



Dye It Yourself—Naturally!

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Topic

Extracting and using dyes from plant materials



Time

about 1 hour for each dye, after all materials have been collected



Safety

Please click on the safety icon to view the safety precautions.

Materials

natural dye materials: vegetables
(onion skins, beets, carrots,
spinach, etc.)
fruits (strawberries, blueberries,
grapes, etc.)
twigs or bark from a tree
brightly colored flowers
lichens
nut shells
leaves
electric range or hot plate
enamel or glass saucepan with cover

wood, plastic, or glass rod for stirring
graduated beaker, cylinder, or
measuring cup
strainer or other filtering apparatus
water
small glass vials or clear pill bottles
samples of unbleached natural
fibers/fabrics:
cotton squares (5 cm \times 5 cm)
linen squares (5 cm \times 5 cm)
silk squares (5 cm \times 5 cm)
wool yarn (tied in tassels)

Procedure

1. Select and obtain the natural materials and fibers/fabrics you wish to use in the experiment.
2. Place approximately 250 mL water into a clean glass or enamel pan. Crush or break up one of the natural materials you have selected. The amount is not critical, but generally a larger amount of material will produce a more intense dye.
3. Cover and boil the mixture for 20 min.
4. Strain out the natural material and discard. What remains is the pure dye.
5. Pour dye into a clean glass or enamel pan and bring to a slow boil. As the dye starts to boil, add the fiber/fabric samples to it.
6. Boil for 20 min or more. If water is in danger of boiling away, add more water.
7. Remove fiber/fabric samples. Rinse in clear water and dry.
8. Examine the samples to determine how the different fibers/fabrics responded to the dye. Record your results on the data table.
9. Repeat steps 1 to 8, using other natural materials you have selected. If necessary, expand the chart to include more natural materials.

DATA TABLE						
Name of natural material	Color of natural material	Color of dye	Color of dyed cotton	Color of dyed linen	Color of dyed silk	Color of dyed wool
1.						
2.						
3.						
4.						

10. Which dyes gave the fiber samples the deepest colors?
11. Did the dyes color the fiber samples evenly? Which dyes covered most evenly?
12. What color variations did you find when using a single dye on different fabrics?
13. Which dyes do you consider the best? Give reasons for your choices.
14. Colonial Americans used many natural materials for dyeing fabrics. Which of those you used do you suspect were used by pioneers? Give reasons for your answers.
15. Make a display showing each raw material, a sample of each pure dye in a small vial, and the dyed fibers/fabrics. These can be mounted on a board or set up as a table display. Be sure everything is completely and neatly labeled. Use your imagination to make a creative display.

What's Going On

Many natural materials make deep, richly colored dyes. Often, however, these dyes will color the fiber/fabric samples only a light shade. Different fibers/fabrics will accept color differently, with one being deeply colored while another, exposed to the same dye, has a pale color. Dyes of one color sometimes produce a completely different color on different fabrics or fibers. In this experiment, you explored various natural dyes and their relationships to different fabrics.

Connections

Dyes are used to give color to textiles. They are made of colored matter that is used in a water-based solution. Natural dyes, obtained from natural sources such as plants, were used in the Middle East and China as long ago as 3000 B.C.E. Synthetic dyes, which are produced from chemical sources, were developed in the mid-19th century. All dyes do not impart their colors to all textiles in the same manner. This is determined by the chemical affinity between the dye and the textile.

Safety Precautions

READ AND COPY BEFORE STARTING ANY EXPERIMENT

Experimental science can be dangerous. Events can happen very quickly while you are performing an experiment. Things can spill, break, even catch fire. Basic safety procedures help prevent serious accidents. Be sure to follow additional safety precautions and adult supervision requirements for each experiment. If you are working in a lab or in the field, do not work alone.

This book assumes that you will read the safety precautions that follow, as well as those at the start of each experiment you perform, and that you will *remember* them. These precautions will not always be repeated in the instructions for the procedures. It is up to you to use good judgment and pay attention when performing potentially dangerous procedures. Just because the book does not always say “be careful with hot liquids” or “don’t cut yourself with the knife” does not mean that you should be careless when simmering water or stripping an electrical wire. It *does* mean that when you see a special note to be careful, it is extremely important that you pay attention to it. If you ever have a question about whether a procedure or material is dangerous, stop to find out for sure that it is safe before continuing the experiment. To avoid accidents, always pay close attention to your work, take your time, and practice the general safety procedures listed below.

PREPARE

- Clear all surfaces before beginning work.
- Read through the whole experiment before you start.
- Identify hazardous procedures and anticipate dangers.

PROTECT YOURSELF

- Follow all directions step by step; do only one procedure at a time.
- Locate exits, fire blanket and extinguisher, master gas and electricity shut-offs, eyewash, and first-aid kit.
- Make sure that there is adequate ventilation.
- Do not horseplay.
- Wear an apron and goggles.
- Do not wear contact lenses, open shoes, and loose clothing; do not wear your hair loose.
- Keep floor and work space neat, clean, and dry.
- Clean up spills immediately.
- Never eat, drink, or smoke in the laboratory or near the work space.
- Do not taste any substances tested unless expressly permitted to do so by a science teacher in charge.

USE EQUIPMENT WITH CARE

- Set up apparatus far from the edge of the desk.
- Use knives and other sharp or pointed instruments with caution; always cut away from yourself and others.
- Pull plugs, not cords, when inserting and removing electrical plugs.
- Don’t use your mouth to pipette; use a suction bulb.
- Clean glassware before and after use.
- Check glassware for scratches, cracks, and sharp edges.
- Clean up broken glassware immediately.

- Do not use reflected sunlight to illuminate your microscope.
- Do not touch metal conductors.
- Use only low-voltage and low-current materials.
- Be careful when using stepstools, chairs, and ladders.

USING CHEMICALS

- Never taste or inhale chemicals.
- Label all bottles and apparatus containing chemicals.
- Read all labels carefully.
- Avoid chemical contact with skin and eyes (wear goggles, apron, and gloves).
- Do not touch chemical solutions.
- Wash hands before and after using solutions.
- Wipe up spills thoroughly.

HEATING INSTRUCTIONS

- Use goggles, apron, and gloves when boiling liquids.
- Keep your face away from test tubes and beakers.
- Never leave heating apparatus unattended.
- Use safety tongs and heat-resistant mittens.
- Turn off hot plates, bunsen burners, and gas when you are done.
- Keep flammable substances away from heat.
- Have a fire extinguisher on hand.

WORKING WITH MICROORGANISMS

- Assume that all microorganisms are infectious; handle them with care.
- Sterilize all equipment being used to handle microorganisms.

GOING ON FIELD TRIPS

- Do not go on a field trip by yourself.
- Tell a responsible adult where you are going, and maintain that route.
- Know the area and its potential hazards, such as poisonous plants, deep water, and rapids.
- Dress for terrain and weather conditions (prepare for exposure to sun as well as to cold).
- Bring along a first-aid kit.
- Do not drink water or eat plants found in the wild.
- Use the buddy system; do not experiment outdoors alone.

FINISHING UP

- Thoroughly clean your work area and glassware.
- Be careful not to return chemicals or contaminated reagents to the wrong containers.
- Don't dispose of materials in the sink unless instructed to do so.
- Wash your hands thoroughly.
- Clean up all residue, and containerize it for proper disposal.
- Dispose of all chemicals according to local, state, and federal laws.

BE SAFETY-CONSCIOUS AT ALL TIMES