



Natural Product Chemistry: Extracting Pigments

Objective:

To extract organic pigments from a variety of vegetables. Organic pigments are large and often complex organic molecules responsible for the different colours of plants and foods. Besides giving the vegetable their characteristic colour, they are also responsible for critical plant functions. For instance the colour of carrots and tomatoes is due to carotene while the green colour of spinach is due to chlorophyll. The different variations of colours are due to combinations of pigments. The carotenoid pigments of which carotene is a member, are responsible for orange, red, and brownish colours. There are two other groups of pigments: anthocyanins and anthoxanthins. The anthocyanins produce violet, blue, black and red colours while the anthoxanthins produce orange, yellow, and white colours. Thus, there is some overlap between the pigments' colours. Chlorophyll and carotene are both fat soluble and are easily extracted with mineral oil. Chlorophyll is an important plant pigment as it is used during photosynthesis. Carotene is important for proper vision as it is a precursor to vitamin A which is needed for good eyesight. Try to extract the pigments from other plants and foods. Do the pigments have a taste or odour?

Materials:

- carrots or other brightly coloured vegetables (i.e. spinach, tomato)
- grater or knife and cutting board
- measuring spoons
- jars or glasses
- mineral oil
- softened butter
- tissue paper

Procedure:

0. Grate or finely chop a small amount of carrot (~5 mL) and thoroughly mix it with 10 mL of mineral oil.
0. Place a piece of tissue paper over the top of a jar and pour the mineral oil mixture on top of the tissue paper.
0. After a few minutes a solution containing the pigment will drip through. Set this mixture aside.
0. Mix 5 mL softened butter with 10 mL mineral oil and filter the carrot mixture again.
0. In a brightly lit area place a piece of white paper behind the two jars and compare the first and second solutions.
0. Repeat the above steps using different vegetables. Try chopping up some green leaves and see what happens.

(Adapted from Bates, G. and Hayward, D., "It's Elementary! Investigating the Chemical World")