

SAMPLE SUBMISSION - SECONDARY SCHOOL

Innovation Type: Enhanced Knowledge / Bio-Innovation

Focus Area: Translational Biotech

Idea Description: Our project explores how natural plant extracts can replace synthetic chemical preservatives to extend the shelf life of fresh local fruits. Freshly harvested fruits like bananas and papayas spoil quickly in warm climates due to rapid fungal growth and oxidation. Standard chemical sprays are often expensive and non-organic.

Instead of synthetic preservatives, our team will test an eco-friendly bio-coating made from **cassava starch and lemon grass extract**. The cassava starch creates a thin, edible barrier that slows down oxygen intake, while the natural active compounds in lemongrass act as a natural antifungal agent. This offers an accessible, plant-based solution to keep fruit fresh longer without changing its taste or quality.

STEM Concepts:

1. **Biology:** Plant physiology, fruit respiration rates, and fungal inhibition using natural bio-actives.
2. **Chemistry:** Polymer film formation (starch gelatinization), oxidation reactions, and natural pH preservation.
3. **Food Science:** Post-harvest preservation techniques, edible coatings, and shelf-life evaluation.
4. **Mathematics:** Measuring mass loss percentages, tracking day-to-day deterioration rates, and data graphing.

Methodology:

1. **Bio-Coating Preparation:** Mix cassava starch, warm water, and varied concentrations of distilled lemongrass oil (0%, 2%, 5%) to form a clear liquid solution.
2. **Sample Application:** Coat equal-sized fruit samples (Sample A: Untreated control, Sample B: Starch only, Sample C: Starch + Lemongrass).
3. **Storage & Exposure:** Place all samples in identical ambient conditions (28°C, 75% humidity).
4. **Observation & Testing:** Measure fruit mass loss, skin color change, and fungal spot emergence every 24 hours over a 7-day period.
5. **Firmness Test:** Perform a simple penetration test to measure structural integrity over time.

Final Product/Outcome: A biodegradable, edible plant-based coating that delayed fruit browning and fungal growth by up to 4 days compared to untreated samples. The coating effectively reduced oxygen exposure and moisture loss.

Economic & Social Impact:

- **Post-Harvest Conservation:** Helps smallholder farmers and local fruit vendors reduce fruit spoilage during transport.
- **Chemical-Free Agriculture:** Promotes organic, non-toxic alternatives to synthetic chemical sprays.
- **Upcycling Local Resources:** Utilizes readily available native crops like cassava and lemongrass.

Supporting Documents:

