

# AN ADVENTURE IN HAND-DYED YARN



YARN HOLLOW

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## Table of Contents

Why Dye?.....	3
Getting Started.....	3
Safety.....	3
Fiber Selection.....	3
Classes of Dye: .....	4
Fixatives.....	4
Measuring.....	4
TLAs.....	4
More About DSS.....	5
Formulas and Dyeing.....	5
Solid Color.....	5
Mixed Color.....	5
Metric Pros and Cons.....	6
Immersion Dyeing Process.....	6
Now, for something completely different.....	7
Notes: .....	8
Variations:.....	8
Links:.....	9
Color! .....	9
Dyeing Information: .....	9
Supplies:.....	9
Bibliography and Suggested Readings.....	9

## Why Dye?

There are so many great yarns and fibers available for the fiber artist to purchase – an amazing array of colors, fibers, textures, fabrics, yarns, and weights in almost every possible color. One would think that every possible color combination has been put to fiber, but this is not true. If you give two different dyers the same colors, the same dyes, and the same chemicals, they may end up with vastly different results – the possibilities are infinite! Why not try it out – you can get started with a small investment of just a few colors, simple chemicals such as household vinegar, and some undyed (or even already dyed!) fiber.

The purpose of this document is to give you some guidelines about dyeing techniques, fiber selection, color mixing, and special topics and experiments. Hopefully the information contained here will help inspire you to try more dyeing, to fall more in love with fiber arts of all types, and most importantly, to help unleash your creativity.

## Getting Started

### Safety

Safety is the **most important thing** to consider when dyeing, because you want to protect your lungs, nose, clothes, hands, and others around you from the chemicals, vapors, dye particles from long-term exposure. Safety precautions to take are as follows:

- Always wear a dust mask when measuring dye stocks from powdered dye.
- Wear rubber gloves to protect your skin from dye. If you find you are doing a lot of dyeing, get good rubber gloves, and get a spare pair for when they inevitably get holes. Better yet, get a pair for where you rinse your dyed yarn, too.
- Spray your work surface with water to catch any drifting dye powder.
- Measure dye powders in a mixing box with a clear top so that any dye drifting is kept to a minimum.
- Have good ventilation in the areas where you are dyeing and rinsing the yarns and fibers.
- Wear an apron or old clothes and old shoes – dye splatters!
- If you plan to dye with non-food dyes, do not re-use your equipment! Once it is used for dyeing, that is it's only use.
- Label all mixed chemicals and dyes with the date and percentage of chemicals inside. Keep all dyes, chemicals, and accessories out of the reach of children and animals.
- Store chemicals and dyes appropriately.
- Clean up your work area thoroughly and clean up spills immediately.
- Don't eat or drink near your dyeing area!

### Fiber Selection

One of the first questions you should ask yourself before beginning dyeing is “which fiber do I want to use?” Please try to use the best-quality fiber you can afford in this process. Check with your local yarn shop to see what types of undyed fiber they carry or can order. Support your LYS as much as possible! There are many internet resources that provide undyed yarn at reasonable prices, so look around to find the fiber you want.

Also, consider the end project that you want to create with this yarn. Do you like knitting multi-colored socks? Scarves? A sweater? Baby items? Mittens, or something bulky? Or do you want to knit, crochet, weave, or felt something unique that requires unusual yarns and fibers? A little bit of time spent at the beginning of the project determining which yarns you want and what your desired end results are will save time and money.

However, sometimes you just want to dye and dye NOW and want to try a crazy new color – go for it! Seize the moment! Run, do not walk, to your dye space and do it. Don't be afraid to try new fibers and new techniques – sometimes you will get the best results by throwing creative caution (not safety caution) to the wind.

Fiber selection will also determine the type of dye and fixative you need for your project. If you are choosing a protein fiber or a protein and silk blend, you will need to use a dye and fixative appropriate for that fiber. Cellulose fibers, such as cotton, rayon, bamboo, and hemp require the use of a fiber reactive dye and an alkaline fixative, specifically soda ash, for the dye to “bond” to the fiber. Fiber reactive dyes on cellulose fibers are very wash and light fast, since the dye reacts with the cellulose fiber at a molecular level, creating a permanent bond.

## Classes of Dye:

There are many different classes of dyes: acid, fiber reactive (H, MX, Sabracron, SabraSet/Lanaset, etc), diazol/direct dyes, organic dyes, natural dyes/dyeing, plant dyes, indigo, and vat dyes, among others. For the purpose of this booklet, these instructions apply to working with different types of acid dyes, specifically Washfast acid. The information in this booklet will also apply in large part to using Jacquard, County Classic, Gaywool, and other acid dyes on protein fibers.

What are acid dyes? Most simply, acid dyes are “...a class of dyes for wool which use an acid as a fixer.”<sup>i</sup> There will be more discussion about fixatives in the next section.

Procion MX Fiber Reactive dyes can also be used on protein fibers, with varying results. This is not mean that the results are undesirable— just not necessarily reproducible. If you want consistent, predictable results when dyeing protein fibers, nylon, and silk, use dyes especially formulated for protein fibers only.

## Fixatives

For protein fibers, you will need to use an acid dye and an acid for a fixative, in most cases. Some dyes, such as Country Classic, have the fixative already in the dye powder, so no extra fixative is needed. The most common and readily available fixatives is household distilled white vinegar (5% acetic acid), which you can get by in large quantities. It is easy to use, easy to store, and great if you want to make buttermilk pancakes, too. Seriously, for the hobby dyer, white distilled vinegar is the way to go.

Other fixatives that can be used for acid dyes are citric acid, and ammonium sulfate. These can be purchased in bulk from Pro Chemical or other dye/chemical suppliers. Powdered acids are more cost-effective over time and when dyeing large quantities. However, you have to purchase several pounds of the chemicals at one time, pay for shipping, and have a place to store them properly. These may or may not be attractive to the hobby dyer.

## Measuring

Remember in “The Graduate” where Mr. Braddock tells young Benjamin “...plastics.”? Well, I have one word for you: **Metric**. Measuring in metric will give consistent, reproducible results, and the math is easier. You can measure a teaspoon of dye and mix it with a quantity of water to dilute it, but different dyes have different densities (are heavier) and will be more concentrated.

For example, a gram of yellow is the same weight as a gram of indigo, whereas a teaspoon of yellow may weigh different (lighter) than a teaspoon of indigo, depending on the brand of dye.

Also, dye is measured in stock solution relative to the weight of the fabric/yarn/fiber that you are dyeing, so by using a 1% Dye Stock Solution, determining the amount of dye relative to the fiber weight will be easy math. If you want a solid immersion dye stock solution for a 100-gram skein of yarn, 1% of a 100 gram skein is one gram of dye, or 100 ml of 1% DSS.

## TLAs

Before we get into much more about measuring and dyeing, we need to cover terms and TLAs (three-letter acronyms) for familiarity.

DSS – Dye Stock Solution refers to a liquid solution of dye powder dissolved in water.

OWG – Original Weight of Goods refers to the dry weight of the fiber that you are going to dye. OWG determines how much DSS you will use to achieve the Depth of Shade desired in your dyeing. Also abbreviated as **WOG** for Weight of Goods.

DOS – Depth of Shade refers to the Depth (strength) of the Shade (color) you want on your fiber. Typically from 0.25% DOS which is very pastel to 3-4% DOS for deep, intense color. Most samples of fiber are dyed at 1% DOS. Black, Turquoise, Fuchsia, and other intense colors often have a very high DOS for their most concentrated colors.

### More About DSS

Dye is typically measured in grams and then mixed into a Dye Stock Solution (DSS). The DSS is then used to apply color to the fiber.

Working with Dye Stock Solutions has many benefits:

Storage – you can mix several grams of dye into solution at once, store them and have them available when you get a dyeing whim.

Measurable – easy to measure/pour from DSS.

Dye Stock Solutions are typically mixed to 1%. This means that 1 gram of dye is dissolved into 100 ml of water (which weighs 100 grams.) So 1 gram of dye is 1% of the 100 mls liquid. If you have a 2-quart jar to work in, you can measure 10 grams of dye in 1000 mls of water, and you will still have a 1% DSS, just a large quantity of it, which is good. DSS doesn't typically go bad, so it will last a long time.

### Formulas and Dyeing

Now, you need work with the weight of the fiber you want to dye, and determine the Depth of Shade (DOS) (color) you want. Yarn samples of dyes are typically shown as 1% of the Original Weight of the Goods (fibers – OWG). Most dyes will show changed in the depth of the shade up to 3 to 4% of the OWG.

Consider the color National Blue, for example. If its sample is dyed at 1% OWG, the dyer weighed the yarn (i.e., 100 gr) and dyed it using 1 gram of dye (1% OWG), in Dye Stock Solution.

2% will be deeper, more intense color. 3% OWG of DSS will be even darker, and more vibrant. At certain percentages, the DSS will not be able to darken the fiber any more, and the dye won't exhaust; at this point, the dye has reached its maximum saturation.

The formula is:

$$\text{WOG} * \text{DOS} = \text{Total Dye Needed}$$

Here's a more concrete example of how WOG/OWG, DSS, and DOS relate to each other.

#### Solid Color

Jo Dyer has a 113 gr. skein of yarn that she wants dyed a great, deep, vibrant blue. From her stash of Wash Fast Acid Dyes, she chooses National Blue. Jo has weighed her skein on a postal scale and knows it is 113 grams. Jo wants a deep, intense shade of blue, so she chooses to dye to 3% WOG.

Jo will need 3.39 gr. of dye to dye the skein to 3% OWG.

$$113 (\text{WOG}) * .03 (\text{DOS}) = 3.39 \text{ gr.}$$

So, Jo will dissolve 4 gr. of dye into 400 ml of water to make a 1% DSS. Then she measures out 339 ml or 1% DSS to get 3.39 gr. of dye to dye her yarn.

#### Mixed Color

For a mixed color, Jo wants to try a really, really dark shade of wine. Her experiments have shown her that a 50/50 combination of olive and magenta make a terrific wine color. This time she has three (3) 4-ounce skeins of yarn, and she's making a shawl with the resulting yarn. She thinks she may make a matching hat later with a different yarn, so she wants to take accurate measurements of her dye quantities to insure that she gets repeatable results.

To determine her OWG/WOG, Jo weighs the yarn on a scale and finds out it is 339 gr.

(Alternatively, she googles the ratio of ounces to grams and determines that 1.0 ounce = 28.35 gr., and 12 ounces is 340.2 grams approximately.)

To determine the amount of dye, she decides she wants a 3% DOS for the wine color, comprised of equal parts olive and magenta.

Total Dye Needed = WOG \* DOS

Total Dye Needed = 339 gr.(WOG/yarn) \* .03 (3% DOS)

Total Dye Needed = 10.17 gr.

Total Olive Needed = 10.17 \* .50

Total Magenta Needed = 10.17 \* .50

5.08 gr. of each dye is needed

So Jo will measure 508 ml of 1% DSS of each dye to get her 3% DOS of Wine.

When Jo decides that it's time to dye the same concentration of wine for the hat she's making to match the shawl, she determines the amount this way:

WOG \* DOS = total dye needed

50 gr. \* .03 = 1.5 gr. of dye needed

1.5 gr. \* .50 of magenta = .75 gr dye

1.5 gr. \* .50 of olive = .75 gr dye

Jo will then mix 75 ml of olive with 75 ml of magenta to get 1.5 gr. of 3% DOS wine for 50 grams of fiber.

In the next section, the how-to's of dyeing will be discussed, such as fiber preparation, mixing dye, heating, cooling, etc.

## **Metric Pros and Cons**

Pros:

Easy to do the math between 1% of Original Weight of Goods and the DSS.

1 ml = 1 gr. – elegant and efficient

Pre-packaged fibers come with metric weights indicated. 4 ounces = 113 gr., for example.

Cons: you need a scale and metric measuring devices to get accurate measurements. (Don't let this stop you...)

Suffice it to say, learn from my pain and go metric today.

## **Immersion Dyeing Process**

Weigh your fiber, if the quantities are unknown.

Wet your fiber thoroughly in warm water. If the fiber you are dyeing contains silk, you will want to wet it for at least an hour to make sure it is thoroughly saturated.

Prepare the DSS if it isn't prepared, and measure the amounts needed

Prepare the dye pot with water and a leveling agent (salt) and stir well. (Leveling agent = 1 T. per 100 gr., roughly)

Add the pre-measured DSS and stir well.

Bring the dyepot gradually to a simmer for 30 minutes.

Remove the fiber from the dyepot and add a fixer (i.e., vinegar) and stir well.

Add the fiber back to the dye pot and return to a simmer.

Remove dye pot from heat and allow to thoroughly cool gradually

When the fiber is thoroughly cool, rinse with warm water until the water runs clear. Line dry.

#### Notes

Some dyeing techniques indicate that the fiber should be stirred frequently. I tend to not stir my fiber frequently, especially if I am dyeing loose fiber (roving or top.)

For more details about immersion dyeing techniques, please consult *Hands on Dyeing* by Betsy Blumenthal and Kathryn Kreider (see bibliography.)

## Now, for something completely different

Or, how to dye yarn in multi-colors.

Now the good stuff. How to make multi-colored, variegated yarns. Suffice it to say, there are many methods, each giving great results. And the best way to learn is to experiment. This is one of the ways I have been dyeing variegated yarns. Please feel free to use these techniques as written, or use these as a starting point to take off on your own explorations. The only limit is your own creativity – in other words, you aren't limited at all!

#### Assemble Materials:

Yarn, water, vinegar, dye powder/dye stock solution, a vessel for heating the yarn, plastic wrap, sponge brushes, dye containers, bucket of water for rinsing your hands, dust mask, rubber gloves, salt (if desired), lime, tequila. No, just kidding... notebook, tape, scale, paper towels, spray bottle.

Prepare your work area. Put down newspaper on the flat surfaces. Liberally spray them with water to catch any floating dye powder. Are there any other areas that need to be protected? Cover them up, and even put some newspaper down on the floor to protect it. Old shower curtain liners or vinyl tablecloths work great to cover flat surfaces while dyeing. **Make sure you use all necessary safety precautions.**

Prepare the yarn. If you have purchased yarn in balls, you will want to rewind it into hanks or dye skeins. You can do this using a niddy-noddy, the back of a chair, etc. If you don't have a niddy, you can also use your bent arm and wrap the yarn around it loosely. Basically, you need to get the yarn laid out in a big loop in order to dye it. But not so big that you can't easily and efficiently rewind it into a ball. If you make any ties in the yarn, make sure they are tied loosely so that the yarn isn't being strangled by the ties – strangled yarn leads to white spaces.

Soak the yarn to get it thoroughly saturated, at least 30 minutes, or longer if your yarn contains silk.

While the yarn is soaking, prepare the acid soak: 1 gallon of warm water (90 degrees F approx.) and 1 cup of vinegar. Take the yarn out of the plain water soak, gently squeeze, and put it into the acid sock. Don't crowd the bucket. All the yarn should be gently floating in a water/vinegar solution. If there is too much yarn, put it in the acid soak a few skeins at a time. This acid soak can be reused multiple times, as long as it maintains an acid pH. (You can test pH with pH test strips.)

While the yarn is soaking, prepare your dyes and sponge brushes. Carefully mix your DSS, mix any dye color combinations that are pleasing to you, and make sure your brushes are thoroughly rinsed and ready to be used.

On your dye area, put down a few overlapping pieces of plastic wrap that are as long as the skeins on yarn you have wound. This is your work surface. (You should be laying this plastic wrap out on newspaper to soak up any run-off. Please make sure your work areas are well-protected.)

Take your yarn out of the vinegar and water soak and gently wring it out. The yarn needs to be not sopping wet, but also not so dry that you have to pound the dye in. After the water is squeezed out, give it a gentle shake to loosen it up and lay it on the plastic wrap.

Now is the time that dye meets yarn. Grab a container full of dye, and sponge away! Add the dye to the yarn, pressing the sponge brushes gently (or not, depending on your preferences) into the yarn. Feel free to overlap

the colors. Or let them sit side-by-side and gently merge into one another. Make the pattern random. Make some sections bigger, some smaller. Press the dye in with gloved hands to get it absorbed. The yarn shouldn't be sopping with dye, either. Press some dye in with a sponge brush and then "massage" it in with a gloved hand to work it in.

The more color you use, the more variegated the yarn will be, and the less random the pattern and the less likely the yarn is to stripe.

Once the yarn is covered with dye, carefully mop up any dye spots around the yarn and turn it over. Look for areas that need a **light** touch-up. The second side of the yarn doesn't typically need as much dye as the first side. To make sure that the "bendy" areas in the skein get thoroughly dyed but not too-saturated, pry the bends open to see if there is any light yarn peeking through. Sponge some more dye on those areas, and work the dye in with a gloved hand. Try to match the colors on the second side with the corresponding colors on the first side.

Now make your yarn packet. Wrap the plastic wrap carefully around the yarn, and nestle it on a microwave tray. Try to get the yarn sealed in so the steam created in the microwave heats the yarn and doesn't escape.

Microwave, full power. I use 6 minutes at full power for a 4-ounce skein, 8 minutes for an 8-ounce skein.

When the yarn is done, take it out and let it sit until it is cool enough to handle. If the yarn is superwash, you can rinse it more quickly than non-superwash yarn, and the change in temperature won't felt it. I typically let the yarn rest in its snugly sack of plastic until it's completely cool.

Unwrap your yarn, and rinse! You can add a DROP (and I mean a DROP) of dishwashing liquid to your rinse water to facilitate the excess dye rinsing out.. Rinse until the water is clear.

Hang dry. Patiently wait for the yarn to dry, and then knit with it, preferably right away. Don't wait.

Clean up after yourself. Leftover dye can be saved for many months; make sure it is well labeled. You will **never** remember what it is, even two weeks later, so label it thoroughly and place somewhere safe. (I put this in bold, as it is one of the areas I am notoriously lax at.)

Take notes on what you have done, because you may want to reproduce it. Make notes on the DSS used, the dye type and colors, mixtures and color combinations, the quantity of vinegar, the time in the microwave, the yarn type and quantity. Keep a dye notebook with notes, and if it's on the computer, you can add digital photos, or a snippet of the yarn as a sample on a hard copy.

## Notes:

Superwash yarns are very thirsty and will drink up your dye. When working with superwash, prepare more dye than you think you may need.

Yellow dyes (yellow, gold, mustard, golden yellow) need about 30%-40% more in comparison to the other dyes used, since it seems to require more dye to be as bright as the other colors. If preparing dye, plan on making 1-1/2 times the amount of yellow as the other dyes. For example, if you are preparing 2 grams of red and 2 grams of blue, prepare 3 grams of yellow.

Single-ply yarns tend to hold onto dye loosely, so between the first side and second side, it's not a bad idea to wait a little time before adding a touch-up, otherwise you may be applying too much dye.

Some dyes absorb better into the yarn and/or fiber when warm, so if the dye doesn't seem to want to work into the yarn, heat it in the microwave for a minute or two. Hot dye is dangerous, so handle with care. **NEVER** heat a closed container. Two words: Ka Boom.

## Variations:

Put your yarn in a percolator, with different colors in between sessions and see what happens.

Crock pots are great for pouring dye on and letting it mooove slowly into the yarn. It's also a pretty tidy way of dyeing and great for dyeing loose fibers as it is very gentle. You don't need plastic wrap in this method, just wet fibers floating in an acid and water solution and dye to pour on.

Instead of painting the dye on with sponges, pour the dye on carefully with syringes and massage the dye in with gloved hands. This can create some great color variations and will result in a totally random distribution of

color. Make sure that the back side of the yarn gets colors, too. Do this on a plastic-lined microwave plate and then fold the plastic wrap over the yarn and microwave as the other directions indicate.

Don't like your results? Overdye! Either by immersion or sponging on new or different colors.

Try dyeing some yarn in a black metal canning pot in the sun! That's super fun, and saves on energy. The dye will eventually exhaust (completely absorb into the yarn), and will be light and wash fast. It just may take longer, like over a warm weekend.

Squirt bottles are great for applying dye. Mix the DSS, and carefully pour into squirt bottles and then squirt the dye onto the yarn.

## Links:

### Color!

[www.adobelabs.com/kuler](http://www.adobelabs.com/kuler)

[www.colourlovers.com](http://www.colourlovers.com)

<http://www.colorschemer.com/online.html>

[www.pantone.com](http://www.pantone.com)

### Dyeing Information:

<http://www.weavespindye.org/> – the website for the Handweaver's Guild of America has an enormous amount of information on fiber arts, and bibliographies of dyeing books related to their master dyer's program.

[www.craftster.org](http://www.craftster.org)

[www.ravelry.com](http://www.ravelry.com)

Dyeing groups on Yahoo Groups – there are several

### Supplies:

[www.prochemical.com](http://www.prochemical.com) – dyed, chemicals, lots of product instructions

[www.dharmatrading.com](http://www.dharmatrading.com) – dyes, chemicals, fabric, yarn

[www.halcyon yarns.com](http://www.halcyon yarns.com)

[www.pburch.net](http://www.pburch.net)

[www.itidye.com](http://www.itidye.com) - great for learning about Pro MX dyes for cotton and cellulose fibers.

**Thrift stores** are great places to find microwave trays for microwaving the yarn. Also, they have lots of old Tupperware containers, old freezer jam tubs, large 2-quart iced tea pitchers, old crock pots, roasters, electric roasters, percolators, shower curtains, mixing utensils, measuring spoons, etc. You can easily furnish a dye studio with the left-overs from thrift stores. And you can get your play clothes there, too, and maybe even some old sneakers to wear. Look around for items that will find new life in your creative endeavors – you will be surprised at what you find.

## Bibliography and Suggested Readings

Knutson, Linda. Synthetic Dyes Natural Fibers.

Revised edition. Loveland, Colorado; Interweave Press, 1986

Blumenthal, Betsy and Kreider, Kathryn. **Hands on dyeing**

Second edition. Loveland, Colorado: Interweave Press, 1988

Johnson, Ann. Color by Accident. Third edition, Lake Oswego, OR,

Ann Johnson, Publisher, 2000  
Johnson, Ann. Color by Design. First edition, Lake Oswego, OR,  
Ann Johnson, Publisher, 2001  
Klos, Dagmar. Dyer's Companion. First edition. Loveland,  
Colorado: Interweave Press, 2004  
Menz, Deb. ColorWorks, First edition, Loveland, Colorado,  
Interweave Press, 2004.  
Taylor, Kathleen. Yarns to dye for. First edition, Loveland, Colorado,  
Interweave Press, 2005  
Vogel, Lynn. The Twisted Sisters Sock Workbook. First edition, Loveland, Colorado,  
Interweave Press, 2002  
Wilcox, Michael. Blue and Yellow Don't Make Green. Revised edition, Cincinnati, OH,  
North Light Books, 1994.

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<sup>i</sup> Hands on Dyeing by Betsy Blumenthal and Kathryn Krieder, P. 33.