CANDY CHROMOTOGRAPHY

Ever wondered why candies are different colors? Many candies contain colored dyes. But which dyes are used in which candies? We can answer this by dissolving the dyes out of the candies and separating them using a method called chromatography.

Materials:

- M&M or Skittles candies (1 of each color)
- coffee filter paper
- a tall glass
- water
- table salt
- a pencil (a pen or marker is not good for this experiment)
- scissors
- a ruler
- 6 toothpicks
- aluminum foil
- an empty 2 liter bottle with cap

Instructions

1. Cut the coffee filter paper into a 3 inch by 3 inch (8 cm by 8 cm) square. Draw a line with the pencil about ½ inch (1 cm) from one edge of the paper. Make six dots with the pencil equally spaced along the line, leaving about ¼ inch (0.5 cm) between the first and last dots and the edge of the paper. Below the line, use the pencil to label each dot for the different colors of candy that you have. For example, Y for yellow, G for green, BU for blue, BR for brown, etc.

2. Next we'll make solutions of the colors in each candy. Take an 8 inch by 4 inch (20 cm by 10 cm) piece of aluminum foil and lay it flat on a table. Place six drops of water spaced evenly along the foil. Place one color of candy on each drop. Wait about a minute for the color to come off the candy and dissolve in the water Remove and dispose of the candies.

3. Now we'll "spot" the colors onto the filter paper. Dampen the tip of one of the toothpicks in one of the colored solutions and lightly touch it to the corresponding labeled dot on your coffee filter paper. Use a light touch, so that the dot of color stays small - less than 1/16 inch (2 mm) is best. Then using a different toothpick for each color, similarly place a different color solution on each of the other five dots.

4. After all the color spots on the filter paper have dried, go back and repeat the process with the toothpicks to get more color on each spot. Do this three times, waiting for the spots to dry each time.

Instructions Continued...

5. When the paper is dry, fold it in half so that it stands up on its own, with the fold standing vertically and the dots on the bottom.
6. Next we will make what is called a developing solution. Make sure your 2-liter bottle or milk jug is rinsed out, and add to it ⅛ teaspoon of salt and three cups of water (or use 1 cm^3 of salt and 1 liter of water). Then screw the cap on tightly and shake the contents until all of the salt is dissolved in the water. You have just made a 1% salt solution.
7. Now pour the salt solution into the tall glass to a depth of about ¼ inch (0.5 cm). The level of the solution should be low enough so that when you put the filter paper in, the dots will initially be above the water level. Hold the filter paper with the dots at the bottom and set it in the glass with the salt solution.
8. When the salt solution is about ½ inch (1 cm) from the top edge of the paper, remove the paper from the solution. Lay the paper on a clean, flat surface to dry.

Science!!

What does the salt solution do? It climbs up the paper! It seems to defy gravity, while in fact it is really moving through the paper by a process called capillary action.

As the solution climbs up the filter paper, what do you begin to see?

The color spots climb up the paper along with the salt solution, and some colors start to separate into different bands. The colors of some candies are made from more than one dye, and the colors that are mixtures separate as the bands move up the paper. The dyes separate because some dyes stick more to the paper while other dyes are more soluble in the salt solution. These differences will lead to the dyes ending up at different heights on the

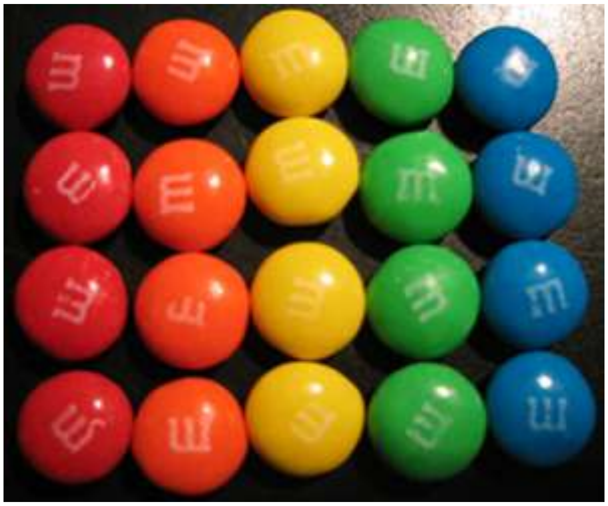
This process is called chromatography. (The word "chromatography" is derived from two Greek words: "chroma" meaning color and "graphein" to write.) The salt solution is called the mobile phase, and the paper the stationary phase. We use the word "affinity" to refer to the tendency of the dyes to prefer one phase over the other. The dyes that travel the furthest have more affinity for the salt solution (the mobile phase); the dyes that travel the least have more affinity for the paper (the stationary phase).

What's next?

Compare the spots from the different candies, noting similarities and differences. Which candies contained mixtures of dyes? Which ones seem to have just one dye? Can you match any of the colors on the paper with the names of the dyes on the label? Do similar colors from different candies travel up the paper the same?

You can do another experiment with a different type of candy. If you used Skittles the first time, repeat the experiment with M&Ms. If you used M&Ms first, try doing the experiment with Skittles. Do you get the same results for the different kinds of candy, or are they different? For example, do green M&Ms give the same results as green Skittles?

You can also use chromatography to separate the colors in products like colored markers, food coloring, and Kool-Aid. Try the experiment again using these products. What similarities and differences do you see?



Reference:
http://scifun.chem.wisc.edu/HOMEEXPTS/candy.htm