



Enzyme Activity Lab – Bromelain



Introduction

Enzymes are essential to the human body. They are proteins that speed up the chemical reactions in your cells so that your body can work more efficiently. Bromelain is an enzyme that breaks down proteins, like the one found in gelatin. Pineapples and kiwi fruit have a high concentration of bromelain. You have similar enzymes in your digestive system to help break down foods with protein in them.

In this experiment, we will use pineapple juice to break down gelatin and test the action of the enzyme under different temperature and pH conditions. You will see the gelatin break down (it will actually turn into liquid) and then you will know that the bromelain is working.

Pre-Lab Questions

1. How will you know if bromelain is working? _____
2. Why are we using pineapple juice for the source of bromelain in this experiment?

3. What is the control in Part 2? _____
4. What is the experimental variable in Part 2?

Problem: At which pH does bromelain function the best (pH 1, 3, 7, 10, or 14)?

Hypothesis (regarding pH) _____

Materials

6 test tubes	Frozen pineapple juice (thawed)	prepared gelatin
50 mL beaker	10 mL graduated cylinder	markers
stirring rod	1 M NaOH	1 M HCl
canned pineapple juice	large watch glass	scoopula

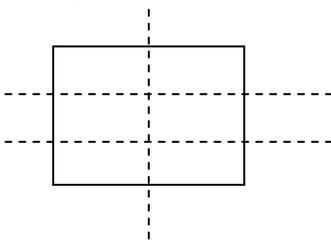
** Warm the solutions prior us use(35-40°C)*

Procedure

Part 1: Fresh vs. Canned Pineapple Juice

1. Obtain a 50 mL beaker. Using the graduations on the side, pour about 25 mL of warm “fresh pineapple juice” into the beaker. This will be your source for fresh pineapple juice throughout the entire experiment, do not get rid of it until you are completely done with the experiment.

- Obtain one 1" x 1" square piece of gelatin from the instructor and place it on your watch glass. Cut this up into 6 equal pieces with your scoopula. This will be your source for gelatin for the entire experiment, do not throw it out until you are done with the experiment.



- Using a graduated cylinder, measure out 3 mL of warm “fresh pineapple juice” (from your beaker) and pour it into a test tube labeled “**fresh – pH 7**”.
- Wash your cylinder and get 3 mL of warm “canned pineapple juice” from the front of the room. Pour it into a test tube labeled “**canned**”.
- Use a scoopula to place 1/6th of your sample of gelatin into the bottom of each test tube. Use a stirring rod to push the gelatin to the bottom.
- Gently shake each tube and observe for the next 2 minutes. Record your observations and final results in the data table...focus on the appearance of the jello and solution.

Part 2: How does pH affect bromelain activity?

*** Warning: HCl and NaOH are corrosive and caustic. Be careful when working with these chemicals. If you spill some on your hand, wash your hands thoroughly and tell your instructor immediately.**

- Label four clean test tubes “**pH 1**”, “**pH 3**”, “**pH 10**”, and “**pH14**”. Place 3 mL of warm “frozen pineapple juice” into each tube.
- Into the “pH 1” test tube, add 20 drops of hydrochloric acid (HCl) and shake the tube to mix.
- Into the “pH 3” test tube, add 10 drops of hydrochloric acid (HCl) and shake the tube to mix.
- Into the “pH 10” test tube, add 10 drops of sodium hydroxide (NaOH) and shake the tube to mix.
- Into the “pH 14” test tube, add 20 drops of sodium hydroxide (NaOH) and shake the tube to mix.
- Place 1/6th of your sample of the gelatin into each test tube at the same time and push it down with a stirring rod. Gently shake the test tubes. Let the test tubes sit for two minutes and then record your observations about how solid the gelatin appears...focus on the appearance of the jello and solution.

Data

Part 1: Fresh vs. Canned Pineapple Juice

Fresh - pH 7	
Canned	

Part 2: Effect of pH on bromelain activity

pH 1	
pH 3	
pH 7 (a.k.a. fresh)	
pH 10	
pH 14	

Conclusions

1. Which kind of juice (fresh or canned) worked more efficiently at breaking down the gelatin?

2. Ask someone who may know about the canning process or look up the canning process on the Internet. Why won't the gelatin break down using canned pineapple juice?

3. Referring to Part 2, under which pH condition did the bromelain work most effectively? Why do you think this condition works the best (give a scientific reason)?

4. Name all of the conditions which slowed down or stopped the action of bromelain in this experiment.

5. I made Jell-O last night (strawberry – yum!) and I added some fresh pineapple to it. This morning I discovered that the Jell-O never gelled. What happened?

6. Use the information from the questions above to write a 4 part conclusion about this experiment.
