Formulation and evaluation of herbal antimicrobial gel containing *musa acuminata* leaves extract

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**Abstract**

*Musa acuminata* commonly known as banana plant is vastly being consumed across the world. It is known for many antimicrobial activities and reports show that phenolic compounds mainly contribute to this trait. Considering these advantages an herbal gel containing 4% extract obtained from plant leaves was prepared. Extraction of phenolic compound from leaves was carried out using suitable solvent. The phenolic recovery from acetone extract was showing good antimicrobial activity. The physiochemical parameters of formulations (pH, viscosity, Spreadability and homogeneity) were determined. The herbal gel showed that formulation containing *Musa acuminata* leaves extract have better antimicrobial activity.

The antimicrobial activity was carried out against *E.coli* and *Candida albicans*.

**Keywords:** *Musa acuminata*, Carbopol 940, Herbal gel, antimicrobial activity

1. **Introduction**

80% of the world population relies on medicinal plants for their primary health care. Such herbal medicines that are easily available, cheaper, time tested and considered safer than most of modern synthetic drugs.

Furthermore, evolution has already carried out a screening process whereby plants are more likely to survive if they contain potent compounds, which deter animals or insects from eating them. These potent compounds are secondary metabolites with quite complex structures, in which most of them are biologically active compounds. It is sobering that very few plants were been fully studied and the vast majorities have not been studied at all.

Banana is thought to have antibacterial activity, antioxidant activity and other biological activities such as antidiabetic, anti diarrheal, anti-tumoral, antimutagenic, antihelminthic and antieulcerogenic. The phytochemical components like alkaloids, glycosides, flavonoids, saponins, steroids, serotonin and dopa-mine present in Banana also contribute to pharmacological effects.

So a preliminary phytochemical screening of the plant is performed. Then select appropriate extract which give better activity. Then the formulation of gel, the efficacy is often dependent on the composition of the vehicle. The ability of a drug in gel formulation to penetrate the skin and exert its effect depends on to consecutive physical events. The drug must first diffuse out of the vehicle to the skin surface and then, it must penetrate the natural barrier to enter into the site of action.

Carbopol polymers are bearing very good water sorption property. They swell in water up to 1000 times their original volume and 10 times their original diameter to form a gel when exposed to a pH environment above 4.0 to 6.0. Because the pKa of these polymers is 6.0 to 0.5, the carboxylate moiety on the polymer backbone ionizes, resulting in repulsion between the native charges, which adds to the swelling of the polymer. The glass transition temperature of Carbopol polymers is 105°C (221°F) in powder form. However, glass transition temperature decreases significantly as the polymer comes into contact of water. The polymer chains start gyrating and radius of gyration becomes increasingly larger. Macroscopically, this phenomenon manifests itself as swelling.

2. **Material Method**

**Chemicals**

Carbopol-940, methyl paraben, propyl paraben, propylene glycol-400, tri-ethanolamine, acetone
Collection of plant material
The authentic fed *Musa acuminata* leaves (Grand nine) were collected from the campus of Agriculture College, Pune. The collected leaves were washed thoroughly under running water and air dried for few minutes. The fresh leaves were immediately extracted with the solvents.

Preparation of plant extracts
2gm of dried leaves powder dissolved in 50ml acetone was kept the extract for 24hours. The extract was filtered through whatman filter paper no. 41. After filtration, supernatants were evaporated in rotary evaporator to obtain crude extract.

Method of extraction
Cold-maceration

<table>
<thead>
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<th>Formulation</th>
<th>Carbopol-940 extract</th>
<th>Propylene glycol</th>
<th>ethanol</th>
<th>Methyl paraben</th>
<th>Propyl paraben</th>
<th>EDTA</th>
<th>Water</th>
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<td>1%</td>
<td>1%</td>
<td>4%</td>
<td>3%</td>
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<tr>
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<td>4% Gel</td>
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Evaluation of gel formulations

**Determination of pH**
The pH value of gel formulation was determined by using a pH meter.

**Appearance and homogeneity**
All developed gels were tested for physical appearance and homogeneity by visual observation.

**Viscosity**
The measurement of viscosity of the prepared gel was done with Brookfield viscometer. The reading was taken at 100 rpm using spindle no. 6

**Spreadability**
The spread ability of gel formulations was determined by measuring the spreading diameter of 1g of gel between two horizontal plates (20 cm × 20 cm).

**Antibacterial assay**
The screening was done by disc diffusion method. The gel were tested against *Escherichia coli*. A loopful of the pure Bacterial culture was suspended in nutrient broth and incubated for 24 hours. Nutrient agar media was sterilized and poured into plates. After solidification, 0.1ml of the inoculum was spread over the agar even using L rod. 6mm diameter cavity was prepared. Placed gel in cavity. Antibiotic marketed formulation were used as the control. The inoculated plates are incubated for 24 hours. Later, the zone of inhibition around the disc was measured and recorded.

**Antifungal assay**
The assay was performed against *candida albicans*, sabouraud agar was used as the growth media. In each plate 15ml of the sterile media was added allow it to solidify then 0.1ml of the inoculum was spread over media then cavity was made at different position and add 1gm gel was added and the plate was kept in incubator for 24hrs. Nystatin cream USP used as control.

3. Results and Discussion of gels

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<th>Fungi</th>
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<table>
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<td>13mm</td>
<td>14mm</td>
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4. Conclusion
Based on literature and current investigation we found that the acetone extract obtained from leaves of plant *Musa Acuminata* possess significant antimicrobial activity. Out of the formulated gel preparation 4% gel was good in appearance and showed better antimicrobial effect than other gel formulations.

5. Reference
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