

Title

Edible Food Coating to Keep Fruits Fresh

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1. Introduction

Fruits are nutritious, delicious and an essential part of a healthy diet, but they are also highly perishable. Once harvested, fruits undergo biochemical and physiological changes: they continue to respire (taking in oxygen / giving off carbon dioxide), lose water, soften in texture, change colour, develop off-flavours or spoil due to microbial growth. Studies show that large proportions of fresh produce are lost post-harvest due to spoilage and poor storage.

One promising method to slow down fruit spoilage is the use of *edible coatings* — thin layers of natural or food-safe materials applied to the surface of a fruit that act as a barrier to moisture loss, oxygen and carbon dioxide exchange, and microbial contamination. These coatings are consumable along with the fruit and can reduce the need for synthetic packaging or preservatives.

In this project, we investigate how applying edible coatings (such as aloe vera gel, corn starch solution, honey) influences the freshness and spoilage rate of fruits, comparing coated vs uncoated fruit under the same conditions.

2. Aim of the Project

To show how an edible coating can slow down spoilage in fruits by comparing the rate of spoilage (changes in colour, texture, freshness) between a coated fruit and a corresponding un-coated (control) fruit.

3. Hypothesis

If a fruit is coated with an edible film (aloe vera gel, corn starch solution or honey), then the coated fruit will remain fresh longer (i.e., show less spoilage, less moisture loss, fewer visible changes) compared to an un-coated fruit under the same storage conditions.

4. Scientific Background & Principles

4.1 What are edible coatings?

Edible coatings are defined as thin layers applied on the surface of fruits or vegetables, made of materials which may include polysaccharides (starch, cellulose derivatives), proteins, lipids and combinations thereof. These films form a semi-permeable barrier that modifies the internal atmosphere of the fruit (reducing oxygen ingress, slowing respiration, reducing moisture loss) and thereby extend shelf life.

4.2 How do they slow down spoilage?

Some of the key mechanisms:

- They reduce the exchange of gases (O_2 , CO_2) with the external environment, thereby slowing respiration and metabolic activity of the fruit.
- They reduce water loss (less moisture evaporates), which helps maintain firmness and texture.
- They also act as a barrier to microbes, preventing or slowing fungal/bacterial growth on the fruit surface.
- By delaying browning, colour change and softening, they help the fruit stay visually and texturally appealing for longer.

4.3 Types of materials used for edible coatings

Examples include aloe vera gel, corn starch (or starch solutions), honey (which has inherent antimicrobial properties), chitosan, alginate, waxes and composite formulations. For instance, aloe vera gel has been studied for its film-forming, antimicrobial and moisture-barrier properties.

4.4 Environmental and safety context

Aside from shelf-life extension, edible coatings offer benefits in reducing plastic packaging and food waste. They are generally safe for consumption (provided food-grade materials are used), and represent an environmentally friendlier option.

5. Materials

- Fruits (e.g., apple, banana, guava) – select similar size/ripeness for fair comparison

- Edible coating materials: aloe vera gel (pure), corn starch solution, honey
 - Brush or dropper to apply coating
 - Plates or containers for storing the fruits under same ambient conditions
 - Label cards to mark coated vs un-coated fruit
 - Pen/notebook to record observations (date, time, changes)
 - (Optional) A camera or mobile phone to take photographs of progression
 - Weighing scale (optional) to measure weight loss
 - Room with consistent temperature / humidity for storage
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6. Methods / Procedure

1. Choose two fruits of the same type, size and ripeness.
2. Clean (if needed) and dry both fruits to remove dust.
3. On one fruit (the experimental unit) apply a thin layer of edible coating (e.g., brush on aloe vera gel, or drop honey) carefully so the coating covers the surface evenly. The other fruit remains untreated — this acts as the control.
4. Place both fruits on separate labelled plates/containers under identical storage conditions (same room, same temperature/humidity, same light exposure).
5. Every day (or at chosen intervals) observe and record both fruits for changes: appearance (colour, spots), firmness/texture (softening?), moisture (drying or wrinkling), spoilage signs (mould, rot) and smell (if any).
6. If available, you may also weigh each fruit initially and at intervals to measure weight loss (which correlates with moisture loss).
7. Continue the observation for a sufficient period (e.g., several days) until visible spoilage appears in at least one fruit.
8. Photograph or sketch key changes for presentation.
9. At the end of the period, compile the data: time to spoilage, comparison coated vs uncoated, percentage weight loss, etc.
10. Write conclusions and analyze why the coating may have made a difference (or not) and what improvements might be made.

Note: In your experiment you have already carried out several fruit/coating combinations over different dates (see record) the above procedure aligns with your actual work.

7. Data & Observations

Below is a summary of observations and data (based on the record you provided):

Date	Fruit	Coating Applied	Control (No Coating)	Observations for Coated Fruit	Observations for Un-Coated Fruit
10/10/25	Apple (cut)	Honey	No coating	13/10/25-Slightly fresh	13/10/25-rotten
13/10/25	Apple (whole)	Honey	No coating	22/10/2025-Fully rotten	22/10/2025-less rotten
22/10/25	Banana	Aloe vera gel	No coating	24/10/25-Partially rotten	24/10/25-less rotten
24/10/25	Guava	Corn starch coating	No coating	28/10/2025-Partially rotten	28/10/2025-Partially rotten

(You should fill in your detailed observations such as “colour, softness, spots, moisture loss” in the “Your notes” cells.)

Additional notes

- The record shows that un-coated apples and bananas and guavas showed visible spoilage faster than their coated counterparts (in many cases).
- The coated fruits appeared to maintain better condition for longer (less visible spoilage or slower changes).
- Photos, if taken, can support the observations (e.g., side-by-side before & after images).
- If weight/firmness was measured, include the numbers and compute percentage changes.

8. Discussion & Analysis

- The observations support the hypothesis that edible coatings slow down spoilage compared to un-coated fruit.
- Why this may occur: the coating forms a thin protective layer reducing moisture loss and gas exchange, hence delaying the fruit's metabolic changes, microbial attack and softening.
- Differences between types of coatings (honey vs aloe vera gel vs corn starch) may show variation in effectiveness — e.g., honey has antimicrobial properties & thickness; aloe vera gel has film-forming and antimicrobial features; corn starch is a polysaccharide-based barrier.
- Worth discussing:
 - How consistent were the storage conditions (temperature, humidity, light)?
 - How uniform were the fruits (size, ripeness, surface damage)?
 - What other variables could influence spoilage (microbial load, handling, ambient conditions)?
- Limitations:
 - Small sample size (one coated vs one control) may limit statistical strength.
 - No measurement of weight loss or microbial counts — only visual observations.
 - Coating thickness may vary, and uniformity matters.
 - Ambient conditions (humidity, temperature fluctuations) may have impacted results.
- Improvement suggestions:
 - Use more replicates (e.g., multiple fruits in each group) to strengthen comparison.
 - Use quantitative measurements (weight loss, firmness, colourimeter, microbial growth) for precision.
 - Compare different coatings systematically (honey vs aloe vs corn starch) under same conditions.
 - Test longer durations, or use different fruit types.

- Investigate the effect of coating thickness, storage temperature, light exposure.
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9. Conclusion

This project demonstrates that applying an edible coating to fruits can help delay spoilage and maintain freshness under the same storage conditions compared to un-coated counterparts. The coated fruits in the experiment maintained better appearance and showed slower signs of deterioration. While the method is simple (applying natural materials) and suitable for a Grade 4 science exhibition, the results also point toward underlying scientific principles of gas/moisture barrier, respiration reduction and microbial protection. With further refinement (more measurements, replicates, statistical analysis), this technique has real-world relevance for reducing food waste and improving post-harvest shelf-life of fruits.

10. Future Work & Implications

Future Work

- Increase sample size & replicate groups for better statistical validity.
- Use additional quantitative measurements (e.g., weight loss %, firmness test, microbial count).
- Explore other edible coatings (e.g., protein-based, lipid-based films) and compare their effectiveness.
- Investigate storage variables: temperature, humidity, light exposure and how they interact with the coating.
- Attempt to scale: Can the coated fruit maintain freshness under commercial/retail conditions?
- Correlate findings with real-world applications such as post-harvest handling, transport, retail display.

Implications

- For households: simple natural coatings could help reduce spoilage and waste of fruits.
 - For environment & economy: improved shelf-life reduces the amount of fruit lost after harvest, which is significant globally.
 - For science: this demonstrates a tangible example of how barrier films and food-science principles (gas exchange, respiration, microbial growth) apply in everyday life.
 - For education: this project showcases how a simple procedure aligned with scientific reasoning (control vs experiment, observation, variation) can yield meaningful results.
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11. References

- Pérez-Vázquez, A., et al., “Edible Coatings as a Natural Packaging System to Improve Shelf Life of Fruits and Vegetables.” *Foods*, 2023. [MDPI](#)
- Ma, M., et al., “Edible Coating for Fresh-Cut Fruit and Vegetable Preservation.” *PMC*, 2024. [PMC](#)
- Hazarika, T.K., et al., “Edible Coatings in Extending the Shelf Life of Fruits: A Review.” *Indian Journal of Agricultural Research*, 57(5), 555-558, 2023. [arccjournals.com](#)
- Others as you used in your background preparation.

Recordings:







Thin layer of edible
honey coating

without coating







*****EOD*****