

Topic

Why do Apples turn Brown?





Investigation Question



**Which liquid
prevents apple
browning the
most?**





Purpose

I wanted to choose this topic because when my mom packs apples for me, they always turn brown, so I want to find a way to prevent that.



Background Research

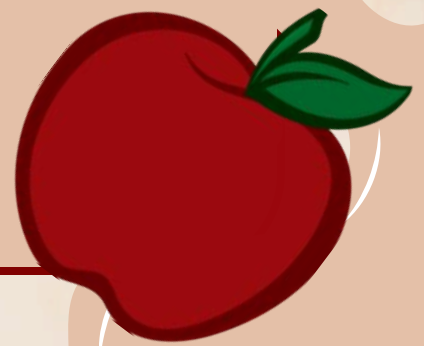
Fruit browning is caused by several factors, including exposure to oxygen. See, when you leave a fruit like an apple outside, the molecules inside an apple, like phenols and enzyme phenolase, make that brown color appear when it is exposed to oxygen. Another reason is that if you leave a fruit to over-ripen. Enzymes are found in fruits, which act as biological catalysts, speeding up chemical reactions.

Normally, enzymes are in the fruit tissue, but when the fruit is damaged or overripe, it turns brown. Overall, fruit browning is caused by over-ripening, exposing it to oxygen, or damaging it.



Hypotheses

The effect of different types of liquids like apple juice, lemon, white vinegar, and the control, water on the amount of brown on the apple is the lemon juice will do the best, the vinegar the second, the apple juice the third, water the fourth, and control the last. Since lemon juice has the most acidity, I infer that it will protect my apples from that brown color the most.





Variables



Control Variable

Water, the untouched apple, the time the apples are left out, the amount of liquid poured onto each plate, the type of apple, and the same number of apples on each plate.

Independent Variable

The types of liquids that I am putting on the apples, and the color of the apples.



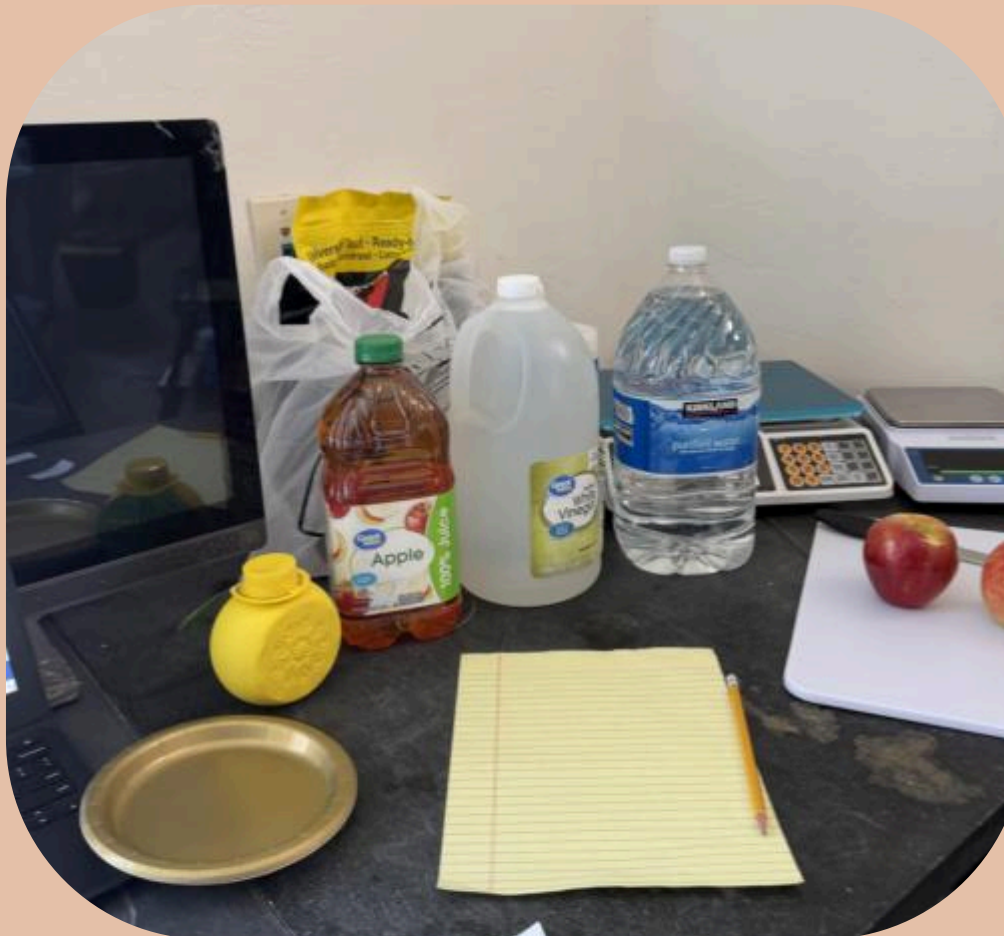
Dependent Variable

The brownness of the apples.



Materials

- 1. Two apples,
- 2. Cutting board,
- 3 . Five Plates,
- 4. Masking tape,
- 5. Permanent marker,
- 6 . Knife
- 7. Fork
- 8. Spoon



- 9. Lemon juice,
- 10. White vinegar,
- 11. Apple juice,
- 12. Water,
- 13. Notebook
- 14. Timer,
- 15. Pencil,
- 16. Camera

Procedure

- **Step 1:** First, make some space for your project, and place all your materials there to prepare for your experiment
- **Step 2:** Secondly, organize all your stuff, and get your notebook, juice, and apples ready.
- **Step 3:** Next, label all your plates with the masking tape with all the liquids: water, lemon juice, vinegar, and water.
- **Step 4:** To start the experiment, cut the four apples into equal slices and place them on the labeled plates.
- **Step 5:** Then pour an equal amount of liquid on each designated plate.
- **Step 6:** Then, leave them for two hours, but check on them every thirty minutes and record them in your notebook
- **Step 7:** Create a scale for the brownness of the apples, with 5 as the brownest. And one having the least amount of brownness.
- **Step 8:** Record your observations in your notebook and create a chart based on them.
- **Step 9:** Keep your notebook for your final project for the recordings.
- **Step 10:** Lastly, present your project on your science fair board.
- You can use more paper if you need to.

Photos





Data

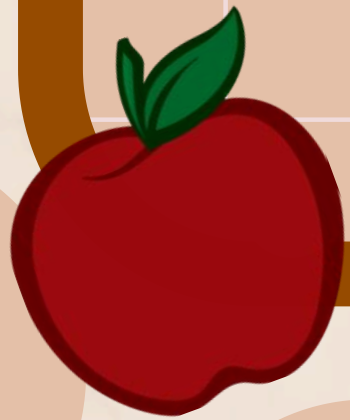
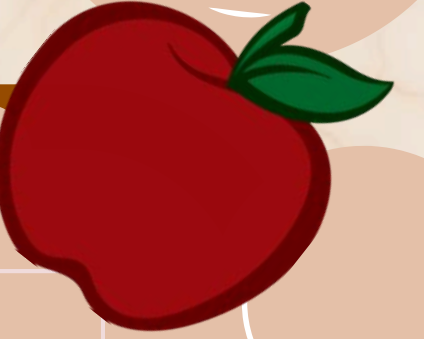


Treatment	Apple Slice 1	Apple Slice 2	Apple Slice 3	Average for All Slices
Control	4	3	2	3
Lemon	1	1	1	1
Water	1	2	2	2.3
Apple Juice	2	1	2	1.3
White Vinegar	4	3	2	3



Results

**Lastly, the results were lemon juice
1st, with an average of 1, apple juice
2nd, with an average of 1.3, water 3rd,
with an average of 2.3, and white
vinegar, and the control was tied for
last, both with an average of 3.**





Conclusion

The outcome was that lemon did the best, apple juice did the second best, water the third, and white vinegar and control were tied for last. My data does not show that my hypothesis was correct, since I put white vinegar second, even though it was tied for last. One problem I had was making sure every liquid got the right amount poured on, since that could've changed the results. I would be more organized next time, so my results could be more accurate.



Futtrue Research

Most parts of my project went well, but here are some things I would do differently next time. First of all, I would try to make my portions more equal, like making the amount of liquid in each apple the same, and making the apple slices the same size. Lastly, I would make the time the apples were left out for the same time, since to make it the most accurate. So, those would be my improvements next time I do this science experiment.

Bibilograhy

<https://www.ifst.org/lovefoodlovescience/resources/fruit-and-vegetables-enzymic-browning>

[https://www.britannica.com/story/why-do-sliced-apples-turn-brown.](https://www.britannica.com/story/why-do-sliced-apples-turn-brown)

https://www.sciencebuddies.org/science-fair-projects/project-ideas/FoodSci_p082/cooking-food-science/enzymatic-browning

