

Ancient Textile Dyes: Cochineal

This is a fun, hands-on, activity that can be enjoyed by students of all ages. The preparation required ahead of time can be adjusted to suit your class size, available time, and personal interest in the topic. No prior knowledge or experience in textiles and dyes is required to carry out this activity. The instructions provided here are based on successful workshops carried out with students ranging in age from 15 to over 50!

What is Cochineal?

Cochineal Insects live on the leaves of prickly pear cactus. They secrete a waxy white substance that protect their bodies from sun exposure, so they appear as clusters of white on the surface of cactus leaves.



The insects produce carminic acid to protect itself from predators, and it is this acid that is red in colour. The insects were used by Pre-Columbian peoples as a dye ranging in colour from orange to red to purple. Large cactus farms were set up to harvest the insects in Pre-Columbian times, and in colonial times cochineal became an extremely valuable import—almost as valuable as gold and silver. Today, cochineal is a popular food and cosmetic colourant labelled as “carmine, crimson lake, carminic acid, or red no. 4.”

Obtaining Colour from Cochineal Insects

The insects are collected from the leaves of the cactus (see images in the Mexicolore document on ‘Red- the colour of cactus blood!’) and they are then dried in the sun. The dried insects can then be crushed into a fine and vibrant powder with a purplish-red colour (see image below). This powder can then be added to water to create a dye for fabrics.



Dyeing Fabric with Cochineal

Cochineal Insects are available in the UK from www.cochinealdye.com. A 10g pack of cochineal is sufficient for one class activity, since 6g of cochineal will dye 100g of fabric.

Equipment needed for a classroom activity

One 10g pack of cochineal insects
Rolling pin or mortar & pestle
Plastic bowls
Large metal cooking pot
Portable camping stove
Distilled water
100g of fabric

Optional but recommended: Paper coffee filters; plastic table cloth; paper towels; plastic gloves; aprons; paintbrushes; twine; lime juice, vinegar, and salt

Choosing the correct fabric: Wool and silk are protein-based fibers and bond with cochineal dye more readily than plant-based fibers such as cotton. Keep in mind that wool and silk were not available in Pre-Columbian times, yet cotton was used throughout ancient Mesoamerica. Whatever the choice for your classroom, be aware that modern fabrics are treated with various chemicals and oils and require “scouring” (cleaning) prior to dyeing. This involves boiling the fabric with soda ash for one hour (35g per 100g fabric)—you will be amazed at how dirty the water is afterwards! Failure to scour fabric prior to dyeing will result in unsuccessful and inconsistent colours, due to the reaction of dye with modern oils and chemicals. Some fabrics can be purchased “pre-scoured”, which removes the need to carry out this process. Find more information here: <http://www.wildcolours.co.uk/html/cotton.html>



To increase the success of bonding dye to plant-based fabrics such as cotton, a mordant must be added to the fabric after scouring. A mordant is a chemical compound that allows dye molecules to bind to fiber, and can brighten a dye colour, darken it, or make it colourfast. The fastest method to mordant cotton is to soak pre-wetted fabric in dissolved Aluminium Acetate (10g per 100g fabric) overnight. Find more information here: http://www.wildcolours.co.uk/html/mordant_cotton.html#aluminium-acetate-mordant

Steps for Classroom Activity

1. First Step: Grinding the insects

Students can use either a mortar and pestle or rolling pin to crush the insects. The resulting powder should be emptied into a small plastic bowl, ready to be later added to hot water.



2. Second Step: Creating the Dye

Distilled water should be added to a large stainless steel cooking pot and brought to the boil (hard water gives very pale colours in comparison to distilled or soft water). Once hot, it can be added to the cochineal powder to create the dye. Note that the more water that is added, the less intense the colour.

Ideally, the dye should be boiled for 30 minutes but if there are time constraints the dye can be used almost instantaneously—you will see and smell the change in the water immediately after adding the powder! To avoid particles transferring to the fabric, the dye should be strained prior to use (paper coffee filters are very effective). Since this is a fairly time-consuming process, it is not an essential step in the classroom activity. If preparing the dye at home ahead of time, it can be stored in the fridge for several weeks.



3. Third Step: Dyeing Fabric

Once prepared, the dye is ready to be transferred to fabric. Fabric can be added to the dye in the cooking pot (taking care that it has sufficiently cooled), or it can be transferred to a plastic bowl. Small bowls allow for fabric to be carefully submerged in dye, or they allow for dye to be applied onto fabric with a paintbrush.



4. Fourth Step (Optional): Altering the Colour of Dye

This is an optional, but fun, step! Adding ingredients such as lime juice, salt, and vinegar changes the pH level of the dye and alters the colour. The ingredients should be kept in separate bowls to avoid unwanted reactions. As a guide, this is how they affect the dye colour:

Lime Juice= Light orange

Salt: Dark purple

Vinegar: Light pink



5. Fifth Step (Optional): Creating tie-dye Patterns



Another, fun, but optional part of the classroom activity is to create tie-dye patterns. Twine can be used to tie sections of the fabric, so that dye does not penetrate them. Students can experiment with dyeing the fabric a light shade of cochineal to begin with, then tying sections and dyeing the fabric a second, darker, shade. Not only does it produce interesting effects, but it demonstrates the ability that ancient peoples had to create many different shades and colours!

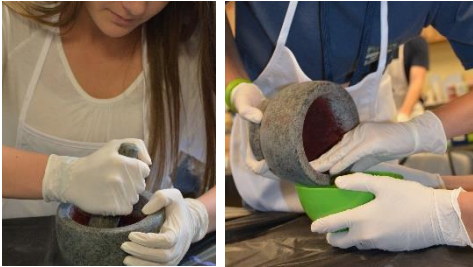
Figures

All figures taken by the author except for the following:



Both images from:

<http://www.webexhibits.org/causesofcolor/7.html>



Both images courtesy of Tiffani Thomas