

# Plants in Your Pants: Indigo

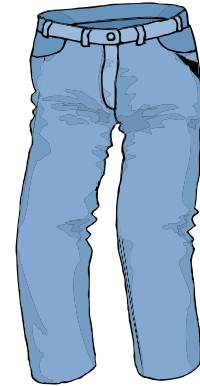


*Indigofera tinctora*

700 species  
 tropical and subtropical  
 shrub or herb  
 hairy leaves & leaflets  
 flower clusters  
 1-3 meters tall  
 peapod-shaped fruit



**BLUE**  
jeans



cool  
 rugged  
 in-style  
 comfy  
 timeless  
 universal  
 easy

## How do Indigo Plants Get into Denim Pants?

Indigo plants produce **indican**. **Indican** is made from **dextrose** (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) & **indoxyl** (C<sub>8</sub>H<sub>7</sub>NO). When crushed **indigo leaves** soak in water the **indican** dissolves. Bacterial enzymes get added to this **indican** solution. The enzymes eat up the **dextrose** and leave behind the colorless **indoxyl**.

**Indoxyl** combines with oxygen to make **indigo blue**. **Indigo blue** does not make a permanent dye so it gets chemically changed to **indigo white**.

**Denim** cloth is soaked in water & **indigo white** dye. The dye's chemicals grab on loosely to molecules on the outer layer of each **cotton fiber** in the **denim**. When the **denim** cloth is removed from the water, the oxygen in the air changes the **indigo white** back to **indigo blue**.

*That's how indigo plants get in your pants.*

Paraphrase the facts from anywhere on this sheet to make an acrostic poem for the word 'INDIGO'.

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<b>I</b>	
<b>N</b>	
<b>D</b>	
<b>I</b>	
<b>G</b>	
<b>O</b>	

Since 1987, jeans have been dyed with synthetic indigo. More recently, organic interests are driving a new demand for natural indigo

## River washing

softens and fades denim jeans. First, the denim is washed with pumice stones. Pumice rubs the indigo dye off the cotton fibers. Next, enzymes are added to eat away more dye and soften the fibers. The dye fades away because cotton does not absorb dye into the core of its fibers. Only the outer layer of each cotton fiber soaks in the dye. The core remains white. Faded jeans get their cool look when the inner core of the cotton fiber is revealed.

Color this model of a cotton fiber to show where the indigo dye is absorbed.



13 shades of indigo: milk pearl pale flat middling sky queen's Turkish watchet garter mazareen deep navy

How much indigo is left on your jean's cotton fibers?



## Dye Naturally



1. Assemble a variety of naturally-occurring dyes such as green or black teas and cranberry, grape, tomato, or lemon juices.
2. Cut an old white cotton sheet or t-shirt into strips.
3. Dye the strips using a variety of **measurable variables** to create and control for different colors & patterns.  
*Optional variables: dye:water ratios, dye color combinations, steeping times*
4. Precisely record methods and measurements so that your **results can be duplicated**.
5. Create textile art with the dyed strips. Describe the aesthetic and scientific components of the finished art.

## Stressed Out Denim



1. Cut 4x6 rectangles of denim, one per student. (use old jeans).
2. Students divide their rectangles into 2 even swatches.
3. Reserve one swatch as the '**control**'. Analyze the control for factors such as dimension, softness, denim color/fade and other observable variables. Record the **observations** precisely.
4. Subject the second swatch to a series of environmental stressors in order to change the texture and/or color of the swatch. Define each stressor precisely.
5. Record the **results** (according to the predetermined factors) after each stressor. Summarize the total effects.
6. Create a **poster** listing variables, defined stressors, factors, and results.

## Sort it Out

Goal: Create **objective measures** to sort the jeans from deepest to lightest indigo dye levels.

Process: Answer these questions to determine the most consistently applicable methods for defining indigo levels:

- Is the same section of denim (say, the left back pocket) the one spot reviewed on each pair?
- Or, are several sample areas reviewed on each pair to determine an average rating?
- Can all factors under consideration be defined and objectively measured or rated?
- How can **subjectivity** be handled within the review process?
- Is there a way to coordinate measured data with aesthetic evaluation to create a valid overall ranking of the denim levels in the available jeans?

