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## Review Article

# Evaluation Of Antimicrobial Activity of Banana Peels Extraction

**Pritam Gavali\*, Lalita Battase**

*Aditya Institute of Pharmacy, Chalisgaon Dist-Jalgao.*

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## ABSTRACT

In the food business, banana peels—which account for over one-third of the fruit’s weight—are routinely discarded as trash. However, their therapeutic properties have long been recognized. Numerous health benefits are associated with the bioactive chemicals present in banana peels. With an emphasis on extraction methods, bioactive composition, and applications, this review provides a thorough examination of the benefits of banana peel bioactives.

## INTRODUCTION

Bioactive compounds are naturally occurring elements in foods that aren’t nutritional and are usually found in small amounts. Nutra-Ceuticals, a specific type of bioactive compound, have health benefits and are used for therapy and preventing certain health problems. Among these compounds, phenolics and flavonoids—like flavonols and isoflavones—are important subcategories of polyphenols known for helping prevent diseases. By-products from plant processing industries are plentiful and cost-effective sources of essential bioactive compounds, including vitamins, carotenoids, flavonoids, and anthocyanins. Fruits and vegetables are key parts of a healthy diet and are known to lower the risk of various chronic diseases. They have significant amounts of

bioactive components that are linked to lower rates of morbidity and mortality from cardiovascular diseases and some cancers. The waste from fruits and vegetables, along with their by-products, is produced in large quantities during industrial processing, creating a serious environmental issue due to their harmful effects. The peels of fruits and vegetables are the main by-products obtained during the processing of different fruits, and some research shows that these peels are great sources of polyphenols, carotenoids, and other bioactive compounds that provide many health benefits. Different components show activities like antimicrobial, antioxidant, and anti-cancer properties. The main way to treat ulcers is by reducing the stomach’s acid production, neutralizing the acid, and protecting the affected

**\*Corresponding Author:** Pritam Gavali

**Address:** Aditya Institute of Pharmacy, Chalisgaon Dist-Jalgao.

**Email** ✉: [PRIG504@GMAIL.COM](mailto:PRIG504@GMAIL.COM)

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area to Facilitate healing. However, numerous frequently prescribed antiulcer drugs, such as antacids, H<sub>2</sub>-receptor antagonists, and proton pump inhibitors, mainly operate by reducing aggressive factors but are known to produce side effects, foster tolerance, and heighten the risk of relapses during ulcer therapy. The significant expenses and toxic repercussions linked to these medications highlight the necessity for initiatives aimed at identifying alternatives. A viable protective agent for managing peptic ulcer disease can be sourced from natural plant materials, which offer superior protection and diminish the likelihood of relapse, thus making it accessible to all socioeconomic groups. Notably, herbal treatments frequently bolster protective factors such as mucin secretion, cellular mucus, bicarbonate secretion, and mucosal blood circulation. To extract polyphenols from a sample, an ultrasonic bath was employed with a predetermined time and temperature to combine the sample with organic solvents like ethanol, methanol, and acetone. It was crucial to create cavitation bubbles adjacent to the sample to generate sound waves that ultimately ruptured the cell walls, facilitating the release of phenolic compounds from the sample and their subsequent extraction into the solvent medium. Ultrasound-assisted extraction is widely utilized in laboratories due to its effectiveness and simplicity [22,23]. This research aimed to assess the impacts of maceration and sonication on the extraction of bioactive compounds from banana peel powder. It also examined how various solvents (ethanol, methanol, acetone) at different concentrations (25, 50, 75, 100%) affected the extraction parameters.

### Chemical Composition of Banana Peel:-

Research has shown that banana peel (*Musa sapientum*) is abundant in a variety of nutrients and

minerals [18]. The analysis revealed crude protein levels at  $1.95 \pm 0.14\%$ , crude fat at  $5.93 \pm 0.13\%$ , and carbohydrates at  $11.82 \pm 2.17\%$  within the banana peel. The mineral composition of banana peel encompasses phosphorus, iron, calcium, magnesium, and sodium. Trace amounts of zinc, copper, potassium, and manganese were also identified, quantified in mg/100 g (Figure 1). Nevertheless, Nagarajaiah and Prakash [19] observed a lower iron concentration in their study compared to the results of Hassan et al. [18]. They identified the highest iron concentrations in three banana varieties: Pachabale (10 mg/100 g), Nendranbale (4 mg/100 g), and Yelakkibale (3.33 mg/100 g). The polyphenol content varied between 200 to 850 mg equivalent of tannic acid per 100 g. Additionally, they reported phosphorus levels that were comparable to those documented by Hassan et al. 2018 [18] for Yelakkibale. However, phosphorus levels were found to be lower in both Pachabale and Nendranbale. Notably, Yelakkibale exhibited a remarkably high calcium concentration of 244.68 mg/100 g, which is five times greater than the 204.80 mg/100 g noted by Hussein et al. [18] for Nendranbale and 166.54 mg/100 g for Pachabale. Another significant observation is that vitamin C, tannins, phytic acid, total oxalate, and water-soluble oxalate levels were considerably elevated in Yelakkibale when compared to Nendranbale and Pachabale. The vitamin C content in Yelakkibale was measured at 17.83 mg/100 g, which is ten times higher than that found in both Nendranbale and Pachabale. The tannin levels in Yelakkibale were recorded at 1073 mg/100 g, followed by 1114 mg/100 g in Nendranbale and 517 mg/100 g in Pachabale. Emaga et al. [20] investigated the chemical composition of six varieties of banana and plantain peels. Their results suggest that the various varieties did not consistently affect the chemical constituents. However, the ripening process of the fruits was associated with an



Increase in soluble sugar content alongside a reduction in starch. The degradation of starch by endogenous enzymes is also noted. Enzymes may provide insight into the increased levels of soluble sugar. They associated the degradation of starch with the function of these enzymes, potentially accounting for the elevation in soluble sugar concentrations. Additionally, they emphasized the notable presence of essential amino acids such as leucine, valine, phenylalanine, and threonine. Potassium is recognized as the most vital mineral element. Figure 2 depicts the chemical structures of the amino acids present in banana peels: leucine, valine, phenylalanine, and threonine.

## **MATERIALS AND METHODS: -**

### **Collection and preparation:-**

Fresh banana peels (*Musa spp.*) were sourced from local fruit vendors and confirmed by a certified botanist. The peels were thoroughly washed with distilled water to remove any dirt and contaminants. After cleaning, the peels were cut into small pieces and dried in the shade for 5 to 7 days to prevent the degradation of phytochemicals. Once completely dried, the peels were ground into a coarse powder using a mechanical grinder and stored in airtight containers.

### **Extraction of Banana Peel:-**

About 50 grams of banana peel powder were obtained using a Soxhlet apparatus, with ethanol acting as the solvent. This extraction took around 6 to 8 hours and continued until the siphon cycle was clear. After that, the extract was filtered and concentrated using either a rotary evaporator or a water bath. The final semi-solid extract was kept in amber bottles and stored in the fridge to avoid degradation. Ethanol, being a polar solvent, helped extract a variety of phytochemicals like flavonoids, tannins, alkaloids, polyphenols,

saponins, and vitamin C—these compounds are known for their antimicrobial and wound-healing effects.

### **Phytochemical screening of the extracts:-**

The phytochemicals screening of the various solvents extract were carried out using standard procedures

#### **Test for glycosides**

A small quantity of the extracts was added to 1 mL of water in a test tube, and then 1 mL of NaOH was included. A yellow precipitate shows that glycosides are present.

#### **Test for phenols**

5 mg of the extract was dissolved in distilled water, and then 3 mL of a 10% lead acetate solution was added. A large white precipitate indicates the presence of phenols.

#### **Test for flavonoids**

A few drops of concentrated hydrochloric acid were added to a small amount of the extract. The immediate appearance of a red color indicates that flavonoids are present.

#### **Test for saponins :-**

One milliliter of each extract was diluted with distilled water to a total volume of 20 mL and shaken in a graduated cylinder for 15 minutes. The formation of foam about 1 cm high indicates the presence of saponins.

### **Antimicrobial Activity Testing**

Microorganisms: Common strains like *Escherichia coli*, *Staphylococcus aureus*, and *Pseudomonas aeruginosa* are usually used.



## Procedure:

- Petri dishes are set up using Mueller-Hinton Agar and left to solidify.
- Bacterial cultures are spread evenly across the agar surface.
- Wells are created with a sterile cork borer and filled with different concentrations of banana peel extract.
- A standard antibiotic solution is used as a positive control.
- The plates are incubated at 37°C for 24 hours.

## Antioxidant Activities:-

A prime illustration of a useful benefit that plant extracts can provide is their antioxidant activity. Plants are recognized for having a range of natural antioxidants that assist in preserving and safeguarding their physical and metabolic integrity, along with their genetic material through the seeds they generate. Numerous plant extracts and compounds are demonstrating promise in diminishing the visible signs of aging on the skin by reducing the metabolic impacts of oxidation. Vitamin C, vitamin E, anthocyanin, catechin, and rosmarinic acid (RA) are frequently utilized in food and cosmetic products because of their potent antioxidant properties, which help maintain product stability []. Additionally, banana peel extract presents considerable antioxidant advantages []. Decreased oxidation clearly benefits both the product and the skin, and consumers generally view antioxidants favorably, making them especially appealing as ingredients in cosmetics. The difficulty lies in the fact that a single antioxidant is often promoted as a universal solution. Plant antioxidants vary not only in their redox potential and solubility but also in how they operate. Certain reactive oxygen species (ROS), such as superoxide, hydroxyl radicals, and singlet oxygen, are neutralized [63]. Others diminish the

activity or expression of oxidative enzymes, enhance the activity or expression of antioxidative compounds or enzymes like catalase, chelate oxidizing metal ions, or work through various mechanisms, some of which are known while others remain to be uncovered. Considering the wide range of chemical structures and biological processes linked to plant antioxidants, it's understandable that not all antioxidants provide the same degree of skin protection.

## CONCLUSIONS: -

One of the benefits that humans get from scientific studies on plant waste is recognizing banana peels as a source of useful and nutritious compounds. This research pointed out the biological activities of banana peels, especially their antioxidant and antimicrobial properties because of the biologically active compounds they contain. Compounds like phenolics, alkaloids, flavonoids, tannins, saponins, glycosides, carotenoids, sterols, triterpenes, and catecholamines found in banana peels are known for their antioxidant and antimicrobial effects. It has been discovered that banana peels have a lot of potential for more research. Future studies are necessary to find out the biologically active compounds, their possibilities, and the different advantages that banana peels could provide instead of being ignored as waste.

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