

SCIENCE FAIR RESEARCH PLAN

•**PROJECT TITLE:** Smart Biodegradable Food wrap: Turning Kitchen scraps into eco-friendly plastic with a Natural Antibiotic Coating and a built-in Spoilage Indicator

•**STUDENT INFORMATION:**

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Grade/Class- 8-A

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•**INTRODUCTION:**

Plastic waste from food packaging is a major environmental problem because conventional plastics take hundreds of years to decompose. This project creates a biodegradable food wrap using kitchen scraps like corn starch and mashed banana peel, with a natural antibiotic coating and a spoilage indicator. By comparing wraps made from different ingredients, with and without the coating, it tests which produces a durable, eco-friendly wrap that decomposes faster while keeping food fresh.

•**RESEARCH QUESTION :**

Which kitchen scrap ingredient—cornstarch or mashed banana peel—produces biodegradable plastic that is more durable, decomposes faster than conventional plastic, and better preserves food both with and without a natural antibiotic coating?

•**HYPOTHESIS:**

I think the biodegradable wrap made from corn starch might be stronger and keep food fresh longer, while the banana peel wrap could break down faster. I also think adding the natural antibiotic coating and spoilage indicator will help both wraps preserve food better.

•**MATERIALS REQUIRED:**

Corn starch

Mashed banana peels

Glycerol

Lemon juice

Vinegar

Distilled water

Beakers or small bowls

Measuring cups/spoons

Flat trays for drying sheets

Fresh food samples (bread) for wrapping

For Turmeric Coating:

Turmeric powder

Distilled water

Small bowl

Filter cloth or strainer (to remove lumps)

Small brush for applying coating

For Red-Cabbage Indicator:

Red-cabbage juice

Plain white filter paper or thick absorbent sheet (for dipping in red-cabbage juice)

Shallow tray (for dipping and drying paper)

•PROCEDURE:

Preparation of Biodegradable Plastic Sheet:

- 1) Mix 4 tablespoons Corn starch (or mashed banana peel of the same volume for the Banana-peel sheet) with $\frac{1}{2}$ cup water in a small pan.
- 2) Add 1 tablespoon lemon juice and 1 teaspoon vinegar to help the starch set and make the sheet stronger
- 3) Stir in 1 tablespoon glycerin for flexibility
- 4) Heat on low-flame while stirring until it thickens to a gel-like paste.
- 5) Pour onto a flat tray and spread evenly
- 6) Leave to dry at room temperature for 24-48 hours until firm.

Turmeric Coating:

- 1) Mix 2 teaspoons turmeric powder with $1\frac{1}{2}$ teaspoons water to make a smooth, thick paste.
- 2) Add a pinch of salt and a few drops of lemon juice to help the coating stick.

3) After the plastic sheet is completely dry, brush or spread the thin layer of the Turmeric paste on the sheet and let it dry again.

Red-Cabbage Indicator Paper

- 1) Chop about ½ cup red cabbage and boil it in 1 cup hot water to release the purple juice.
- 2) Filter the liquid using filter paper or a strainer
- 3) Let the paper soak until it is fully purple, then dry it flat for later use.

Bread Freshness Test

- 1) Equal slices of bread are wrapped separately in each type of sheet—corn-starch plain, corn-starch with turmeric, banana-peel plain, banana-peel with turmeric—and a plastic wrap sample is kept as a control.
- 2) A small strip of the red-cabbage indicator paper is placed inside each wrap.
- 3) All samples remain at room temperature, and changes in smell, appearance, texture, and indicator color are observed each day to find which wrap keeps the bread fresh the longest.

•DATA ANALYSIS:

- 1) The strength of wraps made from cornstarch and banana peel will be tested to see which is more durable.
- 2) Decomposition time will be recorded by checking how fast each wrap breaks down in soil.
- 3) Bread freshness in each wrap will be observed by looking at color, smell, texture, mold, and pH changes using the red-cabbage indicator.
- 3) Average durability, decomposition, and freshness will be shown in tables and graphs.
- 4) Wraps with and without natural coating will be compared to see how the coating affects preservation.

Wrap type	Natural coating	Bread freshness observations (color, smell texture, mold)	Daily pH changes	Decomposition time(in soil)
Cornstarch wrap	with coating			
Cornstarch wrap	without coating			
Banana peel wrap	with coating			
Banana peel wrap	without coating			

EXPECTED RESULTS:

*Biodegradable wraps made from cornstarch and banana peel are expected to be strong enough to hold food but will decompose faster than regular plastic.

*Bread stored in wraps with the natural antibiotic coating is expected to stay fresh longer than bread in wraps without coating.

*pH changes in the indicator are expected to show slower spoilage in coated wraps.

*Among the two ingredients, one may produce a wrap that is stronger, decomposes faster, and preserves food better.

RISK AND SAFETY:

Wash hands before and after.

Avoid cut contact with coatings.

Use gloves for hot mixtures.

Have Adult supervision

Dispose of waste properly.

Check for allergies.

BIBLIOGRAPHY:

Science Buddies. Making Biodegradable Plastic from Kitchen Ingredients. www.sciencebuddies.org

Science Textbook, Class Notes – Food Preservation and Biodegradable Materials.

Simple websites and articles on natural antibiotic coatings (like turmeric or garlic)