

**HISTORY OF DENIM, INDIGO AND
HOW-TO DYE WITH INDIGO AT
HOME**

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ABSTRACT

Denim has an unclear history, but it impacts our everyday lives. It has been a textile that has been around for centuries and the dying process has been around for even longer. The development of new techniques in dying has caused major advances in the indigo dying process but it has also caused major setbacks to the environment. Is there a way for sustainability in indigo dye? With a step-by-step on how-to dye denim at home, is it a good idea?

Even though the exact location of denim's origin has never been determined, it is certain that denim was being produced worldwide at the start of the 19th century. Despite popular belief denim was not first used by Levi Strauss during the gold rush. Due to denim's tough and durable tendencies, it was the ideal fabric used by laborers, both men and women. The first pair of denim work trousers was discovered to date back to the 1840's where it was also used to patch the knees and thighs of worn in fabrics. (McClendon, 2016, Pg. 15)

At the most basic level, denim can be defined as a warp-faced, twill textile woven from cotton threads with the warp threads dyed blue from indigo, and the weft threads left undyed or white. The "warp-faced" structure ensures that the blue-dyed warp threads appear most prominently on the top or "face" of the denim fabric, while the white weft threads appear on its reverse side. The cotton threads used for the warp are traditionally dyed with indigo through a procedure known as "rope Dying." In this process, groups of cotton thread are passed through vats of indigo dye — The nature of this process ensures that the indigo will only penetrate the top layer of the cotton threads. This gives denim a unique quality - as it ages, the blue surface of the fabric begins to brush away, increasingly exposing the threads' white core. (McClendon, 2016, Pg. 13)

Though Levi Strauss did not invent denim, he was the first to put it on the map and reinvent the original, basic design. Since the textile was originally used as workwear, he noticed that the denim would easily rip in certain areas due to the heavy loads of gold being carried inside the pockets during the gold rush. He decided to add copper rivets, which he patented in 1873, to reinforce the pockets. When the patent expired in 1890, the company decided to add a 4th pocket, the watch pocket to the design. This now meant that the design had 3 front pockets

and one rear, it wasn't until 1905, that they added a second back pocket. (Sullivan, 2007, Pg. 5) It wasn't until the 1930's that denim began to be used as a fashion textile, it did return back to its functional role at the start of WWII. Once Europe saw jeans on the sailors the craze began, and everyone wanted to wear denim. (Balfour-Paul, 2011, Pg. 204)

Indigo is said to be the world's oldest textile dye. Archaeologists have found traces of indigo in Egypt, India, and China that date back 4000 years. During an excavation in the Nîmes Canal, wooden vats were found that contained traces of indigo dye that go back to 1700. It is easy to imagine "the ancestors of modern jeans could have been dyed in these very vats." (Balfour-Paul, 2011, Pg. 203) Blue dye can come from fruits, plants, and flowers but they are not long lasting compared to indigo. Indigo is the only natural source that produces a long-lasting blue color for textiles. However, indigo does not occur in nature as the plants used to make indigo does not have any blue in them. Instead the color indigo is achieved by fermenting the leaves of certain plants to create indigo dye. (Edwards, 2017)

Natural indigo dye has declined in 1897 when chemist Adolf von Baeyer synthesized the color. It quickly gained popularity because it relieved the suffering of the plantation workers, but it created new suffering by exposing them to toxic chemical dyes. Today a majority of denim that is dyed with indigo is done so with synthetic dyes. Synthetic indigo requires numerous amounts of toxic chemicals that have been polluting the water in the parts of the world in which the dying is done so much so that the rivers run blue. It is contaminating the fish and the people, causing significant health problems. This has become such a huge problem that researchers from The University of California were able to find a more sustainable method to indigo dying. "They were able to engineer a strain of *E. coli* bacteria indigo precursor that is stable and can be stored until needed. Unlike traditional synthetic indigo, which requires chemical treatment to reduce

and solubilize the indigo so it can crystalize in the cotton fiber, the *E.coli*-produced precursor only needs the addition of an enzyme. The final result is “identical” to traditional synthetic indigo dying.” (Matchar, 2018)

How to dye denim with indigo dye:

STEP 1: Fill a 5 gallons bucket with 4 gallons of warm water

STEP 2: Empty the indigo dye into the water and stir, ensure the dye is completely dissolved at the bottom of the vat

STEP 3: While stirring, slowly empty the soda ash and reducing agent into the water

STEP 4: Slowly and thoroughly stir the vat in a circular motion until well mixed, then reverse the direction

STEP 5: Cover the vat with a lid and allow it to settle for about an hour

STEP 6: Once the vat has settled, remove the lid, there should be a thin layer of blue skin covering the top of the bath

STEP 7: With gloves on, gently move the thin layer of blue skin to the side and check the color of the bath. It should be a clear yellow or yellow-green color. If it’s not, cover the vat with the lid and wait another ½ an hour and check again

NOTE: Keep gloves on throughout the entire process. If possible, get longer gloves to avoid dying your hands dye

STEP 8: The fabric that you will be dying must be thoroughly soaked in water before beginning the dying process

STEP 9: When you’re ready to begin dyeing, remove the lid and carefully move the thin layer of blue skin to the side **while wearing gloves**

STEP 10: Squeeze the excess water and air out of the fabric

STEP 11: While squeezing the fabric, slowly submerge it into the dye vat

NOTE: Try to prevent splashing, that way air doesn't get into the vat

STEP 12: While submerged, move the fabric around to ensure that the dye penetrates all areas evenly

NOTE: Keep doing this several minutes. Don't let it sink to the bottom, there will be residue that has settled on the bottom which can cause spots on your fabric

STEP 13: When you are ready to take the fabric out of the vat, you should squeeze it below the surface as you slowly remove it from the vat and cover it with the lid

NOTE: Try to prevent splashing, that way air doesn't get into the vat

STEP 14: The fabric should come out the same yellow or yellow-green as the vat and should slowly turn blue as it starts oxidizing

STEP 15: Set the fabric aside for about 20 minutes, so it oxidizes

STEP 16: Once the fabric has completely oxidized, you can repeat steps 10-15 as many times as you'd like to achieve darker shades of blue

STEP 17: Once you're satisfied with your dyed fabric, you can wash with mild detergent and warm water to remove any excess indigo (Jacquard, n.d.)

Even though the indigo dyeing process is something that can be achieved at home, it is very time consuming and an extremely messy process, even if you are being careful. So, if you are not ready for the heavy clean up that is ahead, I suggest that this is a task that you do not put on yourself.



STEP 1



STEP 2



STEP 3 & 4



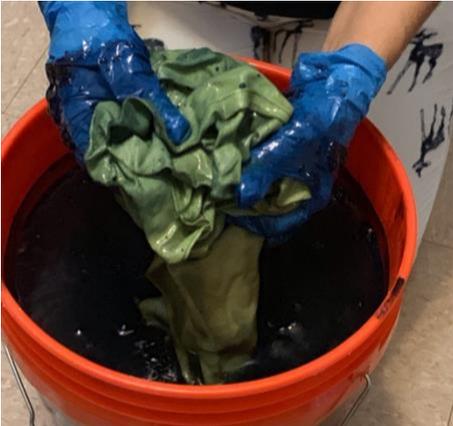
STEP 5



STEP 6 & 7



STEP 11 & 12



STEP 13 & 14



STEP 15



STEP 16



STEP 17

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