



Apple Color: Down with Brown

Why does an apple turn brown after it has been cut?

Plant cells produce *enzymes*. Those enzymes speed up a chemical reaction called *oxidative enzymatic browning* when oxygen comes into contact with phenolic compounds which are naturally within the apple. By cutting the apple the air is able to reach those compounds due to the broken cell walls. The brown color created is formed by a pigment call *melanin*.

What can one do to prevent *oxidative enzymatic browning*?

Our experiment today will involve applying different substances to cut apples to see what will occur. Some substances will have more success than others in preventing browning. Possible solutions to add would be cold water, lemon juice, sugar + water, and vitamin C (ascorbic acid) + water.

How do these work?

The enzymes speed up the reaction when contact is made between the phenolic compounds in the apple and oxygen. If contact with the air can be avoided the reaction will not occur as fast. The enzymes are also slowed down by the pH or acidity of what they come in contact with. The more acidic (lower the pH) the greater affect there is on the enzymes.

Challenge Question: Which substance was most effective in preventing the browning and why? (See answer below.)

Testing ways to prevent oxidative enzymatic browning.

Ingredients/Supplies	Instructions
<ul style="list-style-type: none"> 1 apple sliced into equal size pieces (at least 5 slices) 5 paper plates, 5 small cups & marker 1/4 c. lemon juice 1 vitamin C tablet crushed and 1/2 c. water 2 t. sugar and 1/2 c. water 1 c. cool water with ice 	<ol style="list-style-type: none"> 1. Prepare the lemon juice, vit. C mixture, sugar mixture, and cool water in small cups. 2. Cut apple in equal size slices and place 1 slice in each cup for 30 seconds. 3. Remove each slice with a clean utensil and place on a labeled plate so that you know what it had been placed in. Have a fifth slice placed on a separate plate that was not placed in a cup. This is your "control". 4. After 60 minutes, look at the apple slices and compare the difference in appearance.

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Challenge Question: The control should show the most browning, Water only very temporarily covers the surface to prevent contact with the oxygen. Sugar adds a bit more of a covering. Lemon juice and Vit. C add acidity which slows down the reaction.



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