antibacterial activity against gram negative bacteria *(E. coli)* than the gram positive bacteria (*S.aureus*).

CONCLUSION

Frequent intake of allopathic drugs for the treatment of bacterial infections results in the generation of adverse side effects. Phytomedicines from herbals have been considered safer than the allopathic drugs. Banana is a tropical fruit cultivated all over the world and all the parts of the banana have assorted medicinal applications. The present study has explored the phytochemicals and antibacterial activity of methanolic extract of *Musa acuminate* bract. 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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