

Training for Educators

Food Science – Physical vs Chemical Changes

Laboratory for Primary Level Students
Ages 6-12

Mission of the lab

In this lab, students will learn the effects of storing food under different conditions: packaging, preservatives, time, temperature, etc.

The main takeaways for students are that physical and chemical changes occur in food preparation and food spoilage can be slowed by using preservative and packaging.

Key Subjects: Chemistry, Scientific Observation

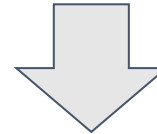
Summary of experiments

First, students will isolate variables to learn how food spoilage is impacted (2 experiments):

Part I:
Preservatives



Part II:
Packaging



Then, students will use this information to design their own packaging system:

Design Challenge:
Apply what they have learned and be creative.
Practice elementary engineering skills.

Supplies list

Tools: knife, paper, pen or pencil

Vegetables or Fruits (Produce): Potato, banana, or plantain
other options: apples, pears, lettuce, any similar local fruit or vegetable

Preservatives: Lemon juice and table salt

other options: lemon, orange, orange juice, lime, lime juice, vinegar, raw honey

Packaging: Aluminum foil and paper

other options for aluminum foil: wax paper, metal container, foil wrappings from candy, something mostly impermeable to air and non-absorbent

other options for paper: newspaper, paper bags, wastepaper, cloth, something permeable to air and absorbent

For all materials, we encourage you to (re)use waste materials when possible!

Safety considerations

Before the students begin the laboratory, please take into consideration the following safety concerns:

- Demonstrate to the students how to safely hold a knife and cut produce to avoid injuries. You may also **pre-cut the produce to avoid any safety concerns.**
- Lemon and lime juice (or citrus juice) are acidic and may **sting open cuts and wounds as well as if they get into students' eyes.**
- While tasting food is part of the food preparation process, **please do not taste the food in this lab** because the spoiled food may cause the taster to get sick.

Setting up your space

Before students arrive:

1. Cut fruits and vegetables as needed into bite-sized pieces. If you are worried about running out, cut into smaller pieces. This shouldn't affect the experiment.
2. Place supplies on tables (groups of 2-4) before students arrive, if possible. This way you can get right to the experiments. If there are shared materials for the whole class, keep those at the front of the classroom with the educators.

Setting up your space

Each student workspace (groups of 2-4) should have:

1. pencils or pens for each student
2. 2 pieces of paper
3. 6 pieces of 1 fruit or vegetable listed (optional: 6 pieces of another) if precut. 1 vegetable and 1 knife if not pre-cut.
4. two types of packaging (e.g., metal container and paper)

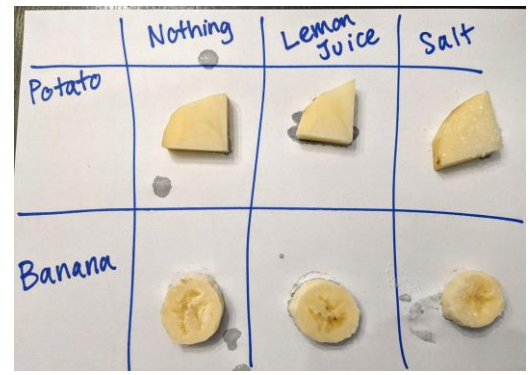
Possible shared lab supplies per classroom:

- 2 preservatives (e.g., lemon juice and table salt)

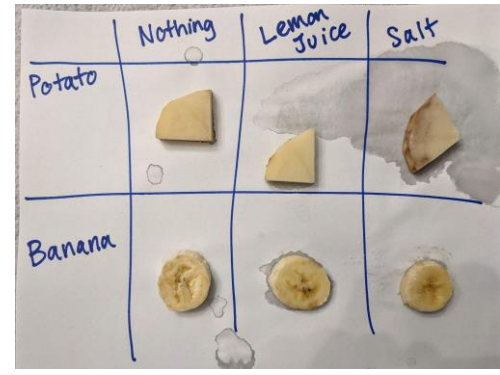
Part I: Preservatives

Example: Potatoes and Bananas

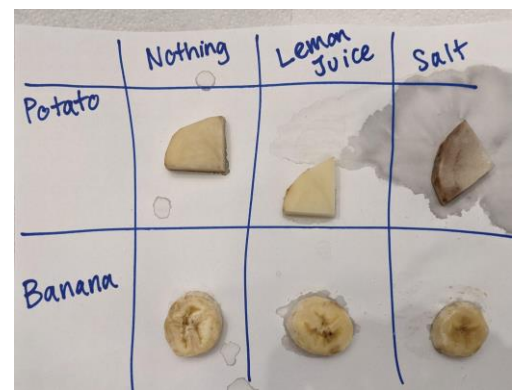
Start:



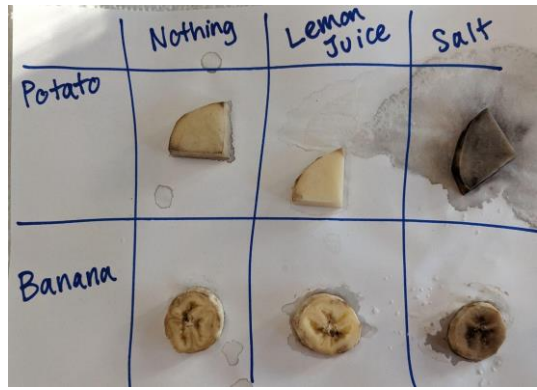
3 hours:



12 hours:



24 hours:



Each group of students should set up one paper like this:

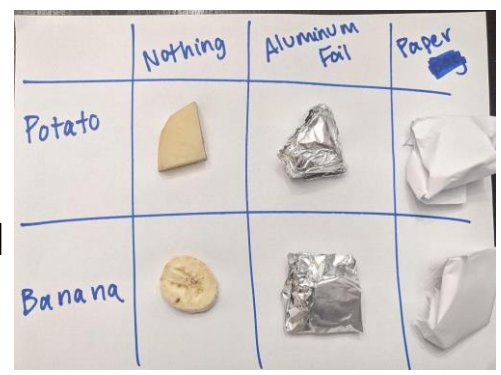
Fruit or vegetable used can vary! See the supplies list for options.

Over time, the food with salt will appear the most spoiled, followed by the 'nothing', followed by the food with lemon juice which should look the freshest!

Part II: Packaging

Example: Potatoes and bananas

Start:



24 hours:

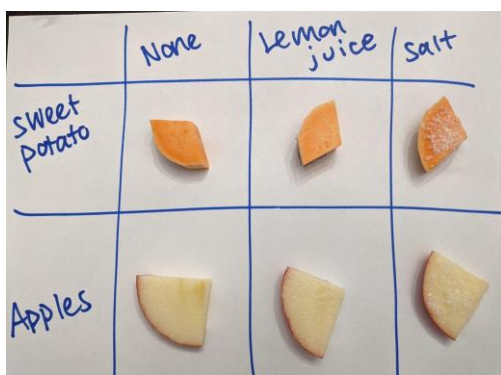


On the 2nd piece of paper, each group of students should set up their paper like this:

Fruit or vegetable used can vary! See the supplies list for options.

Sweet potatoes and apple

Start:



3 hours:



Over time, the food with 'nothing' will appear the most spoiled, followed by the wrapped in paper (or something permeable to air), followed by the food wrapped in metal (or something impermeable to air) which should look the freshest!

Design Challenge

Students are asked to design packaging that would make food last as long as possible. This is meant to spark creativity and let students apply what they have learned in the first two experiments!

We encourage educators to let students come up with ideas on their own, but if students are really stuck, guide them to think about the results they have seen so far and what may work well using the items they have access to locally.

You can also lead a class discussion about how they might help to improve food storage at their own home or in their own community!

Troubleshooting

As everyone running this laboratory is in a different climate around the world, there may be effects of humidity, temperature, and environment on the outcomes of the experiments. Don't worry if you see different outcomes than the pictures shown here!

Reach out to WS2global.org@gmail.com to discuss how this may have impacted your experiments and how we may improve this guide for your location.