Dyeing with Cochineal

What is an experiment?
What is experience?

Procedure

Curiosity

Testing

Sharing results

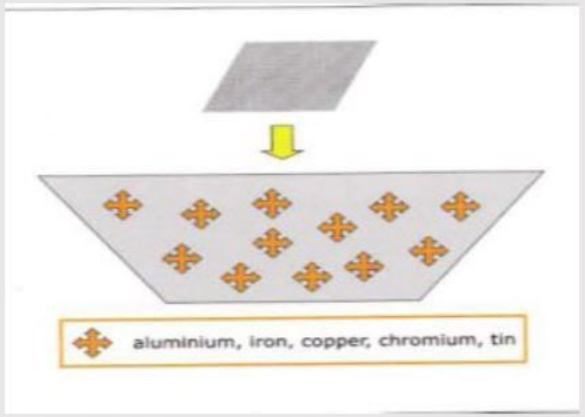
Dyeing

Mordant

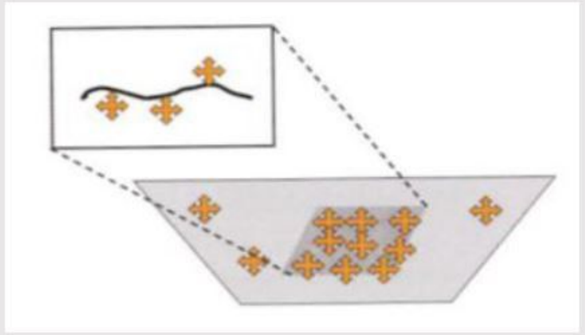
- Mordants are metals that connect the textile fiber and the dye
  - They strengthen and prolong the colors by keeping them from fading in response to harsh physical conditions.
- Alum - potassium alum ($KAl_2 \cdot 12 H_2O$)

Mordant dye process

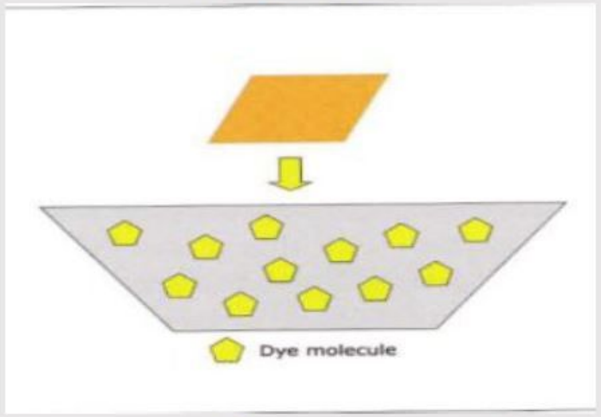
(1) Mordant bath is prepared by dissolving metal salts in water. Textile is then added



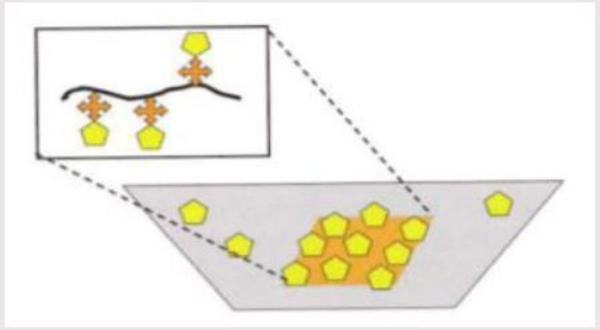
(2) Metal is bound to the textile



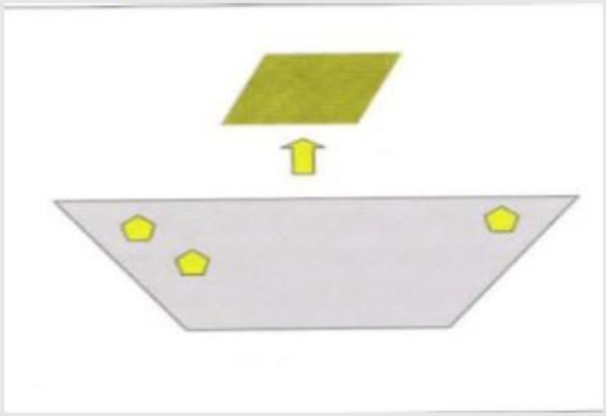
(3) Mordanted textile is added to dye bath



(4) Dye molecules bind to coordination metals of mordanted textiles



(5) Dyed textile is removed



Adapted from Jo Kirby et al, *Natural Colorants for Dyeing and Lake Pigments: Practical Recipes and their Historical Sources* (Archetype, London, 2014), 27.

Mordant

- Measure out water into pot
  - 1g Textile (weight of fiber - WOF) : 0.2g mordant (alum) : 50g water
- Add alum and stir
- Place beaker onto hot plate and turn on to medium-low
- Stir to dissolve alum in the water
- Add textiles when alum solution reaches 70° C
- Heat the textiles for 30 minutes at 80-90° C, stirring occasionally to ensure homogenous absorption
- Remove textiles, rinsing them thoroughly in cold water

Cochineal

Art History and Environmental Biology

Textile fragment with faces and birds.
Peru, 4th-6th century

A bit of history...

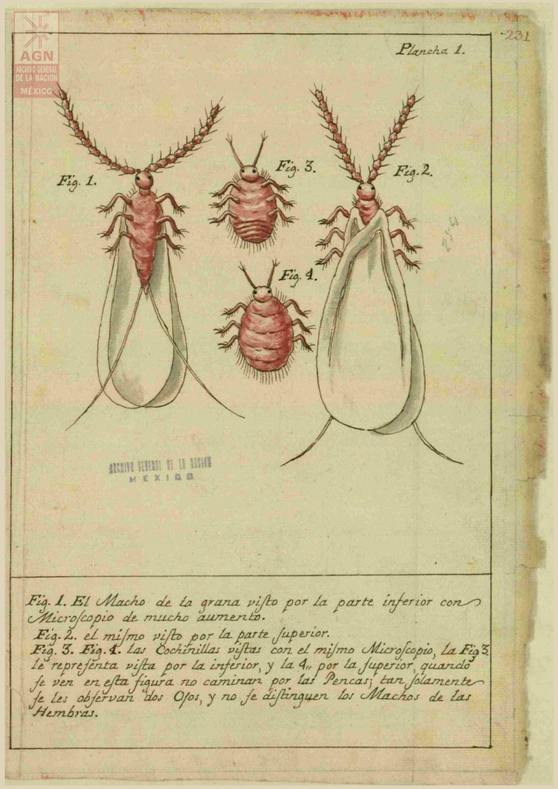
- Cochineal has been used as a dye and pigment since ancient times

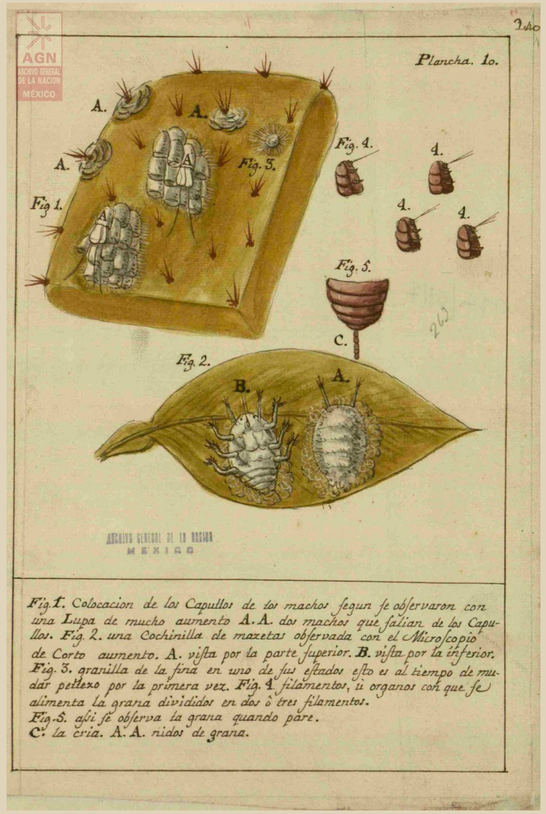
- “In our 21st-century world, colour lacks history; we are mostly unaware of where the colours we inhabit come from… [We ought to] rethink perfect red as an assemblage of plants, insects, meteorological conditions, qualities of soil and climates, and temperaments, of places and of people.” -Miruna Achim, historian

Cochineal

- *Dactylopius coccus* is a species of insect native to parts of Mexico and South America.
- It is a **parasite** that lives on the prickly pear cactus
  - Its nutrition comes from sugars inside the plant.
  - Once it latches onto the cactus, it cannot move again

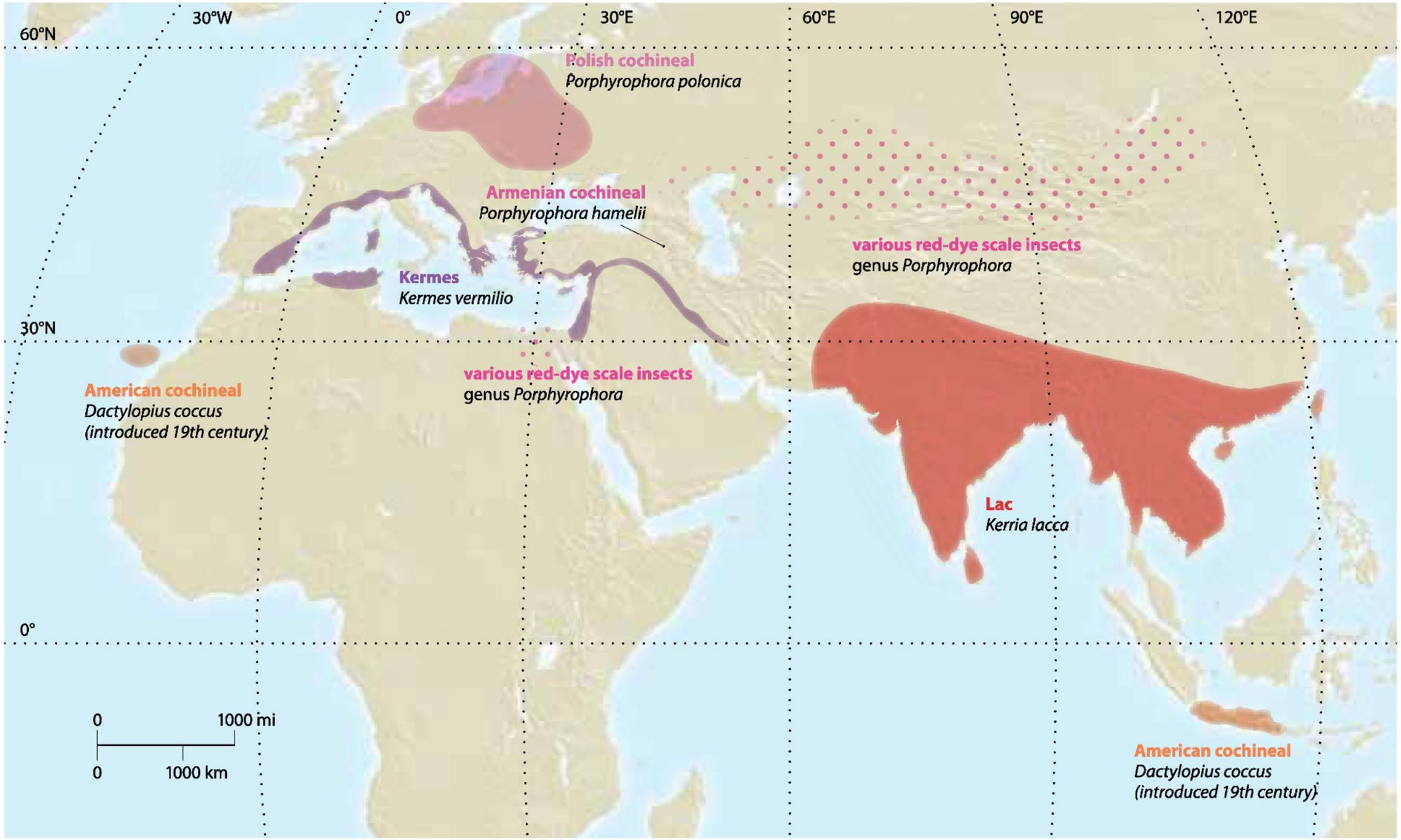
Cochineal





José Antonio de Alzate y Ramírez, a Spanish priest, published *Memoria sobre la naturaleza, cultivo y beneficio de la grana (Treatise on the Nature, Cultivation and the Processing of Cochineal)* in 1777

Cochineal cultivation from the 16th-19th centuries, from *Cochineal Red: The Art History of a Color* by Elena Phipps



9. Habitats and later areas of cultivation of red-dye insects in Europe, the Middle East, Africa, and Asia

Life Cycle

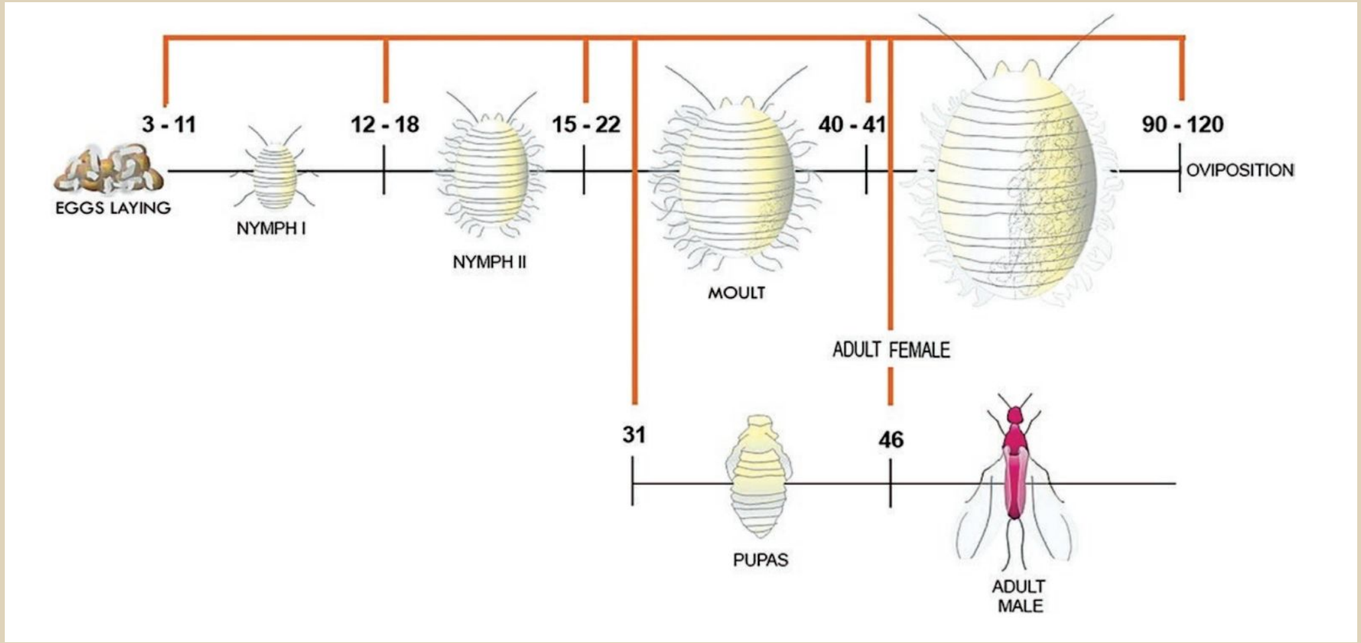
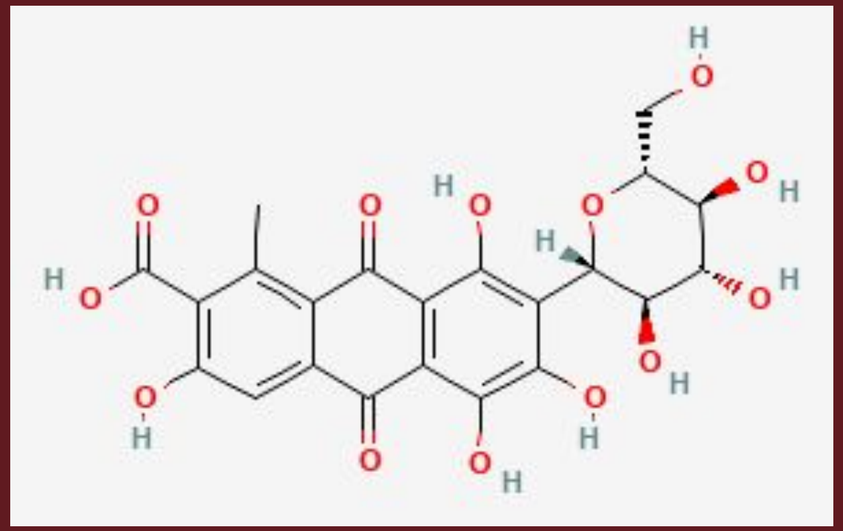


Image created by Francisco Javier Roque-Rodríguez.

How does this life cycle compare to other insects you know about?

Its weapon:



Carminic Acid

$C_{22}H_{20}O_{13}$

Synthetic dyes

The rivers around Tirupur are often red or purple with runoff from nearby factories, such as those in the Netaji Apparel Park, that are the city's economic engine.

HK RAJASEKAR/INDIA TODAY/GETTY

Extract dye

- Using mortar and pestle, crush dyestuffs to a fine powder or into small pieces
- Measure out water and pour into pot
- Add dyestuffs to coffee filter, close with a rubber band, add bag to water
- Place pot on hot plate, at medium-low
- Heat the bath (without the textiles) at 80-90 °C for 30 minutes, stirring occasionally
- After 30 minutes, remove dyestuffs in drawstring bag

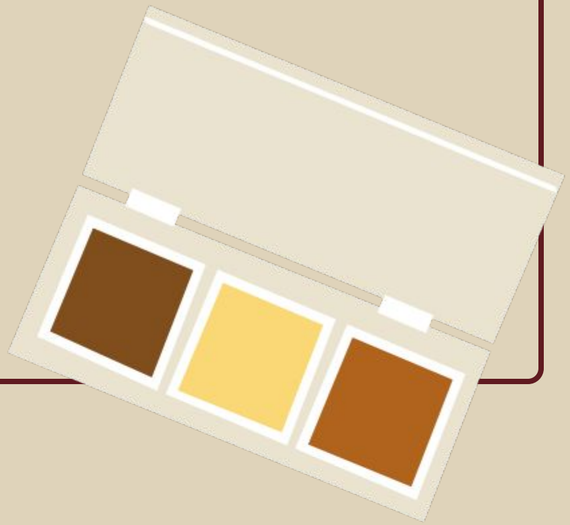
Dye bath

- Add textiles to the dye bath
- Heat textiles at 80-90 °C for 30 min, stirring occasionally to ensure homogeneous dyeing
- After 30 minutes, remove the textiles from the bath
- Wash textiles with clean water to remove any dye that has not bound to them
- When the water runs clear over the textiles and no color comes off the textiles, wring out excess water

Resources

When does a natural resource become a material?

What is the importance of understanding where materials come from?



Reflection