



Dyeing with natural colorants

Recipes from *Natural Colorants for Dyeing and Lake Pigments: Practical Recipes and their Historical Sources*

by Jo Kirby, Maarten van Bommel, and Andre Verhecken (2014)

Naomi Rosenkranz

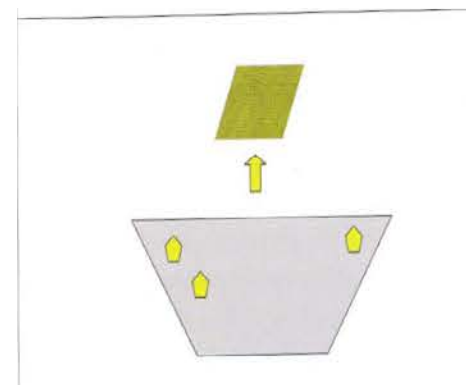
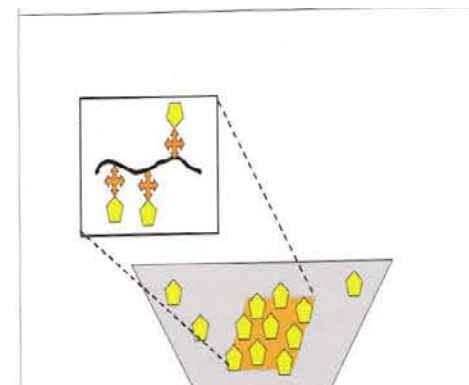
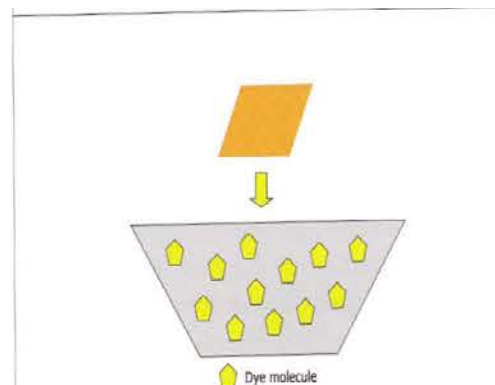
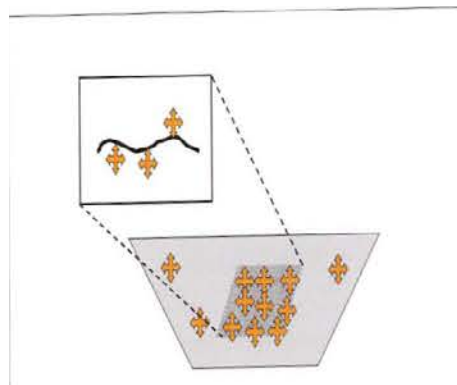
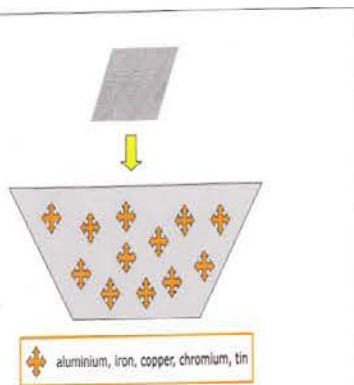
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Outline

- Quick review of mordant and dye bath procedures
- Materials and sourcing
- Example step-by-step instructions for dyeing with alum and cochineal (using hotplates and beakers)
Example of an alternative method for dyeing with mason jars and large pots

Mordant Dye Process

- Mordant bath: Textile is heated in mordant bath
- Dye bath: Dyestuffs are extracted in water (sometimes with other additives to affect color)
- Mordanted textile is added to the dye bath



Mordant baths

- Add mordant and water to beaker, and heat to 80-90°C
- Once at this temperature, add textile and heat for 30 minutes, stirring occasionally
- After 30 minutes, remove textile from mordant bath, and wash in several changes of water, being careful not to felt the textile (especially if using wool)

Dye baths

- Enclose dyestuffs in a mesh bag or cheesecloth bundle and add to water
- If using potash as an additive, add potash to this solution
- Heat water and dyestuffs to 80-90°C
- Once at this temperature, heat for 30 minutes
- After 30 minutes, remove dyestuffs (if needed, filter this solution)
- Add textiles to dye bath and heat at 80-90°C for 30 minutes, stirring occasionally
- After 30 minutes, remove textile from dye bath, and wash in several changes of water, being careful not to felt the textile (especially if using wool)
- Lay out the textile to dry

Materials and Sources

General Sourcing

- Kremer Pigments
 - <http://shop.kremerpigments.com/en/>
 - Order online or visit the New York storefront: 247 West 29th Street New York, NY 10001
- Natural Pigments
 - <https://www.naturalpigments.com/>
 - Order online
- Maiwa
 - <https://maiwa.com/>
 - Order online or visit retail locations in Vancouver, Canada
- Dick BLICK Art Materials
 - <https://www.dickblick.com>
 - Order online or visit numerous locations in New York and the USA
- Michaels Art and Craft Supplies
 - <https://www.michaels.com>
 - Order online or visit numerous locations in New York and the USA
- TALAS Bookbinding, Archival & Conservation Supplies
 - <http://www.talasonline.com/>
 - Primarily a mail order business, but storefront located: 330 Morgan Ave, Brooklyn, NY 11211
- Test Fabrics
 - <http://testfabrics.com/index.php>
 - Order online
- Knitty City specialty yarn and craft store
 - <http://www.knittycitynyc.com/>
 - Stock sometimes includes undyed raw materials (and they are happy to order specialty yarns or wool on your behalf)
 - Storefront: 208 West 79th St, New York, NY 10024
- Find in your garden or local park or even the grocery store!

Textiles

1. Wool yarn #1

1. 100% wool, undyed from [Catskills Merino Sheep](#), New York

2. Wool yarn #2

1. 100% wool, undyed from [LB Collection® Pure Wool Yarn](#)

3. Alpaca yarn (#3)

1. 100% baby alpaca, undyed from [Island Alpaca Company](#), Martha's Vineyard

4. Cascade Ecological Wool

1. 100% Natural Undyed Peruvian Wool from [Cascade Yarns](#) (also available from Knitty City, 208 W 79th St, New York, NY 10024)

5. Cotton twine

1. 100% cotton, undyed (amazon.com)

6. Cheesecloth

1. Cheesecloth - 45 Sq Feet: Grade 50 - 100% Unbleached Cotton, [Pure Acres Farm amazon.com](#)

7. Linen canvas

1. 100% linen Utrecht Unprimed Belgian Linen Canvas [Type 185 \(Blick Art Supplies\)](#)

8. Silk thread

1. Undyed Ready to dye 100% Silk Lace Weight Yarn, [Lace Weight \(amazon.com\)](#)

9. Silk fabric

1. Jacquard Products 15 by 60-Inch Jacquard Habetai Silk Scarves, 5mm, [Jacquard \(amazon.com\)](#)

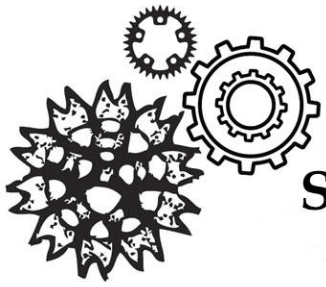
10. Conservation-quality fabrics from [Test Fabrics](#)

MORDANTS AND ADDITIVES:

Name	Chemical formula	Source	Appearance
Alum	Potassium aluminum sulfate	Kremer #64100 Also available from amazon.com	Clear, colorless crystals
Iron	Iron sulfate (iron(ii) sulfate heptahydrate)	Kremer #64200 Also available from amazon.com	Light green, humid salt
Galls	Aleppo galls (formed on Quercus infectoria) - tannic acid and gallic acid	Aleppo galls, whole (oak apples, gallnuts) Kremer #37400	Light brown/tan, slightly spiked round pieces (1-4cm diameter)
Copper	Copper sulfate pentahydrate	Alpha Chemicals (amazon.com)	Blue crystals, 2mm-4mm
Additive: potash	Potassium carbonate	Kremer #64040 Also available from amazon.com	White, non-toxic, hygroscopic, granular powder or crystals

DYESTUFFS:

Name	Scientific name	Source
Madder	Rubia tinctorum	Kremer #37201
Dyer's Broom	Genista tinctoria	Available from amazon.com sold as tea
Weld	Reseda luteola	earthues, Kremer
Brazilwood	Paubrasilia	<p>INCREDIBLY DIFFICULT TO SOURCE.</p> <p>Brazilwood is an endangered species and strict regulations are in place to protect these trees. Sources from dyeing are usually found in old inventories from before selling restrictions or from off-cuts and wood shavings from violin bow makers (where the wood is still allowed to be used)</p>
Cochineal	Dactylopius coccus	<p>Kremer #36040, Jaquard Products (amazon.com)</p> <p>Also available from Kremer #36040</p>
Logwood	Haematoxylum campechianum	Kremer #36100
Turmeric	Curcuma longa	Any market, sold as a spice. Also try fresh roots if you can find them at specialty stores
Galls	Formed on Quercus infectoria by the female Gallwasp, Cynips Gallae-tinctoria	Aleppo galls, Kremer #37400
Buckthorn (ripe)	Rhamnus catharticus	Kremer #37380



THE CENTER FOR
SCIENCE & SOCIETY

AT COLUMBIA UNIVERSITY

The Making and Knowing Project

Intersections of Craft Making and Scientific Knowing

October 9-18, 2017

experiments - during Jo Kirby

Expert Maker residency Fall 2017

Cochineal and silk experiments (some for lake preparation) and alum+cochineal dyes on various textiles

10/9/17 - 10/11/17 Experiment

First experiment in M&K lab with dyeing silk following standard procedure

Dye experiment with Sophie Pitman, Jo Kirby, Pamela Smith, and Naomi Rosenkranz

Goal: dye silk to then create cochineal lake from dyed silk threads

Both mordant and dye baths heated for full 1 hour

Preparation of large amount of silk plus strand of wool (wool #1) as a "control" to see if color is comparable to previous cochineal dye experiments where no silk was used

Silk preparation - washing the textile

2017-10-09	
Textile:	Jaquard "silk scarf" Habotai 8mm x 15" x 60" #6608604 100% chinese silk
Weight textile before wash =	18.9g
Washing procedure:	Textile is washed with neutral soap to remove impurities as manufacturing process is not clear. Then it will be left to dry before dyeing
Soap:	Johnson's head-to-toe baby wash #30033070
With NYC tap water in Chandler 260 lab, washed silk as follows:	<ul style="list-style-type: none">- in clean ceramic pot, bundled silk inside, added a small amount of tap water, then 2-3 drop soap- added more water and used hands to lather---> water gains a slight blue tinge- dumped out soapy water + added new water- repeated until no further soap bubbles visible- washed once more with 2-3 drops and repeated process- left to dry in fume hood on a makeshift clothesline (plastic cups set up upside down in succession to drape textile over

RECIPE

Silk - alum mordant, cochineal dye

For reference - Cochineal lake from dyed silk (pg 100)			Alum		
Material	Amount (g)		Material	Amount /1g (g)	Amount (g)
cochineal-dyed silk	10		textile	1	9.7
0.1M potash solution	300	(13.82g potash in 1 litre)	alum	0.2	1.94
alum	10		water	50	485
water	50		Cochineal		
			Material	Amount /1g (g)	Amount (g)
			textile	1	9.7
			cochineal	0.125	1.2125
			water	62.5	606.25

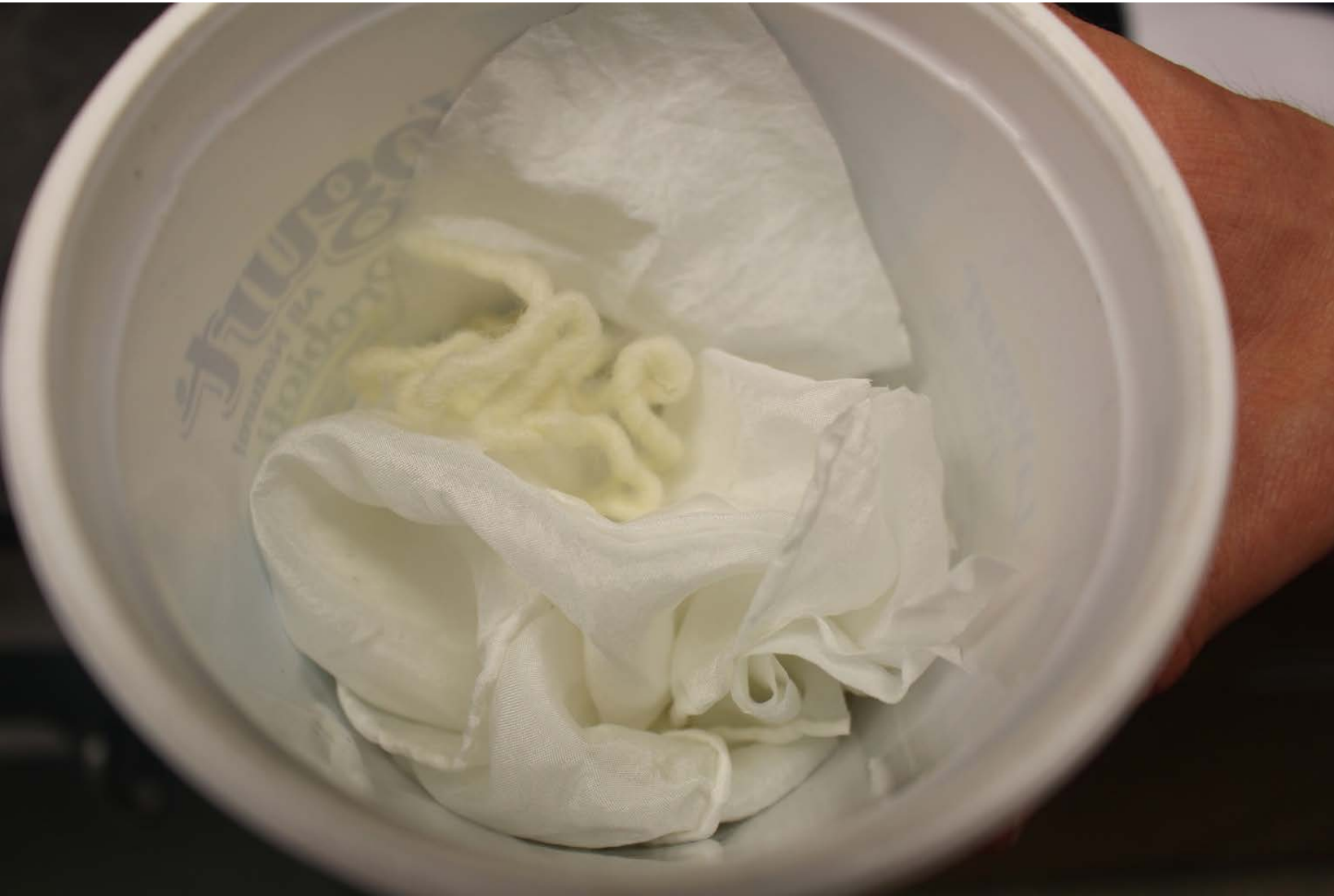
Field notes 10/11/17

- mordant and dye baths for silk

2017-10-11	
Following Kirby "Natural Colorants"	<ul style="list-style-type: none"> - pg 49 Mordanting: "silk pre-treatment - only if needs to be degummed, wash with neutral soap" - in clean ceramic pot, bundled silk inside, added a small amount of tap water, then 2-3 drop soap - added more water and used hands to lather ---> water gains a slight blue tinge - dumped out soapy water + added new water - repeated until no further soap bubbles visible - washed once more with 2-3 drops and repeated process - left to dry in fume hood on a makeshift clothesline (plastic cups set up upside down in succession to drape textile over)
Silk after washing, weight =	19.2g
Cut full silk scarf in half (to work with ~10g)	
Weight of silk to be dyed =	9.4g
Cut the 9.4g textile into 6 pieces for more even dyeing	
Added strand of wool (wool #1) as a "control" to see if color is comparable to previous cochineal dye experiments where no silk was used	
Weight of wool #1 =	0.3g
TOTAL TEXTILE weight =	9.7g
Field notes 1:15pm	Distilled water added to 1000ml beaker on hot plate, with glass thermometer to check temperature and wooden chopstick to mix
	1:18 PM alum added
	1:25 PM textile added temperature >40C
	1:27 PM Dye bath put on heat (water+ground cochineal)

	MORDANT BATH	DYE BATH	
Time	Temperature (C)	Temperature (C)	
1:28 PM	55	20	
1:35 PM	65	55	
1:42 PM	80	80	
1:46 PM	85	97 (turned down, because went up to 100)	Silk should be around 90 - higher and it will start to react
1:52 PM	88	98	
2:22 PM	90 (turned down)	93	
2:30 PM	81	97	
2:45 PM	Textile out		
Washed with multiple changes of water (distilled)			
2:54 PM		Textile added to dye bath	
		80	
3:00 PM		84	
3:11 PM		80	
3:26 PM		73 (turned up)	
3:45 PM		83	
4:11 PM		85	
Textile removed and washed in several changes of water			
Started with distilled water only, but tested a small patch with tap water to see if any color change occurs. None does and so the remaining was is conducted with tap water			
Wrung out and left to dry in fume hood overnight			

10/11/17 - silk + one strand wool #1 before mordant



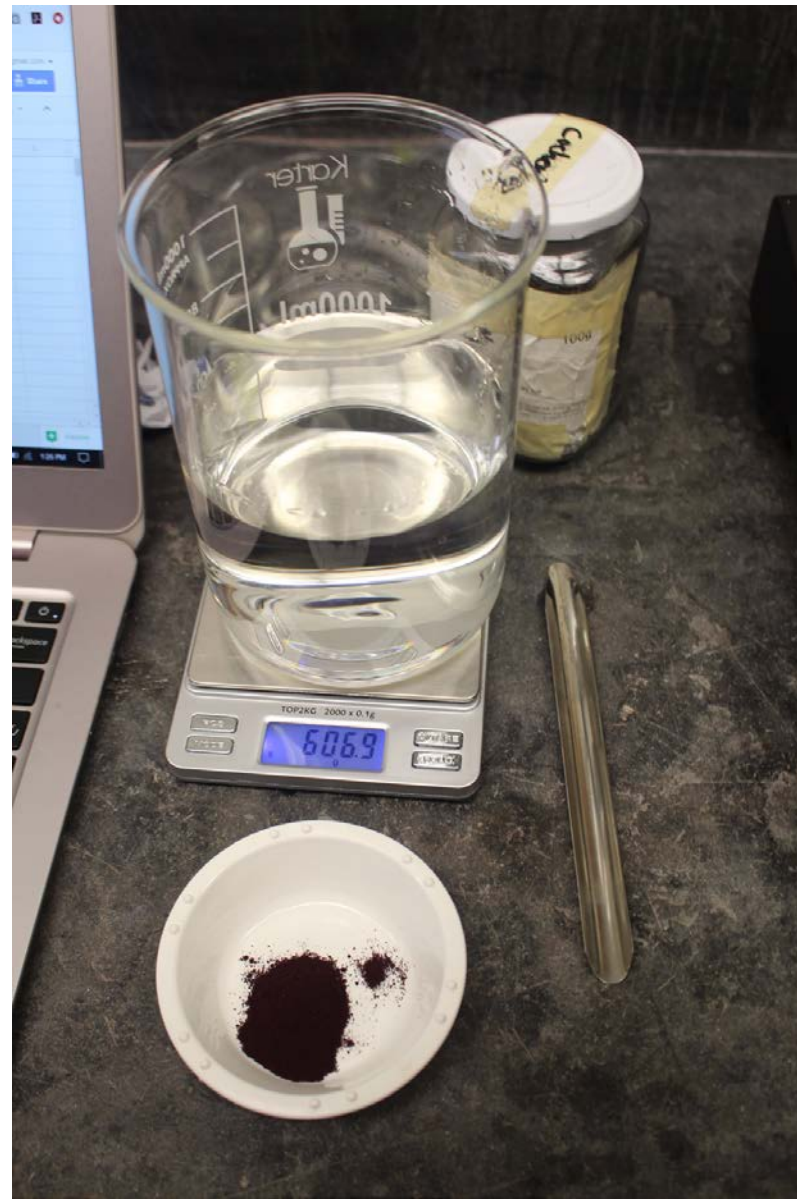
10/11/17 - alum bath



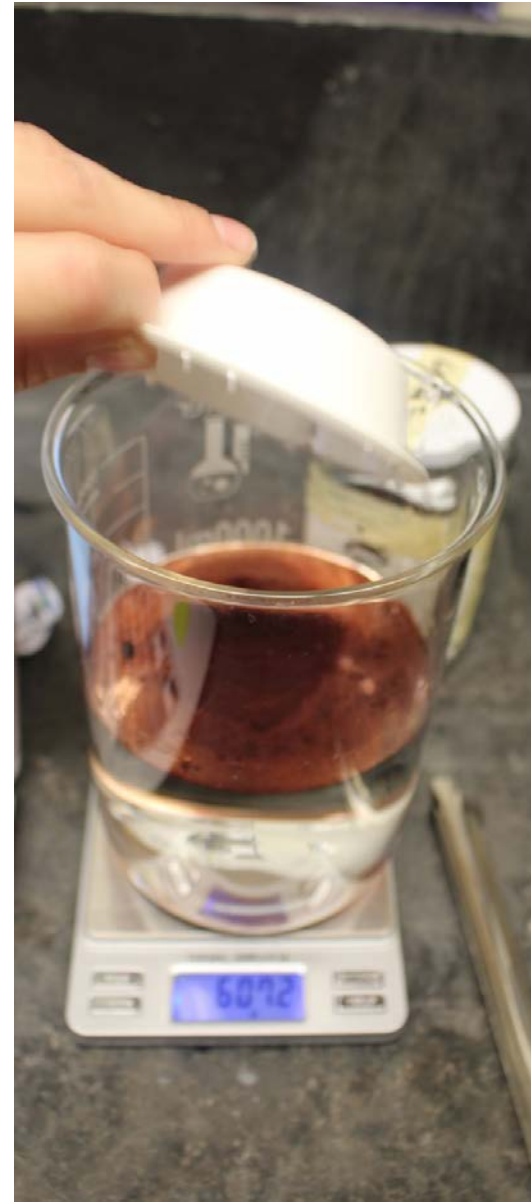
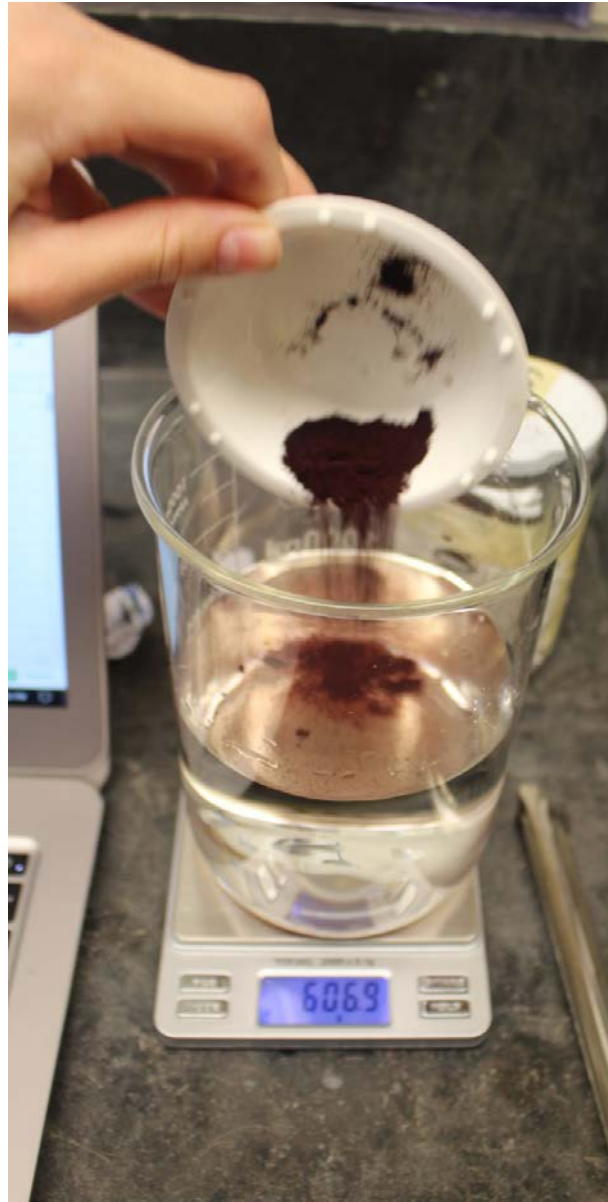
10/11/17 - wash after alum mordant



10/11/17 - dye bath - ground cochineal and water



10/11/17 - dye bath



10/11/17 - dye bath - ground cochineal and water



10/11/17 -
dye bath



10/11/17 - dye bath - textiles added



10/11/17 - dye bath



10/11/17 - dye bath



10/11/17 - textiles after dye bath, before washing

Notes:

Began washing with distilled water.

Tested small area of silk with tap water - no color change evident.

Continued washing with tap water



10/11/17 - textiles after wash, drying



10/11/17 - silk after wash, drying



10/11/17 - wool #1 after wash, drying



An alternative method to hotplates and beakers

Mordant bath	Dye bath	
	Colorant	Additive
alum	buckthorn	potash
none	buckthorn	potash
alum	turmeric	potash
none	turmeric	potash
alum	dyer's broom	potash
none	dyer's broom	potash

March 25, 2017 experiments

Buckthorn (ripe), turmeric, dyer's broom
NYC, NJR kitchen, bain-marie

This method uses a water bath or bain-marie

(see this cooking blog for more information about bain-maries: <https://www.thekitchn.com/technique-how-to-make-and-use-70190>)

Process

- On your stove at home, prepare your mordant and dye baths in mason jars (or other glass jars that can withstand prolonged heating such as pickling or jam jars).
- Place the jars in a large cooking pot (the pot's material doesn't matter – can use steel, ceramic, etc)
- BE CAREFUL ABOUT USING THESE POTS TO PREPARE FOODS AFTER YOU HAVE DYED WITH THEM IF YOU ARE WORKING WITH MATERIALS THAT ARE NOT FOOD SAFE
- Fill the pot with enough water to come up past the solutions in your mason jars, being careful not to contaminate the baths inside your jars
- Heat the pot on your stove and follow the procedure for mordanting or dyeing the textiles

Advantages and Notes

- This is one way to dye at home without beakers or other shock-resistant containers
 - Beakers, Pyrex, and other borosilicate glass is specially formulated to withstand direct high heat (like when placed directly on a hot plate) as well as shocks or sudden changes in temperature (like placing a hot glass vessel with your bath onto a cold surface like a counter)
 - Regular glass, including mason jars, are not formulated in this way, and so it can be very dangerous (and messy) if used in the same way as beakers – direct high heat or sudden change can cause the glass to shatter
- This method also allows for easier dyeing without a thermometer
 - The temperature of your baths is determined by the temperature of the water in the pot
 - You will know the baths have approximately reached the desired temperature range of 70-90 °C when the water in the pot is beginning to gather bubbles just before simmering
 - Because water boils and begins to evaporate at 100 °C, your baths will never exceed 100 °C, the temperature where your baths and textiles can begin to degrade. This is an easy way to prepare baths without a thermometer and ensure you are not reaching high temperature levels
 - If the water in the pot begins to boil or simmer violently, your jars will start to shake and move around the pot. If this happens, it is a sign to turn your heat down



Samples (bain marie) (03/25/17)



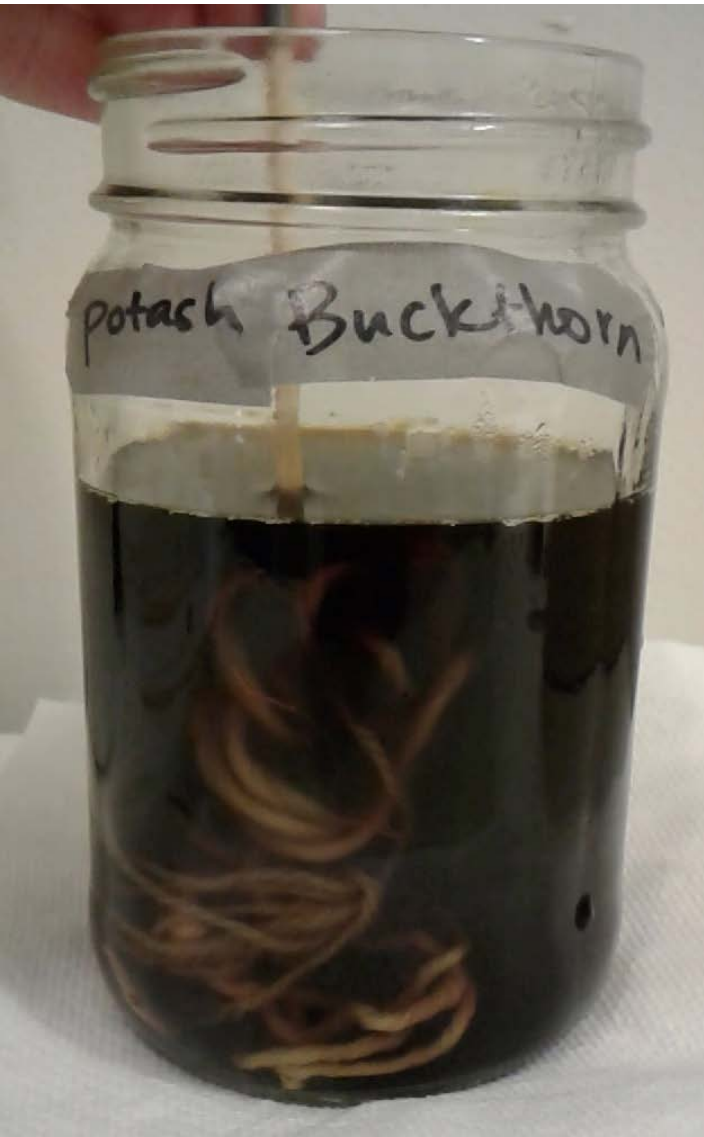
Buckthorn - ripe berries + potash in dye bath (03/25/17)



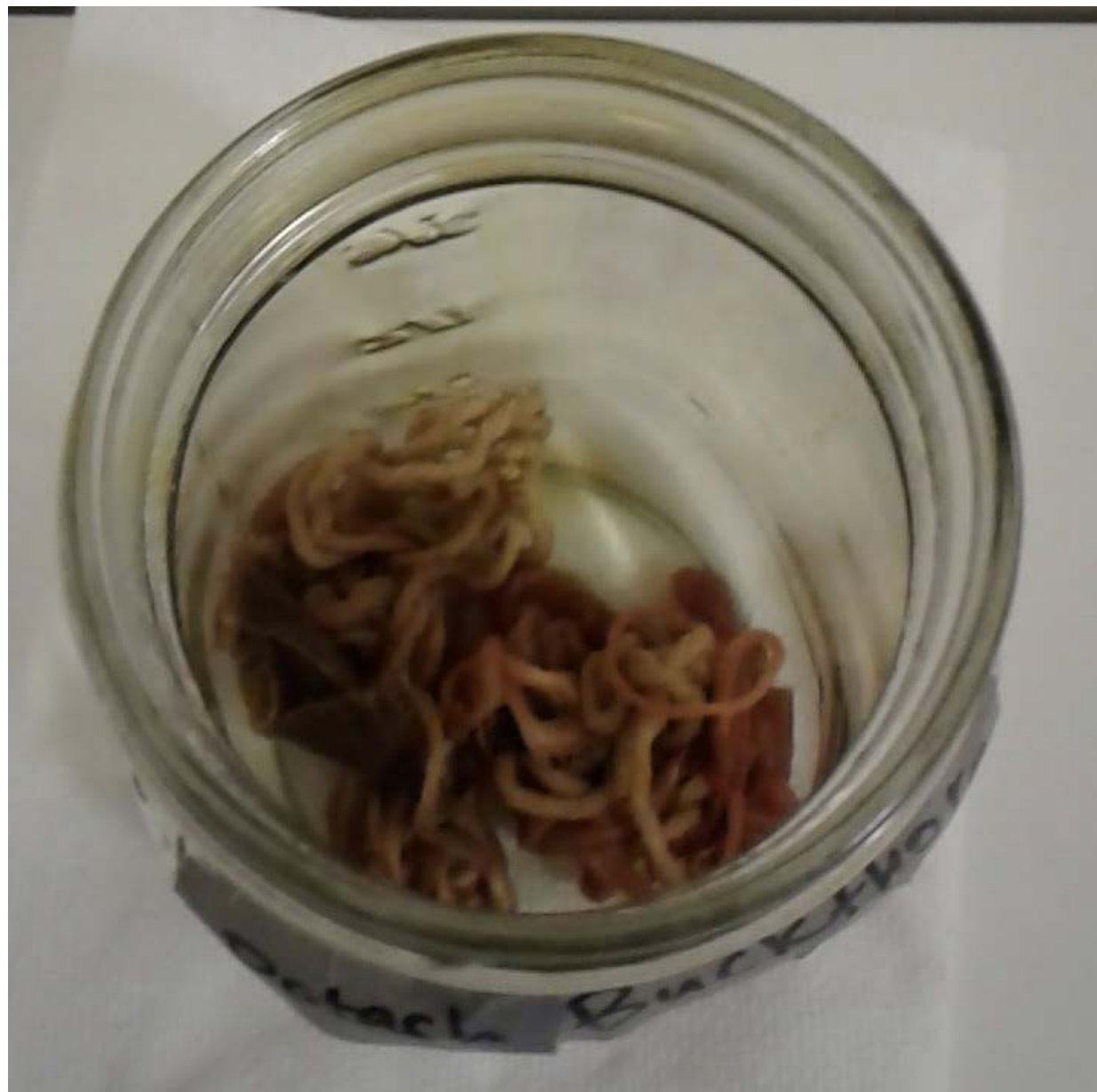
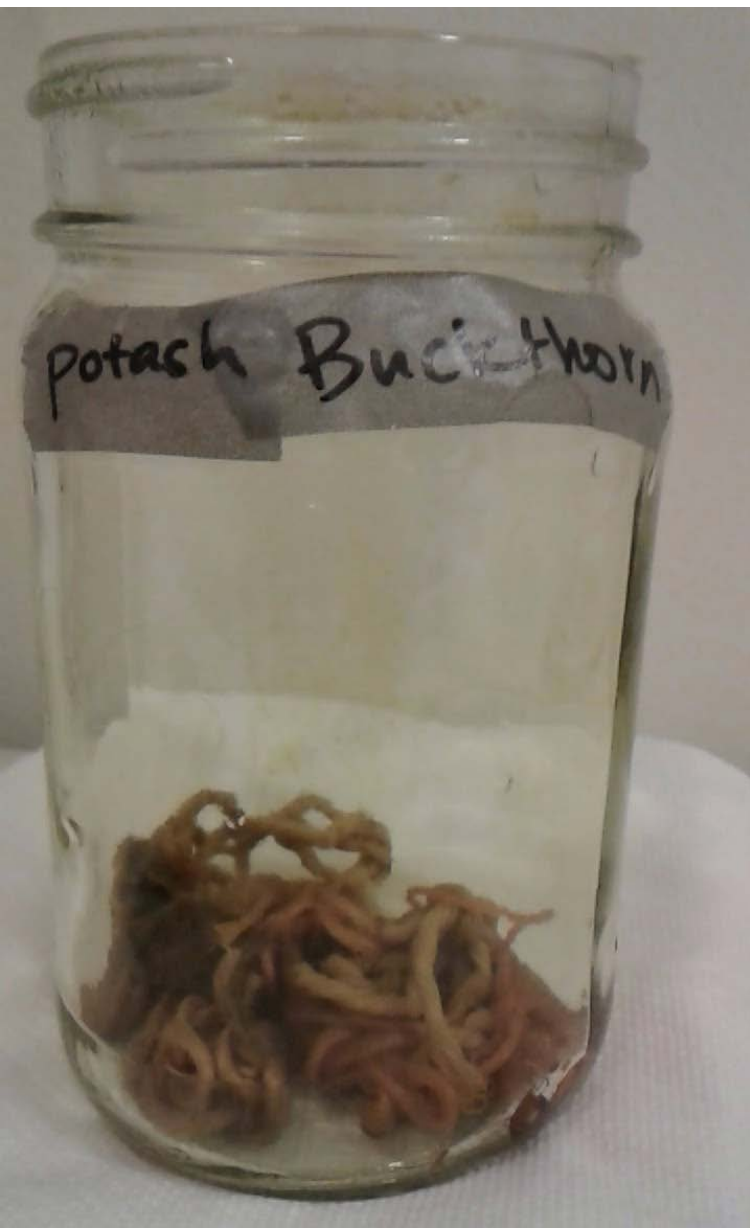
Dyestuffs in muslin bag removed after 30 min



Buckthorn - textiles added to dye bath (03/25/17)





















Buckthorn - drained before washing (03/25/17)



Buckthorn - washed (03/25/17)



Buckthorn (03/28/2017)

RIPE BUCKTHORN	None	Alum	Alum + potash	potash (dye bath)	iron sulfate	gall nuts
wool #1						
A+W						
W+N						
cotton	