

**SYNOPSIS OF THE PROPOSED RESEARCH PROJECT FOR  
“NATIONAL SCIENCE AND TECHNOLOGY (NST)”**

FELLOWSHIP: 2025-2026

**1. Title of the research**

**In English: Development of Sustainable Edible Coating Using Banana Peel, Tamarind Seed, and Guava Leaf Extract to Extend Postharvest Shelf Life of Mango.**

**In Bangla:** কলার খোসা, তেঁতুল বীজ এবং পেয়ারা পাতার নির্যাস ব্যবহার করে আমের সংরক্ষণক্ষমতা বৃদ্ধির জন্য টেকসই ভোজ্য আবরণ উন্নয়ন।

**2. Introduction:**

Mango (*Mangifera indica L.*) is one of the most important tropical fruits worldwide, valued for its taste, nutritional benefits, and economic significance. However, mangoes are highly perishable and vulnerable to rapid spoilage due to their climacteric nature, resulting in considerable postharvest losses, especially in developing countries (Le et al., 2022). Conventional preservation methods often involve synthetic or plastic packaging to extend shelf life, but these pose environmental and health risks due to their non-biodegradable nature (Siracusa et al., 2008).

Edible Coatings and s from natural biopolymers have gained attention as eco-friendly alternatives. These s provide semi-permeable barriers that reduce moisture loss, delay respiration, and inhibit microbial growth, thus maintaining fruit quality (Kocira et al., 2021). However, production costs and reliance on food-grade materials limit their widespread adoption. Valorizing agricultural wastes such as banana peel and tamarind seed offers a sustainable, low-cost source of biopolymers. Banana peels are rich in starch and pectin, known for good Coating-forming abilities while tamarind seeds contain polysaccharides with excellent gel-forming properties (Sigiro et al., 2022).

To further enhance Coating functionality, natural plant extracts with antioxidant and antimicrobial properties can be incorporated. Guava (*Psidium guajava*) leaf extract is a rich source of phenolic compounds and flavonoids, which inhibit spoilage microorganisms and oxidative damage (Majhi et al., 2023). Combining these components can produce a sustainable edible that extends mango shelf life, promotes agro-waste utilization, and supports environmental and economic sustainability.

**3. Objectives:**

- To extract biopolymers from banana peel and tamarind seed for edible Coating formation.
- To evaluate the physical, mechanical, and barrier properties of the developed edible Coatings.
- To assess the effectiveness of edible Coating in extending the shelf life and maintaining the postharvest quality of mangoes under storage conditions.
- To conduct a sensory evaluation to determine consumer acceptance of coated mangoes.

#### **4. Research Methodology**

#### **4.1. Raw Material Preparation**

Banana peels and tamarind seeds will be collected, cleaned, oven-dried at 50–60°C, and ground into powder. Guava leaves will be air-dried and extracted using ethanol via maceration or Soxhlet extraction to obtain antimicrobial and antioxidant-rich extracts.

#### **4.2. Biopolymer Extraction**

Banana peel powder will be mixed with water (1:10 w/v), heated, filtered, and polysaccharides will be precipitated using ethanol. Tamarind seed kernel powder will be boiled in water, filtered, and precipitated similarly (Ling et al., 2023).

#### **4.3. Edible Coating Preparation**

Extracted biopolymers will be blended in various ratios with guava leaf extract (0–5%) and glycerol (2%) as a plasticizer.

#### 4.4. Coating Characterization

Coating will be tested for thickness, tensile strength, and water vapor permeability. Functional properties like antioxidant (DPPH assay) and antimicrobial activity (agar well diffusion) will be evaluated. FTIR and SEM will be used for structural analysis (Mondal et al., 2022).

#### **4.5. Mango Coating and Storage**

Mangoes will be coated by dipping, dried, and stored at room and refrigerated conditions. Quality parameters (weight loss, firmness, color, TSS, microbial load, Sensory evaluation) will be assessed over 21 days.

#### **4.6. Sensory and Sustainability Assessment**

Sensory evaluation using a 9-point hedonic scale will assess acceptability

## **5. Time Frame of the Research Work:**

To achieve the required objectives, it will take one year with the following schedule:

## 6. Contribution & Socio-Economic Importance

This study contributes to sustainable postharvest technology by developing an edible coating from banana peel, tamarind seed, and guava leaf extract, agro-wastes that are often discarded. The natural coating helps extend the shelf life of mangoes by reducing spoilage, maintaining quality, and ensuring food safety. It offers an eco-friendly, biodegradable alternative to synthetic preservatives. Socio-economically, this low-cost method can reduce postharvest losses, increase farmers' income, and promote rural entrepreneurship by turning agricultural waste into valuable products. It also supports food security and enhances export potential by improving the storage life of mangoes.

## 7. References:

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Signature of the Supervisor  
**Md. Entaduzzaman Jony**  
Assistant Professor  
Department of Food Engineering  
Gopalganj Science and Technology  
University  
Gopalganj- 8100.  
Mobile: +8801764821058  
E-mail: [jony007.bau@gmail.com](mailto:jony007.bau@gmail.com)

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Signature of the researcher  
Nur Mohammed Imran Hossain  
ID: 22FE504  
Session: 2022-2023  
MS in Food Engineering  
Gopalganj Science and Technology  
University  
Gopalganj- 8100.