A Year in Natural Dyes

with Madeleine McGarrity of Cold & Deadly

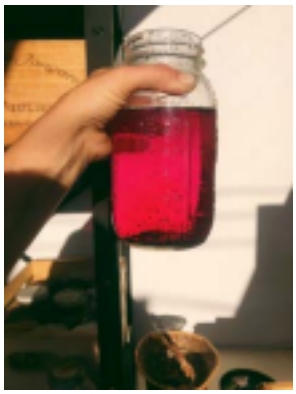
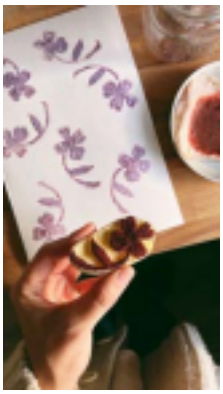
December 2024 - COCHINEAL

Natural Dye Screen Printing



This multi-part tutorial will focus on **Screen Printing –how you can do it at home – by way of Printing with Mordants & then Dyeing textiles with a special intensive focus on Cochineal.** The beauty of this process is that **ANY natural dyestuff** (with the exception of Indigo because of its unique chemistry & mechanical character as a dye) can be employed- not just Cochineal. The body of the information is focused on the screen printing process itself, with a section detailing my own **Mordant Printing/'Dyed Style'** recipes as well as an explanation of other printing styles like discharge printing & direct application printing. Remember that each dye is unique and there is no one-size-fits-all chemistry between natural dyes. Learn about the dye you plan to use for best results –and **do a lot of tests!**

The Cochineal Dyeing GUIDE section will inform how to extract cochineal dye and can be useful for all types of dyeing including whole cloth color immersion dyeing, and yarn dyeing.

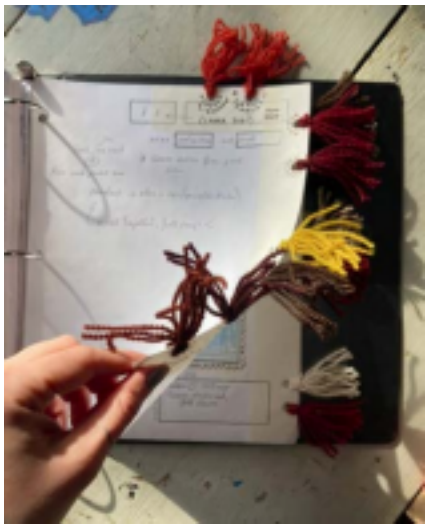
Meet Madeleine of Cold & Deadly

Cold and Deadly is a project investigating natural dye print processes with the goal of designing a modern system for production textile printing that is circular and climate beneficial.
The project is run by Madeleine McGarrity. She graduated from Rhode Island School of Design with a BFA in Printmaking, and worked as a printmaking teacher and professional textile printer in Brooklyn, NY from 2012 to 2020. Cold and Deadly began in 2019 in a rural New Jersey studio, originating from a desire to use natural dyes in her own fine art print work. She recently relocated to Providence, RI, and works for the Rhode Island School of Design as the Surface Technician for the Textiles Department. In the rest of her time, Madeleine sustains a studio art practice, is an avid outdoors person, bike commuter and gardener.

Currently, the project focuses on researching and testing traditional methods of printing with dyes known to be light- and wash-fast. Historically, printers and dyers used these techniques to produce permanent, vibrant, multi-color prints on textile yardage, using woodblocks, engraved rollers, stenciling, and hand painting. The Cold and Deadly system will be built around silk screen printing–the most common modern method for commercial textile printing. Historical documents, scientific papers, input from members of the modern natural dye community, and rigorous testing drive the research for the project; the resulting processes are a mix of modern dyers' processes, historical industrial practices, and discoveries that evolve naturally during testing.

The name Cold and Deadly comes from a treatise on small-scale industrial dyeing written by Elijah Bemiss in 1815. As was common at the time, he describes his materials through their perceived characteristics, inferring their preferred use in those terms. Thus, he deems cotton and silk to be "of a cold and deadly nature," inferring both dye best in cold processes only (an inference that is arguably almost entirely incorrect.)

In part, Cold and Deadly is a nod to historical natural dye systems and their passionate creators, as well as an acknowledgment of the current state of global textile manufacture, which is nothing if not deadly—for garment workers, for our planet—and devoid of any feeling of community or conscience. Cold and Deadly is founded on the belief that natural dyes present a unique opportunity to create a circular system for textile printing, specifically for smaller production studios that operate as an integral part of local economies and Fibersheds.



Scouring

Fabric Preparation ///

Be sure to scour! Skipping on a good and thorough cleaning and scouring process (especially for cellulose/plant fibers) can result in inferior print quality and dye saturation. For cellulose fibers- use a washing machine on the hottest wash cycle with pH neutral detergent & 2%WOF soda ash/washing soda/sodium carbonate. This removes naturally occurring wax/pectin/lignin/starch/dirt/sizing etc that can prevent good mordant & dye uptake. The washing machine method works especially if you have control over the strength of your hot water heater and the soaking times in your washer- I will say though that scouring is MOST effectively done by hand in a pot with ample water. Learn more about efficient scouring in the **Solid Foundations Natural Dye Workshop**. Protein fibers like wool and silk require a more gentle approach to scouring with less alkaline detergent.

Screen Printing works well on most textiles–even more so than techniques like block printing or painting with mordants and dye–since it fills the fibers evenly with less "ink" and makes tight contact with the surface, keeping the prints sharp even with heavy application.

You will notice some print better than others though: many light cottons wick the print media away from the image after printing resulting in blurred line and images edges, lofty fabrics are hard to penetrate, and some silks, though they produce beautiful images in the end, can initially reject the print mixture, or absorb it excessively. It is something learned by trial and error, and knowledge can only be built with experience. Give yourself a break and **don't aim for perfection right out of the gate.** Good materials for beginners would include medium or light weight, tightly woven cotton (muslin, sateen, percale), linen, silk noil, or wool challis.

Cochineal Dyeing Guide: In the latter part of this tutorial you will see a dyeing demo and a discussion

about the outcomes of two sample tests, highlighting the **multitudinous nature of cochineal as a dyestuff.** This section is meant as a guide to starting to investigate cochineal, as well as encouragement to learn as much as you can about any other dyes you wish to use in your practice. **Natural dyes represent complex, sometimes tempestuous chemical processes and it takes time to become familiar with each individual dye.**

Supplies

- **Well scoured cellulose/plant fiber,** if you wish to print in **The Dyed Style**, detailed in the dyeing section of this tutorial (**also known as mordant printing**) - any weight will do.
- **Wool or silk yardage-** scoured well- expect protein fibers to have more background staining since they naturally have more of an affinity for natural dyes even without mordant
- **A Silkscreen correctly sized for your image -** you want at least two inches of space from each frame edge *see silkscreen description in the introduction for more info on choosing a screen ● **A squeegee which fits your image well (at least an inch to spare on either side) and suits your printing style (description below)**
- **Materials for making your screen** *see optional list in the Making A Screen section below

/// Silkscreen materials are a simple search on the internet in most places–nearly every city, big or small, has a silkscreen shop taking on local clients and there are silk screen suppliers servicing those shops. Here are some I routinely use:

Victory Factory is based in Queens, New York, USA and offers a full range of aluminum frame screens, materials, and restretching services. If you're in NYC, or nearby, you can avoid the large shipping fees that come with large screens by picking up in person.

River City Supply is based in Texas, USA and carries a slightly wider selection of materials than Victory, with the added bonus of charging no sales tax.

Screenprinting.com used to be called Ryonet and is (I believe) based in the midwest, though they really only exist online. They carry everything that Victory and River City carry, as well as offering a ton of educational material on their site, including classes and free articles.

Suppliers who provide pre-press services…
USA:
Nor Cal Screen Print Supply
Anthem Screen Printing

Europe:
Art 2 Silkscreen (UK)

Hunt the Moon (UK) **offers pre-press services*
Rittagraf (ES)
Siebdruck-versand (DE)
A. Buisine (FR)

Australia:
Australian Screen Printing **offers pre-press services*
Leapfrog Ink Spot **offers pre-press services*
Jones Brothers **offers pre-press services*

- **Glass jars/ measuring cup for ink mixing** these should be heat-resistant
- **Several large buckets** (5gal from local hardware are usually rated for heat and work perfectly)
- **Food Scale** that measures in grams
- **Heat source for pot**- hotplate, propane stove, induction burner etc.
- **Sieve and tightly woven cloth of a similar size**
- **Textile detergent-** pH neutral (most eco friendly brands are pH neutral- avoid enzyme based detergents for already naturally dye textiles) & remember not to use fat or oil based soaps when cleaning textiles these can add substances to fabrics that prevent good mordant and dye uptake. I like using **Prosapol–**an ecofriendly wetting agent and scouring detergent.
- **"Good Water"** water free of trace minerals (the calcium/magnesium of hard water but ALSO any sodium added by water softeners). Distilled water is excellent and so is rain water. If you are unsure of what kind of water you have you can purchase a simple water hardness meter or test strips which will give you a basic numbered rating, or send away for a full water test, which will give much more detailed results.
- **Guar gum**
- **Soda ash** (pH modifier & scouring assist)
- **White vinegar**

- **Sodium acetate**

- **Alum acetate**
- **Ferrous sulfate (Iron salt)**

- Finely ground dried **Cochineal** (buy whole & grind yourself in a mortar & pestle) **OR Any Natural dyestuff of your choice** (with the exception of indigo because of its unique chemistry and application rules that differ from all other natural dyes)
- **Calcium carbonate/Chalk**
- **Wheat bran**
- (optional) **Tannin extract**
- **pH strips**

///Dyes & Auxiliaries can be purchased:
USA/CANADA- Botanical Colors, Maiwa, Aurora Silks, Pro Chemical & Dye Dharma Trading, Carol Leigh's Hill Creek Fiber
EUROPE- Wild Colours, The Mazi, Saber Fazer, Kremer Pigments
AUSTRALIA- Kraft Kolor
JAPAN- Aikuma Dyes

///Fabric Recommendations (listed by company location) & blanks (*blanks are pre-sewn pieces):

USA:

Maiwa for handwoven, some organic, thoughtfully/transparently sourced natural fabrics **blanks available*

Aurora Silks for everything silk including wild silks, wild/raised silks, Ahimsa silk, peace silk, silk yarns and threads. Transparent/Ethical sourcing. **blanks available*

Test Fabrics for a wide array of high-quality fabrics that print beautifully. Many selections are "prepped for printing" which means they are scoured and ready to dye right out of the mail. Their sourcing is transparent but not necessarily mindful. Pricing by request, ordering best done by phone.

Organic Cotton Plus is exactly what it sounds like. A wide selection of cottons, linen, wool, etc. Their sourcing is transparent but not mindful.

Sally Fox for white and naturally-colored cotton yardage. Colored cottons take on dye really beautifully, but their backgrounds tend to hold on to dye if you are using the mordant printing process. Direct application printing results in less staining. Sally Fox runs her own cotton farm, producing colored cottons she bred herself over her long, amazing career. She also offers some wool yarns, heritage wheat, and cotton yarns as well. **some blanks available*

Europe:

Cloth House for a wide range of fine fabrics from all over the world. There are many natural-colored textiles for dyeing and printing, including naturally-colored wools other than basic white. (Besides dye-ables, if you like to make your own clothing, this store is a delight.)

The Mazi for printable natural textiles and homegoods. **blanks available*

FibreBio for printable yardage, garments and homegoods in thoughtfully sourced natural fibers. **blanks very available*

Merchant and Mills for a beautiful international selection of textiles collected with the home-sewer in mind. Sort by color or fabric type to find dyeables.

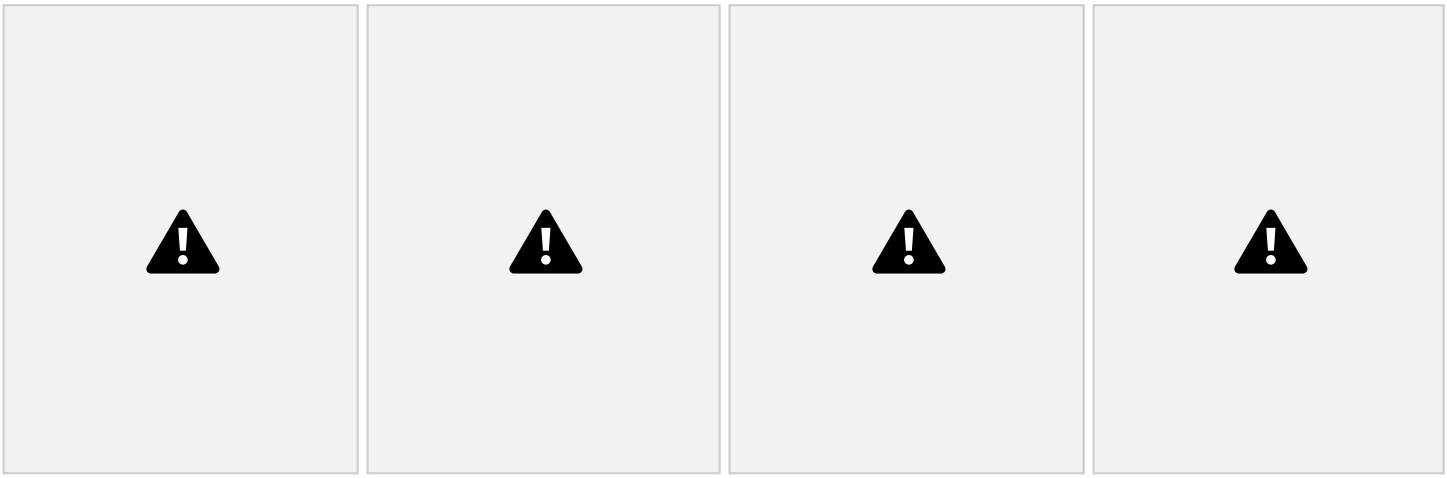
Australia

The Fabric Store

Understanding Screen Printing - An Overview

Silkscreen printing involves pressing ink (thickened mordants, pigments or dye combined with mordant) through a mesh screen with a rubber squeegee to create a pattern or image, the image is determined by the stencil. Anywhere the stencil is not, the media can pass through and is pressed onto the substrate (which can be nearly anything including of course textiles.) Multiple patterns can be layered on top of each other, creating complex images together. Each layer requires a separate screen, and usually–but not always–each screen/layer adds a unique color. Most important is to get a good connection between the screen and the substrate and a firm, sharp application of whatever media you are printing with. You can adjust everything in the process–the screen, the squeegee, the ink, the substrate–to suit your skill or printing

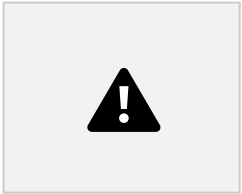
style in order to produce a good print.



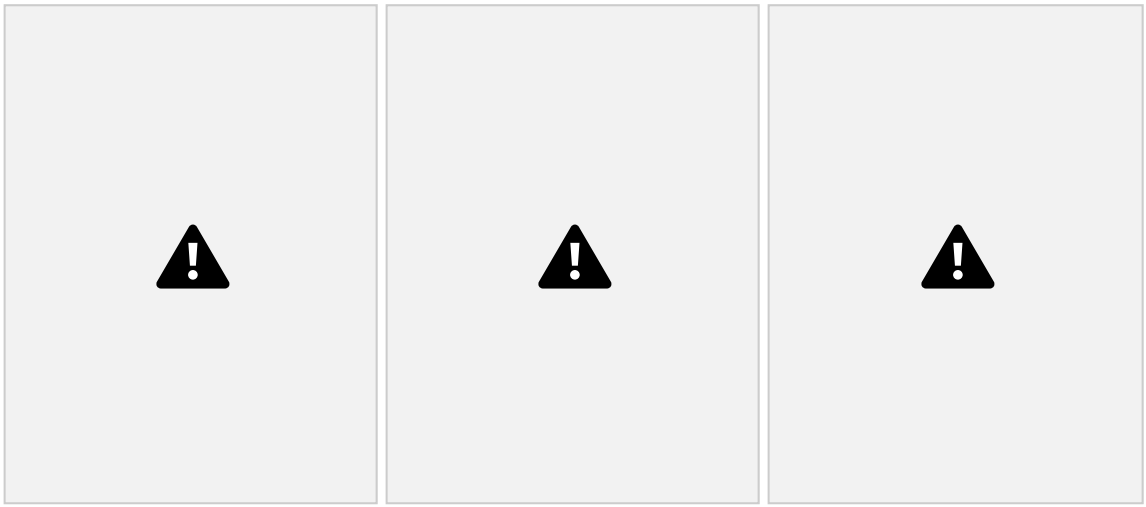
Screen printing is a simple process that is especially well suited for production applications. It is both a newer form of printing (for production) and perhaps the OLDEST form of printmaking. The process relies on the creation of a stencil, which blocks part of an image, leaving the rest open and allowing for a layer of color to be applied through it.

The prehistoric handprints outlined on the cave walls at **Lascaux** are an example of stenciling, as are the skillful indigo katazome prints produced over hundreds of years in Japan, as are the relatively simple-to-print many-layered images on graphic T-shirts in modern shops. The foundations of the silkscreen printing process originated in China during the Song Dynasty, but the process we know as silk screen printing today is closer to its own invention, especially in its more complex and technical applications. Also, because it is still in use as an industrial process, it is constantly being re-invented and improved by modern printers all over the world.

Screen printing with natural dyes is interesting because, though it is a very ancient process, it was not historically used to print patterns on textiles while natural dyes were still the industrial standard. Woodblock and engraving techniques were used heavily in the textile printing industry before the advent of coal tar derivative dyes (synthetic dyes).



Silkscreen became the go-to technique for industrial printing only after synthetic dyes had taken the market over completely. Too bad, because screen printing lends itself extremely well to natural dye printing, and provides nearly endless opportunities for experimentation and both artistic and design application.



I always think of silkscreen as a pyramid, where the topmost point is the most basic, entry-level knowledge–very similar to its original iteration–and the base represents precise, specific techniques that multiply as you learn more about them, like those used to produce many-layered printed artist editions, apply complex dyes and finishes to textile yardage, or even print circuitry with conductive inks.

You can screen print t-shirts and textile yardage, but also wine bottles and drinking glasses, street signs, and wallpaper; silkscreen techniques are used to produce 3D prints on textiles, metallic prints, and museum signage.

Of all the printmaking processes, it represents the shortest, straightest line to getting images onto almost any substrate and it is as simple as it can become wildly complex. (It's also the only print process that uses a film positive to produce an image, meaning you don't need to flip your image to get a right-side-round outcome at the end.)

Don't get overwhelmed though, because the fundamentals have barely changed since the process' inception: while you can become more knowledgeable about iterations of material, chemistry, and specific processes with time, the base knowledge remains the same and everyone must start at the top of the pyramid, so you're always in good company.

Silkscreens:

They *were* made of real silk originally–yes. Now they are made of polyester, nylon, or stainless steel. They come in multiple mesh counts, which you can usually find listed on the frame by number. The number is a description of the tightness of the weave, referencing the number of threads in a given area. In the US we use inches, but in the rest of the world it is largely measured in centimeters(T).

Screen mesh ranges from 24(10T) mesh, which is like a screen door, to around 457(180T) in which the holes

are barely visible, almost giving the effect of sheer paper. For printing on textiles, 110(43T) is common, though I personally prefer 137 in most of my projects. The conversion factor between inch and centimeter mesh counts is 2.56 –so a mesh count of 137 in the US would convert to 54T in Euro sizing (because 137 / 2.54 = 53.9).

(above) If you look closely (zoom in), you can see the screen on the left (110) has much larger holes in its mesh than the screen on the right (156.)

Different mesh counts are appropriate for different applications. The lower the number, the bigger the holes in the mesh. Big holes allow more ink to pass through compared to smaller holes, making low mesh counts excellent for laying down chunky media like glitter ink or saturating fabric in specialty inks applications, while high mesh counts are appropriate for printing on paper, glass, metal, or anything that is non-porous and therefore requires a thin, even layer of print media. Different mesh counts paired with different inks also provide different effects (something to think about as you work silkscreen into your own practice.) 110 - 156 is a typical range for most basic textiles projects, though certain textiles processes still require lower or higher mesh counts; **110 is a great place to start if you have never printed on textiles before.**

One other consideration is how mesh count affects the line quality of your print. Lower mesh counts struggle to hold onto fine detail when used with photo-sensitive emulsion or drawing fluid. The coating on the screen has to bridge the gaps in the mesh, and most emulsions/drawing fluids cannot hold the line across the larger gaps in low-numbered meshes, resulting in a pixelated look. Some emulsion comes in a sheet application, where the exposure occurs before the emulsion is adhered to the screen, diminishing the likelihood of pixelated edges. Some technical emulsions also provide more advanced bridging capabilities.

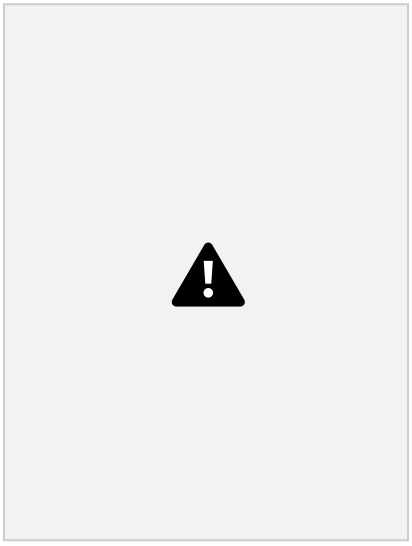
If you are using your local community studio, sending away for an exposed screen, or purchasing your own emulsion/drawing fluid for use at home, I recommend sticking to 110 mesh or higher to preserve your image quality. If your image is very finely detailed, start with 137 or 156.

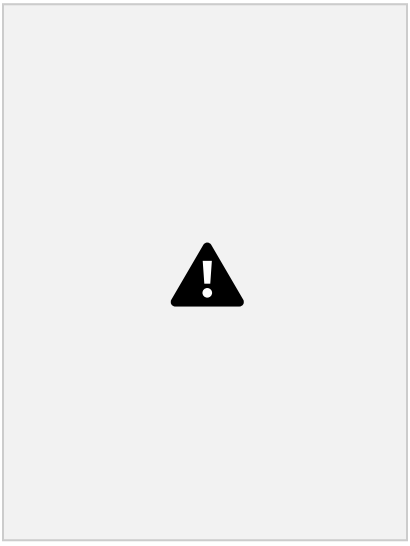
Typically, every color of a design requires its own screen. Small spots of color can share a screen if need be, but if you are just learning I recommend keeping it simple. Printing with alum and iron on separate layers? Get two small screens that fit your image well, or one large one that will accommodate both layers with lots of space. If you can't fit both layers onto the screen without smashing them together (at least three inches away from each other), you need more than one screen.

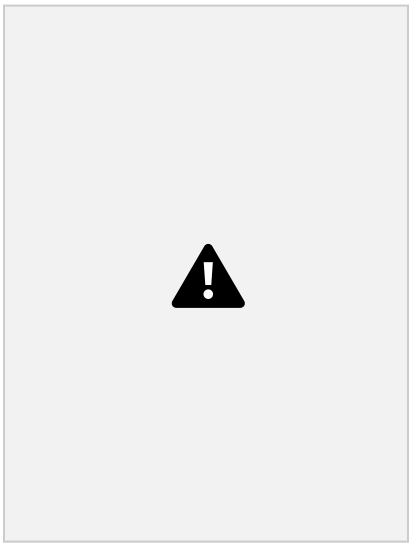
///Upshot: Silkscreens come in a variety of mesh-types and mesh-counts. Look for regular white poly mesh between 110 (43T) and 156 count. Select a screen that will give you generous space around your image (at least 2 inches on all sides!) Best to get a screen for each layer, rather than crush your images together on one screen.

Squeegees:

Squeegees are rubber blades inserted into a wood or metal handle. Squeegees come in a variety of shapes and hardnesses, meant for specific applications. The most common style of squeegee is square tip, though a small handful of textile printing studios use a double bevel (or, as I like to call it, "arrow tip") squeegee.







(above) You can see the yellow blade on the far left is much firmer than the orange blade on the far right, and the two blades in the middle frame have completely different profiles. The flat edge is on the right and the double bevel is on the left.

Squeegee blades come in a range of hardnesses, called "durometer" in the US, and described as "shore" internationally. Varying hardnesses are usually indicated by color, though the colors vary from producer to producer. 60, 70, and 80 durometer (65, 75, and 85 shore) are the typical offering from most retailers, though combination durometer squeegees also exist, offering a softer outer blade with a stiffer, resistant core; these are listed by their combination, such as 70/90/70.

I recommend a square-tip squeegee with a durometer of 60 or 70 for beginner printers. Across the printing industry, 70 is the most common durometer in use for square tip squeegees. 80 is almost exclusively used for paper printing or special applications. Yellow is the most common blade color for 70 durometer squeegees.

Squeegees also come in many tip shapes, like rounded, bulb-end, double bevel, or single-bevel. Silkscreen kits from companies like Speedball often come with a thin bulb-tip squeegee or a hard plastic squeegee. I do not recommend these options–better to buy your squeegee separately than spend money on a kit like this. The print quality they produce will be low and you will not be able to improve upon it by improving your technique. You will find that some of the silk screen suppliers I list in this document also sell kits: kits from such suppliers are much better quality than those you will find in an arts and crafts store, and worth the money if they contain what you need without many extras.

Squeegees lose their sharp edge over long durations of heavy use. **Buying squeegees used or second hand is not recommended.** Often production shops will buy metal squeegee *handles* second hand and swap out the blades, since metal handles are excellently stiff and nearly eternal. Wood handles frequently warp from long exposure to water or crack with use, which can be hard to see online. Squeegees are relatively inexpensive and it is not a good idea to try to cut costs in this area of the process: the only acceptable used squeegee for a beginner is a free one! (And even then, check it thoroughly.)

///Upshot: For your first print project, select a flat-tip squeegee of 60 or 70 durometer hardness, that will

fit your image with an inch to spare on either side, but fits comfortably within your silkscreen frame as well. Squeegees are usually sold by the inch and it is easy to find one that is the right size. If you're struggling to find a good fit through one supplier, I guarantee you will find it through another. Shop around. Buy a new squeegee to get a sharp blade.

"Making" a screen:

There are many ways to get your image onto a screen for printing, and I will cover the most accessible ones here. The basic idea is always the same, however. You are blocking out what you do not want to print, leaving open what you do. The ink will press through the opening in your screen when you draw the squeegee down, and imprint onto your substrate. It is the only print process that gives a positive image of your design. In other types of printmaking, like woodblock, lithography, or letterpress printing, you must invert your image during the process to make a right-way-round final product. This is one of the many things that make silkscreen one of the most accessible forms of printmaking–especially for textiles. It remains the best way to print patterns on fabric if you want a vibrant, sharp outcome.

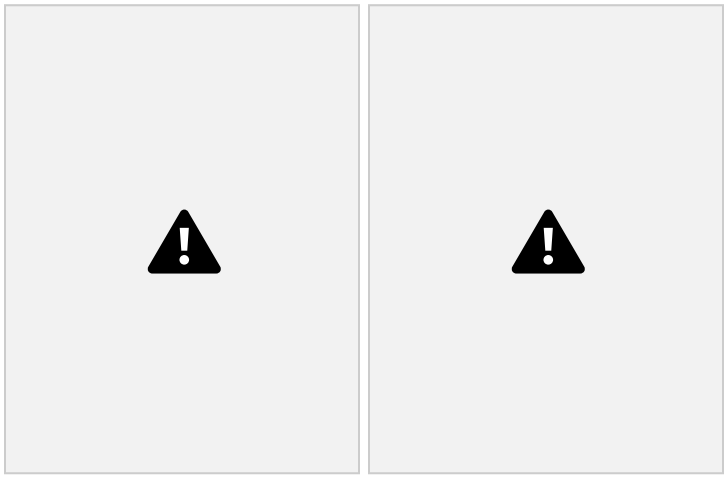
OPTION 1: Adhesive Vinyl Contact Paper

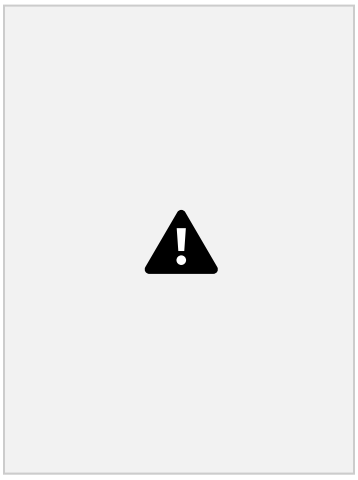
You can buy this sticky plastic sheeting by the roll at most hardware stores. People usually use it to line drawers or decorate walls and windows. By carefully cutting it and adhering it to the face of your screen, you can produce quick, simple stencils. It is budget friendly and low-tech, but only suitable for undetailed, simple imagery or quick additions of color under a more complicated design.

Simply cut your design out of the vinyl with a sharp Xacto-type blade and adhere the sticky side to the flat side of your screen. Tape off the edges and print normally. You'll find these types of screens are difficult or impossible to reuse, since the image will de-stick and peel off the screen when you wash the ink away. This fact, which creates unnecessary plastic trash, coupled with the poor detail, makes this technique one of the least useful/responsible in my view, but in lieu of other options, or in a pinch, it serves its purpose well.

Recommendation: Cut the vinyl face-down for a right-facing image. You can draw on the paper backing easily, or transfer your image onto the backing using transfer paper. To apply, do not pull the backing off of the vinyl first. Lay the vinyl face up on the screen and peel away only a little of the top of the backing.

Adhere it carefully and evenly to the taped edge of your screen and then peel the backing away carefully, like a band-aid, to slowly stick the vinyl down and prevent warping in your image.





(above) Take your time cutting the vinyl and stick it to the face of the screen as carefully as possible: any bubbling or areas raised above the screen will create printing problems later.

OPTION 2: Drawing Fluid & Screen Filler

This is very simple, old printing technology. It relies on the concept of water vs oil.

The drawing fluid is made of water-based sugar syrup and usually tinted blue so you can see what you are drawing while you paint it directly on the screen as the first part of the process. The screen filler is a combination of clay and an oil base, usually tinted red. The drawing fluid can be washed out easily with cold water, but the filler requires hot water and soap for full removal, allowing the drawing fluid to be easily rinsed out of the fill, giving you an open stencil in the shape of your design.

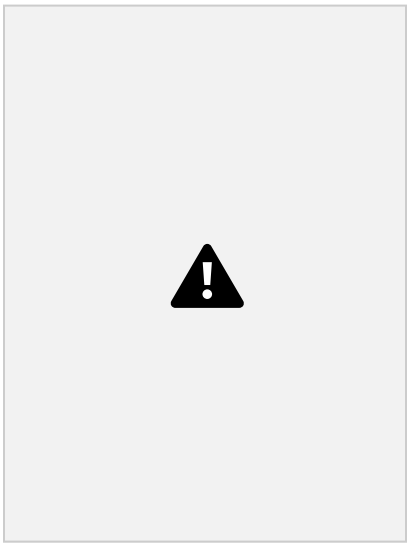
In order to draw with the screen filler neatly and get a good result, your screen must be slightly raised off of the surface of the table so that you don't ruin your image (or your original drawing) by offsetting the design onto the surface through the open mesh. A pencil or a small stack of paper taped underneath each corner of your screen will do the trick. I recommend paper, so you can adjust the height as you see fit.

Process Overview

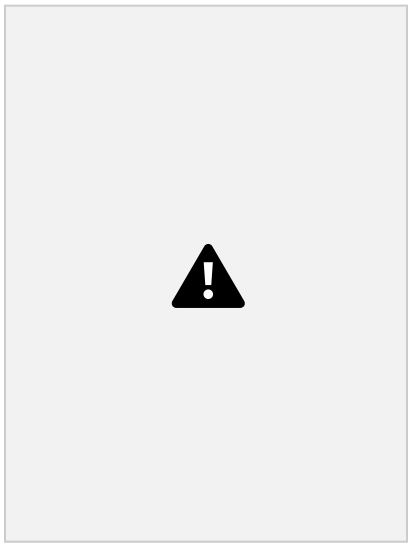
- Paint with drawing fluid on the well side of the screen, not the flat side, and apply a good solid coat of drawing fluid
- Let it dry completely
- Apply the filler to the screen by gently carding a thin layer of filler over the whole face. Fill all the way to the taped edges
- Let it dry
- Rinse the drawing fluid out of the screen with **cold** water. The drawing will fall away quickly and easily leaving the filler intact on the screen
- After printing, the screen filler can be washed away with **warm** water and dish soap. (Screens that have been used with this method must be degreased thoroughly before other screen-making materials can be applied.)

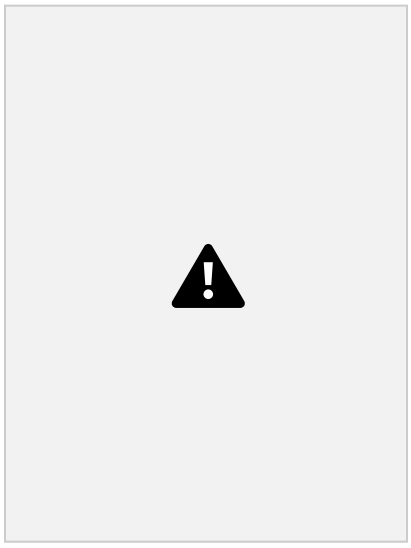
This method is very useful and can give you an excellent depth of detail, as well as accurately retaining mark making and brush strokes. The sugar syrup drawing fluid can be adjusted to give different effects by thinning with water or dehydrating –extremely useful for creative experimentation and painterly effects.

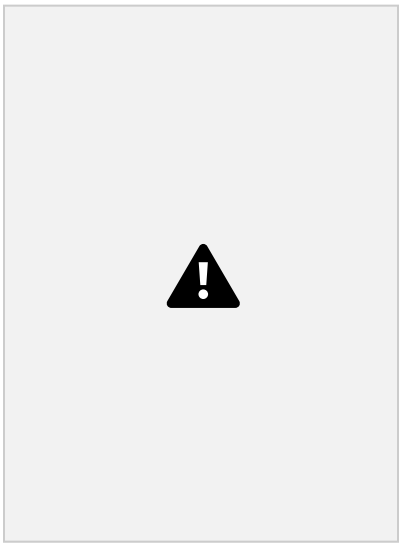
Recommendation: The cheaper, more basic systems like those offered by Speedball are very user-friendly and of excellent quality. Believe me when I say the more expensive fine-art-type systems you can find in serious art stores or online are not well-suited to beginners or those without dedicated studio spaces. They will absolutely hold up to more aggressive, extended printing, but the media are often more difficult to use and remove than the more accessible systems. I recommend starting with the simpler systems if you are a beginner – and purchasing from your local art store if you can. Not only will they appreciate your business, but they will also probably be able to help you troubleshoot, should you have any issues.



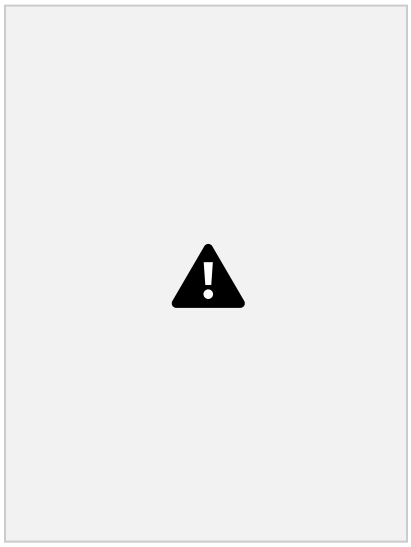
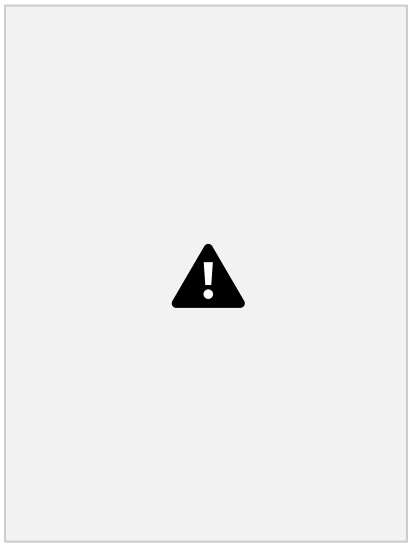
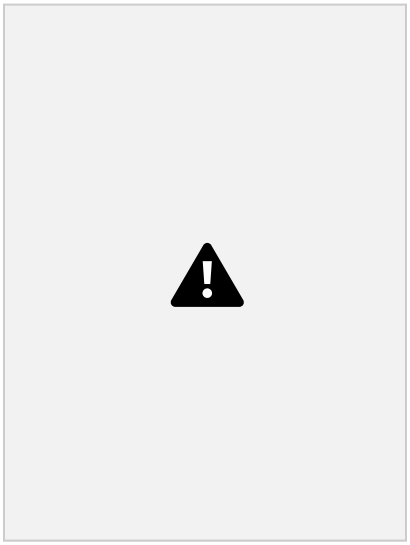
(above) For this method your screen must be slightly raised off of the surface of the table so that you don't ruin your image (or your original drawing) by offsetting the design onto the surface through the open mesh. A small stack of paper taped underneath each corner of your screen will do the trick.



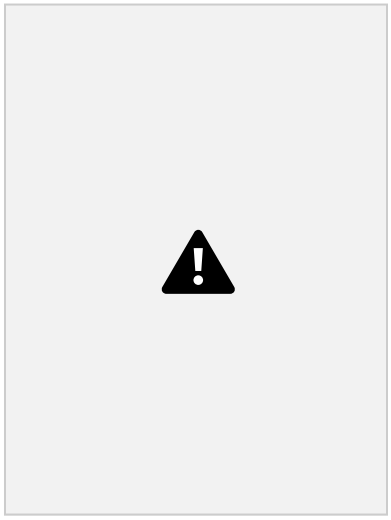
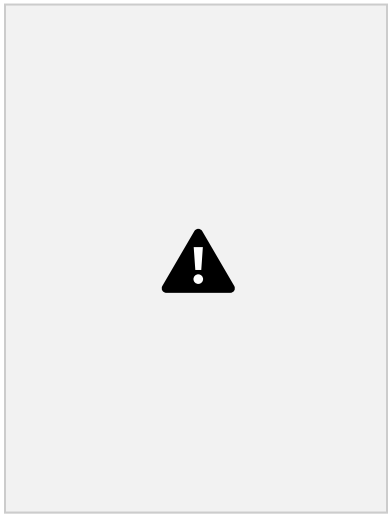
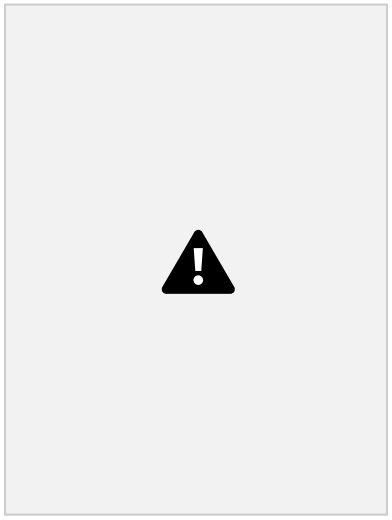




(above) Paint with drawing fluid on the well side of the screen, not the flat side. Apply a good solid coat of fluid. Let it dry completely before proceeding to the filler application.

(above) Now apply the filler to the screen by gently carding a thin layer of filler over the whole face. Fill all the way to the taped edges. Let it dry completely.

(above) Now apply the filler to the screen by gently carding a thin layer of filler over the whole face. Fill all the way to the taped edges. Let it dry completely.

It is important to allow the drawing filler to completely dry between steps –before both rinsing and printing. I highly recommend drawing fluid and screen filler for your first foray into silkscreen printing.

OPTION 3: Photosensitive Emulsion

This is the method almost all professional printers use to make a screen, and how I make all my screens. Stencils produced this way are long-lasting and sharp and can hold an amazing amount of detail. Films can be kept for posterity and used multiple times, which is less costly and more efficient than making and keeping multiple screens.

***However,* this technology is still petrochemical technology** (emulsion is basically sophisticated plastic goo) and this is important to keep in mind as you work. It feels quick and simple to make a screen, but it should be treated as a precious commodity. Making a screen should be an intentional step in your process, not an experimentation to see what "sticks" design-wise.

All that said, I prefer photo emulsion because it is less wasteful than the other alternatives. It holds up better over the course of printing, requiring less re-making, and it provides a reliable stencil as long as you follow the directions well. Drawing fluid and screen filler also produces good images, but the quality is harder to ensure and you will not be able to get sharp, fine details; you may find you need to remake your screen several times if you have a particular outcome in mind.

Photopolymer emulsions are composed of polymers that cross link and become permanent when exposed to UV light. Anywhere not exposed to the light remains water-sensitive and will wash out easily. Printers use clear film with opaque black printed or drawn designs to selectively block the light. This method can produce incredibly detailed, accurate stencils for printing.

Emulsion technology has gone through many iterations since its inception. There are a range of different sensitizing chemicals in use currently, and several wavelengths of light, depending on type of exposure unit. The lights and the emulsion must match to work correctly and produce permanent, lasting stencils.

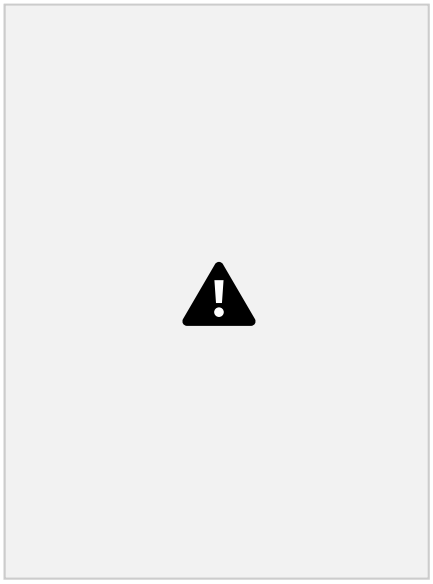
In general, I recommend utilizing a local shop for pre-press services or joining a local community studio to avoid complications. It is possible to build a low-tech exposure unit yourself, but if you must do that, take my advice and call the supplier of your emulsion to understand what lights you need before purchasing. Trusting the knowledge of professionals or participating in your local art community will always be cheaper and more effective than trying to build and make everything yourself. (This applies to all print processes, bar none.)

Emulsions are also developed for specific types of ink. **For natural dye printing, I recommend an emulsion intended for discharge printing**, but in lieu of that (it is a less-common process), the emulsion MUST be rated for water-based inks. **Plastisol-only emulsion is cheaper, but will break down quickly when used for natural dye printing.**

In the next section I'll lead you through making a screen with photopolymer emulsion, including making films.

If you have no local shop willing to do pre-press work, and no community studio nearby, shops that will make screens are easy to find online and should help you send them a digital file. At the end of this tutorial I will list online resources to help you make files and learn more about screen printing on textiles.

Making Films:



The other uncoated side will produce frustrating results.

Films for silkscreen are transparencies with opaque designs printed or drawn on them. The opaque image blocks the light from the exposure light, preventing the emulsion underneath it from curing, allowing it to be washed out with water. These can be made in a myriad of ways, and there are a lot of materials you can do it with. It's largely down to personal preference, but on the most basic level the substrate **must** be transparent and it is important to make the design **as opaque as possible** to minimize difficulty. I prefer to draw my films, but appreciate printed films in certain circumstances.

They're called "films" because they were originally film positives, made in a traditional analog darkroom from film negatives (or drawn by hand.) You can call them films or transparencies, but films will be better understood.

I prefer to use the same acetate that is used for printing films from illustrator/photoshop files. You can buy it through most silkscreen supply companies, where it is called "waterproof film." It has a water-soluble coating on one side, to improve the printability and opacity. Make sure to draw or print only on that side.

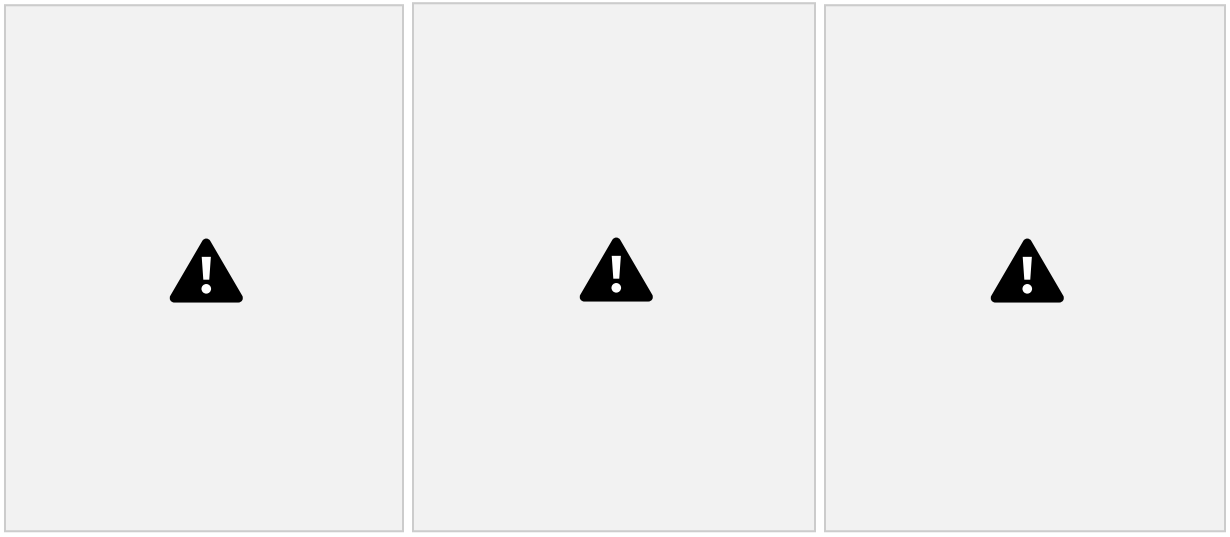
You can also make films using wet-media acetate, like Dura-lar, or frosted mylar (single-sided is best) Acetate will act similarly to waterproof film, though you are limited to pens and ink mostly, while frosted mylar will allow you to use other materials like crayons or wax pencils and therefore get a wider variety of effects by hand, though some inks can chip off of frosted mylar (do not use Posca pens or heavy applications of india ink.) **Waterproof acetate allows you to use any drawing materials without issue and requires fewer applications to produce a solid image, which is why I prefer it.**

(left) waterproof film, **(center)** frosted mylar, **(right)** clear Dura-lar

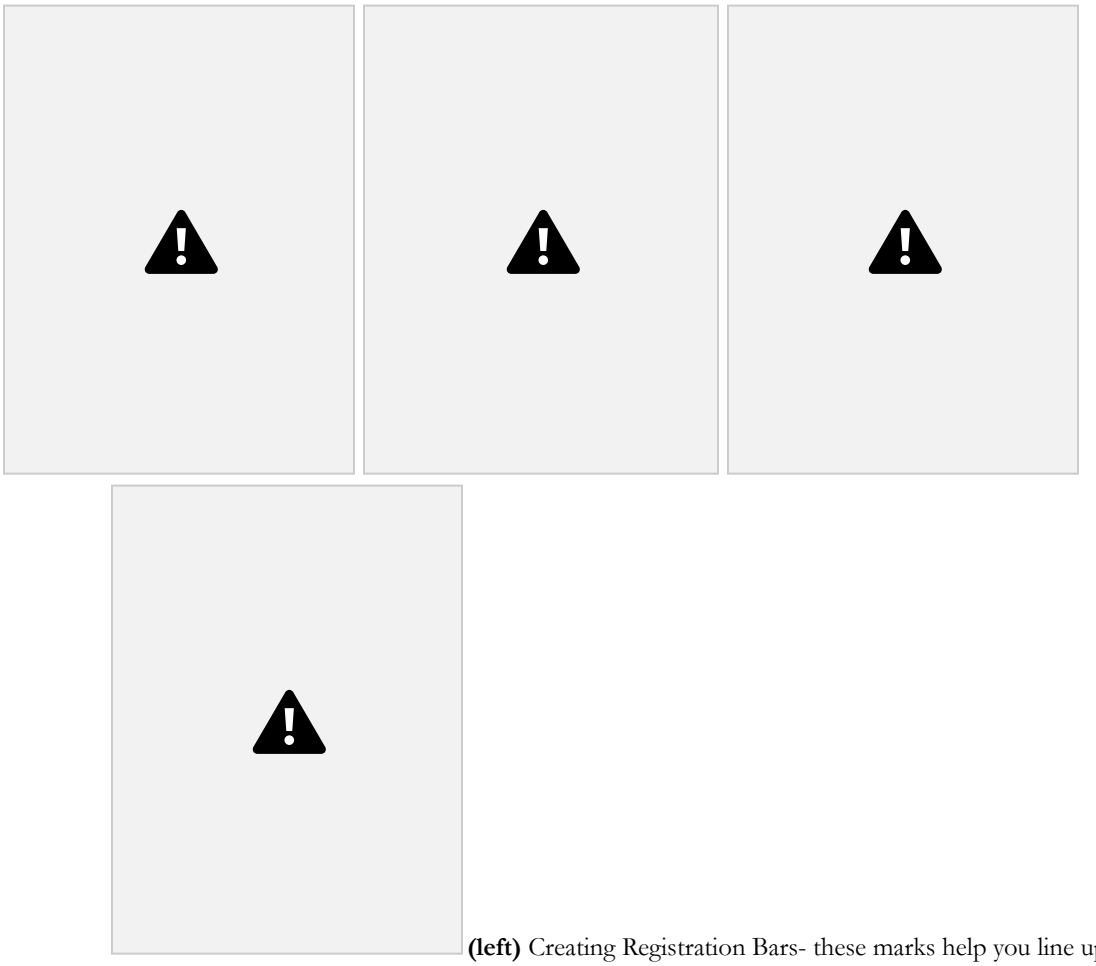
Regardless of what film type you choose, please remember films are also still plastic! Make your film only when you are happy with your image, and use only the amount of film necessary. To my knowledge–and to the limited extent that *any* plastic is–it is not a recyclable material. Films will last as long as you keep them well (stored flat and away from moisture or solvents of any kind) and represent a library of work that can be re-made into new screens at any time in the future.

1. **Sketch out your ideas beforehand and finalize your drawing before making films** I like to use thick drawing paper for designs or artwork that requires a lot of painting, and photo-blue graph paper for anything that can be done with colored pencils. It is important that your original artwork stay flat as it is created, to ease the making of the films. Thin graph paper offers the added advantage of retooling your designs if need be. Since you can trace the original image through a new sheet.

2. **Isolate each color in your design and plan to make a separate layer for each color.** These layers will be printed separately and layer on top of each other to create your design. Registration bars will help you organize and light up your layers as your print. If you are a beginner, I recommend starting with single-color images, and then limiting yourself to three layers maximum until you're more comfortable with printing.
3. **Make sure to add registration bars to complex designs.** Drawn bars will guide you just as well as those generated by computer, though you might need to be a touch more vigilant while printing, depending on how accurately you draw them. Registration bars help you line up the layers of your image and should be placed around the edge of your artwork, at least an inch away from the edge of the image. Three marks are optimal for correct registration.
4. **Tape your original design down, then tape your acetate down on top of it and trace over top with india ink, paint pens, or artist's crayons.** It is important to make sure your image is as opaque as possible. To do this, draw the initial image and hold it up to the light to check the opacity. If you need to add layers, you can do so without needing to re-align the drawing and the film. You can also use a light table if you have access to one, as shown in the images. It will simplify the process significantly.



(above) Tape your acetate of choice down securely overtop your finished image. Carefully trace over it, ensuring that your design is as opaque as possible. I'm using artist wax pastels here (fancy crayons) because they give a lovely uneven, smeary edge to the design. Check your layers all line up well before moving on to burning your screen(s).



(left) Creating Registration Bars- these marks help you line up the layers of your image and should be placed around the edge of your artwork, at least an inch away from the edge of the image. Three marks are optimal for correct registration. **(center left)** finishing the second color layer on acetate **(center right)** all four color layers of acetate **(right)** all four color layers of acetate stacked and aligned.

Tips:

- **Take your time!** Films take concentration and intention, and are frustrating to try to fix after a mistake. You can scrape ink off of acetate with a blade (interesting opportunity for mark making too), or cut pieces out of the film itself, but it is best to approach painting the films calmly and spend time on it.
- **Overlap the edges of your layers slightly to make Registration (consistent and accurate alignment of the color layers) during printing.** This is called "trapping" your image. It is standard practice in the print industry, and can be requested if you are having films and screens made remotely. Trapping is required when two colors meet. Because the screen printing process involves each color being printed as a separate layer- there can be up to an eighth inch of shift in each layer of color application during production. Trapping involves slightly overlapping adjacent areas of color to fill any gaps that might occur. Remember that natural dye print media is transparent and too much trapping will show as a dark line around sections of your image, created by different layers or mordant and or dye overlapping. I recommend trapping anywhere you can–especially where dark layers overlap lighter ones. The lighter color is usually spread underneath the darker color to stay true to the original image.
- **I like Caran D'Ache Neo Color I artist crayons, Koh-i-noor Universal Waterproof India Ink, Posca Pens, Malotow pens (refillable!), and Rubi-lith for making films.** (All the ink/pens/crayons should be in black.) I know artists who use regular india ink, black paint, cut black Dura-lar, and cut black paper as well. Experiment and learn what suits your purpose. Anything that blocks light will do and there are many ways to create painterly effects with a little practice and experimentation.
- **Even if you think you might burn all your layers on the same screen, make separate films to**

give yourself flexibility in the future.

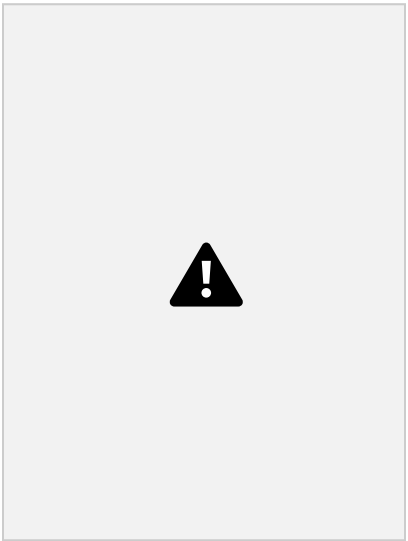
Making Screens:

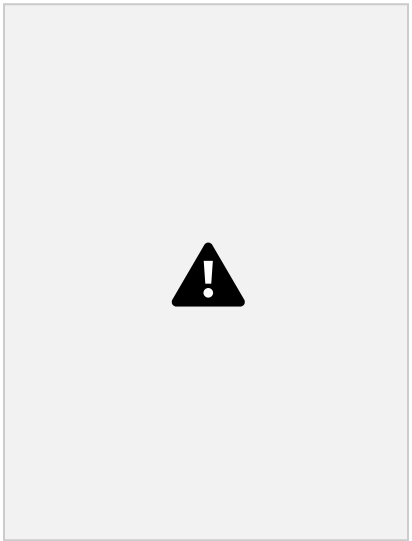
1. **Degrease your mesh before beginning.**

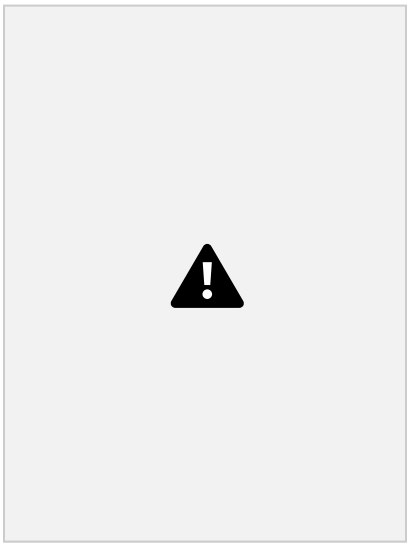
   You can degrease with a professional mesh degreaser (sometimes called mesh prep), or with something like Mr. Clean multi-surface cleaner. Please note: most common cleaners are not degreasers! Check whatever you are considering using thoroughly. If you do not degrease, you risk poor emulsion adhesion which will create issues when printing. It will also improve vinyl and/or screen filler adhesion if you choose either of those screen creation processes.

2. **Tape the edges of the face of your screen and match the tape on the inside edges.**

   For wood screens, this protects them from water and prevents warping and other decay. For metal screens, this prevents ink from getting stuck in the thin space between the screen mesh and the frame. You will also have less trouble blocking off your screen, as well as cleaning up. Leave this tape on for the life of your screen. The blue tape shown here is called "solvent-resistant tape" or "permanent clockout tape"--which is sometimes confusingly shortened to "solvent tape"-- and can be purchased from most silkscreen suppliers and some art supply stores.





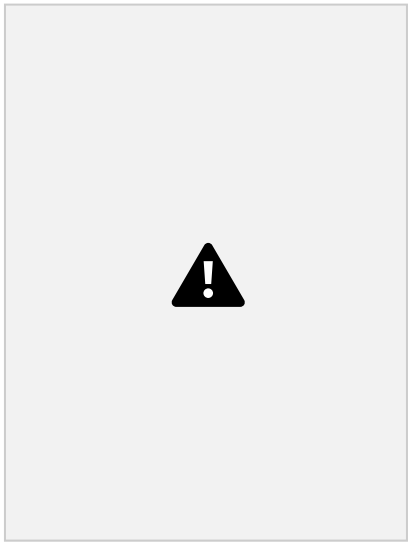


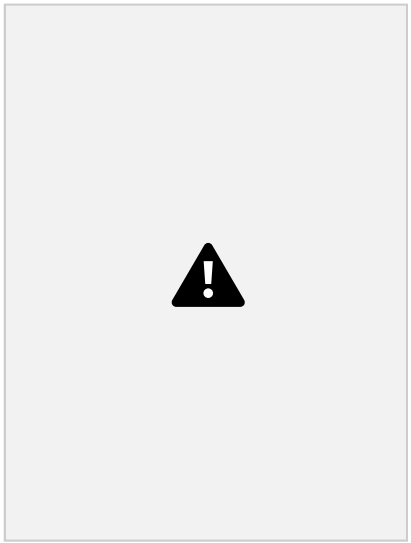
(above) Screens taped inside and out, **(right)** and a scoop coater, for reference.

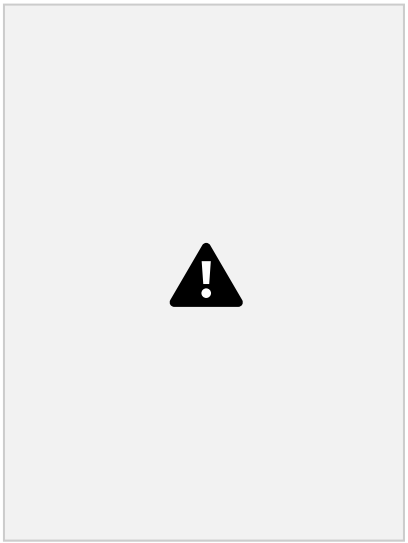
3. Apply a thin layer of emulsion using a scoop coater.

There are many types of scoop coaters and all function perfectly well. Always check the edge by running your finger down it to make sure there are no dings that will cut your screen. It must be wide enough to fill the majority of your mesh area without overlapping the frame. If it overlaps the frame –or the tape if your tape is very thick– you will get a very poor coating.

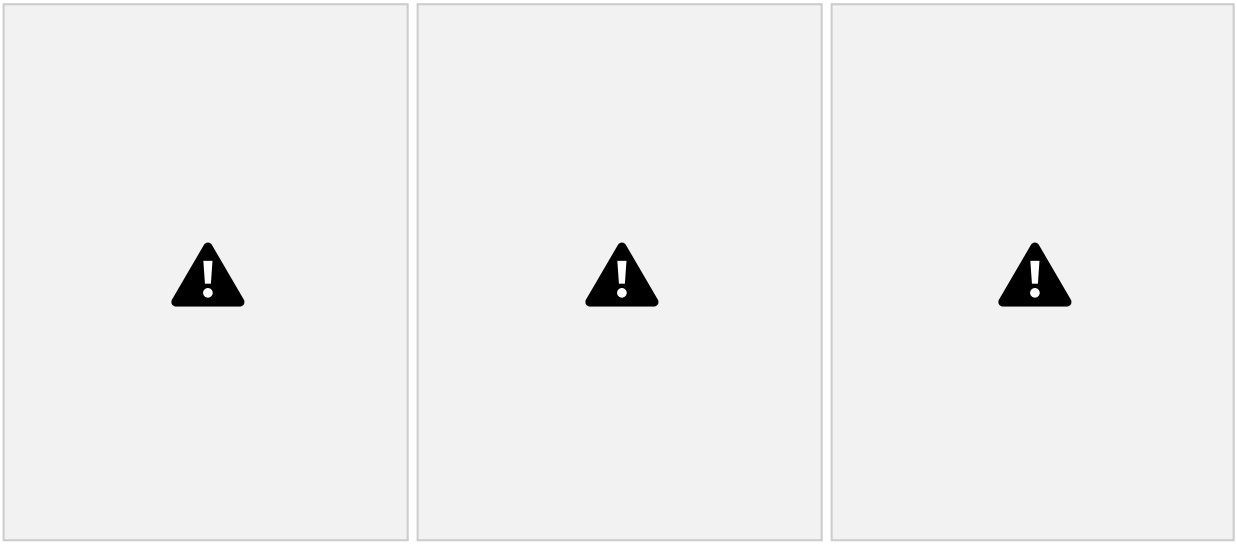
- Fill the scoop coater generously with emulsion.
- Place the lip firmly against the face of your screen on the frame, **then** tilt forward and **wait** for the emulsion to slide forward and touch the screen across the whole length of the scoop coater.
- With even, firm pressure, draw the coater up the length of your screen. Repeat.







Use good pressure and always check your coating by holding the emulsion up against the bug light. DO NOT leave your emulsion to dry in a yellow-light room. It is safe to coat there, but many modern emulsions are sensitive enough to partially expose even in this light.



- Tidy up any heavy edges with a plastic card.
- Put excess emulsion back into the container and close tightly.
- Check coating against a light source. You will see any uneven/thick areas clearly as dark areas. Do not try to touch it up! It is probably too tacky already. Notice if it causes problems in your exposure or printing and do better on your next coating. You can also reclaim the screen and try again.

4. Leave the screen to dry in a dark, well ventilated area to fully dry.

Different emulsions have different drying times. Make sure to check the manufacturer's specifications. Dehumidifiers are always your friend here.

5. Tape your films face down on the face of your screen.

A good way to remember this is to remember that you want the drawing to be the right-way-round when looking down at it through the well of the screen. You can also check to make sure the ink of your drawing is pressing directly against the flat side of your coated screen. You want direct contact for a good image.

Make sure your image is at least 2 inches away from the edge of your screen to improve ease of printing.

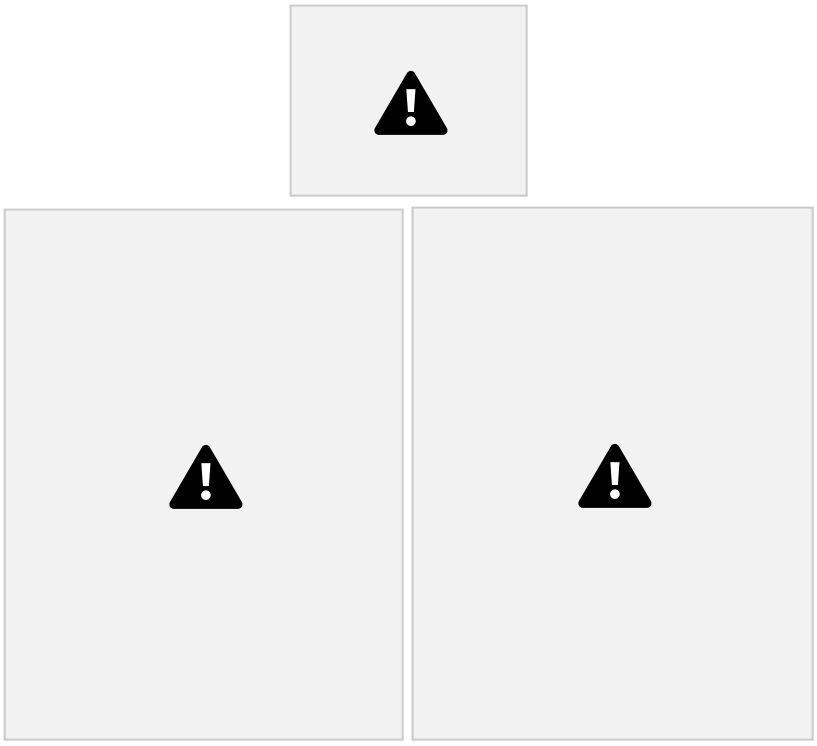
6. Gauge your exposure time based on your emulsion and your exposure unit

Professional studios and community studios alike test their emulsion exposure times using gauging acetates. Trust their timing if your screen is coated thinly, and your films are opaque. If your films aren't completely opaque or you are trying to grab excess detail that is not perfectly opaque, you can underexpose *slightly*. *Do not* underexpose aggressively or your emulsion will not be completely cured! Follow the directions for use wherever you are exposing. All units are different.

(left) Screens face down with film on the glass exposure bed, with the light bank behind. **(center)** Screens under the vacuum blanket, exposing. **(right)** Screens in the sink waiting to be "developed"(washed out with water).

7. Rinse your screen out thoroughly and completely.

Trust the emulsion if you have followed the recommended cure time. If you have underexposed, take care –the details in your image may still have only a fragile hold on your mesh. Make sure to thoroughly rinse your entire image out. Use your film for reference if necessary.



(above) Washing out screens and the finished product. (Always hold your screens up to check against the light before drying. If the image is incomplete or the edges are uneven, continue to wash.) Dry in front of a fan.

8. Let your screen dry completely before printing.

Tape off any unwanted open areas or pinholes in your design. You can see these areas easily by running the screen over a light source and looking for errant open areas. You can use solvent-resistant tape for this or painter's tape. Do not use regular masking tape though: blue painter's tape is best! Remember to ALWAYS remove it before wetting your screen to clean off your ink after printing.

Printing:

For demonstration purposes I am using the "direct application" dye process where print pastes are made with mordant & dye together- this is so that you can see the process of printing multiple layers more clearly because the pastes are more visible. However, the step by step print paste making recipes, dunging/fixing and dyeing processes shown in this Tutorial is for the **Dyed Style** using mordant print pastes, some of which are clear or very lightly tinted with lake pigment (also shown below) and would be difficult to see well in this scenario. **I recommend Dyed Style/Mordant Printing for beginners or those without full studio spaces.** The Direct Application process requires steaming, which can get difficult very quickly as you scale up your printing. Read more about Natural Dye Printing Styles below.

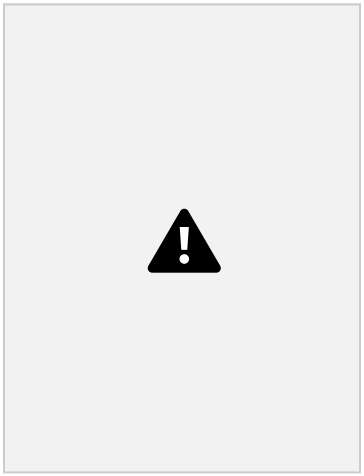
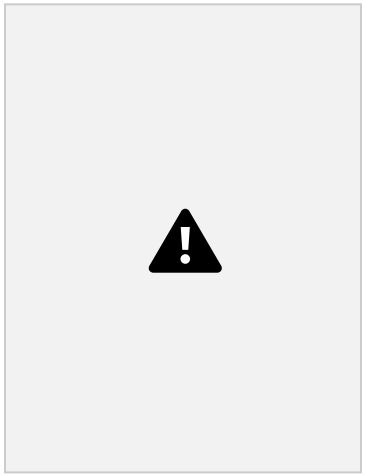
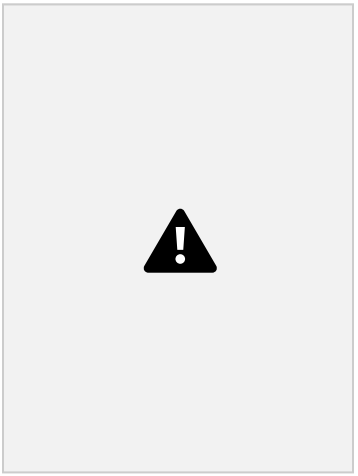
***Printing surface:** There are a lot of possibilities for a print surface. The main concern is preventing your screen from moving during printing, AND also keeping your screen in place so you can successfully register your design. You need a situation where both the substrate and the screen are aligned in exactly the same position print-to-print.

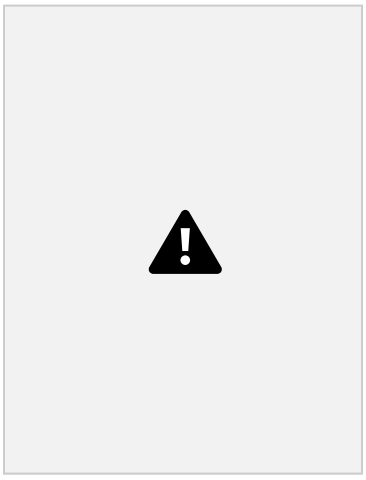
If you have a loose registration, like I do in my tutorial examples below, a tape outline around your substrate and your screen may suffice (you will need a small screen you can hold down yourself or a friend to help you, though.) If you need tighter registration consider constructing a padded table top to mimic a yardage table,

like in the Block Printing Tutorial, with an added rail or some sort of stop for your screen, and pin your pieces down to the table.

Leave them pinned, glued, or taped down as you print all your layers. There is no other way to successfully register fabric than to leave it pinned or glued down for the duration of printing. The minute you pull it up off the table you will warp the image and it will never line up with the rest of your layers. I use a loosely-registered plaid for my testing for exactly this reason: so I can move through a lot of little prints without having to leave them stuck down. If you are just beginning to experiment with printing, I recommend giving yourself a break by choosing loose registration or a single-color image for your first handful of projects.

1. **Set up your printing area carefully.** Spend significant time before you start printing on prep. To print cleanly you will need:
    - **Space to print.** You can use the padded surface we spoke about above, or you can also fix hinge clamps to a wood board and use palette paper and glue to stick your substrate down. This is how I print the majority of my tests, though I do have my own yardage table.
    - **Space for your wet prints.** Wet prints take up a lot of space, since you can't place them on top of one another before they are dry. Have ample *clean* space prepared before you begin.
    - **Masking tape**
    - **Rags-** It will be messy.
    - **Something to prop up your screen.** I use my tape roll, usually, but a small section of board or something similar will also suffice.
    - **Cut down all your substrates** and stack them neatly within arms length.

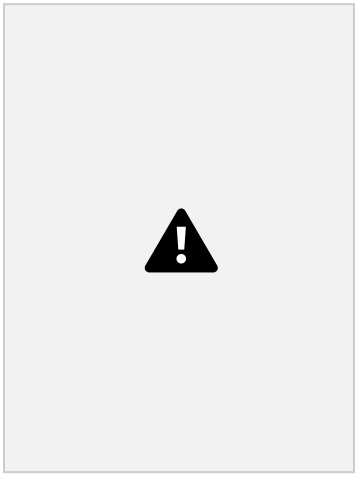


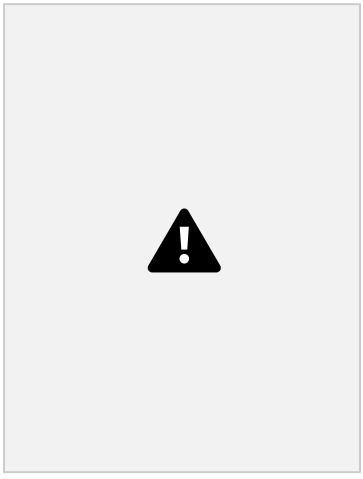
(left) Cut down your pieces first using your design as a guide. **(center left)** An example of the lip on the edge of a yardage table –one way to keep your screen steady/ in register. **(center right)** An example of hinge clamps and board: another way to hold your screen steady for registration. **(right)** An example of my printing set up while printing this demo. I have a lot of room around me, a book to place my unprinted pieces on (bc I know it's clean.) My media, several squeegees, and a large area to the side to dry the wet prints. (Coffee not required but useful.)

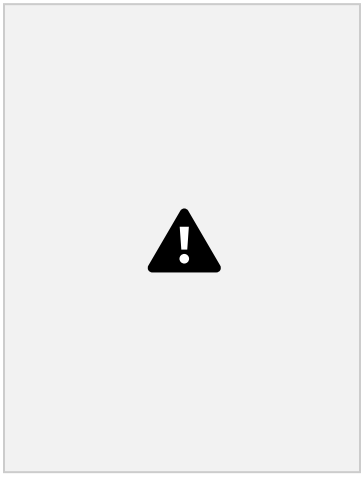
2. **Tape your original drawing OR first film down to register your first screen and align your printing substrate.** Choose a space that allows enough room for your substrate to lay flat. Make sure to tape or mark off the position of your substrate before starting to print. If your image

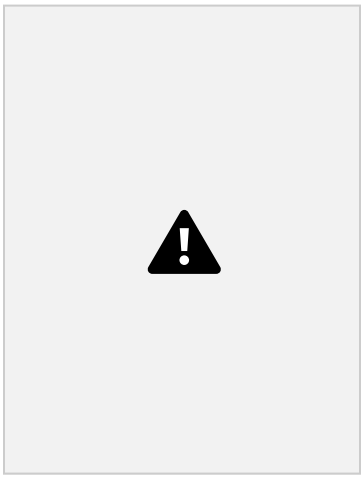
requires good registration be particularly careful or leave your piece pinned/taped down until you have finished printing all layers of color/mordant.

3. Register the screen to the film or drawing. Look down through your screen stencil and align the stencil to the image. *Do not compromise here.* You want perfect alignment: close is not good enough. **4. Mark off the placement of your screen with tape marks OR fix it tightly with the hinge clamps.** Make sure to carefully align your substrate during printing.







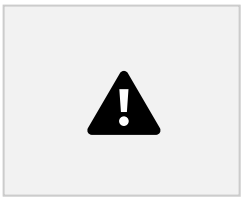


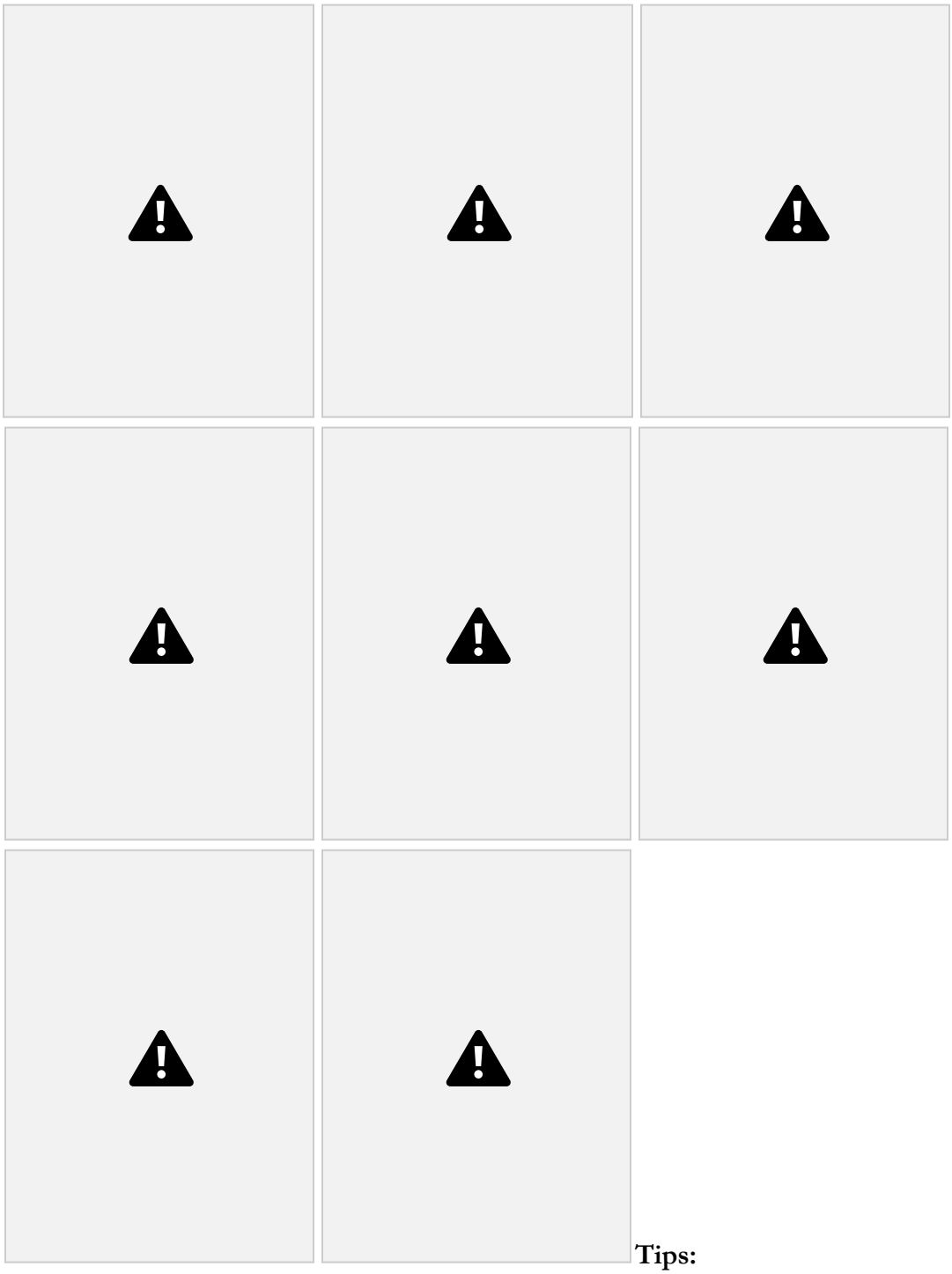
(left & center left) Tape your original drawing OR first film down to register your first screen and align your printing substrate. **(center right)** Make sure to tape or mark off the position of your substrate before starting to print. **(right)** I am blocking off the exposed section of my screen here to prevent printing of this design element.

5. Remove your film or drawing.

6. Begin printing:

- **Lay a thick bead of media** (media=your mordant or dye mordant solution depending on if you're printing in the Dyed Style or Direct Application Style) **at the top of your screen well above your image** (at least an inch distance.)
- **Position the sharp edge of the squeegee just above the bead of ink.** Flat edge squeegees should be held at a 45 degree angle to the surface of the screen. Double bevel squeegees should be held vertically. You want the best possible contact between the sharpest part of the blade and the surface of the screen.
- **Draw the ink down with even, firm pressure.** Remember that the goal is to push a thin, even layer of ink through the screen *into* the fabric substrate (into the woven or knit structure). Make multiple (2 or 3) pulls (passes of the squeegee).
- **Add ink as you print to maintain the same amount on the screen at all times.**
- **Set prints aside to dry as you go.**

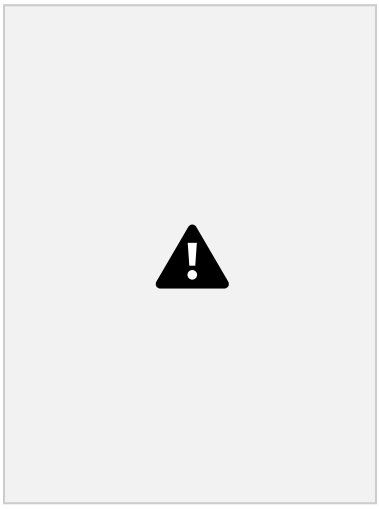
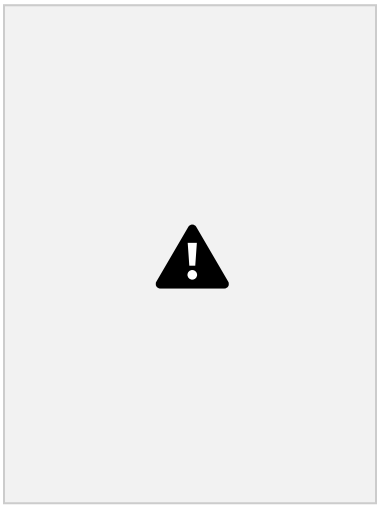
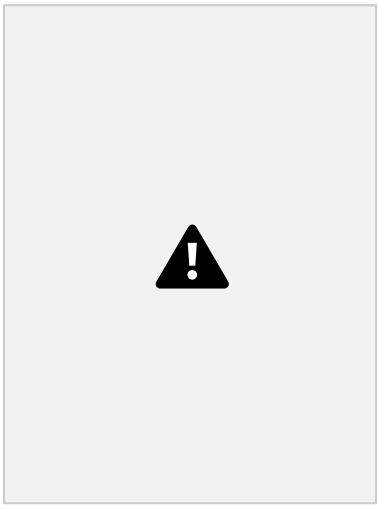




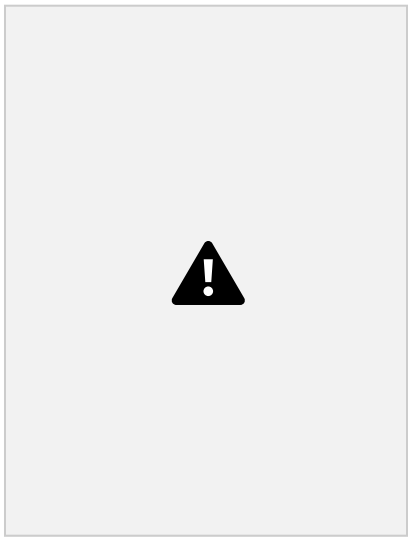
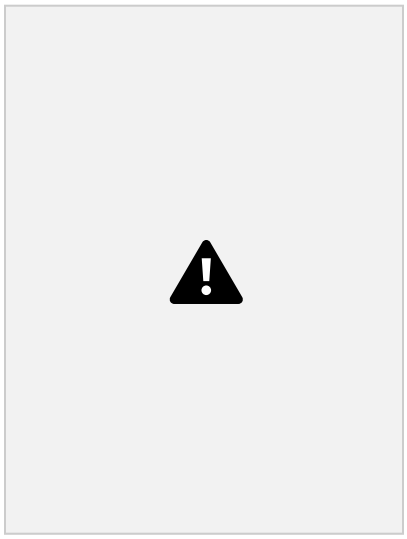
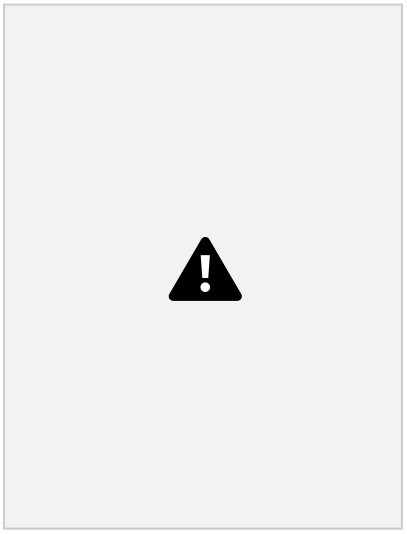
Tips:

- Natural dye & mordant inks are very acidic and do not hold their lines well. Two or three pulls should be all you need. If you notice bleeding, especially after you print, as the piece is drying, apply less ink by pulling fewer times. These mixtures have a habit of leaching into the surrounding fibers as they dry.
- Bleeding beyond the edge of the image can also be caused by a poor connection between the screen and the textile. Examine your squeegee angle/pressure and re-adjust if this becomes a problem as you print. The pressure should be firm but not extreme.
- Move quickly and with intention: your print media can start to dry in your screen mesh if you take too much time between prints. Screenprinters call this "drying in."
- As shown above you can scoop your ink back into your container using your squeegee blade – no need for an extra tool.
- Wash your screen out IMMEDIATELY after you finish printing.

7. **Wait for your prints to be *completely* dry before printing another layer on top.** Damp layers will result in poor overlays as the media bleeds together. Any amount of damp will result in this effect. Be patient.
8. **Use your film or drawing to align your next layer.** In this tutorial I use my drawing since this has loose registration. If your registration is tight, I recommend using the film with the most information and making sure to burn all your registration bars so you can use them to line up your films. Tape them over before printing or leave a margin to print them into that you can cut off during finishing

(left) Use your original drawing or films to line up your next layer. **(center)** Tape off anything you do not want to print on both sides of your screen if you are using masking tape.). **(right)** Perfect example of why you should tape off the rest of your screen: silkscreen media is very liquid and can be frustrating to control. It will seep through the open areas in your screen and make a mess.

(above) The finished prints. These are direct application prints with dye and mordant in a single solution, so their colors are basically hidden until steaming. This print includes madder (red), cutch (rich brown), and himalayan rhubarb (golden yellow.) Once steamed, their colors will become apparent. Please notice how much the substrate affects the final print. On a tight, absorbent silk noil **(left)** the print is sharp and rich and very well registered. This textile doesn't

move around a lot and because it hasn't been stripped of its protein sheath it accepts the dye extremely well. On a shiny, floppy/slippery textile like the silk habotai **(right)** the print's registration suffers. It's impossible to lay this textile down the same way twice. This is an example of a textile that would need to stay pinned down, even for a print with as loose registration as this one. (Unless you like the wobbly outcome, which I definitely do.)

9. **Fully rinse out your screens immediately after printing.** Remove blockout tape before wetting to rinse. If you do not wash your screens out in good time the media will dry in the screen and it can be very frustrating to remove.

Tips: Take your time. Use your rags, wash your hands if you get media on them, examine your prints

carefully as you print. If you notice your registration is slipping or misaligned, stop and reset it, even if it means you have to wash your screen out completely. I promise it's worth it.

Natural Dye Printing Styles

(above) Examples of mordant printed designs, on light cotton voile dyed with madder, pomegranate, and buckthorn.

/// Mordant Printing (the 'Dyed Style'): This technique produces the richest, most permanent results. Best suited for cellulose textiles, like cotton and linen and some rayon/semi-cellulosic textiles like bamboo, Tencell, etc.. Protein textiles' backgrounds will stain badly during the dyeing process due to their natural affinity for the dye. This stain will be impossible to remove but can be a nice tonal effect if that is your aim.

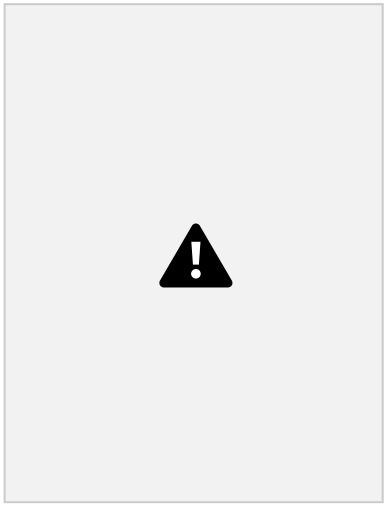
Mordant printing involves printing a thickened mordant onto a textile and later dyeing it normally in a regular immersion dye bath. The color in the dye is attracted to the mordanted areas where it binds and forms a full color permanent image. **THIS IS THE METHOD DEMONSTRATED BELOW.**

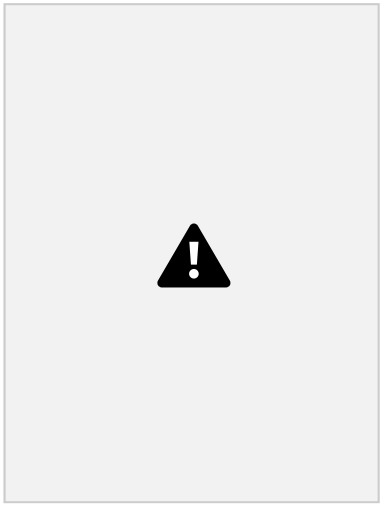
IMPORTANT: The acid in the print media (the mordant paste) must evaporate as well as be neutralized out of the print to allow the mordant to bind to the fiber before dyeing. This requires both a long curing period to complete (traditionally around 2 weeks) AND a fixing/dunging bath before dyeing.

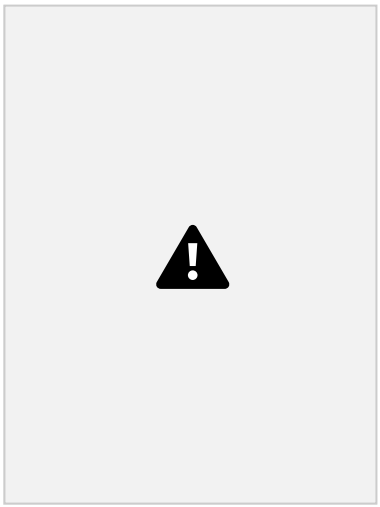
You can dye before the curing period is complete, especially if the textile is very light weight, BUT your print will most likely not reach the saturation levels it could, especially in the iron sections, and the background will struggle to clear due to the loose uncured mordant that releases into the fixing bath. Some climates–especially hot ones– result in quicker curing times, especially if the textiles are cured in a protected space outdoors (and not in a climate controlled space).

Step by Step Mordant Printing Instructions are covered in-depth in the next section where I also show how to make a lake pigment as an addition to alum print paste (making it more visible). This practice of adding lake pigment to the alum mordant paste to make it more visible is not to be confused with the Direct Application Style of Printing.

/// Direct Application Printing: Excellent for protein fibers. Both wool and silk produce vibrant deep prints with this technique. **"Direct Application" refers to print media that includes both dye & mordant.** They are kept separate in solution through the use of an acid–usually white vinegar. The acid needs to evaporate (done with drying/curing) and be neutralized (done with fixing/dunging) out of the textile in order for the mordant and dye to bind inside the fiber. This cannot be done by simple curing and fixing/dunging, however. You need to steam the prints to get good results. Without steam (like trying to dye cellulose fabrics to a deep saturated color without heat), much of the chemistry available in the dye is lost. I recommend a Bullet Steamer or a long metal steaming box if you are printing large pieces. For test prints or smaller pieces, you can use a simple kitchen steamer.



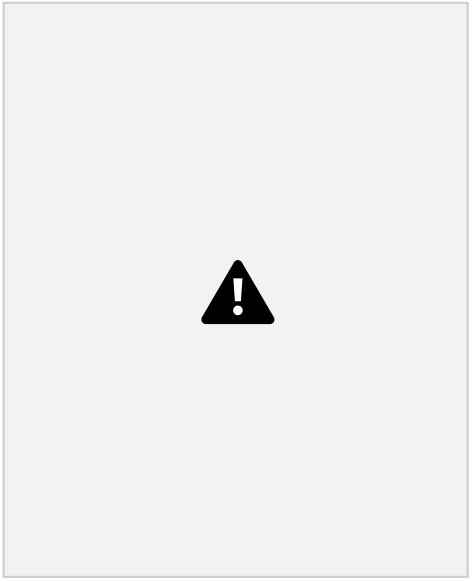


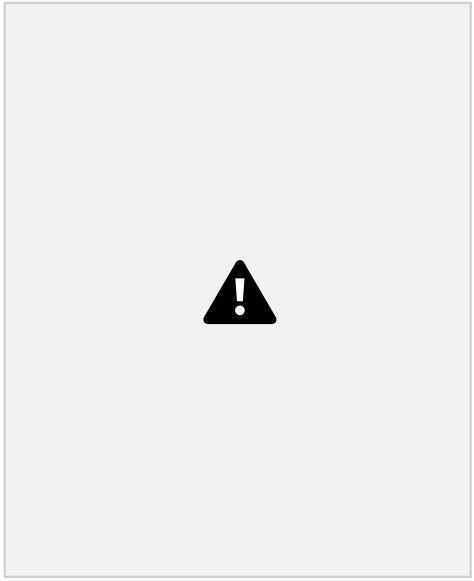


(above) Examples of direct application printing with a variety of dyes on silk noil twill.

Tips: In my experience, even with a big professional Jacquard steamer, I have to steam my direct application prints three times to reach full color and full permanence. It is important to complete the steaming process both to get a good, even depth of color and to prevent the unfixed dye from overly staining the background during finishing.

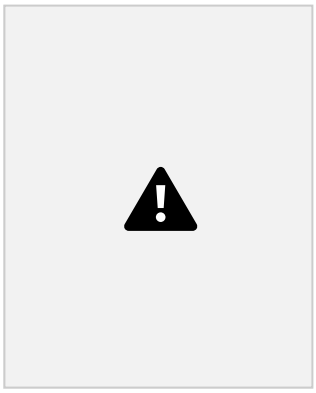
/// Citric Acid Discharge Printing: Citric acid discharge printing is very similar to mordant printing in its processing. However, you must prep the textile by pre-mordanting it with aluminum acetate or ferrous acetate before printing. Then you use a thickened citric acid solution to burn the mordant away in a subtractive rather than additive print application. These prints are thickened and processed the same way as mordant prints. To Learn Discharge Printing see this ***New* Natural Bleach / Discharge Painting & Printing with Natural Dyes Tutorial**





(above) Examples of screen printed textiles employing citric acid discharge printing with madder root dye.

Tip: Use the minimum amount of citric acid in your print paste. Citric acid is harsh on textiles and tends to loosen the paste itself. Use as little as possible to protect your fabric and improve printability.



(above) Examples of printing with a variety of dyes including madder, himalayan rhubarb & lac on silk noil twill using a **process without mordants!** It's satisfying to print with mixtures that print so crisply so easily, and on silk and wool, which take color so well. These tests have a long way to go: the results are super encouraging but also not as vibrant as I believe they could be with some adjustments. I'll talk about it a bit on my instagram as the tests progress, but going forward I'll be publishing most of my research on a platform like substack. **Join my newsletter for info and stay tuned.**

Print Paste Recipes

***Please protect your skin and lungs when working with concentrated metal salts like alum & iron- wear a mask when measuring fine powdered substances and work in a well ventilated place. Wear gloves when skin may come into direct contact with metal salts either in dry or wet form. KEEP CHILDREN AND PETS

AWAY FROM METAL SALTS- ACCIDENTAL INGESTION OF IRON ESPECIALLY CAN BE DANGEROUS

Tip: I use an immersion blender in all my projects to get extra smooth mixtures. A regular blender or electric whisk also works well. For smaller test jars, caping and shaking (hard but carefully) will also do the trick. You can also mix small test jars thoroughly by hand with a paintbrush as your stirring implement The citric acid

solution as well as the alum solution keeps indefinitely if stored with a tight lid. The iron print mix oxidizes and loses its thickness quite quickly in storage. Mix only the amount of iron mixture you need for immediate working projects purposes.

IMPORTANT: The alum print paste is naturally clear, which can make seeing the quality of the print difficult or become frustrating during registration, especially for beginner printers. Some people add a little touch of a non-fast dye extract like brazilwood or beet juice to tint it, but I prefer using a laked pigment addition instead. See instructions below for making a Lake Pigment. Begin making your Lake pigment a day or two before you intend to print since making the lake pigment takes some time. You want to have your wet lake pigment (it doesn't have to be dried) ready when you're making your alum print paste. Iron print paste does not require a lake pigment addition since it isn't clear like alum print paste and can easily be seen when printed on textiles.

Alum Print Paste- Alum will give you the bright, colorful version of whatever dye you are using. In the case of cochineal, expect fuschias and pinks. You can make alum print medium with vinegar, potassium aluminium sulfate and soda ash, but I prefer using water and aluminum acetate, since the consistency after thickening is much better for screen printing.

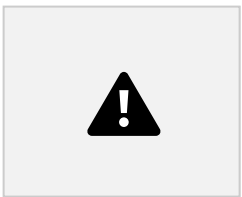
100g 'Good' Water free of hardness (calcium & magnesium) and free of other trace elements/contaminants. Distilled water is very useful for making print paste

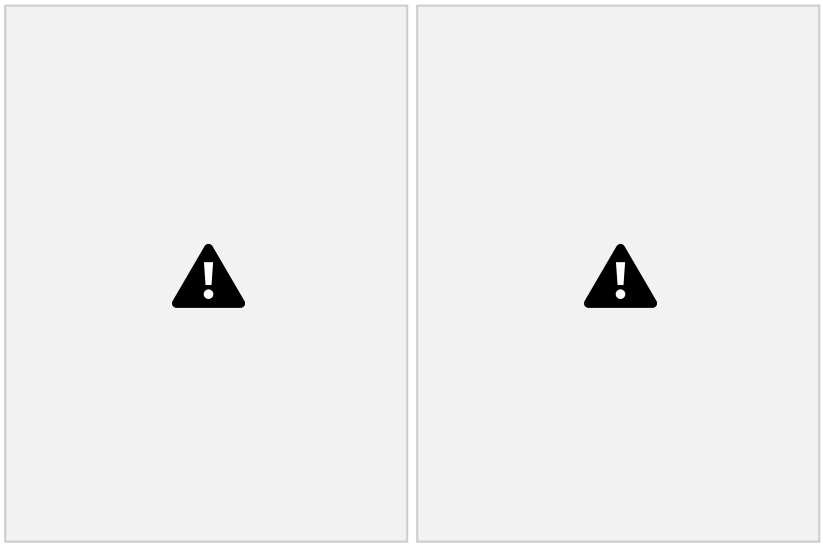
7g Alum Acetate

1g / 1.5g (adjust for print/fabric/materials) Guar Gum

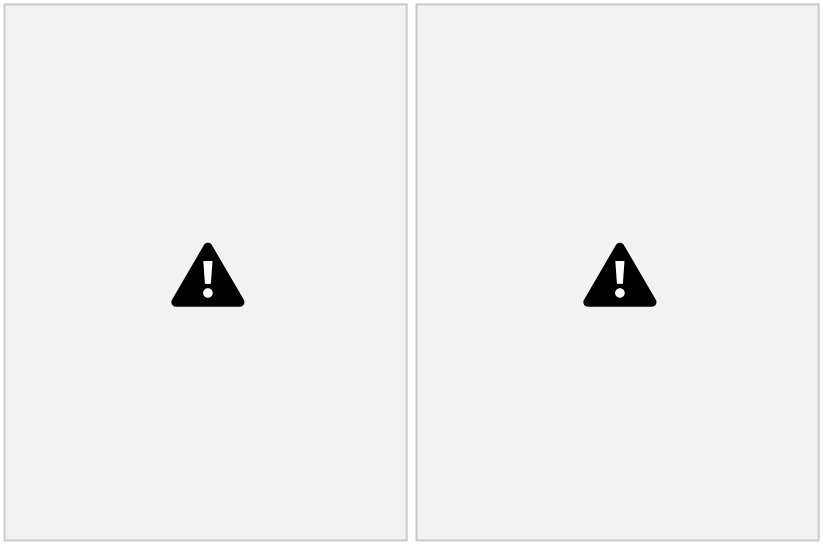
1. Heat water to ≈140F/60C
2. Weigh out aluminum acetate powder and mix into hot water thoroughly.

* Wear a dust mask and protective eyewear: alum acetate is a very fine powder and you should not breathe it in!





3. Weigh out and add guar gum <u>while the solution is still hot.</u> IMMEDIATELY mix thoroughly. Guar gum can form chunks that are very difficult to dissolve if not thoroughly mixed.
4. Leave the print solution to cool.
5. Add ±2tsp **lake pigment** and thoroughly mix before printing.



Making a Lake Pigment - The alum print paste is naturally clear, which can make seeing the quality of the print difficult or become frustrating during registration, especially for beginner printers. Some people add a little touch of a non-fast dye extract to tint it, but I prefer using a laked pigment addition instead.

Lake pigments are natural dye colors that have been bound with a mordant in solution, rendering them mostly non-reactive, since they have no chemistry available to bind to the fibers during printing. I do, however, recommend using a lake pigment close to the color you intend to dye your print.

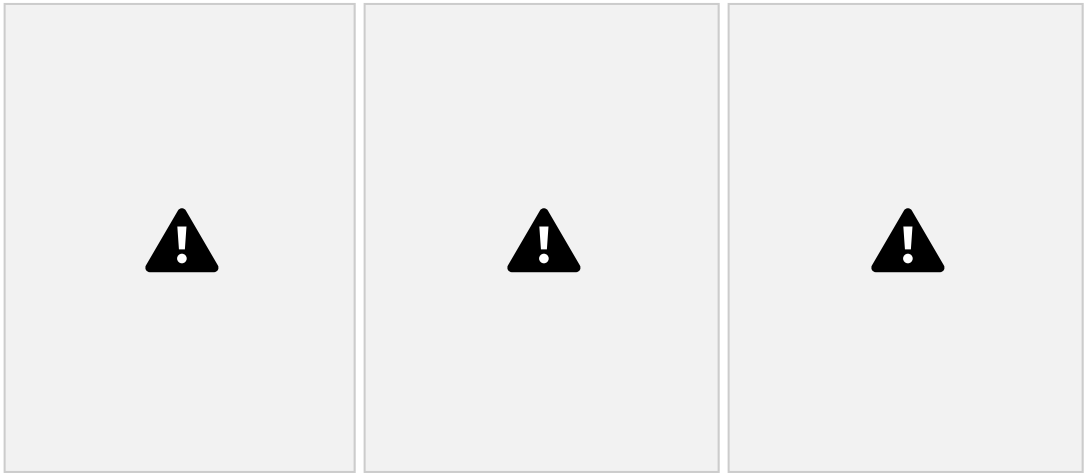
You can make a lake pigment out of a used dyebath, or a fresh one. For tinting print paste, I make the strongest color possible, for the deepest colored laked pigment possible. I used a full tablespoon of ground cochineal to make the dye bath for the lake pigment process you see in this demonstration below.

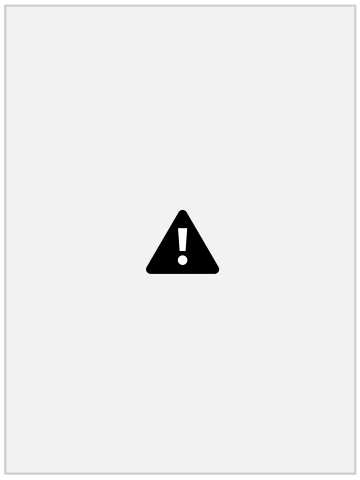
Although precise quantities of alum sulfate and soda ash can be recommended, in my experience laking is so dependent on the amount of dye available in the solution that I proceed mostly by eye. I also don't care about getting every little drop of color out of the solution. **A good rule of thumb to start is to use 10g of alum sulfate and 5 grams of soda ash for every 10 liters of dye bath liquid.**

You Will Need:

- Leftover or Fresh Dye Bath, extracted, made with 'good water' free of hardness (calcium & magnesium) and free of other trace elements/contaminants. Distilled water is very useful for making print paste
- Potassium aluminum sulfate / Alum Sulfate
- Soda Ash / Sodium Carbonate

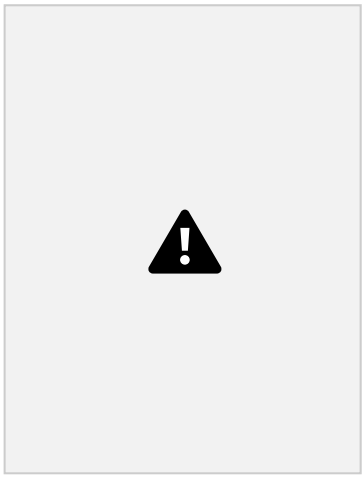
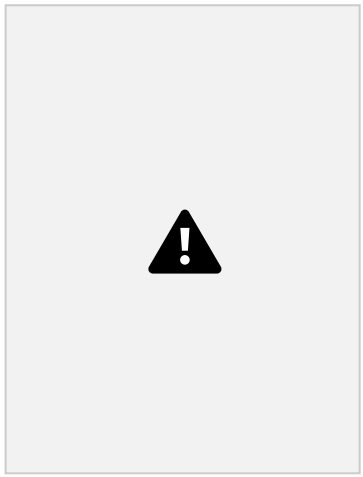
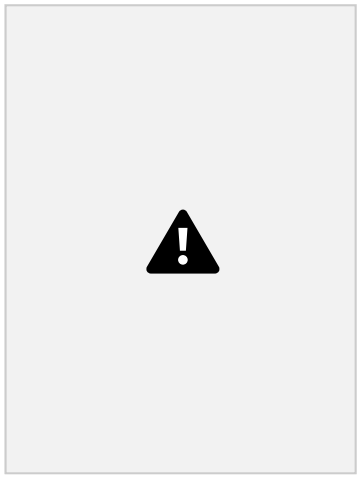
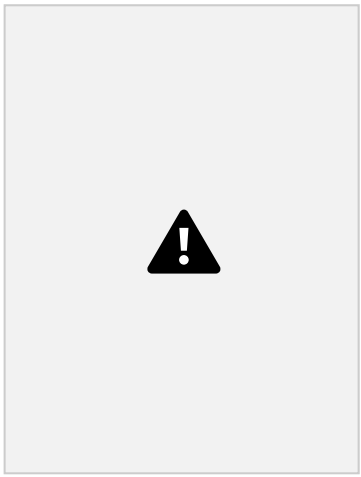
1. Heat the dye bath to 140F/60C. I recommend using a big glass jar in a pot of water so you can keep track of the reaction. The vessel that you will be making you lake pigment in needs to be much larger than the volume of liquid to accommodate the bubbling reaction.
2. Add Potassium aluminum sulfate / Alum Sulfate. I added ~ ¼ cup at first here.
3. Stir to dissolve and combine. You will see the mixture flaking up in the water as the dye and mordant combine.
4. Now you will neutralize the solution with soda ash by adding it carefully bit by bit, to the solution. Expect the solution to bubble dramatically, like a volcano science project in school. In the end you're aiming for a neutral pH of the liquid after bubbling has settled.
5. The mixture will settle over time (usually taking 6-20 hours to fully settle). You will then pour off the lighter colored /mostly clear water on top very slowly and carefully to not disturb the settled pigment too much
6. Then the remaining settled wet lake pigment (consistency of thick yogurt) can be filtered through a tightly woven cloth or coffee filter to further concentrate the wet lake pigment to a custard-like consistency.





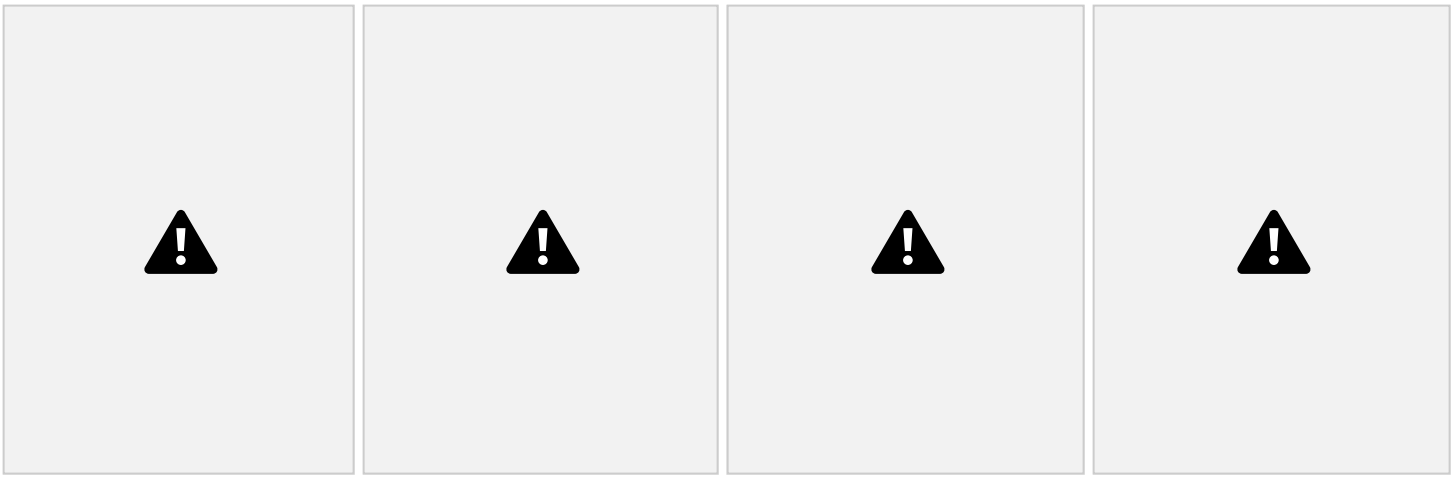
(above) Test your liquid using a pH strip after the addition of the alum sulfate. It will be very acidic. After adding soda ash it will bubble dramatically **(center right & right)** Examples of the shift in the pH, noticeable even though the strips are stained.

The pH will be noticeably higher after the addition of the soda ash: the goal is to neutralize the solution. If the solution is still too acidic or alkaline after adding soda ash you can add a small amount more of alum sulfate (will make it more acidic) or soda ash (will make it more alkaline).

(left) the lake pigment bath after adding soda ash and the dramatic bubbling **(center left)** A few moments later the pigment is starting to form and and settle **(center left)** after a few hours the pigment has finished settling to the bottom of the vessel (even though the top liquid is still colorful with extra dye molecules that have not been laked). This top liquid (called the supernatant) is carefully poured off slowly so as to not disturb the settled pigment too much **(right)** then the settled pigment liquid is filtered further through a piece of cheesecloth or coffee filter- what remind in the cloth/filter is your finished wet lake pigment

7. As I did here, if there is still dye left in the supernatant solution (the top liquid above the settled pigment), you can apply steps 1-5 again to capture more of the color and not waste the dye remaining in the supernatant, but with smaller measurements of alum sulfate and soda ash. If you don't wish to or don't need to, pour the supernatant out–maybe on your house plants if the pH is neutral!
8. Collect the wet lake pigment and store in a small container. No need to dry it to a powder as you normally would with a lake pigment: you will use the mixture as-is in your mordant print paste.



(above) Collect the laked pigment by gently opening up your cloth or filter onto a flat surface and scraping it into a small jar. I recommend saving face care cream jars, like this cleansing balm jar above (Bonus: they often come with small spatulas that will help you collect the goo!) I did two extractions for this dyebath, since it was made so strong. The first was very dark **(left)** and the second was lighter **(center left).** They are combined in my jar **(right)**

Iron Print Paste- Iron is normally used as a post-treatment to sadden natural dye colors. It will give you the dark version of whatever dye you are using. With cochineal, it gives a charcoal black. Once your print pastes are mixed, you can combine alum and iron print pastes in any ratio you like to get different tones. A small amount of iron typically suffices to create tonal shifts to darker and darker colors. For example: To make a medium print paste, try combining your print pastes at a 1:8 ratio (1 part iron print paste, 8 parts alum print paste)

100g 'Good' Water free of hardness (calcium & magnesium) and free of other trace elements/contaminants. Distilled water is very useful for making print paste

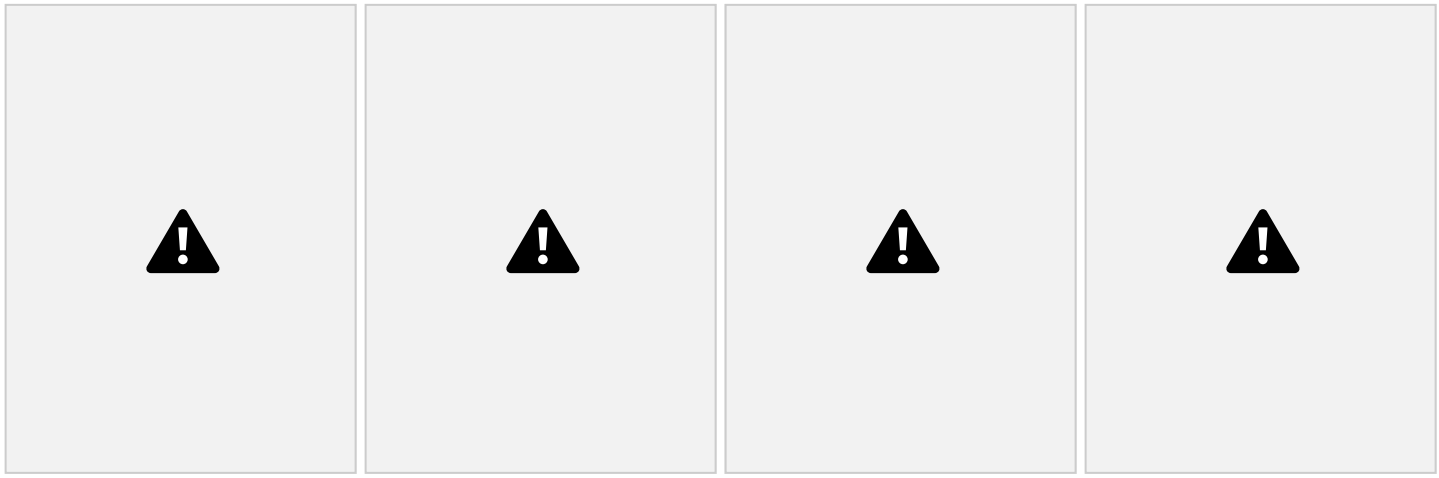
2.5g Ferrous Sulfate

2.5g Sodium Acetate

1.5g/2g (adjust for print/fabric/materials) Guar Gum

1. Heat your water to ≈140F/60C and weigh the appropriate amount of water
2. Separately weigh out the ferrous sulfate and sodium acetate. Add both to the hot water and mix thoroughly. The solution should become a deep forest green as the two powders combine to form ferrous acetate.
3. Weigh out and add the guar gum while the solution is still hot. IMMEDIATELY mix thoroughly and completely.
4. Allow to cool before printing. Avoid over-mixing to reduce surface oxidation which can result in the print paste sticking in your screen and marring your print surface.

Cochineal Dyeing GUIDE:



Where to source cultivated cochineal:

USA
Botanical Colors, Aurora Silks, Kremer Pigments, Dharma Trading,
Long Ridge Farm, Carol Leigh's Hillcreek Fiber Studio, The Yarn Tree

CANADA
Maiwa

EUROPE
Wild Colours, Kremer Pigments, Canaturex

AUSTRALIA
Kraft Kolour

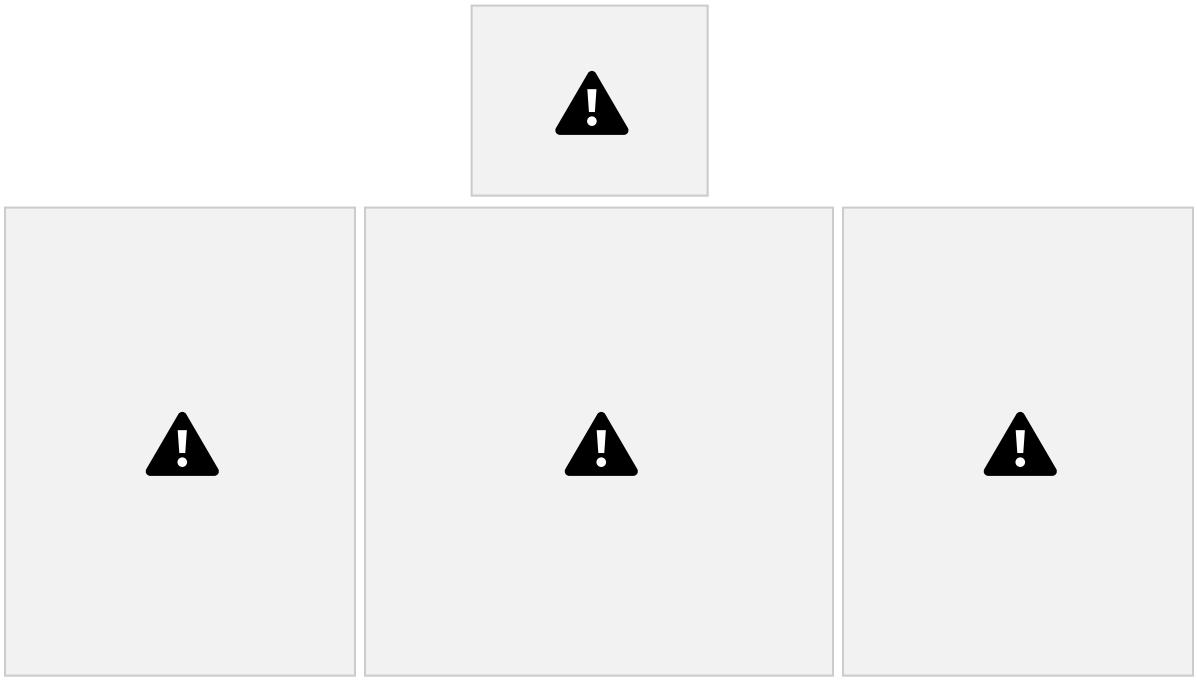
To Learn much more about Cochineal including:

- History, Science, Chemistry Context
- Cultural evolution of Cochineal use & the Future of this incredible dyestuff
- Detailed information of Cochineal Species and varieties and the difference between Cultivated & Wild Collected Cochineal
- How to Work with and seek out **Wild Cochineal**
- Cochineal Production: Traditional and Modern
- Exemplary Artists, Farmers, Researchers working with Cochineal
- Alternative ways of working with Cochineal including Bundle Dyeing, combining other dyestuffs for a rainbow of colors, Painting with cochineal on paper and fabric and MORE!
- Extensive Bibliography on Cochineal Research and dyed Textiles

…See the NEW Cochineal Natural Dye Lesson Here

Extracting Cochineal:

Cochineal can be used as varying Weight of Fiber (WOF) ratios with different mordants and assists for pinks, reds, orange toned reds, purples and grays. Have plenty of mordanted fibers to exhaust the dye bath, or a plan to make a punchy colored lake pigment with the leftover dye bath, as this color goes and goes.
Cochineal is pH sensitive resulting in warmer and cooler tones with pH modification.
Colors will develop to richest and most saturated tones in distilled or 'soft' water. Try sea water or rain water as well if at your disposal.

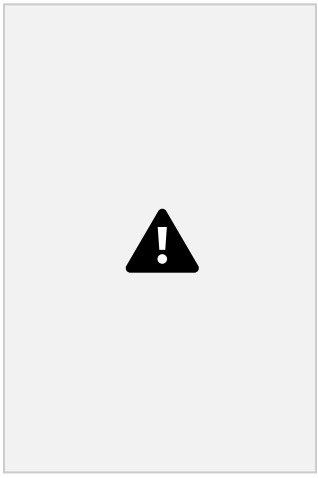
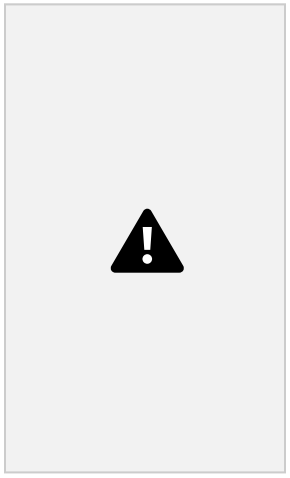
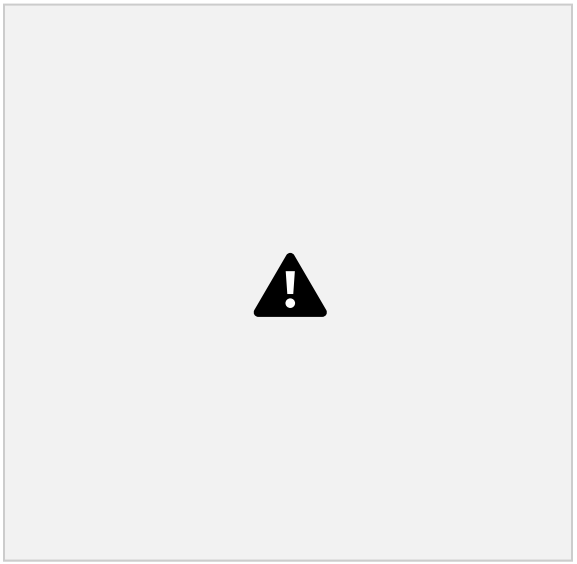
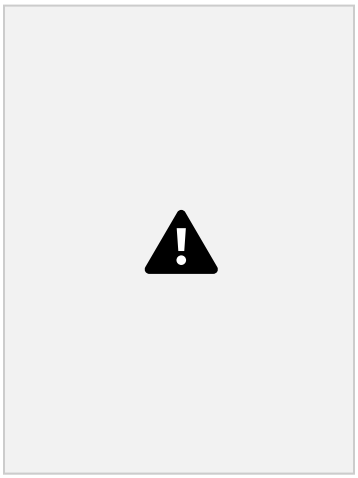


(left) wool flowers made of cochineal dyed wool remnants **(center)** handknit cochineal and avocado pit dyed wool stripe jumper and cochineal and indigo dyed cotton leggings. **(right)** peach colored cochineal and weld dyed Sarah's Silks

playsilk.

Color modification of cochineal can be made with small amounts of iron or copper for shades of purple and plum and will improve lightfastness- see specific color notes for each dye just below. To brighten the color to a brilliant red for protein fibers, add an acidic modifier such as citric acid or lime/lemon juice. The carminic acid dye compound of cochineal has a natural affinity for protein fibers like silk and wool in immersion dyeing context especially **For an additional effective Direct Application of cochineal color fabric- consider protein rich Soymilk in tandem with Cochineal Lake Pigment as outlined in detail in this Painting with Pigment & Lake Pigments on Fabric Tutorial

Use at varying Weight of Fiber (WOF) ratios:
1-2% Weight of Fiber for **light pink**
3-7% Weight of Fiber for **medium pink**
8-12% Weight of Fiber for **dark pink**

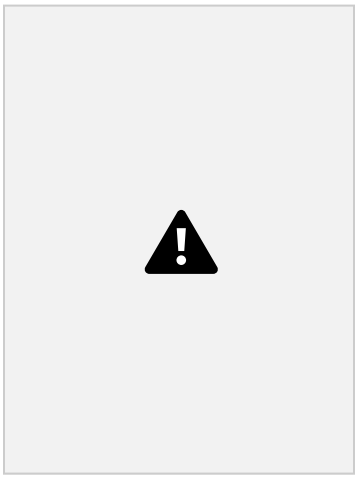





(above) colors from cochineal can vary considerably depending on fiber type, water quality and pre-treatments chosen. **(left)** orange toned red created on silk using lime juice modification of the dye bath **(center left)** various softer shades of pink and salmon on silks and cellulose fibers using wood ash and local lemon modifier using wild cochineal collected at a Local Color natural dye workshop at Wild Mesa Topanga **(center right)** a light shade of pink and deep magenta

from the same cochineal dye bath dyed on cotton fabric- the mordant procedure and duration of the materials in the dye bath accounts for major color difference **(right)** more purple leaning tones on hemp socks dyed for Bodega X Hoka.

Red- adjust the dyebath pH to 5 using a mild acid like cream of tartar & mordant cellulose fibers with tannin AND your chosen alum process
Fuschia- with a neutral pH cochineal dye bath, colors are bright vibrant fuschia with a slight cool leaning tone.
Medium Purple- Mordant or post dye modify with 2% iron &/or modify the dyebath to a pH of 9 (alkaline modification is not recommended for protein fibers)
Lavender & Grey- decrease the amount of cochineal used to 1-2% and/or mordant or post dye modify with 2% iron
Plum- Mordant or post dye modify with 2% copper and/or adjust the dyebath pH to 5 using a mild acid like cream of tartar

Prepare fibers for dye in the method you prefer- being sure to scour well (cellulose fibers especially). You may choose to utilize a tannin in your mordanting process to pretreat materials for maximum color retention on cellulose fibers. ***to see thorough instructions & clear recipes for how to mordant using various different tannins, metal salts, proteins and plant mordants see the **Solid Foundations Online Workshop**.

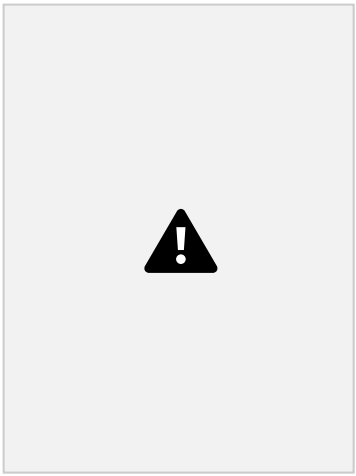


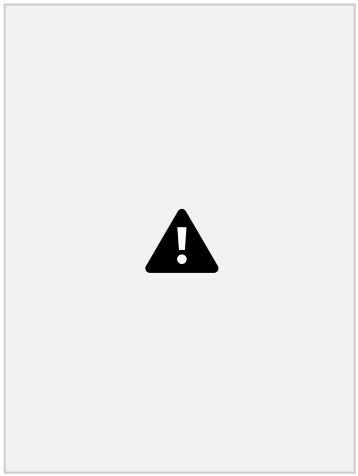
Extracting Color & Dyeing

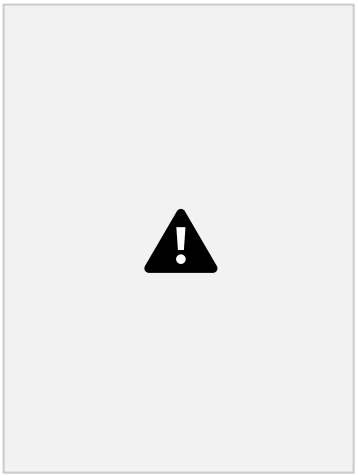
Cochineal needs to be finely ground for maximum extraction. Whole dried cochineal is easy to pulverize in a mortar and pestle at home (I like to listen to a podcast while doing a bunch at a time).

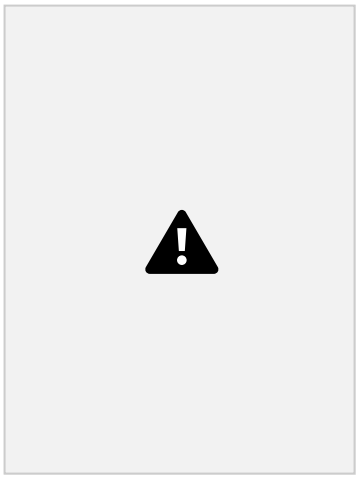
To extract the dye- My preferred fuss free method of dye extraction is to encapsulate the cochineal (after grinding in an old coffee grinder or mortar & pestle) in a makeshift cheesecloth tea bag, mesh bag or nylon stocking with the foot tied off to keep the dye bath neat and residue free from the beginning. Alternatively you can strain well after extracting the dye before proceeding to adding fibers to keep fine ground particulates from wedging in fibers (this is particularly true for well ground cochineal).

Grinding the cochineal first ensures creating as much surface area as possible for superior extraction.

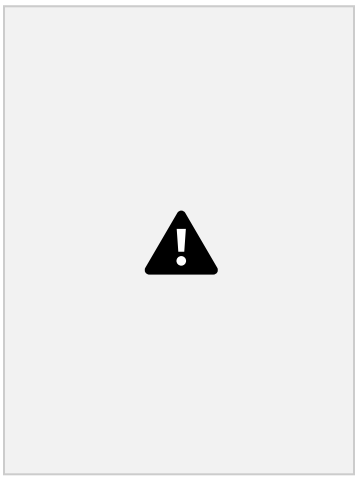
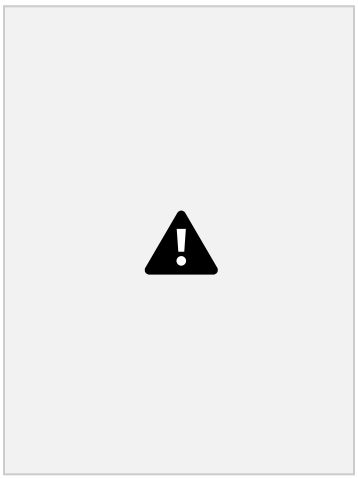
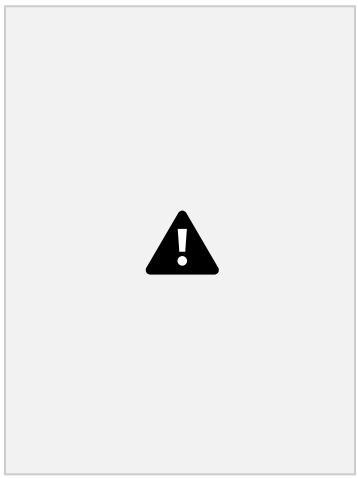
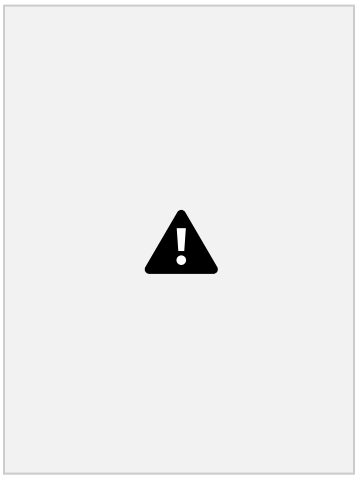








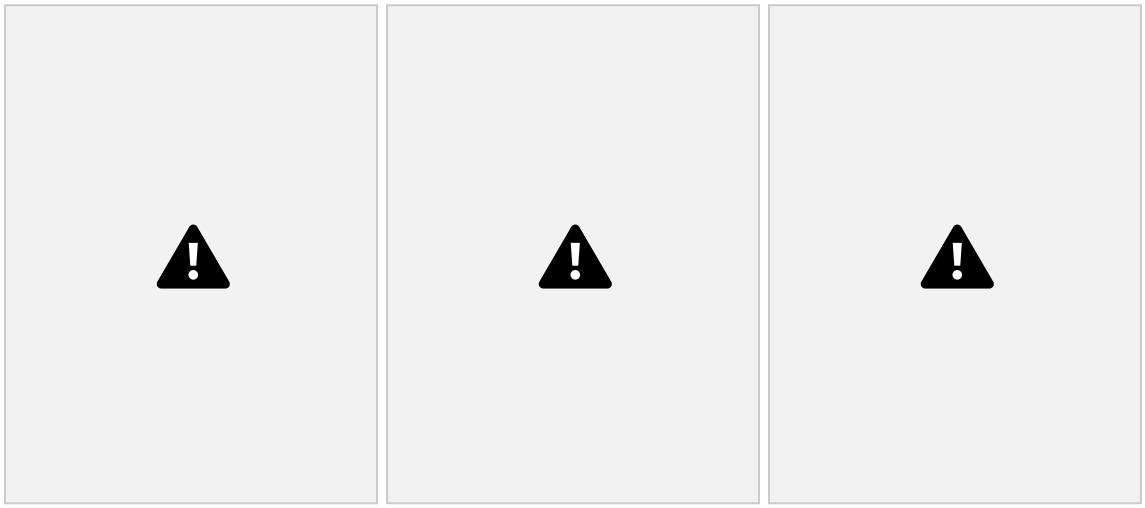
(above) grinding Botanical Colors whole cochineal to a fine consistency in preparation for dye extraction

(above) a sachet of dyestuff can be made with cheesecloth, fine woven fabric and a rubber band, a nylon sock or even an old (clean) sock.

*See Note above about water quality- you make like to use 'soft' or distilled water if your source is 'hard'.

Pour hot water over- just enough to cover to make a strong concentrated dye. Extract color with med-high heat (between 160- 200F) which will produce an abundance of color almost immediately after pouring hot water over the dyestuff.



(left) extracting the very potent dye from a very small amount of cochineal- first extraction. **(center)** second extraction **(right)** you can see the progression of color intensity decrease as multiple extractions are performed- form right to left samplings of the first, second, third and fourth extractions from the same cochineal sachet.

Remove the tea bag/encapsulated dyestuff and squeeze all the dye out, saving every last precious drop in the extraction bath. Alternatively if not using the tea bag method- Strain the cochineal bits out using a fine mesh colander nested with cheesecloth or straining cloth (silk habotai works nicely, as does an old tshirt) for a clear dyebath. Repeat the extraction process with fresh water as many times as necessary before the cochineal is no longer giving color- this is usually 4-5 times until most of the dye has been extracted efficiently.

This concentrated method of extracting dye to begin with allows for the most efficient use of resources (water & heat) and allows the dyer choice between application use from the beginning of the process. At this point, the dye concentrate can easily become paint, a very strong lake pigment, or be diluted with more water to become an immersion dyebath. I've performed as many as 7 or 8 extractions before the cochineal begins to release less color. It is one potent dye!

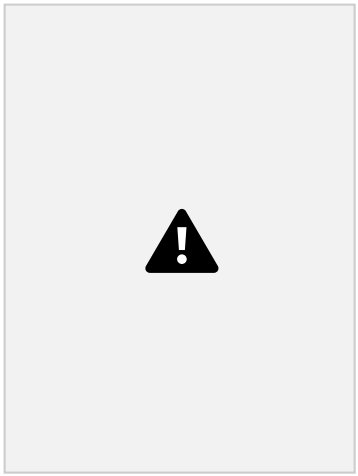
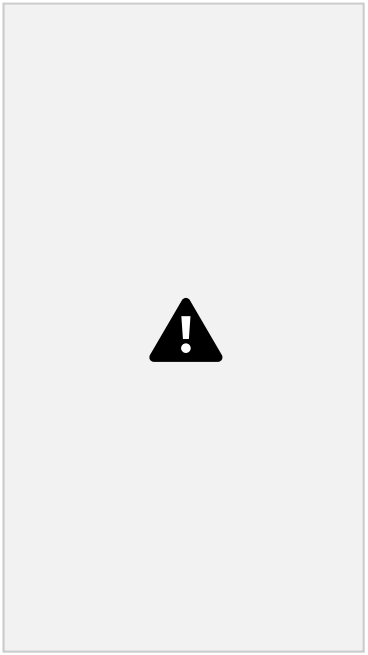
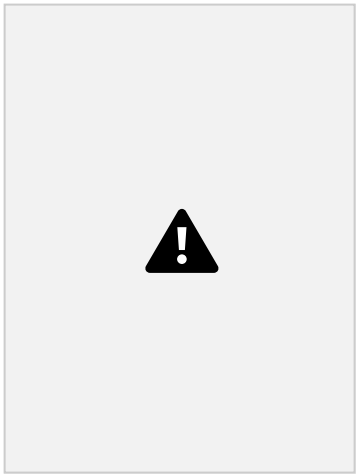
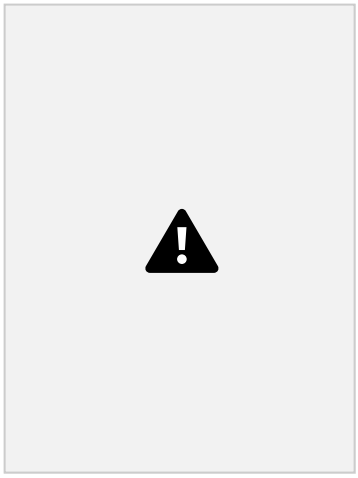
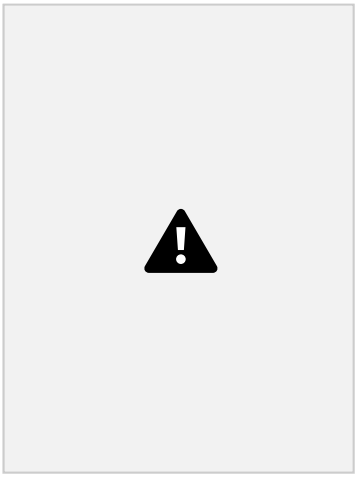
Using Natural Dye Extracts- an extract is as fuss free as it gets for natural dyeing- simply use the suggested quantity as given by the dyestuff supplier from whom you purchased the extract. You will use a considerable amount less than you would if you were using whole raw cochineal. Measure out your extract dissolve with warm to hot water and stir well to fully incorporate. Then add this to a larger volume of warm water in your dye pot. It's also good practice to strain the dissolved extract through fine cheesecloth before pouring into the dyebath to avoid tiny specs of concentrated color on fibers.

GENERAL Cochineal Dyeing Guidance

***For specific mordant screen printed textile dyeing guidance see the directions below ensuring ample time for curing and fixing/dunging first.**

Wet out your prepared textile if it isn't already & introduce it to your dyebath stirring continually for the first few minutes especially. Keeping things moving in the dyepot can help cut down on inconsistencies of dye adhesion of your piece. If you have to walk away from the dyepot for an extended period of time- consider adding a colander or old veggie steamer /steam rack to the bottom of your pot so that the textiles avoid coming in direct contact with any hot spots that can cause extra uneven results.

Let your piece stay in the dye until you're satisfied with the depth of color. For deep saturated colors expect to let the textile stay in the dye bath for about an hour and overnight for the deepest possible saturation. Stir intermittently or as often as you can while the textile is dyeing.

Exhaust the dye bath with other textiles or make a lake pigment with the leftover dye bath as soon as possible for the most vibrant colors. See my Pigment Making Tutorial for full detailed instructions.

(above) when dyeing in cochineal it can be beneficial to add a sliced lime to the dye bath or a squeeze of lemon juice especially if dyeing protein fibers for the most vibrant color **(below left & center)** The cotton t-shirt tie-dyed in this cochineal dye bath was mordanted with a unique method of pre-treatment that can be utilized for Plant Printing and EcoPrinting- resulting in a deeper shade of pink than with conventional mordanting. This method of mordanting is shared in this Bundle Dyeing + EcoPrinting online workshop. **(below right)** rinsing many swatches and skeins of various fibers mordanted in many different ways and then dyed in cochineal as part of the Extracting Color & Dyeing Fiber Online Workshop

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Curing/Fixing & Dyeing Mordant Printed Textiles

IMPORTANT: The acid in the mordant paste must evaporate as well as be neutralized out of the print to allow the mordant to bind to the fiber before dyeing. This requires both a curing period to complete (traditionally around 2 weeks) AND a fixing/dunging bath before dyeing.

You can dye before the curing period is complete, especially if the textile is very light weight, BUT your print will most likely not reach the saturation levels it could, especially in the iron sections, and the background

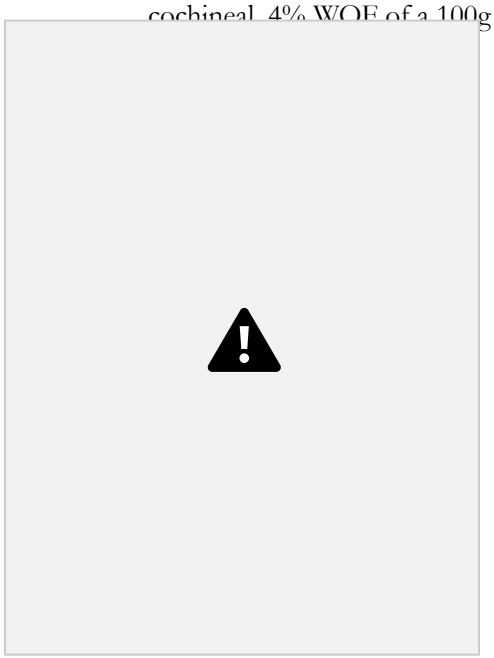
will struggle to clear due to the loose uncured mordant that releases into the fixing bath. Some climates–especially hot ones– result in quicker curing times, especially if the textiles are cured in a protected space outdoors (and not inside in a climate controlled space).

Cure your mordant printed textiles- ideally wait a few days to 2 weeks for your mordant printed textile to cure depending on the humidity in your drying space.

Dye Extraction

Follow the dye extraction steps above in the Cochineal Dyeing Guide to make a dye bath. **Cochineal should be measured out at 8% WOF (weight of fiber) for full color surface screenprints.** When you measure for dyeing mordant prints, you should guesstimate the surface area the print takes up and estimate the percentage of the full color measurement you need. Not only does this prevent wasting dye, but it helps reduce background staining in the final pieces.

So for example if your textile weighs 100g & the mordant printing covers 50% of the textile, you should use 50% of the recommended 8% WOF recommendation for full color prints, so you would use 4%WOF cochineal. 4% WOF of a 100g textile would be 4g cochineal.



Fix/Dung your Printed Textiles

The dung bath is the fixing bath that ensures the mordant is fully attached to the fibers in your textile. It is referred to as the "dung" bath because it was traditionally made with animal dung. Luckily, a mixture of calcium carbonate and wheat bran does just as well. Not only does it help fix the print, but the wheat bran extraction also encourages the gum in the print mixture to release from the fibers.

I do not contain the bran in a bag, though sometimes it sticks to the textiles. You can bundle it up in some cheesecloth if you like. Use a pot big enough for your textiles to float freely. You can do several rounds of dunging for a larger amount of printed goods if you have enough water.

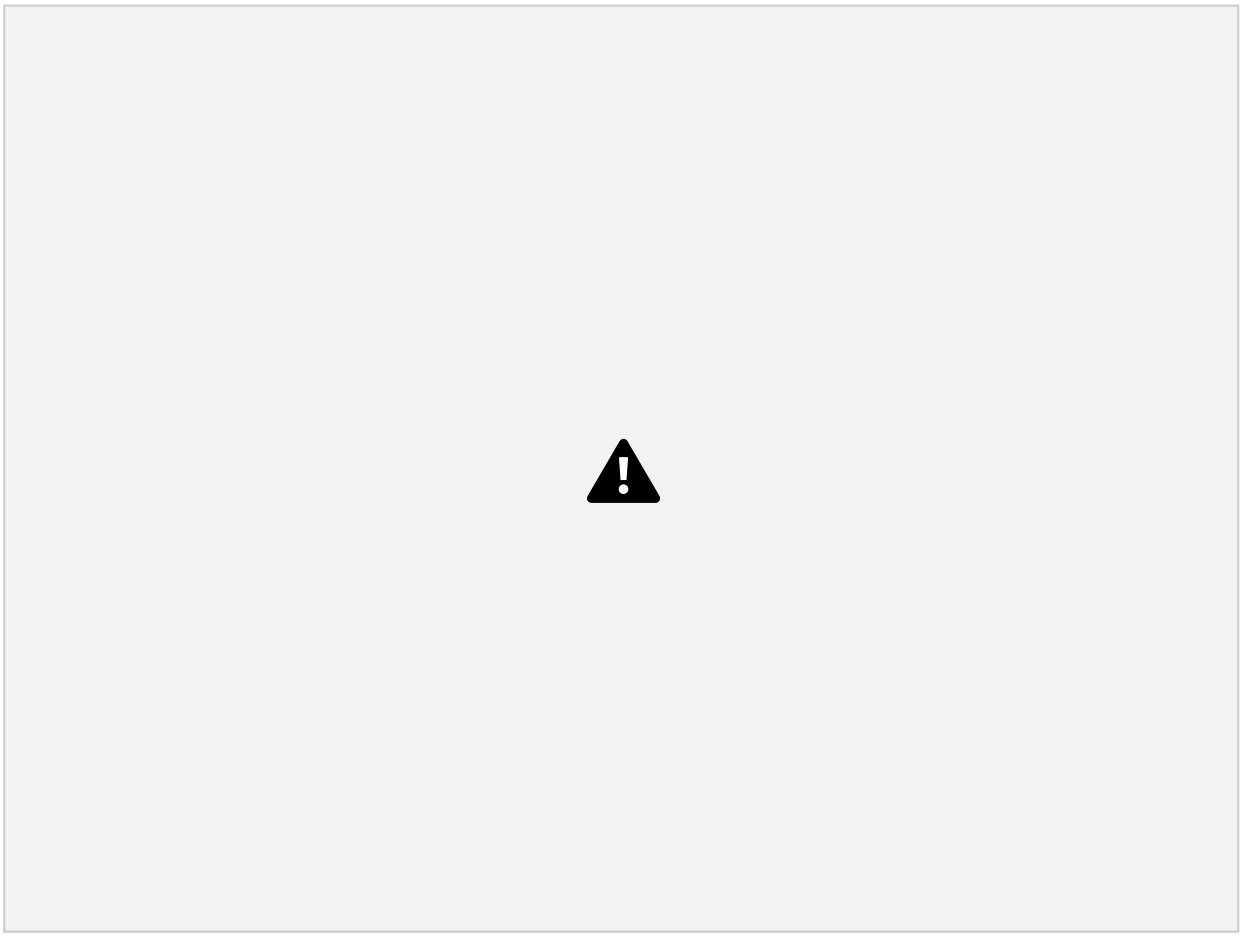
Tips: Do not stuff a lot of printed items into a fixing bath together. If the fixing bath water turns grey stop using it.

Filter the bran out of the fixing bath before you pour it down the drain. Alternatively, pour the exhausted fixing bath out onto your garden. Plants (especially madder) LOVE this as long as it's not too acidic. (TEST IT.)

Per 5 Gallon (19L) Vessel:

- ¼ - ½ cup calcium carbonate (or 10-15g per L of water)
- ~5 cups wheat bran (or ~1 c per gallon of water)

1. Add all ingredients and bring to 140F
2. Add printed items printed side down one by one and stir well between each addition. 3. Leave to sit. Agitate once or twice by gently pushing fabrics around. Don't aggressively stir! 4. Leave in the dunging solution for at least 20 minutes but no more than 40 minutes. 5. Rinse your textiles thoroughly. Very thoroughly–until the water runs clear of calcium carbonate. 6. Fixed/Dunged textiles can be dried and stored for future dyeing or you can add them to your dye bath straight away while they're still damp.



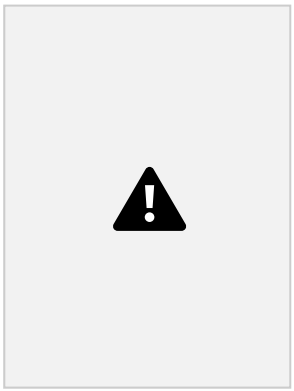
(above) these jars hold the "B" tests for cochineal, which are an initial, uncomplicated test for pH. You can see the pH clearly defined here, left to right, from more acidic to more basic.

Tip: Always have plenty of pH trips of a pH meter with you when dyeing. It simplifies everything.

Dyeing Mordant Printed Textiles

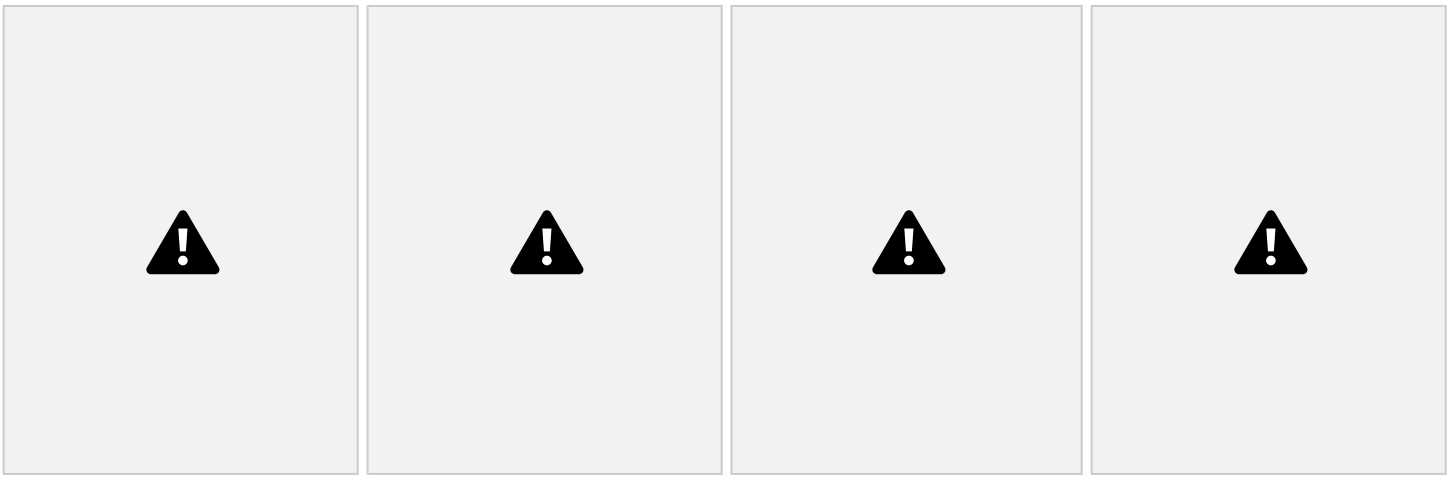
By this time your cochineal dye bath has cooled to room temperature- This is the time to introduce additives like a small amount of tannin extract or change the pH.

Add the already wet textiles to the room temperature dye bath and let sit. Let sit at least an hour, or overnight. Observe the color that has accrued in the print. It should be significant, and noticing the color of your prints will help you evaluate the success of your future projects.

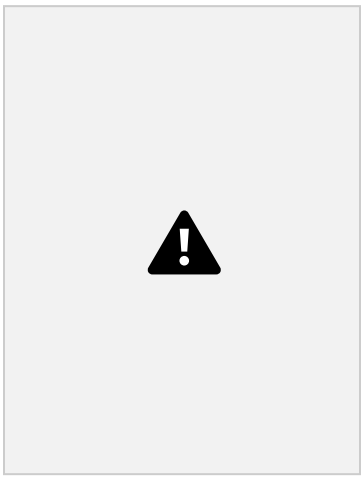
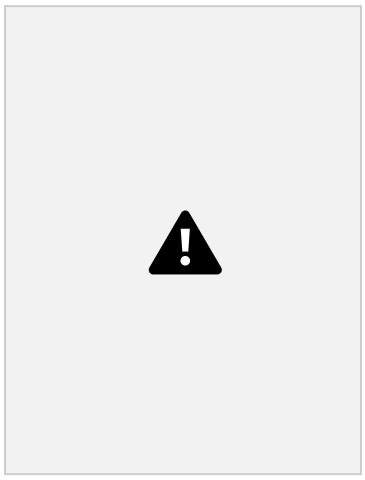
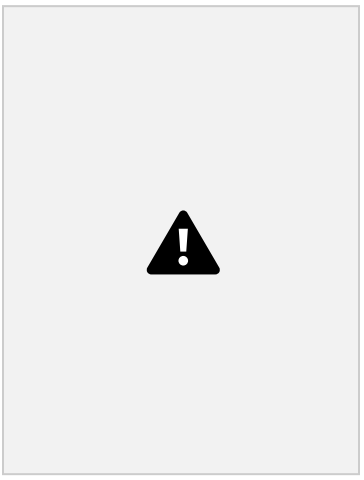
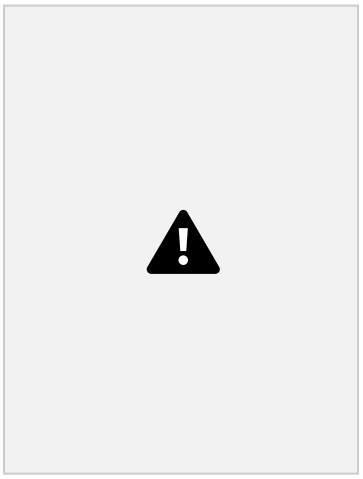


(above) These prints sat in a cool dye bath overnight. Expect noticeable color after the prints have soaked, especially in alum-heavy areas. If you do not see significant color accrued in the print area, it might be a clue that your dye bath additives and/or pH are incorrect, or that something has gone wrong in the print prep or processing. The only way to know what the color at this stage suggests is through a lot of practice. Note the color, then compare against the success of the final outcome and repeat.

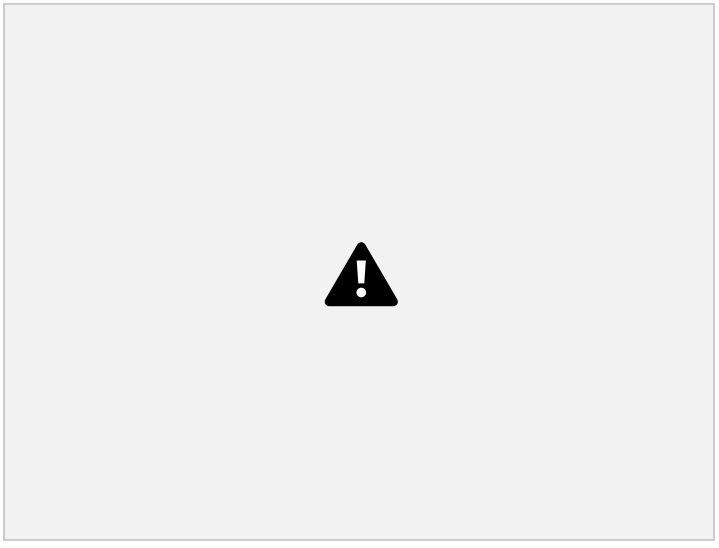
Slowly pull the heat up to 180 F/80C. This should take around an hour to do. **Hold at this temperature until the color of your printed areas is correct. Stir frequently.** The printed areas should look very dark. Remember that your dry pieces will be several steps lighter than they look in the bath. **Let the pieces cool in the dye bath.**

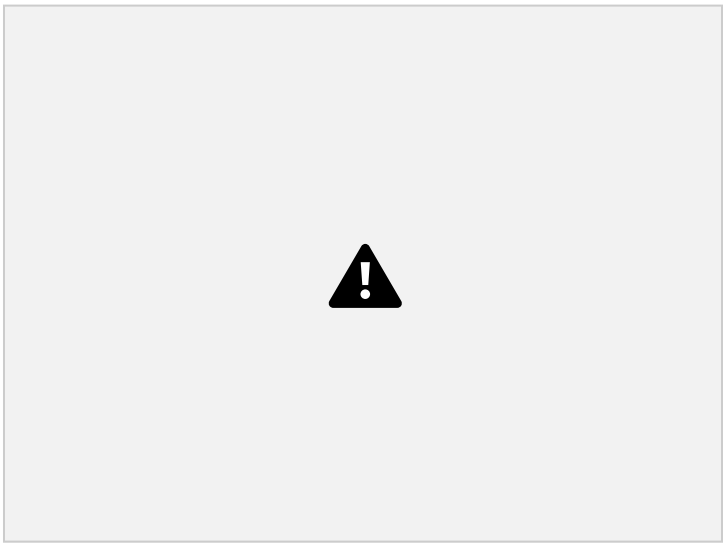


(above) “E” tests after sitting overnight.

(above) “E” tests mid-dye.





(left) finished prints wet **(right)** finished prints dry

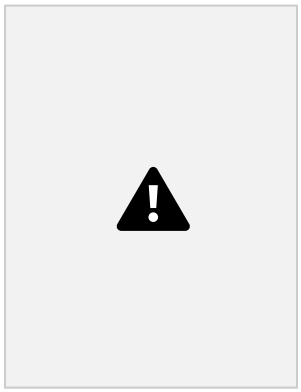
* (E) tests were more successful on the whole than the (B) tests, but were informed by the (B) set
More discussion of outcomes in the final section.

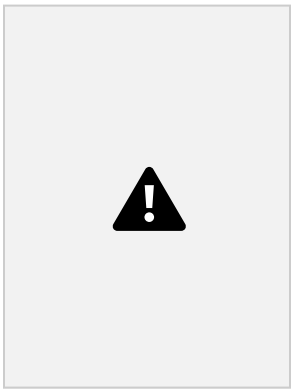
Finishing & Clearing the Background

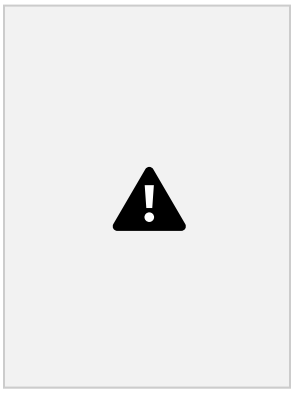
Prepare a bath of wheat bran (same measurement as the fixing/dung bath) & **a small amount of neutral detergent.**

Add your printed pieces directly to this pot while still room temperature.

Bring to a boil and hold for at least an hour. Stir frequently. This bath helps clear the background of your print and the high heat encourages the dye to migrate further into the fibers.







(above) The finishing bath relies on wheat bran and heat more than soap. I only added ¼-½ tsp of synthrapol to this finishing bath, and several cups of wheat bran. I don't contain it in a sack –I just rinse the pieces well and strain out the wheat bran before disposal. The backgrounds should be relatively clear already before you finish them: finishing isn't magic.

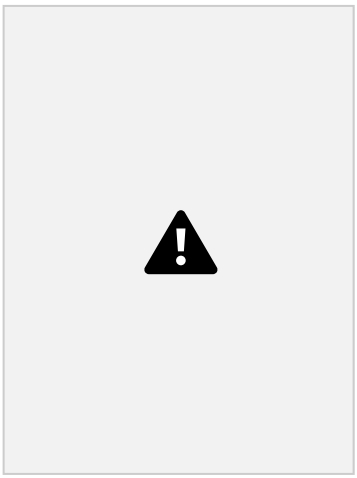
Rinse your textiles thoroughly. I recommend a warm/hot bath first, then cooler baths to follow, simply to avoid shocking your textiles.

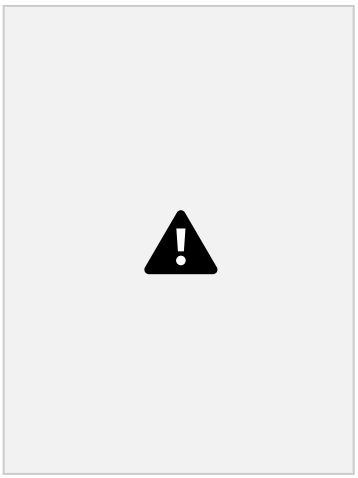
Dry on a line or flat on a towel. They might be a little crispy from the finishing process. They will soften with washing and wear. (See image sets under step 5 for reference.)

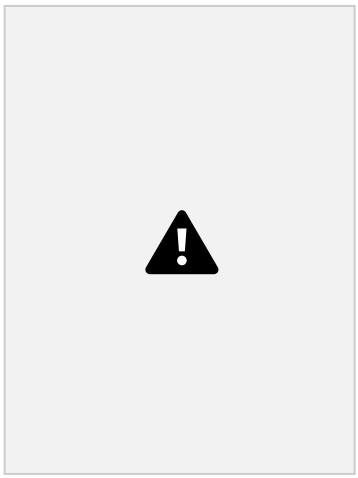
Tip: Any residual staining of your backgrounds will likely fade with time and use. They will also look far less stained when dry than when wet.

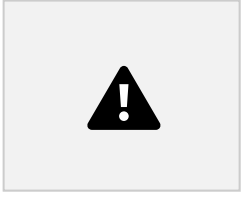
Discussion of Outcomes

It is important to understand how additives & pH changes can determine outcomes. Below, you will see a selection of cochineal tests from my research. The two test sets highlighted here are the first two tests I run on any new dye. One is a simple test of pH using citric acid and soda ash, and the other a test of different ratios of two typical additives: calcium carbonate and tannin. Can you guess which test is which?









A note on Cold & Deadly labeling & testing procedures:

Each test is marked with the test's goal or "question" as an uppercase letter, the type of dye as a number, and the variable as a roman numeral.

Early in this research I labeled tests with strings sewn through the edge of the swatch and tied, or with a pencil mark, which usually (but not always) survived dyeing. The down side was that, after the test was done, I still had a long road of labeling and classifying left to travel in order to store the swatches for easy future reference against my worksheets and notes. I had a folder for serial numbers and a masking tape labeling system, but it started to dissuade me from continuing testing since it took so long to move onto another test, and made referencing the tests later, in writing or for further testing, unnecessarily complicated. It was also much too easy to lose track of the tests mid-testing and make outcome-ruining mistakes.

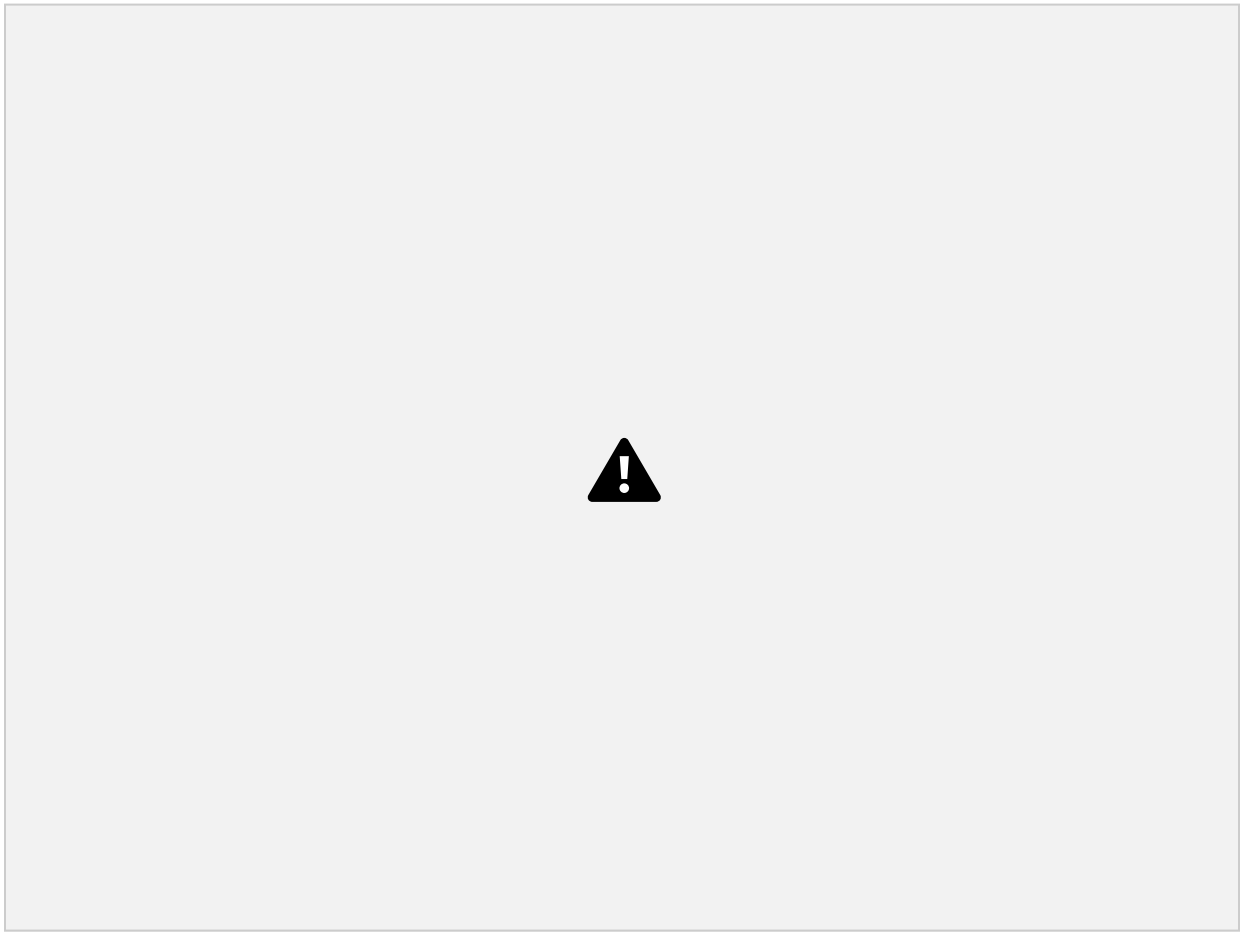
An easy solution was to print the reference numbers and letters directly on the prints before dyeing and assign letters and numbers to tests and dyes letters and numbers. Many of the lettered test questions stay the same as a thread through the body of the research. For instance, (B) is always the initial pH test and (E) is always the first additive test. I have a full alphabet of labels available to me and I often use them all up!

Some standardized "alphabet" tests fall outside of dye tests. For instance, (XX) is always a water quality test, used when I start working somewhere new, or before teaching a class as an example of the baseline results possible, based on the water available.

There are also several special characters that I can use to denote anything that falls outside the normal categories. For example, the (△) in set (B) denotes an extra fabric, in this case Sally Fox's Sea Island cotton lawn (an absolutely wonderful choice for printing–highly recommend.) Most of the other textiles I use are the same ones from test to test, though some test sets are larger than others.

Direct application tests are assigned numbers, as you saw in the printing section of this tutorial. The numbers correspond to sets of notes and observations. There are too many colors and color combinations in these sets to list the individual dyes on the tests themselves, and they don't require the roman numeral system for variable comparison that the dye baths require in the mordant printing technique.

Each test set is testing a single variable inside the dye process, without exception. The tests are brought to temperature together in large jars arranged inside a very large pot –bain marie-style, or steamed together in the case of direct application prints. Thus, I know that nothing in the dyeing procedure has varied between tests, in addition to all their ingredients –but one– being the same.



Test (E) is a test of additives.

Additives can help you alter your test results or improve them. There are many additives available to you as a natural dyer, and some offer more benefits than others. Calcium carbonate and strong tannins are both very common additives–most familiar from madder processes and some mordanting techniques. In my experience, both additives offer benefits regardless of the dyestuff. Every new dye I test undergoes test "E" to explore its relationship to these two additives.

From right to left, tannin increases, while from left to right, calcium carbonate increases. This means test (I) has no tannin–as evidenced by its brown iron mordant line, while test (IV) has no calcium carbonate. For this test set, I would reject swatches (I) and (V) as failures, though I suppose if you were aiming for a layer of brown and fuschia, test (I) additive measurements would be a one stop shop!

As I've seen in most of my other tests, a high concentration of tannin in the bath makes for very rich colors & deep black iron prints, but muddy unclearable backgrounds. This effect would be excellent for immersion-dyed pieces, but not suitable for clear prints. If you refer to the pictures in the "Dyeing" section of this tutorial, you will notice that (II) and (V) both start to show unreliability after soaking, alluding to their poorer showing in the final prints. Tests (III) and IV are the most successful. They contain an even amount of tannin (III) or slightly more tannin than calcium carbonate (IV) –a measurement that is also preferred in madder dye baths in test (E.)

The pH of test (E) was determined by the results of test (B):

Test (B) is a test of pH.

PH plays an important role in natural dyeing. Many dyers use it as a color shifter, but in my experience it is more notably one biggest determiner of color quality and background clearing. Every dye has a pH preference–usually skewing more neutral or acidic rather than basic. I understand that many recommendations for natural dyeing suggest that certain fibers, dyes or processes prefer a higher pH. This is not my experience thus far in my research.

In the test above the samples read at a pH of 4, 5, 6, 7, 8 from (I) - (V). These were adjusted to the set pH using citric acid or soda ash. Sample (VI) was adjusted to a pH of 5 using cream of tartar. Several parts of this test are interesting.

In my experience, soda ash is a rather poor choice for adjusting natural dye baths. Besides being an unnecessarily powerful pH shifter –like trying to kill an ant with a boulder– many natural dyes have a poor reaction to it, like the set above–better to use something gentler. Citric acid often performs similarly and I find I have better results using white vinegar. More research needs to be done to investigate this observation, so that's about all I'll say on it, except that many dyers' recipes also reference specific pH changers over others, based on the dye in question, which suggests it is generally understood to be of particular importance.

As an example, notice that the sample adjusted to a pH of 5 with cream of tartar (VI) has a completely different outcome from the sample (II) adjusted to the same pH using citric acid. Moreover, the sample (I) adjusted to a pH of 4 nearly disappeared, whereas when I run tests on madder using white vinegar, some of the best results come from the pH 4 tests.

All the (E) tests were set to a pH of 6 based on the outcome of test (B).

Thank you

for following this tutorial and please SHARE your results with us

We can't wait to see what you create!

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-or- instagram @thedogwooddyer, @coldndeadly