Why Do Leaves Change Color?

Raccoon Creek Explorers Activity #14

Supplies:

- **Rubbing Alcohol**
- **Glass Jars**
- **White coffee filters, cut into strips**
- **Leaves (especially colorful ones)**
- **Tape (optional)**
- **Blender (optional)**
- **Casserole dish or other heat safe container (optional)**

Time: 1 to 8 hours, depending

Vocabulary:

Chromatography: a laboratory technique for separating a mixture. The mixture is dissolved in a fluid, called the liquid phase, which carries it through another material, called the stationary phase. Different parts of the mixture travel at different speeds, which causes them to separate.

Chlorophyll: the chemical in leaves that gives them their green color. It is found in chloroplasts, the cells in plants responsible for photosynthesis.

Deciduous: term for a kind of tree which sheds its leaves seasonally

Photosynthesis: a process used by plants to convert light energy into chemical energy which can be used as fuel for the plant to grow and live.

Pigment: a substance in plant or animal tissue which produces a distinct, characteristic color. A substance used to impart color.

Background

As summer changes into autumn we enjoy the beautiful fall leaves but have you ever wondered what makes them so colorful?

In parts of the world that have cold seasons, some trees survive the cooler temperatures and decreased sunlight by entering a kind if dormancy, similar to they way some mammals hibernate. Trees do this to conserve energy when resources are scarce. We call these trees deciduous, meaning they shed their leaves in the fall.

As they prepare for winter, the trees slow and then stop their food making process, which relies on photosynthesis. In warmer, sunnier weather, trees use their leaves to gather sunlight. In each leaf are cells called chloroplasts, which contain chlorophyll and turn sunlight into sugar (fuel for the plant) and oxygen (a by-product plants give off). This process is called photosynthesis.

Once trees stop photosynthesis, they loose their bright green chlorophyll and we can see the other colors present in the leaves!

Lets Start!

1) Gather leaves from outside. Fresh, colorful leaves work best!

2) Remove the stems and break the leaves up into tiny pieces. If you have a blender, you can use it (with adult supervision) to break them into even smaller pieces.

3) Put the leaves in jars and carefully pour in enough rubbing alcohol to cover them. You could separate different leaves into different jars, or combine them in the same jar to see what happens!

4) Cut paper coffee filters into strips that are 1 inch wide.

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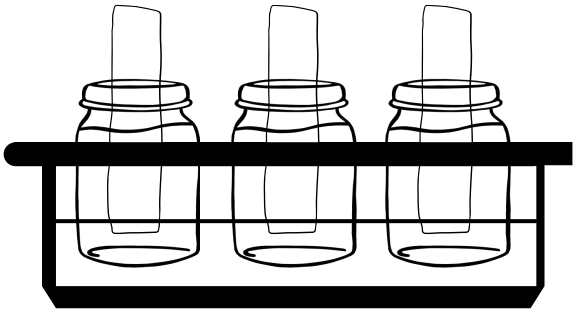
5)Put a strip of coffee filter in each jar and fold the top over so it hangs on the edge of the jar and doesn't fall in. The strips need to be as vertical as possible for the best results. If you like, you can use a piece of tape to secure it in place.

6) Let the jars sit undisturbed until the alcohol has carried the colors up the coffee filter strips and they are dry. You may see results in a few hours, but its best to let them sit overnight! (If you have adult supervision, you can speed the process up by placing your jars in a heat-proof container, like a casserole dish, with an inch or two of hot water to warm the alcohol).

7) Observe the colors on the strips.



Apply:

What colors do you see on the coffee filter strips?

Which colors traveled the farthest?

Compare the colors to the chart below to see which pigment is responsible for each color. This way, the colors can tell you what is present in the leaf!

Leaf Color and Pigment

Chlorophyll
Gives leaves their usual **green** color. As the weather cools and sunlight decreases, plants get ready for winter by producing less chlorophyll.

Flavonoids
Give leaves a **yellow** color. They are always present, but don't become visible until the amount of chorophyll decreases.

Carotenoids
Give leaves and **orange** color. They break down more slowly than chlorophyll does.

Anthocyanins
Give leaves a **red** color. They aren't present in all leaves, but they increase along with sugar production as the weather cools.

Wrap Up

Not every tree or leaf contains the same compounds or pigments, which is why we see so many different colors.

Maple trees tend to turn bright red and orange, sometimes with a bit of bright yellow. most oaks tend to be brown or orange in color. Hickory, sycamore, tulip poplar and sweetgum all tend to turn bright yellow. Some ornamental trees planted in parks and gardens even turn purple! Seasonal weather can also affect how bright or dull the tree's colors are in fall. A year with a warm, wet spring and summer followed by a cool, dry fall produces the most vibrant colors.

However, all leaves eventually end up crunchy and brown, as you've likely noticed if you've ever walked through a pile of leaves on the ground. This is because after the leaves fall they dry up or freeze in cold weather, which destroys the pigments. So, get our there an enjoy them while you can!