

Scientific investigation: Browning apples

Scientific question: How are different substances going to affect apples browning?

What are you going to investigate?

How does one variable (what we will change) affect the other variable (what we will measure)?

Science behind the browning

If you cut an apple, it will soon go brown. This is because an apple contains an enzyme called polyphenol oxidase that reacts with the oxygen in the air and turns polyphenol into coloured melanin that give the apple the brown colour.

This reaction is generally undesirable when it occurs in tissues of fruits such as apples, bananas, or pears. It is thus important to know how to control this browning reaction.

We can slow down the oxidation with not allowing the oxygen to react with the polyphenol in the fruit.

Hypothesis

Prediction:

I think that ... because ... (experience + scientific ideas).

Materials

For the experiment you will need:

- two apples (at first cut different species of apples and use the one that browns the most)
- paper towel
- water at room temperature (1 l)
- a knife and chopping board
- 4 glasses (2 dl)
- 1 tablespoon
- sugar, salt, citric acid, vinegar
- a clingfilm
- a waxpaper
- a pencil
- labels
- a watch

Methods

Describe your work.

Put the apple slices into different solutions to find out which one is preventing the apples from browning. We suggest some, but you can also try with others.

1. Choose the variety of apple that browns the most.
2. Wash the apples and dry them with a paper towel.
3. Label the glasses (2 dl) with numbers from 1 to 4.
4. Put the substances in separate glasses:
 Glass number 1: 1 tablespoon salt
 Glass number 2: 1 tablespoon sugar
 Glass number 3: 1 tablespoon citric acid
 Glass number 4: 1 tablespoon vinegar
5. Put 1,5 dl water (room temperature) in each glass and stir the solutions.
6. Write down numbers from 0 to 4 on a wax paper.
7. Peel the apples.
8. Cut an apple into 6 slices.
9. Put two slices on a wax paper with the label 0, one slice wrap in a clingfilm. Add the other four pieces to the prepared solutions.
10. After one minute take the slices out and put them on labelled wax paper.
11. Observe the colour of the apples for 90 minutes. Write down a time when the change appears.

Results

Draw as a table, use a pencil and paints.

Table:

- first row (what we change) e.g., substance
- second row (what we measure) e.g., the colour of apple slice

If you also measure the time when the change appears, you can also draw a graph.

Graph:

- write a title (A graph shows how one variable affects the other variable the same as a question)
- label the axis (x-axis what we change, y-axis what we measure)

Conclusion

Write down what you learned during the experiment (an answer to the question).

1. Which substances prevent the slices of apples from browning?
2. Why doesn't the apple go brown before we cut it?
3. What happens with an apple wrapped into clingfilm?
4. Why we left one slice on the air?
5. Do all the slices colour equally fast?
6. Which slice browned the first/the last?
7. Are the coloured slices still edible?
8. Explain the results with a scientific concept.
9. Think about real life use of the result.