Dyeing with Tannic Acid and Iron: Berry Vines and Leaves

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I. Introduction

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This paper discusses the use of tannic acid and iron to dye fabric; in particular wild blackberry. As far back as Roman times black cloth was produced by dyeing of fabric or skeins in dye baths of tannic acid and iron salts. It is mentioned in Pliny and there is evidence of it in the dyeworks at Pompeii. [2]

From the 13th C. to 16th C. much of what we know about dyeing comes from the accounts of the Guilds and the laws concerning what they were permitted to do. Many plants contain tannic acid in their bark, leaves, stems, or fruit. Some are mentioned in the *Plictho de larte de Tentori che insegna tenger pani telle banbasi et sede si per larthe magiore come per la comune* written by Giovanventura Rosetti and printed in 1540[3] . It is to this book written to popularize dyeing that we have look to for more detailed information about these dyes in the 16th C.

Unfortunately while there is much information on the process, there are few details of the exact order or amounts to be used in historic texts. Thus, there is room for a wide variety of interpretations of these "recipes".

II. Historical Notes on Dyeing

Dyeing black from a combination of tannic acid and iron salts was common in Roman times. Various plant materials were used including all portions of nut trees. The iron mordant was made from dissolving iron in vinegar. The fabric, if it was wool, was then dyed by the *infectores* and *offectores*. Each step in wool production was handled by a separate company.[4]

As dyeing moves into the Middle Ages the Guilds take over the various steps of processing various fabrics. In Germany there is even a specific group for dyeing black called the *Schwartzfarber*. This group is less prestigious than one that dyed colors.[5]

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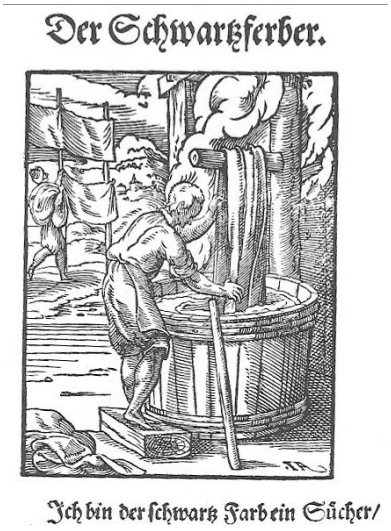
[1] Line Drawing of Rubus allegheniensis
http://plants.usda.gov/cgi_bin/large_image_rpt.cgi?imageID=rual_001_avd.tif
[2] Brunello pg. 110
[3] Brunello pg. 181
[4] Brunello pg. 110-111
[5] Brunello pg. 152

In 15th C York the dyers set out ordinances; as other dyeing guilds had done in prior centuries. There is a specific reference that dyeing may be done at any time.[6] Thus, the dyeing may occur with the raw fiber, after the fiber is spun, or after weaving. The cover illustration of this paper from Rosetti's Plictho shows skeins being dyed. Jost Amman's *Book of Trades,* originally published in 1568, has an illustration of the dyeing of fabric.



Both Brunello[7] and Rogers[8] comment that while there were naturally produced dyes they were not used in commercial production of cloth. Brunello further comments that this may have been due to the preference for brighter colors than those produced by natural tannic acids.

Various documents have recipes for dyes. The Innsbruck Manuscript was written around 1330 and contains a number of German recipes.[9] It notes using both alum and iron as mordants.

In the mid-16th C., with the advent of the printing press, there are a profusion of books published on diverse topics. One is Giovanventura Rosetti's *Plictho: Instructions in the Art of the Dyers which Teaches the Dyeing of Woolen Cloths, Linens, Cottons, and Silk by the Great Art as Well as by the Common.* It contains 108 recipes for dyes of which 20 are for black.[10] A number of these are tannins mixed with iron salts.[11] Included is one that uses common berry bramble leaves and stems to produce the tannins.

Vitriol or Vitriol Romano (green vitriol) is ferrous sulfate. It has other names such as Pisa green copperas and was commercially manufactured in Italy.[12] Recipes in the Innsbruck Manuscript request rusty iron, while recipes in Theophilis and Rosetti refer to vitriol. Iron acetate (also called ferric acetate) can be produced by soaking iron filings in vinegar[13].

[6] Rogers pg. 1770
[7] Brunello pg. 110
[8] Rogers pg. 1766
[9] Brunello pg. 152 and http://costume.dm.net/~drea/dyes/
[10] Brunello pg. 188 & 190
[11] Brunello pg. 190
[12] Brunello pg. 190
[13] Smith pg. 92

Vitriol, tannic acid, oak bark and a number of other acidic compounds were banned from the workshops of Master Dyers by decree in 1480 by Doge Giovanni Mocenigo. These had been found to be destructive to fibers.[14]

In addition, there were years of scandal in the Italian silk industry over a process for dying black, called *in goro* that was alleged to make the fabric heavier and wear poorly. The controversy lead to a decree in 1580 that only gallnut be used. It was an attempt at enforcing the earlier decree of 1546. This debate continued through to the beginning of the 17th C. [15] From the description, this sounds suspiciously like the dyers using metallic salts and then not washing the excess out thoroughly. Both of which would add to the weight of the fabric or thread and cause deterioration over time.

If we lack extant examples of tannic acid dyes, it can attributed to the a couple problems. One problem is that the dyes from such natural dye stuffs as nuts, barks and oak galls are similar to those acquired in the course of fabric being buried. Then too the acid in the dyes may have had a destructive effect on the fabrics. In addition, overdyeing was practiced and so an item identified as being dyed with madder may not reflect a prior dyeing with a tannic acid, for example. [16]

III. The Project Notes

A. Preparing the Dye Bath:
Wash well the leaves and stems of a berry vine – Rubus family. Cut into 3-6" pieces. – Note that the amount filled a small tub (15"x12"x6") but was loosely packed.

Place leaves and stems in 12 quart stainless steel pot. Cover with water – it took 3 gallons. The pot was chosen as it would impart few if any impurities into the dye bath.

Bring to a boil and simmer for 4 hours. Remove plant material from dye bath. The 4 hours was determined by the coloration of the resulting dye.

Remove 1 quart of dye liquid. Immerse 1 skein of wool* in container. Leave in overnight. Remove and rinse well. This quart and skein was designed to show the natural color provided by the resulting tannic acid from the plant materials alone.

[14] Brunello pg. 190-1
[15] Mola pg. 134-7
[16] Crowfoot: Appendix by Penelope Walton pg. 201

** 1 skein for this project is approximately 10 yards of Robin and Russ undyed but cleaned (scoured wool) which has been spun loosely.*

B. Pre-Mordanting:
In a separate pot take 3 quarts water (a sufficient amount to cover the fiber) and bring to boil. Add 1.5 teaspoons of Ferrous Sulfate (Iron) and stir to dissolve. Add in 4 oz of fiber – 6 skeins of wool and silk swatch. Simmer for 30 minutes to ensure that the Iron is dissolved and the material is thoroughly infused with the Iron dye.

Remove 1 skein and rinse thoroughly. This skein will show the effect of the dyeing from the Iron alone. The coloration will depend on the amount of Iron absorbed into the fabric.[17]

The choice of powdered Iron was to both a question of safety and convenience. See section above on historical choices. The amount chosen was to reflect the least amount sufficient to affect the necessary chemical changes as I was aiming to not have long term fiber deterioration.

C. Adding Mordanted Fiber to Dye Bath:
Remove other skeins and silk to the dye bath. Bring dye bath to a boil. Turn off the heat. Historically they may have boiled or simmered the fabric longer. However, once the chemical reaction sets in there is little more that will happen aside from the amount of absorption of the dye into the fiber (see Project Conclusions).

Remove 1 skein and silk swatch after 1 hour. Rinse well.

Remove 2 skeins after 3 hours. Rinse well.

Remove remaining 2 skeins after leaving overnight (15 hours). Rinse well.

D. Project Conclusions:
The non-mordanted fiber took on a color similar to tea dyeing which is another tannic acid dye. The color is a light tan with slight orange tones. When checked at the 1 hour and 3 hour points, it had taken very little color, but it seemed to darken overnight.

The mordanted fiber took on a brick color but in itself was not dark. It has taken on more color after drying and being exposed to the air.

[17] Leggett pg. 93

The chemical reaction of the tannic acid and the ferrous sulfate produced a light black. At the 1 hour point the reaction had set in. At the 3 hour point, there was a little more color but there does not seem to be any difference between the 3 hour and overnight. The uneven mordanting of the silk swatch caused some blotchiness in the color. The black has darkened with drying and being exposed to the air. The color is a blue/brown black.

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