

THE JELLO INQUIRY PROJECT

INTRODUCTION

The active ingredient in Jello that allows it to firm up when cooled is gelatin. This is also one way in which people make jams - by adding gelatin to their fruit mixture. However, gelatin does not work under all conditions. In this project, students will observe how gelatin fails to set under one such condition - in the presence of kiwi fruit - and develop minimum treatments to counteract the effects of kiwi in gelatin.

PART I: A JELLO INTRO ACTIVITY

In this intro activity, students will learn how to dissolve and set gelatin. Students will also observe any differences between setting gelatin in the presence and absence of kiwi.

Materials

- 2 - 250mL beakers
- 1 - pouch of Knox gelatin
- 1 - Kiwi
- 2 - marbles
- Hot and Cold Water

Procedure

1. Dissolve Knox gelatin according to the instructions into the 250mL beaker.
2. Pour half of the dissolved gelatin into the other 250mL beaker. Add additional water to each beaker to make up to 200mL of water.
3. Add 10 small pieces of sliced kiwi to one beaker. Leave the other beaker untouched.
4. Place beakers in the fridge and leave overnight.
5. Take both beakers out the next day. Place one marble in the beaker containing kiwi-gelatin and the other in the beaker containing only gelatin. What do you notice?

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PART II: OPPORTUNITIES FOR INQUIRY

Gelatin does not set in the presence of kiwi because of the presence of naturally occurring digestive enzymes in kiwi. The digestive enzymes in kiwi break down the proteins in gelatin, thereby preventing gelatin from setting. The same thing happens to jello in the presence of pineapple too.

To get gelatin to set in kiwi, the digestive enzymes in kiwi must be destroyed or altered. For example, one way to do this is to force bonds that hold the enzyme together apart (by adding heat). By destroying the digestive enzymes in kiwi before adding gelatin, we make sure there is gelatin present to set.

CONSIDER THE FOLLOWING

Changing the Temperature

What if kiwi were heated at higher temperatures before being added to gelatin? Students can heat kiwi at 70, 80, 90, and 100 degrees Celsius for a set amount of time and determine what minimum temperature will allow gelatin to set.

Changing the Heating Time

What if kiwi were heated at lower temperatures but for longer periods of time? Perhaps, students can experiment with heating kiwi at 80 degrees for 5 minutes, 10 minutes, 20 minutes, and half an hour and note any changes.

Changing pH

What if kiwi was soaked in acidic or basic solution before being added to gelatin? One thing that can be done is soaking the kiwi in increasing concentrations of lemon juice to make it more acidic. Alternatively, kiwi can also be soaked in increasing concentrations of baking soda solution to make it more basic.

Changing salt or sugar concentration

What if dissolved salts or sugars disrupted the covalent bonds in proteins? Students can test this idea by soaking kiwi in saturated salt or sugar solution and solutions of 40%, 60%, and 80% saturation before adding to gelatin.

Changing alcohol concentration

What if polar covalent liquids are strong enough to disrupt kiwi's digestive enzymes? Students can test this hypothesis by soaking kiwi in alcohol of growing alcoholic concentrations (ie. from 5% to 40% alcohol) before adding to gelatin