

Dyeing with Plants

Authors: Richard Merrill & Susan Barrett Merrill

Subjects: Art, Science (chemistry), Language

The primary colors are red, yellow and blue.

The primary plant dyes that produce these colors are:

1. Red
 - a. Madder, *Rubia tinctorum*
 - i. Chemical source in the plant: alizarin, purpurin
2. Yellow
 - a. Goldenrod (*Solidago species*)
 - b. Onion Skins (*Allium cepa*)
 - i. Chemical source in the plant: pelargonidin
3. Blue
 - a. Indigo (*Indigofera tinctoria*)
 - i. Chemical source in the plant: indigotin (not soluble in water)
 - b. Woad (*Isatis tinctoria*)
 - i. Chemical source in the plant: indigotin, but smaller amounts

Most natural dyes need a chemical called a *mordant* to help them bind to the fibers. These are often poisonous metallic salts, such as copper sulfate and potassium dichromate. We avoid these substances because their toxicity makes them dangerous to work with.

Color	Mordant	Dye material
Red	Alum, Cream of tartar	Madder Root
Yellow	Alum	Goldenrod
Yellow	NONE	Onionskin (yellow and red)
Blue	Yeast, sugar, ammonia, lye	Indigo, woad

Madder root and indigo are harder to come by. Goldenrod is seasonal in July through September, depending on your location, and requires alum, an aluminum salt, as a mordant. Onionskins are available to us year-round.

Do not use blues for classroom work because of the noxious chemicals (ammonia) and dangerous caustic materials (lye). Alum is also toxic, so it is not recommended for classroom use. But there is one safe, fun way to dye naturally – onion skins!

Dyeing with Onion Skins

Start preparing the class by asking them to save and bring in onion skins from home (the papery part from yellow onions). We will dye some white wool with onionskins, and weave with it. There are three main things that affect the color: 1) The material you are dyeing, 2) The amount of dyestuff, and 3) the length of time the fiber is in the dye bath.

Materials:

- White 100% wool yarn, 4 yards per student
- Onion skins: the papery part from yellow onions (some red onion skins), enough to fill a five-gallon bucket half full, or 1 peck.
- A large cooking pot, holding at least 2 gallons.
- A hot plate or stove for heating the dye pot
- Water to fill the pot 3/4 full
- One dowel 3/8" diameter and 18" long for stirring and handling wet yarn.
- Large sink to rinse skeins
- Large bowl to contain wet wool
- Rinse the wool, let it cool

Activity:

1. Have class members bring the papery skins of yellow and red onions to class. A mixture makes a richer color.
2. Choose a large pot such as a canning pot to do your dyeing in.
3. Fill the pot with dry onion skins
 - a. Rachel Brown: "figure on about one peck to half a bushel of fresh plant material per pound of wool to be dyed."
4. Put them in a cheesecloth or mesh bag (the bag the onions came in is ideal) to keep the onion skin flakes out of the yarn.
5. Fill the pan 3/4 full with water, and put on to boil.
6. While the water is coming to a boil, each student:
 - a. Winds a skein of wool: spread your fingers and wrap the yarn around your fanned-out fingers several times. Slip the loops off and thread a white twist tie through the loops. Write your name on the twist tie with an indelible marker and drop the skein in the water.
7. Take turns being Dye Chef
 - a. The Dye Chef will keep materials submerged in the dye with a length of dowel, and check the materials for intensity of color.
8. Cook for 1 hour just below boiling. The water should "smile" but not boil.
9. Check the color after an hour by lifting skeins out with a long stick. Cook longer for deeper colors.
10. Experiment with different yarns and cloth to see how well they take the dye.
11. When the color is right, take the skeins out and dry them.

Vocabulary:

Madder, *Rubia tinctorum*
Alizarin
Purpurin
Goldenrod (*Solidago species*)
Onion Skins (*Allium cepa*)
Indigo (*Indigofera tinctoria*)
Indigotin (not soluble in water)
Woad (*Isatis tinctoria*)
Mordant
Dye bath
Dyestuff
Alum
Lye

References:

McRae, Bobbi: *Colors from Nature*, Storey Publishing 1993
Brown, Rachel: *The Weaving, Spinning and Dyeing Book*, Alfred A. Knopf, NY 1978
Kramer, Jack: *Natural Dyes: plants and processes*, Charles Scribner's Sons, NY 1972

Colonial weaving and dyeing:

http://invention.smithsonian.org/centerpieces/whole_cloth/u3tc/u3materials/dyeCot.html

Native American weaving:

Smithsonian's Museum of the American Indian is a wonderful resource. Links may change over time. Search the Smithsonian site for full information.

Smithsonian:

<http://www.si.edu>

National Museum of the American Indian:

<http://nmai.si.edu>

Community basket weaving:

<http://blog.nmai.si.edu/main/2011/04/come-try-your-hand-at-weaving.html>

National Museum of the American Indian Teacher Guide

http://nmai.si.edu/sites/1/files/pdf/education/PreVisitGuide_K-6_final.pdf

Onion Skin chemistry:

<http://www.hindawi.com/journals/chem/2013/685679/>