

Food Color Chemistry

Taken from IFT Mini-Experiments in Food Science Series

Color is extremely important to the perceived quality of a food product. In fact, foods are either accepted or rejected simply on the basis of visual appearance. A blueberry is supposed to be blue, but a glass of blue-tinged milk, due to reduced fat content, may be judged as having lower quality than a glass of white milk. Cloudiness in apple juice is considered a defect, while turbidity in apple cider is acceptable.

Plant Pigments

The pigments in fruits and vegetables fall into three classes: chlorophyll, flavonoids, and carotenoids. Chlorophyll is a green pigment found in many vegetables such as peas, broccoli and spinach. Flavonoids are the red pigments in red cabbage, red grapes, and red onions. Carotenoids are the yellow, orange, and red-orange pigments found in foods such as carrots, squash, and tomatoes. Heating, pH changes, and chemical reactions can alter the appearance of food by causing changes in the color.

Demo 1. Effect of pH on chlorophyll

Preparation Time 20-30 minutes

Laboratory Time 20-30 minutes

Heat 150 ml of deionized water to 100°C.
Add 25 g of frozen peas and boil for 10 minutes.
Drain water and observe color of peas.

Heat 140 ml of deionized water containing 10 ml of vinegar to 100°C.
Add 25 g of frozen peas and boil for 10 minutes.
Drain water and observe color of peas.

Heat 140 ml of deionized water containing 10 ml of 1.0 N NaOH.
Add 25 g of frozen peas and boil for 10 minutes.
Drain water and observe color of peas.

Students should observe that peas boiled in water will have the expected green color while those boiled in acid will acquire a brown-green color and those boiled in the NaOH solution will become bright green in color.

Demo 2. Effect of pH on flavonoids

Preparation Time 30 minutes
Laboratory Time 20-30 minutes

Heat 250 ml of deionized water to 100°C.
Add 1 cup of red cabbage and boil for 10 minutes.
Drain water and observe color of cabbage.

Add 20 ml of vinegar to 230 ml of deionized water and heat to 100°C.
Add 1 cup of red cabbage and boil for 10 minutes.
Drain water and observe color of cabbage.

Add 20 ml of 1.0 N NaOH to 230 ml of deionized water and heat to 100°C.
Add 1 cup of red cabbage and boil for 10 minutes.
Drain water and observe color of peas.

Students should observe that the cabbage boiled in water is purple, while cabbage in acid is bright red, and cabbage in NaOH turns blue-green.