



## A STUDY ON THE ANTIMICROBIAL EFFECTS OF VARIETY OF FRESH BANANA PEEL EXTRACTS

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### ABSTRACT

Banana one of the precious source for sustaining human health. The utilize of fresh banana peel extracts for antimicrobial properties can be of great importance in therapeutic treatments. **Objective:** This research point to assess the antibacterial activity of fresh various banana peel extracts. **Materials and Methods:** Alcoholic extract of banana peel extracts was subjected to antibacterial efficacy against Gram- positive and Gram- negative bacteria by the well agar diffusion method. **Results:** The alcoholic extract of fresh banana peel exhibited a various inhibitory effect against various microbial isolated. Higher inhibitory effects were noticed on Nendran and Poovan against Staphylococcus Aureus (13.55+ \_ 0.04), Bacillus Subtilis (13.26+0.02) and Pseudomonas aeruginosa (14+ \_ 000). **Conclusion:** Alcoholic peel extracts of fresh banana could be observed as a good antibacterial agent both Gram-positive and Gram-negative bacteria.

**KEYWORDS:** Banana, Alcoholic banana peel extract, well-agar diffusion, Gram positive and negative bacteria.

### INTRODUCTION

Nowadays assessment of alternate effective and safe medicine from possible medicinal plants is led by the growing antibiotic-resistant microbial infectious agent. The phytometabolites have enormous potential to repress bacteria, fungi, and virus. Various parts of the plant such as bulb, gel, leaves, roots, barks, peels etc. were used for the extraction of phytometabolites.<sup>[1]</sup> The present practice of medicine today has modified a lot from its practice in medieval times. However, in India, we still use conventional practice for treatment of various diseases since Vedic period.<sup>[2]</sup>

Banana one of the tropical fruit and a member of *Musaceae* family is grown in several regions of all over the world.<sup>[3]</sup> All parts of the banana plant such as flower, pulp, stem, and leaves have a medicinal utilization.<sup>[4]</sup> The flowers in bronchitis and dysentery and on ulcers; cooked flowers are given to diabetics; the astringent plant sap in cases of hysteria, epilepsy, leprosy, fevers, hemorrhages, acute dysentery and diarrhea, and it is used for hemorrhoids, insect and other stings and bites; young leaves are put on as poultices on burns and other skin afflictions; the astringent ashes of the unripe peel and of the leaves are taken in dysentery and diarrhea, and given for treating malignant ulcers;<sup>[5]</sup> the roots are administered in digestive disorders, dysentery, and other ailments; banana seed mucilage is given in cases of diarrhea in India.<sup>[6]</sup>

The previous studies have reveal waste material of Banana peel has medicinal properties.<sup>[4,7]</sup> Several bioactive compounds such as flavonoids, tannins, phlobatannins, alkaloids, glycosides, and terpenoids are present in banana peel which strive a pharmacological effect, especially as an antioxidant, antidiabetic, anti-inflammatory, and antibiotic.<sup>[7]</sup> Phytocompounds extracted from several parts of the banana plant in which displayed remarkable inhibitory effect towards the foodborne pathogens, hence banana plant should be considered to be a significant natural source of antimicrobial as well as antioxidant agent.<sup>[8]</sup> Therefore, the present study was aimed to evaluate the antimicrobial activity of fresh banana peel extracts against clinical pathogens as a comparative study.

### MATERIAL AND METHODS

#### Bacterial culture

The bacterial culture *S.aureus*, *Bacillus subtilis*, *P.aeruginosa*, and *E.coli* were acquired from Microbiological laboratory of Kovai Medical Centre and Hospital (KMCH), Coimbatore and the antibacterial assay was executed in the Department of Microbiology, Dr. N.G.P. Arts and Science College, Coimbatore.

#### Sample collection and Extract preparation

The different variety of the banana peels used for the study was acquired from the farmers in and around Coimbatore. The collected banana peel was directly used

for extraction. Fresh banana peels were roughly chopped and were kept in 70% ethyl alcohol. Then, the entire mixture was homogenized in blender and left at room temperature for about 48 h. As the reaction carried out, the yellow transparent liquid turned to amber and later to an opaque black liquid that served as the indicator for completion of the reaction. After completion of the reaction, the entire slurry was filtered through Whatman filter to get banana peel extract.<sup>[9]</sup> The filtrate was subjected to rotary vacuum evaporator to get solid solvent free curd extract and stored for further bioassay.

#### **In vitro antibacterial assay**

A loop full of bacterial cultures were infused into nutrient broth incubated at 37 °C for 18 hours and inspected the purity. The log phase bacterial suspensions were diluted with sterile nutrient broth to adjust the turbidity and compare with standard tube (McFarland number 0.5) to yield a uniform suspension containing  $1.5 \times 10^8$  CFU / ml. The sterile cotton swab was dib into the standardized bacterial culture to make lawn culture on Mueller-Hinton agar surface of plates and the plates were left for 5-15 minutes at room temperature to dry. Sterile cork borer was used to cut well (6mm diameter) on lawn cultured plates. Solvent-free banana peel extracts were dissolved in Dimethyl sulfoxide (DMSO), from this 0.1ml was added to the well. DMSO and chloramphenicol were used as negative and positive control respectively. The plates were incubated at 37 °C for 18-24h and the size of the zone of inhibition was measured. Each experiment was carried out in triplicate.

#### **Determination of Minimum Inhibitory Concentrations (MICs)**

The banana peel extracts was subjected into Determination of the minimum inhibitory concentration

(MIC) using the tube-dilution technique.<sup>[10]</sup> A two fold serial dilution was made using Muller Hinton broth (MHB). The following concentrations were obtained: 1025mg/ml, 512.5mg/ml, 256mg/ml, 128mg/ml, 64mg/ml, 32mg/ml, 16mg/ml and 8mg/ml. Equal volume of extract and Muller Hinton broth (2ml) was passed into sterilized test tubes. A quantity (0.1ml) of standardized inoculum ( $1.5 \times 10^8$  cfu/ml) was added to each of the test tubes which were incubated aerobically at 37°C for each 24h. A tube containing broth and inoculum without extract similarly tube with broth and extract without inoculum served as organism control and extract control respectively. The lowest concentration of the extracts which inhibited microbial growth (no turbidity) was recorded as the minimum inhibitory concentration (MIC).

#### **Statistical analysis**

Each experiment was done in triplicate, and the data's were expressed as mean± standard error of mean.

#### **RESULTS AND DISCUSSION**

Totally eight fresh peels of various varieties of the banana peel extracts were used for the present study. The antibacterial efficacy of fresh banana peel extracts against clinical isolated were tested and the results were tabulated (Table 1). The fresh peel extract of Nendran showed significant activity against *S.aureus* ( $13.55 \pm 0.04$ ) and *P.aeruginosa* ( $14.5 \pm 0.00$ ) and exhibited moderate activity against *B.subtilis* ( $12.5 \pm 0.04$ ) and *E.coli* ( $10.51 \pm 0.02$ ). Similarly fresh peel extract of poovan showed significant activity than chloramphenicol used as positive control. Other fresh banana (Pachai nadan, Rasthali, Robusta, Kadali, Rasthali and karpooravalli) peel extracts showed minimum efficacy against the pathogens.

**Table: 1. Antibacterial activity of fresh banana peel sample.**

Sample name	Zone of inhibition in mm			
	<i>S.aureus</i>	<i>B. subtilis</i>	<i>P.aeruginosa</i>	<i>E.coli</i>
Karpooravalli	12.23±0.20	10.5±0.04	11.07±0.08	10.51±0.04
Pachinadan	10.53±0.3	9.17±0.12	0	0
Rashthali	9.55±0.04	9±0.06	13.5±0.04	10.5±0.02
Robusta	0	0	12.47±0.03	10.5±0.00
Nendran	13.55±0.04	12.5±0.04	14.5±0.00	10.51±0.02
Kadali	10.55±0.22	6.1±0.41	11.52±0.03	9.5±0.00
Red banana	12.51±0.01	9±0.03	0	12.0±00
Poovan	13.13±0.09	13.26±0.02	0	18.5±0.01
Chloramphenicol	9.03±0.04	13.02±0.02	14.49±0.03	20.0±0.04

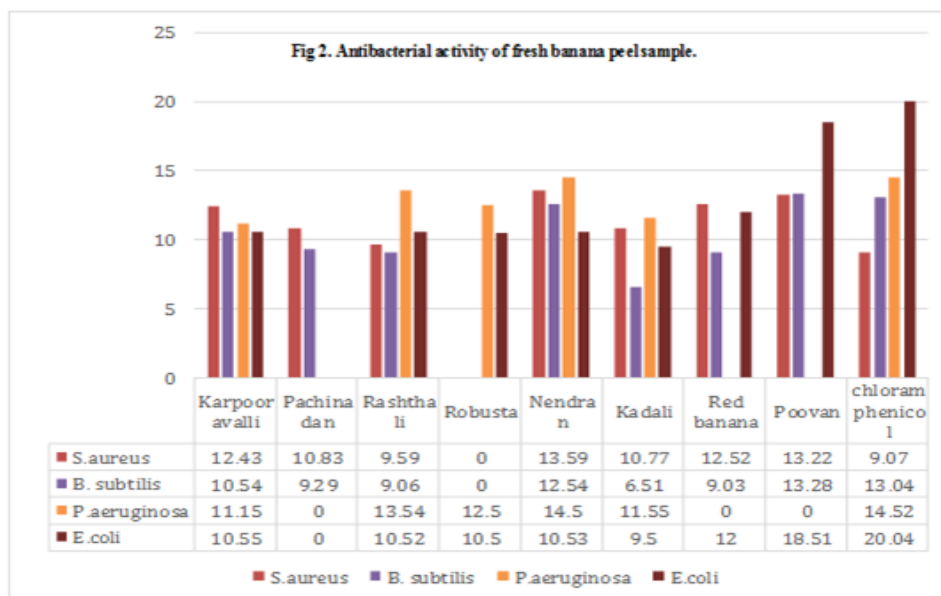
Effect of plant constituents can combat human and plant pathogenic bacteria, fungi and viruses without toxic after effects and environmental hazards.<sup>[11]</sup> The consumption of banana is good because of its nutritional value. It is used in anaemia, stroke,<sup>[12]</sup> depression, stress, heartburn,<sup>[13]</sup> etc., Banana peel which is an outer shell of banana also have been studied for the treatment of mosquito bites,<sup>[14]</sup> gastrointestinal disorders,<sup>[15]</sup> and nipple fissures caused by *Staphylococcus aureus* Previous study described the antifungal and

antimicrobial properties of yellow banana fruit peel and found that it is effective against different Gram positive and negative bacteria.<sup>[16]</sup>

In our present study, we concentrated on various fresh banana peel extract to screen the efficacy on clinical pathogens as a comparative study. In this study aerobic Gram-positive and Gram-negative microorganisms were subjected to assess the impact of banana peel extracts against infectious agent. The previous studies used fresh

peel extracts only but in our present study both extract were scrutinized their efficacy. This study revealed that fresh nendran banana peel extract has significant activity than chloramphenicol which used as positive control. The higher amount of more bioactive compounds was extracted with ethanol 70% due to its higher polarity than

pure ethanol. In the present study also 70% ethanol was used for the extraction of active compounds from the banana peel, it may be the reason for the activity of the nendran peel extracts which indicate the organic solvents like ethanol one of the extracting solvent to extract the phytochemicals.



The ethanolic fresh banana peel extracts was assessed MIC ranging from 8 $\mu$ g/ml to 1025 $\mu$ g/ml (Fig.1). The least MIC 128  $\mu$ g/ml of Nendran and Poovan against *S.aureus* and moderate MIC (256 $\mu$ g/ml) against *B.subtilis* and *P.aeruginosa* was observed. Other banana peel extracts showed highest MIC against the clinical pathogens.

Certain studies conclude that that banana peel extract not only hold back the non-spore forming bacteria but also unidentified substance extracted from banana skin has been shown to inhibit spore formation of bacteria by using plate biological assay, the unknown substance indicates inhibitory effects at pH values as high as 7.5.<sup>[17]</sup> In our present study the fresh banana peel extract showed optimum level of inhibition against some clinical pathogens.

## CONCLUSION

Alcoholic peel extracts of fresh banana could be considered as a good antibacterial agent against both Gram positive and negative bacteria to restore the synthetic medicines in treatment of diseases related to bacteria.

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