Bite the Spoon, Not the Planet – Edible Cutlery for a Plastic-Free Future

NATIONAL SCIENCE FAIR RESEARCH PLAN

LEVEL : PRIMARY LEVEL

CATEGORY : Environmental Science(MES)

SUBMITTED BY

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(GRADE : 5)

(Community Building & Academic Excellence)

Abstract:

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Project Title : Bite the Spoon, Not the Planet – Edible Cutlery for a Plastic-Free Future

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Plastic cutlery is one of the largest contributors to single-use plastic waste, polluting the environment for hundreds of years. This project explores edible cutlery made from rice, wheat, millet, and a wheat–rice blend as a sustainable alternative. Different dough mixtures were prepared, molded into spoon shapes, baked, and tested for strength, water resistance, taste, cost, and decomposition. The results showed that millet spoons were the strongest and most water-resistant, while the wheat-rice blend scored highest in taste and balanced cost. All edible spoons decomposed within two weeks, proving that edible cutlery can significantly reduce plastic pollution.

INTRODUCTION

Plastic spoons and forks are used for only a few minutes but remain in the environment for hundreds of years, releasing toxic microplastics. Researchers such as Sharma & Kulkarni (2021) and Reddy (2022) highlight the urgent need for biodegradable alternatives. Edible cutlery made from natural ingredients like rice, wheat, and millet is gaining attention because it is completely biodegradable and even consumable.

This project investigates whether edible cutlery made from different flours can be strong, durable, cost-effective, and eco-friendly enough to replace single-use plastic cutlery. The research question guiding this study is:

"Can edible cutlery made from rice, wheat, and millet flour serve as a sustainable, durable, and biodegradable alternative to plastic cutlery?"

Hypothesis

Millet and wheat flour spoons will be stronger and more water-resistant than rice spoons, and all edible spoons will decompose much faster than plastic.

Methodology

Materials Needed: Rice flour, wheat flour, millet flour, salt, oil, water, baking molds (spoon/fork shape), oven.

Steps:

- Mixed flour with water, salt, and oil to form dough.
- Pressed dough into molds of spoon shape.
- Baked at 180°C for 3 minutes.
- Cooled and stored samples.

- Performed few tests:
- Strength Test: By applying pressure until breaking point.
- Water Resistance Test: Placed cutlery in hot water for 10 minutes and recorded durability.
- Taste Test: Evaluated by volunteers.
- Decomposition Test:
- Buried samples in soil and recorded time to decompose and then compared it to plastic cutlery.
- Each type of cutlery underwent five tests: Strength, Water Resistance, Taste, Cost Analysis, and Decomposition. Variables were controlled for baking temperature, mold size, and thickness.

Tabulations

Table 1: Comparison of Strength

Type of Cutlery	Avg. Strength (g)
Rice Flour	310
Wheat Flour	410
Millet Flour	460
Wheat + Rice	390
Plastic	490

Graph :1 Comparison Of Strength

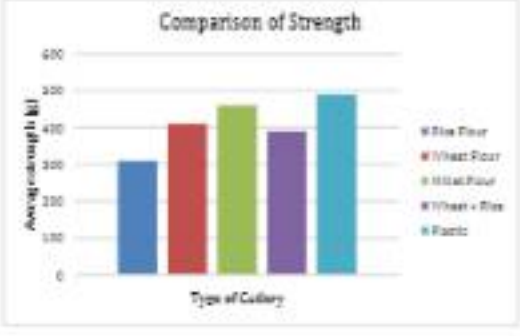


Table 2: Water Resistance Test

Type of Cutlery	Avg. Resistance (min)
Rice Flour	8.3
Wheat Flour	11.3
Millet Flour	14.6
Wheat + Rice	10.3
Plastic	∞

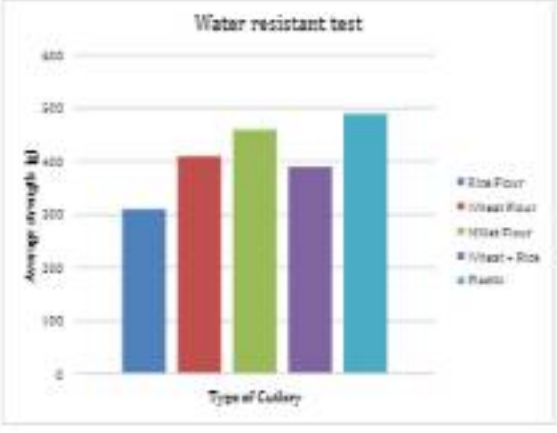


Table 3: Taste Test

Type of Flour	Average Score (1–10)
Rice Flour	8.0
Wheat Flour	8.0
Millet Flour	7.3
Wheat + Rice	8.3

Graph :3 Taste Test

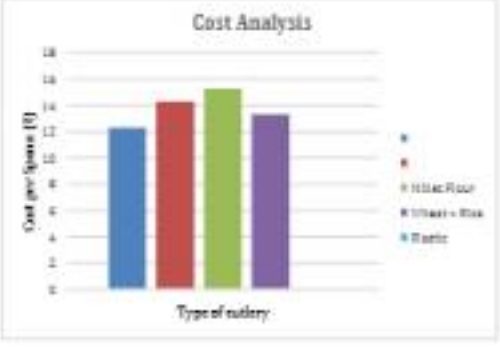


Table 4: Cost Analysis

Type of Flour	Cost per Spoon/Fork (₹)
Rice Flour	5
Wheat Flour	6
Millet Flour	7
Wheat + Rice	5.5
Plastic	2

Graph:4 Cost Analysis

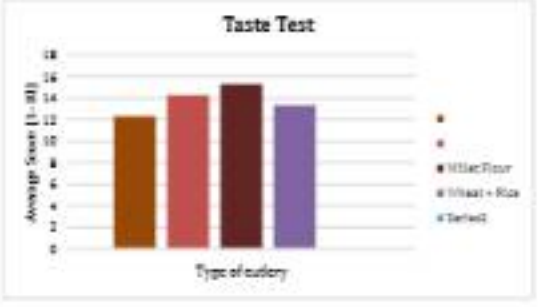
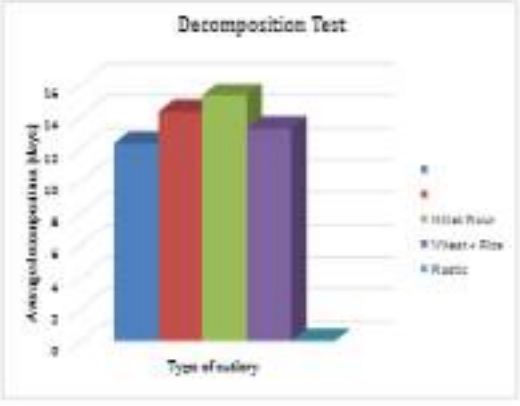


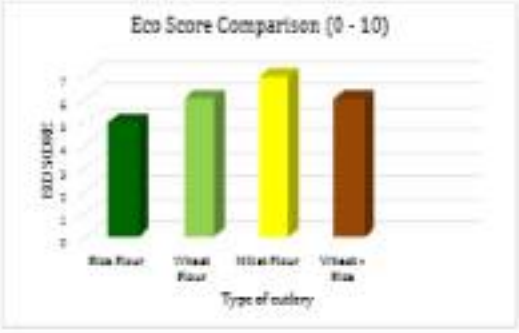
Table 5: Decomposition Test

Type of Cutlery	Avg. Decomposition (days)
Rice Flour	12.3
Wheat Flour	14.3
Millet Flour	15.3
Wheat + Rice	13.3
Plastic	>365

Graph:5 Decomposition Test



Graph : 6 Eco Score Comparison



Collection of data-

Photo graphs


Water
Oil
Wheat flour
Salt


Water
Oil
Salt
Millet flour


Strength test


Decomposition Test

RESULTS & DISCUSSION

Strength Test

- Millet spoons showed the highest strength (460g).
- Wheat spoons followed at 410g.
- Rice spoons were the weakest at 310g.
- Plastic spoons had the highest overall strength but are non-biodegradable.
- Conclusion: Millet flour gives the strongest edible cutlery.

Water Resistance

- Millet spoons again performed best with 14.6 minutes in hot water.
- Rice degraded faster at 8.3 minutes.
- Plastic remained unaffected.
- Millet is the most durable in hot water.

Taste

- The wheat-rice blend received the highest taste score (8.3/10).
- Millet had the lowest taste score (7.3/10).
- Blend offers best taste + acceptable strength.

Cost

- Rice spoons were cheapest (₹5).
- Millet spoons were costliest (₹7).
- Plastic spoons were cheapest overall but harmful to the environment.

Decomposition

- All edible spoons decomposed within 12–15 days.
- Plastic showed no decomposition even after 365 days.
- The results clearly support the hypothesis. Millet spoons outperform others in strength and water resistance, making them the best for durability. The wheat–rice blend shows a good balance of taste, affordability, and strength. All edible spoons decompose quickly, proving they are excellent eco-friendly alternatives to plastic.

CONCLUSION

This study confirms that edible cutlery made from millet, wheat, and rice is a viable eco-friendly replacement for single-use plastics. Millet cutlery was the most durable, while wheat+rice blend offered good taste and strength at a lower cost. All edible cutlery decomposed within two weeks, showing a clear environmental benefit.

Applications: Cafeterias, schools, and events can adopt edible utensils. Entrepreneurs can develop commercial edible cutlery brands.

REFERENCES

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