NATIONAL SCIENCE FAIR 2025 - OMEAIT

eco-friendly plastic

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Abstract

1. Introduction

Conventional plastics are durable but **non-biodegradable**, creating huge waste and pollution problems. Bioplastics made from natural, renewable materials (like cornstarch or banana peels) decompose faster and are safer for the environment.

2. Principle

- **Cornstarch** contains **amylose and amylopectin**, which can form polymer-like structures when heated with water, glycerol, and vinegar.
- **Banana peels** contain **starch and cellulose**, which also work as raw material for bioplastic production.
- Adding **plasticizers** (like glycerol) makes the bioplastic flexible instead of brittle.

3. Aim & Hypothesis

Aim: To make an eco-friendly plastic film from cornstarch and banana peels.

Hypothesis: If natural materials rich in starch/cellulose are processed with heat and plasticizers, they can form biodegradable plastics.

4. Materials

For **cornstarch bioplastic**:

- Cornstarch – 2 tablespoons
- Water – 1 cup
- Glycerol – 1 teaspoon (plasticizer, sometimes available in pharmacies as glycerin)
- Vinegar – 1 teaspoon (helps in gelatinization)
- Saucepan, stove, spatula, flat surface (glass or tray)

For **banana peel bioplastic**:

- Banana peels (ripe or slightly overripe)
- Distilled water
- Glycerol
- Vinegar
- Blender, saucepan, flat tray

5. Method

Cornstarch bio plastic

1. Mix cornstarch, water, glycerol, and vinegar in a saucepan.
2. Heat while stirring until the mixture thickens (gel-like).
3. Pour the paste onto a flat tray and spread thin.
4. Let it dry for 1–2 days → a thin, flexible plastic sheet.

Banana peel bioplastic

1. Wash banana peels, remove fibers.
2. Blend peels with a little water into a slurry.
3. Mix slurry with glycerol and vinegar.
4. Heat gently until thick.
5. Spread on tray, dry for 2–3 days → biodegradable plastic sheet.

6. Observations

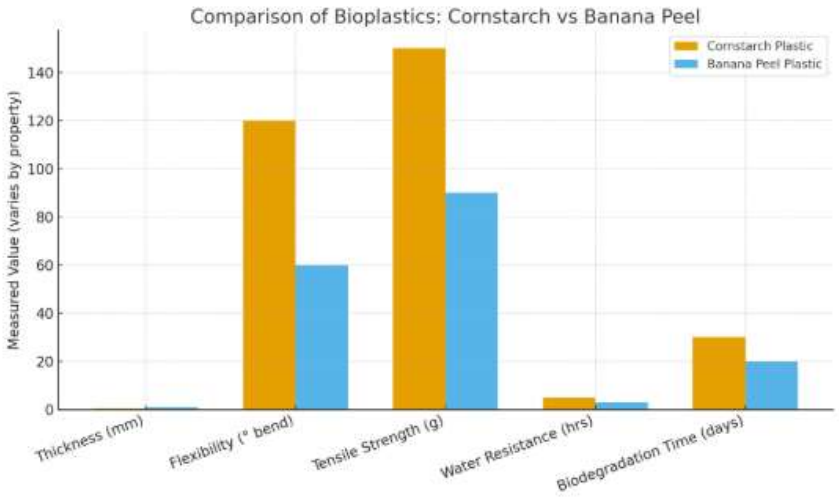
- Cornstarch plastic → transparent, smooth, flexible if glycerol used.
- Banana peel plastic → thicker, slightly darker, less flexible.
- Both are biodegradable (start breaking down in soil within weeks).

7. Results / Data :

Property	Cornstarch Plastic	Banana Peel Plastic
Appearance	Transparent	Brownish / opaque
Flexibility	Flexible (with glycerol)	Less flexible
Biodegradability	~4–6 weeks	~3–5 weeks
Strength	Moderate	Brittle when dry

8. Analysis

- Both **cornstarch** and **banana peels** can produce biodegradable plastics.
- **Cornstarch plastic** is more transparent and flexible.
- **Banana peel plastic** is less flexible but uses waste material, making it sustainable.
- These eco-friendly plastics are promising alternatives to petroleum-based plastics but need scaling and improvements for real-world use.



Conclusion

This project shows that natural materials such as **cornstarch** and **banana peels** can be used to produce simple **biodegradable plastics**. Both types of plastics are eco-friendly alternatives to conventional petroleum-based plastics, but they differ in properties:

- **Cornstarch-based plastic** is smoother, more flexible, semi-transparent, and lasts longer in water.

Banana peel-based plastic is thicker, less flexible, and breaks down faster in soil, making it more biodegradable