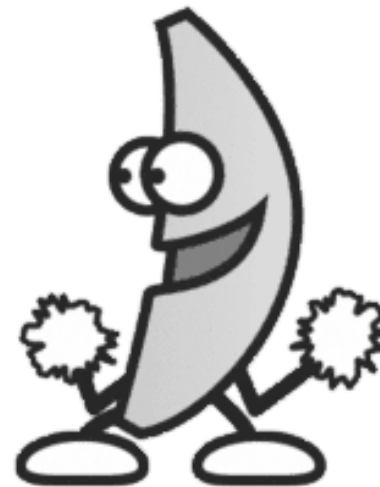


Bananas: The Riper They Are, The Sweeter They Are

Introduction

Bananas are made of many different components: calcium, phosphorus, potassium, and lots of water. Additionally, about one-quarter of a banana's weight is due to carbohydrates in the form of starch. Starch is a large molecule known as a *polysaccharide*, meaning it is made up of lots of smaller glucose sugar molecules. As bananas age and ripen, the complex starch molecules are broken down into the simpler sugars, making the fruit taste sweeter and feel softer. This process is called *hydrolysis*.



In this lab, you will first perform a classic test for starch using iodine solution. You will then simulate hydrolysis by heating the starch solution and observing the change. Finally, you will test both unripe and ripe bananas for starch using iodine, and then again for sugar using Fehling's solution.

Materials

bananas, ripe and unripe
corn syrup
Fehling's solution

iodine solution [I_2], 1%
pipettes
starch solution

Equipment

beaker, 600-mL or 800-mL
Bunsen burner
hotplate
knife
large test tubes, 4

small test tube
stirring rod
test tube holder
test tube rack
watch glass

Safety Considerations

- When heating a test tube over an open flame, you must hold the test tube at a 45° angle and point the open end away from other people.
- Iodine solution and Fehling's solution are toxic; you must wear goggles for the entire lab.
- Sometimes chemicals from previous labs still remain in glassware and on other lab equipment; wash all lab equipment before and after performing this lab.
- Wash your hands thoroughly after completing this lab.

Procedure A – Test for starch

1. Fill a small test tube $\frac{1}{2}$ full of starch solution.
2. Add one drop of iodine solution to the test tube and mix by gently shaking the tube. Record your observations in the Data Table.
3. Using a Bunsen burner, gently heat the starch and iodine mixture until a color change occurs. Record your observations in the Data Table.
4. Cut a thin slice of ripe banana and place it on a watch glass.
5. Test the ripe banana for starch by adding one drop of iodine solution; record your observations.
6. Repeat Steps #4-5 using an unripe banana; record your observations.

Procedure B – Test for sugar

1. Using a hotplate, prepare a hot water bath in a 600- or 800-mL beaker half full of water.
2. Prepare the following mixtures using large test tubes:
 - Tube #1: 3 mL starch solution + 10 mL Fehling’s solution
 - Tube #2: 3 mL corn syrup + 10 mL Fehling’s solution
 - Tube #3: mashed slice of unripe banana + 10 mL Fehling’s solution
 - Tube #4: mashed slice of ripe banana + 10 mL Fehling’s solution
3. Place the test tubes in the hot water bath and heat for 10-15 minutes.
4. Record the final colors of each test tube in the Data Table.

Clean-up

1. Dispose of any banana pieces in the trash, NOT THE SINK.
2. Dump any liquids down the sink and wash the test tubes with soap and a test tube brush.
3. Return all equipment to its proper place.
4. Wipe down your lab area and wash your hands before leaving the lab.

Data Table

Test Tube	Observations
starch + iodine, before heating	
starch + iodine, after heating	
unripe banana + iodine	
ripe banana + iodine	
starch + Fehling’s	
corn syrup + Fehling’s	
unripe banana + Fehling’s	
ripe banana + Fehling’s	

Questions

1. What color change occurs when starch reacts with iodine? Which sample(s) gave a positive test for starch?

2. Name two other foods that are high in starch content.

3. Fehling's solution changes color based on the amount of glucose (sugar) in the sample:
0.5% glucose: green
1.0% glucose: yellow
2.0%+ glucose: orange-red

Based on this table, which samples gave a positive test for sugar?

4. Starch is considered the most important carbohydrate in the human diet. Why do you think this is so?

5. List one way you could change this lab and describe how your results might be different.
