Natural dyeing is a tradition that has been practiced for time immemorial. Indigenous chemists and natural dye specialists have mastered techniques for extracting colors, or pigments, from plants and minerals and using these pigments to dye natural fibers, such as cotton, linen, and wool. Learn how to make your own natural dyes using foods found in your kitchen!

### MATERIALS

- Raw materials for natural dyes: beets, yellow onion skin, red onion skins, spinach, black tea, turmeric, avocado pits and skins, red cabbage, blueberries, and/or blackberries
- · Optional (use with adult supervision): Knife and cutting board
- $\cdot$  Two pots
- · Strainer
- · Clean white 100% cotton fabric (e.g. t-shirt, bandanna, socks, or pillowcase)
- · Salt
- · Measuring cup
- · Tongs
- · Rubber bands (the thicker the better)
- $\cdot\;$  Large shallow dish or rimmed baking tray
- · Kitchen baster or large spoon
- · Sealable plastic bag or airtight container
- · Optional: Rubber or plastic gloves
- · Optional: Clear glass or bowl (optional)
- · Optional (for older students): Lemon juice
- · Optional (for older students): Baking soda

Experiment continued on next page...







### PROCEDURE

#### MAKE THE DYES:

- · Cut large fruits or vegetables into small pieces.
- Place raw dye material in a pot (one type of raw materials per pot) and cover with water. For best results, use one part raw materials to two parts water.
- Heat water until near boiling (but not actually boiling) and simmer for 1 hour.

**TIP:** For a deeper color, leave raw materials to cool in the pot and soak overnight (12-24 hours).

 $\cdot\;$  Strain out raw materials and reserve dye liquid.

#### PREPARE THE FABRIC:

- Before dyeing, prepare fabric using a fixative solution. To make fixative solution, dissolve ½ cup salt in 8 cups water in a pot. Place fabric into the salted water and simmer on stovetop or hot plate for about an hour. This will help prevent dye from washing out of fabric later.
- Remove fabric from water using tongs and allow fabric to cool. Gently squeeze out excess salted water (be careful, water may be hot).

Experiment continued on next page...







### PROCEDURE

#### **DYE THE FABRIC:**

- · Roll damp t-shirt or fabric into a ball, not too tight.
- $\cdot \,$  Wrap several rubber bands around it to hold it in a ball
- Place still-damp ball in large shallow dish or on a rimmed baking tray. Use kitchen baster or large spoon to apply dye to fabric. If using multiple colors, apply each color to different portions of the fabric, following your own design. Be sure to completely cover all side of fabric with dye. Be careful not to splash dye on the clothes you are wearing!

**TIPS:** For fuller saturation of designs with one solid color, soak fabric in liquid dye for 1 hour. Wear gloves to prevent dye from staining hands.

- Seal fabric in plastic bag or airtight container to keep damp while dye sets for 6-8 hours or overnight.
- · After dye has set, rinse fabric in cold water until water runs clear. Remove rubber bands and lay flat to dry.
- To wash, cold wash separately on a delicate cycle with a mild detergent, or hand wash. Tumble dry on low or hang to dry in shade.





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## TRY THIS

- Try a different fabric scrunching and rubber banding technique. How does your technique affect the dyed pattern?
- Many factors can affect how well certain dye pigments transfer and stay in natural fibers. How does using vinegar-based fixative (1 part vinegar to 4 parts water) affect the dye job? How do different dye setting times affect the color vibrancy? Do some natural dyes change color when exposed to direct sunlight? Try different dyeing techniques and compare your results.
- Many native plants can also be used to make natural dyes. Check out this resource guide from the U.S. Forest Service to learn more about native plants used for dyes in your area. When foraging for wild plants, follow the 1 in 20 rule: only take one if you can see 20 other good plants of the same kind.

### **DID YOU KNOW?**

Natural dye specialists need to understand the chemical properties of different dye pigments to prevent colors from fading over time. There are two important types of dyes: adjective dyes and substantive dyes.

Adjective dyes require a bonding material called a mordant (such as alum and tannic acid) to stop the dye from washing out of the fibers. The mordanting process is when fibers are treated with a metal salt solution to create a lasting bond between the fiber and the pigment.

Substantive dyes do not need a mordant because they are from plants that contain natural mordants, such as tannins. The pigment molecules of substantive dyes are water-soluble and can directly bond to natural fiber on their own.









### **K-2 GRADE EXPLORATION**

Here are some questions you can explore together:

- · Look closely at the raw dye materials before boiling them in water. What colors do you see?
- After straining the solids from the liquid dye, what do you notice about the colors of the raw dye materials now? Pour some of the liquid dye into a clear glass or bowl to observe it more closely. What color words would you use to describe the dye? What color do you think it will dye the fabric?
- After you tie up your fabric and dye it, make a prediction about what the pattern will look like.
- Look at the color and pattern of your finished tie dye: Is it similar to or different than what you predicted? How so? Can you tell where the rubber bands were placed? What would you try differently next time?



