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Iowa or Dye! Natural Dyes as American Craft and Horticulture

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Natural dyes are colorants derived from specific items found in the natural environment: plants, insects, animals, and minerals. A natural material that produces a dye is called a dyestuff. For example, the dye, madder, is extracted from madder dyestuff, the roots of a sprawling perennial, *Rubia tinctorum*. Many natural dyes require a mordant to permanently bond with a fiber. Mordants are usually chemical salts such as ferrous sulfate or aluminum potassium sulfate that form a bridge between the dye and the fiber. Natural dyes can be processed in several ways, including one or more water based extractions of the dye from the dyestuff, dyestuff fermentation to produce a useable dye, immersion in a dyebath, or repeated immersions in a dyebath. The traditional process usually involves at least three steps: preparing the textile to be dyed by mordanting it before dyeing; extracting the dye from the dyestuff in a water bath; and heating the mordanted textile in the water-based dye extract to produce a level color and strong bond between the dye and the fiber. However, there are many other options open to dyers including contact dyeing, extracting with a solvent other than water, fermentation, and low immersion dyeing where the water to fiber ratio is low. Commonly used mordants include aluminum potassium sulfate, iron sulfate, copper sulfate, stannous chloride, and potassium dichromate, although there are health and environmental concerns about the last three. Each paper in this section focuses on an individual dimension of natural dyes and represents a small sample of the work created with natural dyes. None of us covers the entire spectrum possible with the hundreds of natural dyes used by dyers today and in the past.

Natural dyers often describe dyed fabric by identifying the dyestuff; the mordant, and the processes used to extract the dye and dye the fabric. Cultural expression reveals the multi-dimensional environment in which a fiber artist lives and works and reflects the technologies within that environment. The use of natural dyes reflects my personal philosophy. The images shown in this paper reflect my work. All these pieces are dyed with natural dyes, but use a variety of dyes, mordants, and processes. Natural dyes ground me in the present, but they also connect me to the past and future. Most of my Iowa-grown dyes are used fresh. So, in the present, I harvest and dye, usually on the same day. Often, I use contact dyeing,[1] a process making use of solar energy, fresh and found materials, liquids, and mordants to develop color and bond the dye to the fiber. Several textiles described in this paper were made using this dyeing method. I also use traditional immersion dyeing, resist dyeing methods, additional extractions, and repeated dips. Historical connections occur as I explore the techniques, processes and resources that have been used by various cultures to achieve specific colors and create visual impressions and patterns. Future connections occur as I explore innovations in processes,

1. Kadolph, Sara J., & Casselman, Karen D. In the bag: Contact natural dyeing. *Clothing and Textile Research Journal* 22, No.1/2 (2004): 15-21.

mordants, and new dyestuffs that minimize environmental problems. Natural dyes motivate me to be more experimental, more creative, and more expressive.

The natural dyes I use in my pieces are a renewable resource. I use two types of natural dyes: Iowa-grown and exotic. The exotic dyes are the ones I have to purchase. The Iowa-grown dyes connect me to horticulture because I grow them myself or harvest them locally. I love the complexities of the colors derived from natural dyes and enjoy the serendipity of the results of experimenting with them.

My position as a university educator and researcher, my knowledge and training in textile science, my background as the daughter and sister of farmers, my work as a master gardener, and my experiences in working with textiles often create interesting synergies. The images in this paper illustrate where the craft of dyeing, the study of horticulture, and the understanding of laboratory research interact, interconnect, and complement each other. Each image demonstrates several aspects of my creative and research work. Most of the slides are close-ups of pieces made using dyestuffs harvested within a few miles of my home or ones I grow on my farm. I prefer using flowers with lots of pigment in their petals. While not all intensely colored flowers work well as dyes, I enjoy experimenting with them and the serendipitous nature of using them for dyeing. I am frequently surprised at the results when I use a new flower in my dyeing.

The piece shown in Figure 1 was made using red and yellow beets, Osage orange, and daylilies using traditional immersion dyeing, contact dyeing, and microwave dyeing. I've been working with beets to identify a technique get a red or pink color for several years and have discovered that extended microwave dyeing works best. However, most of the red is from the daylilies. Other materials used included oxalic acid, acetic acid and sodium chloride. The yellow beets and Osage orange were added via resist immersion dyeing to silk pre-mordanted with aluminum potassium sulfate. I used contact dyeing for two weeks and solar energy with the daylilies.

Figure 1. *Silk chiffon contact dyed with beets, Osage orange, and daylilies.*

I like to work with elderberry (*Sambucus canadensis,* a common native shrub found throughout Iowa. Occasionally, the blue-black berries are used to make jam, jelly, or wine. It is usually found in ditches, along fencerows, and on edges of woodlands.

Different colors can be achieved with elderberries depending on the several variables: mordant, amount of heat used in extracting the dye, and number of extracts. Purple or maroon is most often produced by the first extract while blue is usually more consistent with the third extract. Use of ferrous sulfate will create browner areas while copper sulfate will produce green areas. The piece shown in Figure 2 was created using contact dyeing with resist areas.

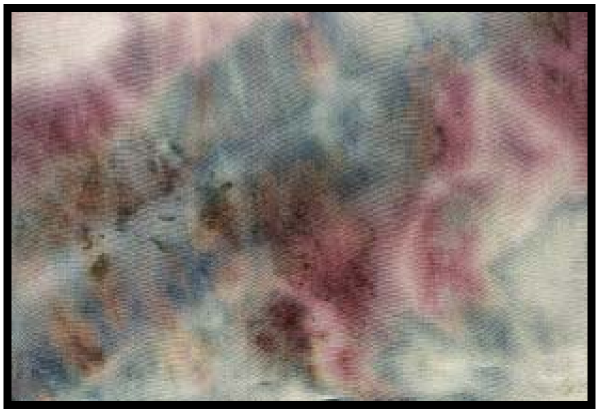

Figure 2. *Silk crepe de chine contact dyed with elderberries.*

Resist processes fascinates me. There are only a few artists who combine resist methods with natural dyes and many of them work with indigo. Figure 3 shows a piece of silk chiffon dyed with goldenrod in an immersion process. After it was dry, it was pleated and wound around a PVC pipe, wrapped with thread, aphids harvested from goldenrod were crushed onto a portion of the surface which was then wrapped with a few lengths of barbed wire, dipped in soy milk (processed from my brother's soybeans), wrapped in plastic to keep the dyes and fabric moist, and solar dyed for 10 days.

Figure 3. *Silk chiffon dyed with goldenrod and resist dyed with aphids.*

Walnut hulls (*Juglans nigra*) are one of my favorite dyes. I have three walnut trees on my farm, but one tree gives a wider and richer range of colors than do the other two trees. Figure 4 is another piece that was dyed in a microwave oven. I used a piece of folded silk crepe de chine, pressed the folds in, rolled it into a tight bundle, secured the bundle, and injected dye into the bundle. The black walnut dye had fermented for several weeks.

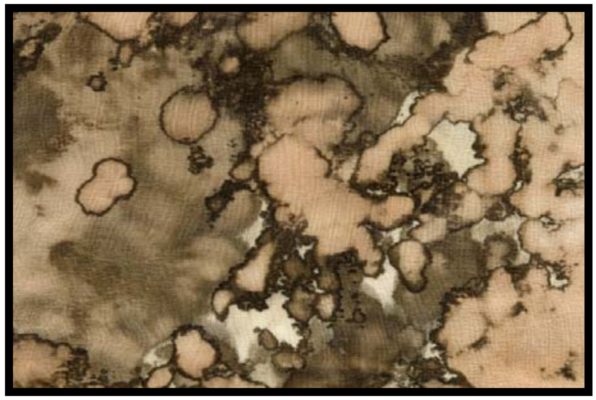

Figure 4. *Silk crepe de chine microwave dyed with black walnut hulls.*

The textile in Figure 5 was contact dyed using two large black iris flowers and the stamens from several iris and tulips. The black streaks are from the stamens.

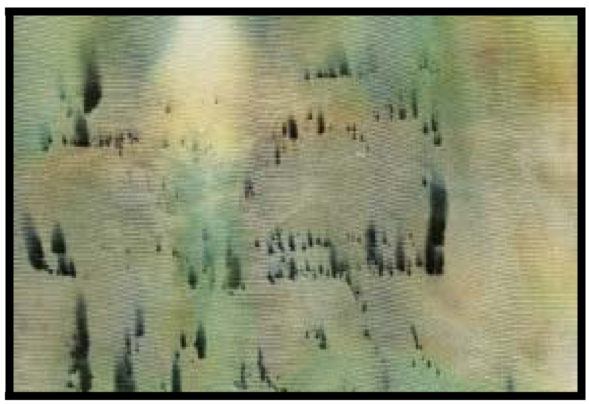

Figure 5. *Silk crepe de chine contact dyed with iris and tulips.*

Although most of my work is with silk, I'm also intrigued by how naturally colored or naturally pigmented wool will accept natural dyes. Figure 6 shows a nuno silk and wool piece dyed with cochineal with aluminum potassium sulfate as the mordant. I used different colors of wool fiber (white, camel, light tan, grey, fawn, and brown) when felting the wool through silk gauze. The piece was dyed after felting.

Figure 6. *Silk gauze and wool nuno felt dyed with cochineal.*

Figure 7 shows a piece that combines Iowa grown and exotic dyes: cohineal beetles, parsley, catsup, cloves, and marigolds and was oven dyed. I used a contact dye method, but placed it in a hot oven as a heat source.

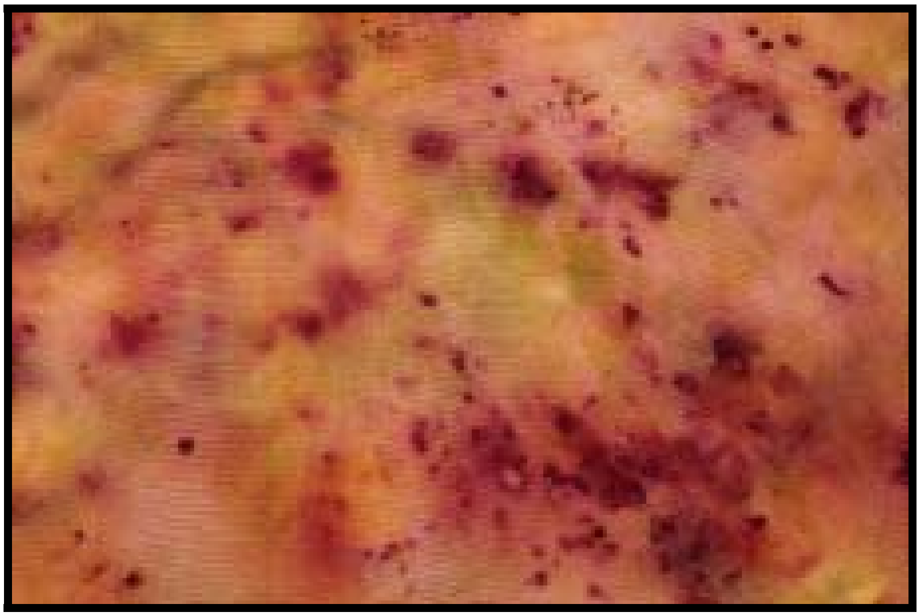

Figure 7. *Silk habutai contact dyed cochineal, parlsey, catsup, cloves, and marigolds.*

Because cabbage is so sensitive to mordants, I made a series of pieces using contact dyeing to explore the potential with the cabbage. I used equal weights of cabbage from the same large head, equal amounts of weak acetic acid or water, and equal amounts of sodium chloride. All pieces were the same size initially and all from the same bolt. I used the same folding method, the same hammer, and pounded them an equal number of times. In the 15 samples created, I varied mordant or combined mordants to determine the range of color possible with this dyestuff. Intense blue occurred with alum and copper and one week of contact dyeing. Less intense colors were achieved using aluminum foil, copper, and two weeks of contact dyeing.

Figure 8. *Contact dyed with purple cabbage: alum and copper (left), aluminum foil and copper (right).*

I have explored several other avenues in my research: fermentation of dyes, repeated dyeing of a single textile in the same bath, multiple extractions, and exploration of alternative mordants. Fermentation is used to achieve color in some dyes – notably indigo, woad, and some lichen dyes. The impact of fermentation on more traditional dyes had not been explored. I studied the process of fermentation – hard to find much about it other than in brewing beer or wine or in making bread or cheese. The rust to peach colored samples are fermented with black walnut using a vinegar to shift the fermentation more acidic. Each sample represents a different extract from the fermented walnut hulls. The most intense color is from the first extract. While the lightest color represents the tenth extract. As you can see, there is a difference between each extract. The purple samples represent four mordants on silk with purple cabbage. The mordants used were alum, iron, potassium sulfate, and calcium sulfate. Potassium sulfate and calcium sulfate are rarely used as mordants, but are relatively readily available, low cost, and have minimal impact on the health of the dyer or on the environment.

Figure 9. *Nontraditional mordants on silk (left) and fermented black walnut on silk (right).*

In my work as a professor, author, artist, and textile researcher, natural dyes reflect technology and express empirical and ecological knowledge. My materials are a renewable resource. In my work I use a variety of natural dyes applied through innovative methods. My approach conveys that I am concerned about the land, crops, climate, and the interconnections that link me to farm women in earlier generations of my family. Dyes go beyond craft for growing natural dyes locates me within the wider family of humankind where cloth production, including dyeing, was for thousands of years, part of women's daily experience.