SYNOPSIS OF PROJECT REPORT

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Project Title : **FROM PEEL TO PLASTIC: "A BIODEGRADABLE REVOLUTION"**

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FROM PEEL TO PLASTIC: "A BIODEGRADABLE REVOLUTION"

-MAAHINA THASKEEN T M

Abstract:

- ✓ Plastic is widely used but poses a severe environmental threat due to its non-biodegradable nature.
- ✓ An eco-friendly alternative is *bio plastic*, which can be produced from natural sources such as banana peels or corn starch.
- ✓ This project aims to develop a biodegradable plastic by extracting starch from banana peels or corn and combining it with natural additives.
- ✓ The resulting plastic is expected to be lightweight, flexible, and environmentally safe.
- ✓ Plastic pollution is one of the most pressing environmental challenges of our time. This research investigates the potential of fruit and vegetable peels—specifically banana, orange, and potato peel—as raw materials for producing biodegradable plastic.
- ✓ The study outlines the process of converting organic waste into bioplastics, compares their properties, and evaluates their environmental and economic impact.
- ✓ The goal is to demonstrate how everyday waste can be transformed into sustainable alternatives to synthetic plastics.

Introduction:

- ✓ Conventional plastic takes hundreds of years to decompose, causing soil, air, and water pollution.
- ✓ Landfills and oceans are increasingly filled with plastic waste, harming wildlife
- ✓ Banana peels and corn starch are cheap, renewable, and rich in starch—making them ideal raw materials for biodegradable plastic.

The Problem with Plastic

- ✓ Traditional plastics are made from petroleum-based polymers that take hundreds of years to decompose. They pollute oceans, harm wildlife, and contribute to climate change.

a. Selection of Problems & Background Information:

- ✓ **Problem Identified:** Pollution caused by non-biodegradable plastics.
- ✓ **Background:**
    - Over **400 million tonnes** of plastic are produced annually worldwide.
    - Plastic waste leads to ocean pollution, microplastics, and health hazards.
    - Agricultural byproducts like banana peels and corn starch can be used to create biodegradable plastics that decompose naturally.

Why Bioplastics?

- ✓ Bioplastics are made from renewable sources and decompose naturally. They offer a cleaner, safer alternative to conventional plastics.

Organic Waste as a Solution

- ✓ Fruit and vegetable peels are rich in starch, cellulose, and pectin—natural polymers that can be used to make biodegradable plastic. Using peels not only reduces waste but also provides a low-cost raw material.

b. Research Questions:

- ✓ Can banana peel or corn starch be converted into a useful form of bioplastic?
- ✓ Which source (banana peel vs. corn starch) produces stronger and more durable plastic?
- ✓ How does bioplastic compare with conventional plastic in terms of strength, flexibility, and decomposition?
- ✓ Can bioplastic be produced at a low cost for practical use?

c. Hypothesis:

"If banana peel or corn starch is processed with glycerine, vinegar, and heat, then it can form a biodegradable plastic sheet that can serve as an eco-friendly alternative to conventional plastic."

Objectives:

- ✓ To produce biodegradable plastic using banana peels and corn starch.
- ✓ To compare the quality and durability of plastics obtained from both sources.
- ✓ To reduce the dependency on petroleum-based plastics.
- ✓ To encourage eco-friendly alternatives that are safe for the environment.

Literature Review:

Banana Peel Bioplastics:

Banana peels contain high levels of starch and cellulose. Studies show they can produce flexible, moldable bioplastics when combined with glycerol and vinegar.

Orange Peel Bioplastics:

Orange peels are rich in pectin and cellulose. They yield firm bioplastics with good structural integrity.

Potato Peel Bioplastics:

Potato peels have the highest starch content among common kitchen waste. They produce strong, durable bioplastics.

Previous Research

- **Shanlax Publications**: Pineapple waste used to create cellulose-based biopolymer.
- **PJBMB Journal**: Comparative study of bioplastics from various peels.

Materials Needed:

- ✓ Banana peels (washed and cut)
- ✓ Corn starch
- ✓ Vinegar (acetic acid)
- ✓ Glycerin (acts as a plasticizer)
- ✓ Water
- ✓ Stove or hot plate
- ✓ Saucepan and spoon
- ✓ Measuring cups/spoons
- ✓ Baking sheet / flat tray
- ✓ Oven or sunlight for drying

Method:

1. **Preparation**: Wash and dry peels.
2. **Blending**: Grind into a smooth paste.
3. **Mixing**: Add water, vinegar, and glycerol.
4. **Heating**: Cook mixture until thick and gel-like.
5. **Molding**: Pour into molds and let dry for 48–72 hours.

Experimental Setup:

Variables

- Type of peel
- Amount of glycerol
- Drying time

Controls

- Constant temperature
- Same mixing duration

Testing Parameters

- Flexibility
- Tensile strength
- Water resistance
- Biodegradation rate

Equipment

- Tensile tester
- Water bath
- Compost bin

d. Procedure:

1. **Banana Peel Method:**
    - ✓ Collect banana peels, wash, and blend into a paste.
    - ✓ Heat paste with water, vinegar, and glycerin while stirring.
    - ✓ Pour mixture into a mold/tray and allow it to cool.
    - ✓ Dry in oven/sunlight to obtain bio plastic sheet.

2. **Corn Starch Method:**
    - ✓ Mix corn starch with water, vinegar, and glycerin.
    - ✓ Heat mixture until it thickens and becomes gelatinous.
    - ✓ Spread mixture on a tray/mold.
    - ✓ Dry thoroughly to obtain corn-starch-based plastic.

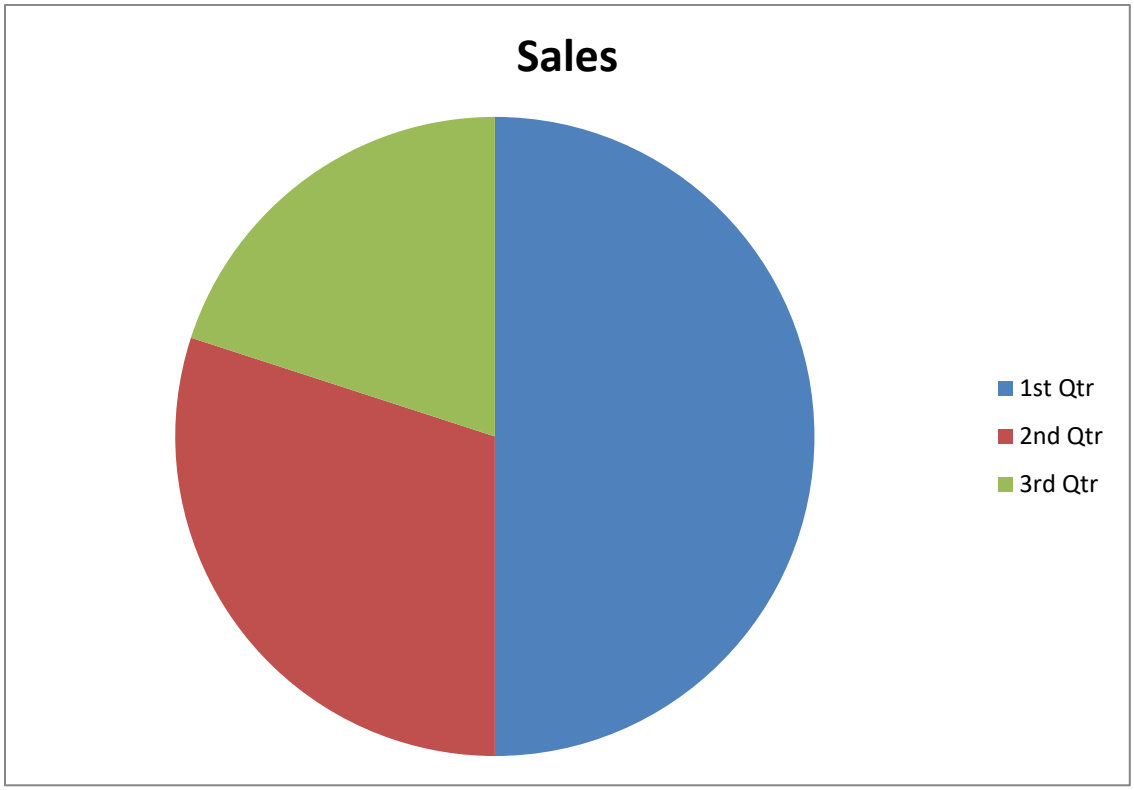
3. Compare flexibility, strength, and decomposition rate of both plastics.

Observation:

- ✓ Note drying time.
- ✓ Test flexibility, strength, and smoothness.
- ✓ Check if material bends, breaks, or cracks.

e. Pie Chart – Raw Material Contribution:

- Corn starch – 50%
- Banana peels – 30%
- Glycerin & Vinegar – 20%

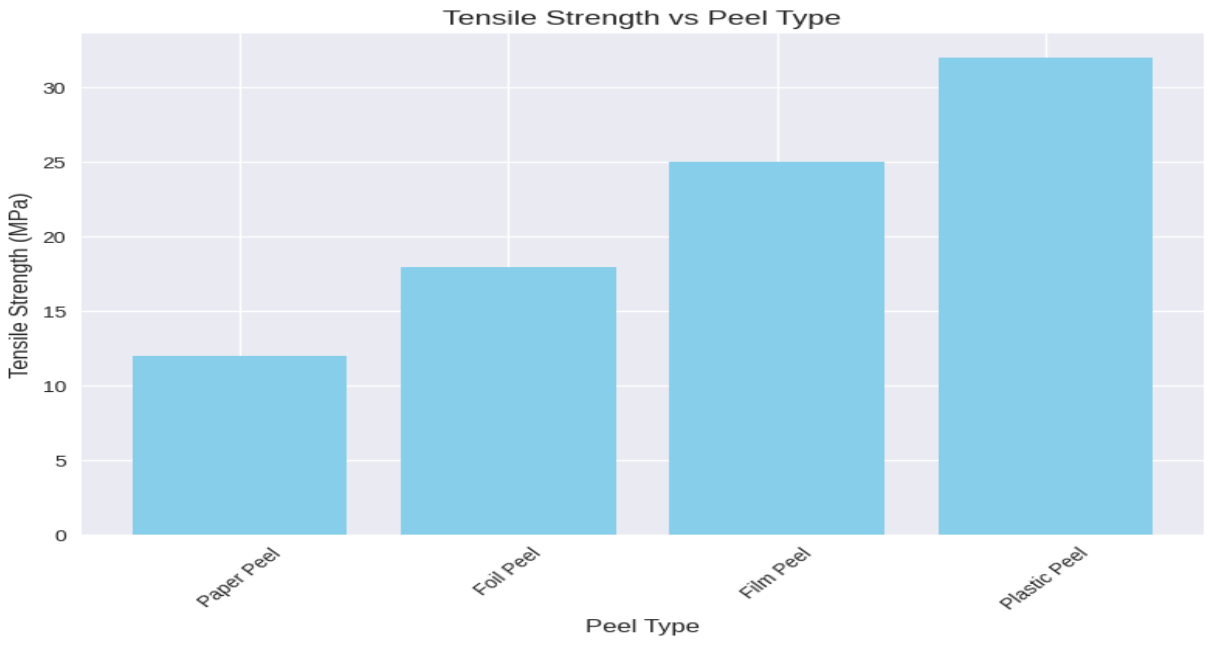


f. Table – Comparison of Bio plastic vs. Conventional Plastic:

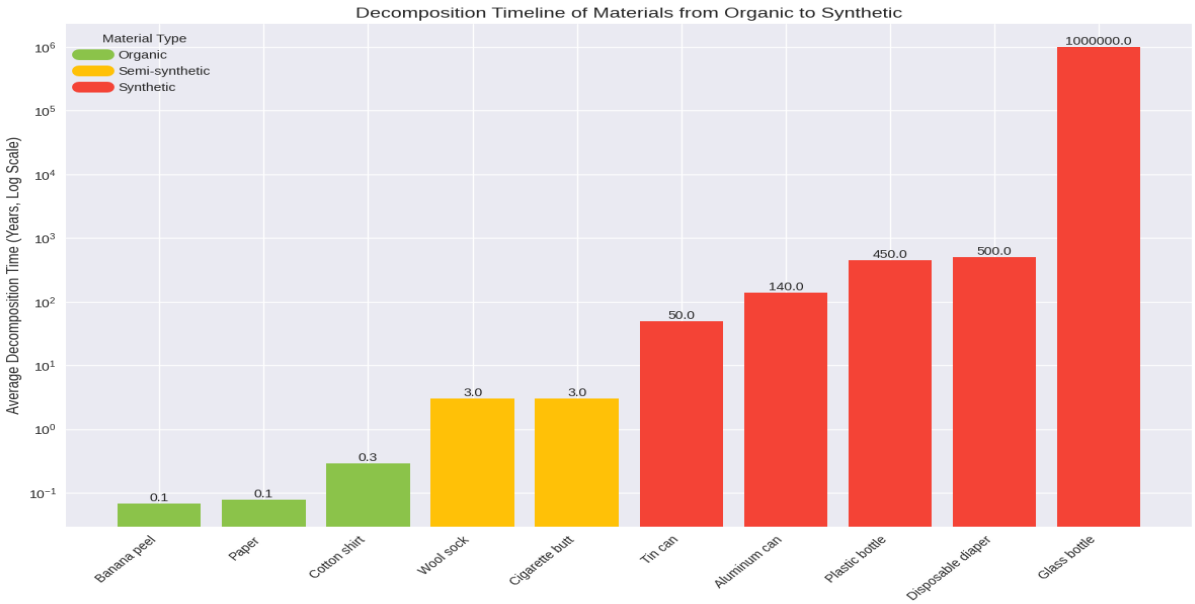
Property	Bio plastic (Banana Peel/Corn Starch)	Conventional Plastic
Raw Material	Natural (peel/starch)	Petroleum
Cost	Low–Moderate	Moderate
Biodegradability	100% (few months)	100+ years
Strength	Moderate	High
Environmental Impact	Eco-friendly	Hazardous

Graphs

- Tensile strength vs peel type

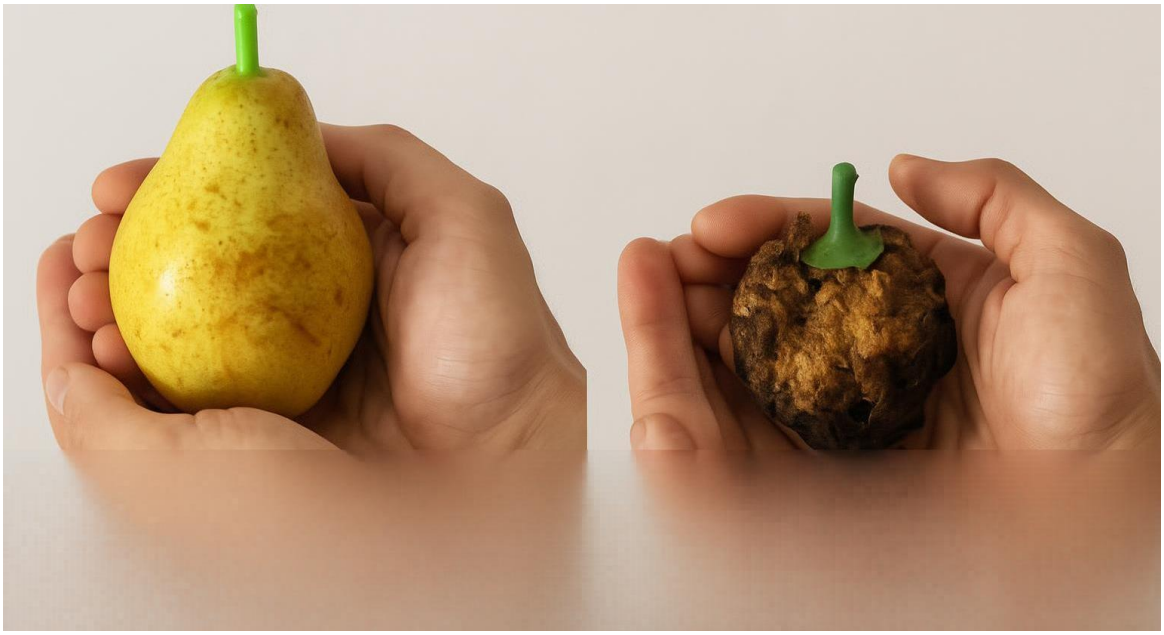


- Decomposition timeline



Photos:

Before Composting After



Risk and Safety:

- ✓ Handle hot mixtures carefully to prevent burns.
- ✓ Wear gloves while using vinegar and glycerin.
- ✓ Ensure proper ventilation during heating to avoid fumes.
- ✓ Avoid ingestion of experimental materials.

Primary Function:

To create an **eco-friendly, biodegradable alternative** to conventional plastic using banana peels or corn starch that can reduce environmental pollution.

Expecting Results:

- ✓ Production of biodegradable plastic sheets from banana peels and corn starch.
- ✓ Bioplastic expected to decompose within months, unlike conventional plastic.
- ✓ Practical applications in packaging, disposable items, and agriculture.
- ✓ A step toward reducing plastic pollution and conserving the environment.

Environmental Impact

Biodegradability

- ✓ Decomposes within 30 days
- ✓ Reduces landfill waste

Waste Reduction

- ✓ Uses food waste that would otherwise be discarded

Carbon Footprint

- ✓ Lower emissions compared to synthetic plastic production

Economic Feasibility

Cost of Ingredients

- ✓ Peels are free waste
- ✓ Glycerol and vinegar are inexpensive

Production Cost

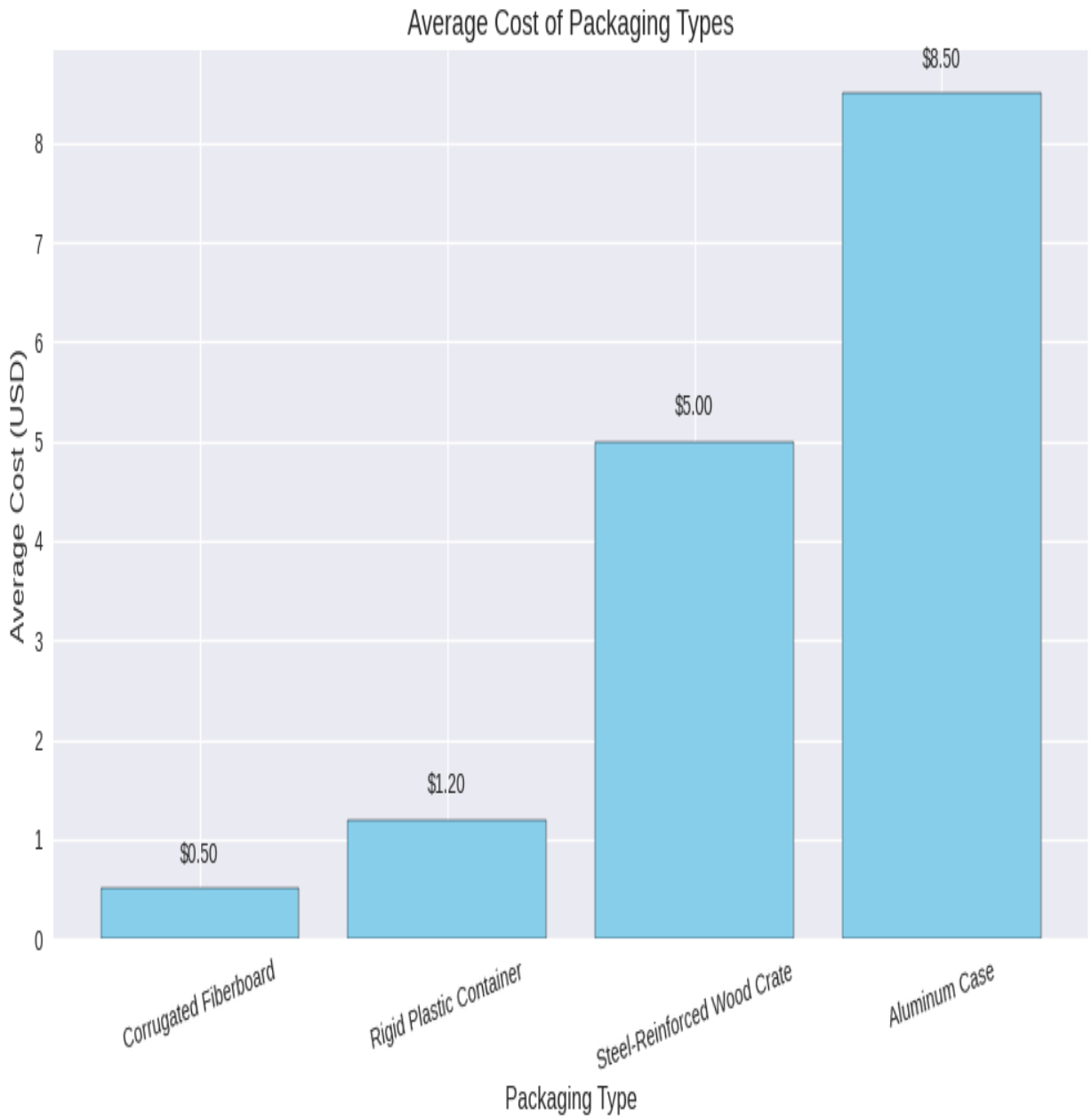
- ✓ Minimal equipment needed

Scalability

- ✓ Can be scaled for local packaging industries

Market Potential

- ✓ Eco-conscious consumers and businesses



Limitations:

- ✓ Water resistance was low.
- ✓ Drying time affected strength.

Improvements:

- ✓ Add natural wax for waterproofing.
- ✓ Test with mixed peels for better results.

Expecting Results:

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Future Scope:

- ✓ **Mixed Peel Formulas**: Combine peels for better texture
- ✓ **Industrial Trials**: Test in packaging and agriculture
- ✓ **Additives**: Use natural resins or waxes for waterproofing
- ✓ **Education**: Promote in schools for awareness and innovation

Conclusion:

- ✓ Bioplastics from peels offer a promising alternative to synthetic plastics.
- ✓ They are eco-friendly, cost-effective, and utilize waste materials.
- ✓ While there are limitations, further research and innovation can make them viable for commercial use.
- ✓ This revolution starts in our kitchens and could reshape the future of packaging.

g. BIBLIOGRAPHY:

- ✓ Ebnesajjad, S. (2013). *Handbook of Biopolymers and Biodegradable Plastics*. William Andrew Publishing.
- ✓ Mohanty, A. K., Misra, M., & Drzal, L. T. (2005). *Natural Fibers, Biopolymers, and Biocomposites*. CRC Press.
- ✓ Ilyas, R. A., Sapuan, S. M., & Harussani, M. M. (2019). *Banana-based biocomposites and bioplastics: A review*. Journal of Renewable Materials, 7(9), 865–879.
- ✓ Anuar, H., Zuraida, A., & Huda, A. (2015). *Banana peel as a renewable resource for biodegradable plastic production*. Journal of Advanced Materials Research, 1134, 47–51.
- ✓ ScienceDirect & ResearchGate articles on *Bioplastics from banana peels and other fruit wastes*.