

Name(s):

Period:

Date:

Fresh Fruit for All

Providing unblemished, ripe fruit to the store all year long



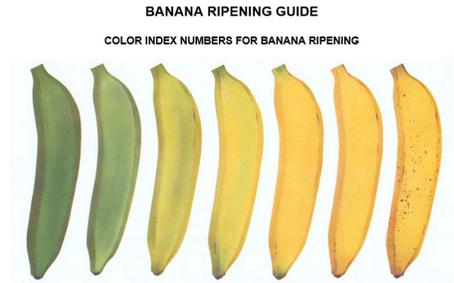
Experiment 1: Bananas

Scenario

You can judge the ripeness of a banana by the color of the peel. For this lab you must design an experiment testing variables that alter a banana's ripening. You can choose only 1 variable to change, so be sure that you get your procedures approved by the teacher before you begin.

This experiment will take place over a full week, and each day you will take data on your banana's ripeness.

Variables you may want to consider: The presence of other fruit, the container the bananas are in, the air around the banana (CO₂ is known to inhibit production of ethylene), the presence of other items, the temperature and the moisture of the container. You may consider additional variables if they are approved by the teacher.



Index No. 1 2 3 4 5 6 7
 Peel Color Green Light green (breaking toward yellow) Yellowish Greenish (more yellow than green) Yellow with green tips Yellow Yellow, flecked with brown

https://www.ams.usda.gov/sites/default/files/media/Bananas_Visual_Aid%5B1%5D.pdf

Materials

All groups will receive 3 bananas, however, since you are writing your own procedure you need to list any additional items here. Your teacher may provide you with certain items, however specialty items will need to be brought from home.

3 Green Bananas			

Procedure

Write your procedure here. Remember, you have 3 bananas and you only want to change 1 variable in each of the experiments.

Hypothesis

Which sample do you think will ripen the most quickly? Describe your reasoning.

Class Wide Data Accumulation

During your experiment you will need to look at your class-wide data. To do this, your teacher will mark the numbers 1-7 on a piece of butcher paper on the wall. You will then create a post-it representing each of your bananas with your team names and place it on the butcher paper at the ripeness number it corresponds to. Each day you can move your banana to the correct ripeness number so you can begin to see the variables causing bananas to ripen quickly.

Example Post-it

IR & ML Banana #1
Environment: Paper Bag
Exposed to: 2 oranges
Temperature: Room Temp
No additional changes

Data

Create your own data table here before you begin your experiment.

Conclusions – Please use full sentences for your reasoning

1. Which of your bananas became the most ripe?

2. Give at least one reason why the environment caused that banana to ripen the quickest:

3. Which of your bananas became the least ripe?

4. Give at least one reason why the environment caused that banana to ripen the slowest:

5. Which of the class wide bananas became the most ripe?

6. Give at least one reason why the environment caused that banana to ripen the quickest:

7. Which of the class wide bananas became the least ripe?

8. Give at least one reason why the environment caused that banana to ripen the slowest:

9. If you needed to transport bananas from Ecuador to your local grocery store, what kind of environment might you provide for them so they do not ripen?

10. If you are a grocer and want to provide ripe bananas to your customers, what kind of environment would you want to provide to encourage ripening?

11. In one paragraph, explain the experiment you ran and the results you got as if you were telling someone who was not here for the experiment.

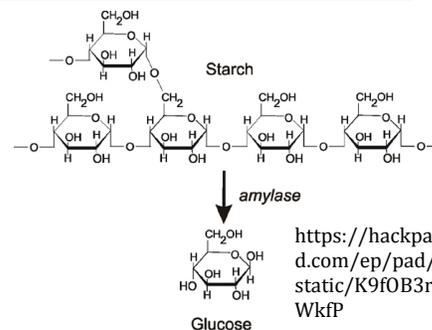
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Experiment 2: Apples Scenario

As apples and other fruit ripen, the ethylene hormone triggers the release of amylase. Amylase is an enzyme that breaks up starches to create sugar. This is actually the enzyme in your saliva that begins the digestion process even when you are chewing. A fun activity to do is to put something starchy in your mouth, like a piece of bread. If you keep it in your mouth for a minute without swallowing it, it will begin to taste sweeter. This is because the enzymes in your saliva begin to break the large starch polymers down into sugars, which are the monomers that make up a starch.



In this lab you will gauge the ripeness of each apple by testing for the presence of starch. There is less starch in a ripe apple, so a positive starch test means that the apple is not ripe. Your class wide goal is to put the apples in order from least to most ripe.

Materials

Un-Ripened Apples Iodine Starch Test Solution Knife to cut apples in half Paper Plates

Directions for Starch Testing



<https://grousemfarm.wordpress.com/tag/starchiodine-test/>

As you have read, the amount of starch in a piece of fruit can help you determine its ripeness. Although you would never perform this test on a piece of fruit you are planning to eat, scientists or farmers can test a few apples in a batch or from a tree in order to determine the ripeness of that group of apples.

Iodine is a chemical that turns dark black or purple when it reacts with starches. The iodine only reacts with starch, so an apple that is ripe will show little to no darkening when sprayed with an iodine solution. An apple that is not ripe will have a strong positive test for starch.

Ripeness Testing Procedure

- Analyze the apple from the outside. Write down observations for the following categories
 - Smell
 - Color
 - Bruising
 - Firmness
- Cut your apple in half across the middle (equator) of the fruit
- Place your experimental half of the apple facing up on a paper plate marked with your team initials
- Spray the apples with the iodine solution
- Record your observations and the starch index for your apple at 1 minute, and again at 2 minutes.

Class Wide Data Accumulation

During your experiment you will need to look at your class-wide data. To do this, your teacher will mark the numbers 1-8 on a piece of butcher paper on the wall. You will then create a post-it for your apple and place it at the starch index you observed after your iodine test.

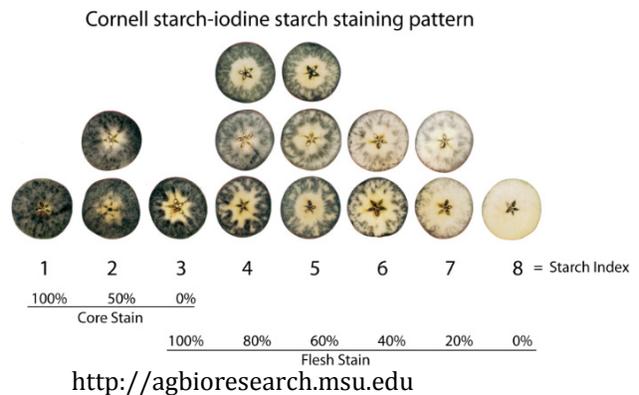
In the area designated by your teacher, collaborate with your class mates to line up the apples in order from most ripe to least ripe.

Example Post-it

IR & ML Apple
Smell: Sour
Color: Mix of red & yellow
Bruising: 1 small bruise
Firmness: Firm
Starch Index: 4

Data

Draw an image of what your apple looks like after the iodine test.



Create your own data table to display your data. Use the Cornell starch-iodine starch staining pattern to identify the starch index for each sample. Be sure to incorporate all of your observations into your data table, not just your starch index.

Conclusions

1. What does the iodine react with in the iodine test?
2. What is the molecular difference between a ripe and unripe apple?
3. What enzyme breaks the polymer into the monomer?
4. When would this test be used in the real world?
5. Describe the process of ripening using the following terms: Sugar, Starch, Ethylene, Amylase, Polymer, Monomer

College & Career Connections

Career Spotlight	College Connections	
<p data-bbox="172 1010 578 1087">Transportation, Storage & Distribution Manager</p> <p data-bbox="172 1094 586 1230">Plan, direct or coordinate transportation, storage or distribution activities in accordance with organizational policies and applicable government laws or regulations.</p> <p data-bbox="172 1241 578 1409">Median Annual Salary: \$85,400 EDUCATION: AS or BS preferred, 5+ years of experience required http://study.com/articles/Transportation_Storage_and_Distribution_Manager_Duties_Outlook_and_Salary.html</p>	<p data-bbox="651 1010 992 1087">International Logistics & Transportation</p> <p data-bbox="651 1094 1040 1272">The certificate/A.S. degree program in International Logistics and Transportation prepares students to work in industries affected by the distribution of goods, such as global, international, and cross border trade.</p> <p data-bbox="651 1283 1016 1409">Schools offering this program of study: Southwestern College http://www.swc-logistics-transportation.org/</p>	<p data-bbox="1040 1010 1414 1087">Global Supply Chain Management</p> <p data-bbox="1040 1094 1430 1272">This program teaches students how to perform typical tasks of a supply chain manager, such as designing and managing the relationships that keep products moving on the global playing field.</p> <p data-bbox="1040 1283 1414 1409">Schools offering this program of study: CSU San Marcos http://www.csusm.edu/oscm/</p>

Extension & Application

Great article on the history & science behind fruit ripening

The Origin of Fruit Ripening

<http://www.scientificamerican.com/article/origin-of-fruit-ripening/>

A web post on the iodine ripening test

<https://grousemtfarm.wordpress.com/tag/starchiodine-test/>