

DISCOVER YOUR FOREST TRUE COLOURS

GOAL: Learn about plant pigments and discover what causes leaves to change colour in the fall.

BACKGROUND:

Chlorophyll is a green pigment found in most plants, primarily responsible for photosynthesis, the process that plants use to create their own food using sunlight, carbon dioxide, and water. This pigment is responsible for the lush green colour of our forests.

Chlorophyll isn't the only pigment found in leaves. Did you know all plants have invisible secondary pigments that serve vital functions in the leaf and shine through in the autumn? Chlorophyll disappears when deciduous trees such as oaks, maples, and even tamaracks, experience shorter days and cooler temperatures as seasons change. As the leaves receive less sunlight, chlorophyll levels drop, but the other pigments remain. As a result, the leaves appear to be a different colour, even though the pigments were there the whole time!

There are two categories of secondary pigments. Carotenoids appear as yellow to orange. They are the same pigments responsible for the colour of carrots. Anthocyanins appear as red to blue and play a silent role throughout the year as protectors from ultraviolet light.

The following experiment works because the pigments in the leaves can dissolve in alcohol. The molecules of different pigments are different sizes, which allow the smaller ones (including most carotenoids and some anthocyanins) to travel through the filter paper faster than the larger ones, (such as chlorophyll). As molecules of the same size move at the same speed, coloured bands will form on the filter paper as the liquid disperses and then dries. This separation of pigments through the filter paper is called chromatography.

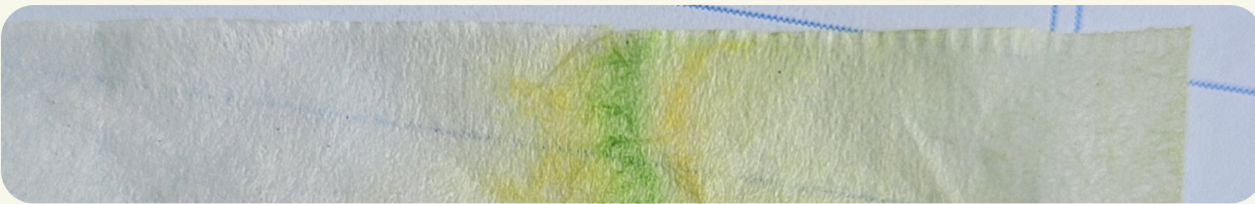
MATERIALS:

- A glass jar
- Rubbing alcohol
- Coffee filter
- Green leaves
- Pencil
- Tape
- Scissors
- Mortar & pestle (or a spoon and a bowl)
- Clean paper



ACTIVITY:

1. Collect a single green leaf from outside.
2. Tear the leaf into small pieces and mash into a pulp using the mortar and pestle.
3. Put the leaf mash into a jar and add just enough rubbing alcohol to cover. Let stand for 5 minutes.
4. While the leaf mash stands, cut your coffee filter paper into 2.5 centimeter wide strips. Tape a coffee filter strip to the middle of your pencil.
5. After 5 minutes, balance the pencil atop the jar and lower the filter paper into the jar. It should just touch the bottom – if too long, remove and cut.
6. When the liquid has moved halfway up the filter paper, remove it from the jar and lay it on a fresh sheet of paper to dry.
7. Observe the bands of colour that appear after the filter paper has dried.
8. Share an image of your True Colours results online using the hashtag #yrforest.



EXTENSION:

Collect and test the leaves of different tree species. What are the differences between species?

Save your filter paper and wait until the leaves of your chosen tree change. Compare the colour of the changed leaves to the bands on the filter paper. Did the experiment correctly predict what colour the leaves would turn?

Perform the True Colours experiment with leaves that have already changed colour. Are there any differences in the resulting filter paper? Why or why not?