Introduction

Two varieties of natural dye plants were planted in the summer of 2014 at Elkus Ranch. The general goal of this trial was to document planting, watering, growth and vigor in order to assist the home gardener in their seed selection and seed saving. This study was conducted in Zone 17 coastal climate.

Statement of Intent

The intent of this study was to test the vitality, productiveness, and appearance of two varieties of natural dye plants: Polygonum tinctorium (Japanese Indigo) and Coreopsis-tinctoria (Tickweed). They were planted in raised beds filled with straw and manure compost in Zone 17 coastal climate.

Background

Polygonum tinctorium, (aka Persicaria Tinctoria) a frost tender annual, is a member of the Polygonaceae family and is informally known as knotweed and smartweed. P. tinctorium likes fertile soil, heat and humidity but will grow almost anywhere when fresh seed from the previous year's harvest is used. Common names include Japanese Indigo and Chinese Indigo. P. tinctorium is native to Eastern Europe and Asia. The leaves are a source of indigo dye. The compound indican, which yields an indigo dye, is present in the leaves. P. tinctorium will be referred to its common name, Japanese Indigo, in this report.

Coreopsis-tinctoria, a somewhat drought tolerant annual, is a member of the Asteraceae family. This quick growing North American native found especially in the Great Plains is commonly referred to as Tickseed, plains coreopsis and calliopsis. The leaves of C. tinctoria are pinnately divided, smooth, and glossy while its flowers are brilliant yellow with brown centers. The Zuni people who live along the Zuni River in western New Mexico use the pigment from the blossoms to make a mahogany red dye for yarn. C. tinctoria typically flowers in midsummer, grows best in sandy or well-drained soil and prefers full sun. C.tinctoria will be referred to as Tickseed in this report.

Methodology

June 26, 2014 Japanese Indigo was seeded into a flat in the greenhouse for a more controlled growing environment. The soil medium was made up of 1 part each of sifted compost, vermiculite and perlite. The Japanese Indigo seedlings were misted daily in the greenhouse.

Tickseed was directed seeded into the raised bed without a cover and received 15 minutes daily of drip irrigation through spray emitters which was approximately 1 gallon of water daily.

July 24, 2014 Tickseed failed to germinate. A 2nd batch of Tickseed was directly seeded into the same raised bed and a sheer cloth cover was added to protect from predatorily pests such as birds that might eat the seed.

Half of the flat of Japanese Indigo seedlings from the greenhouse were transplanted into a raised bed of finished compost. These seedlings were watered by drip emitters for 15 minutes daily.

July 31, 2014 The seedlings in the Tickseed bed looked like dandelions.

Japanese Indigo was transplanted from the flat in the greenhouse into 2 raised beds. To protect the young seedlings from direct sun and pests such as birds, the beds were covered with sheer cloth.

August 14, 2014 The plants I thought were Tickseed turned out to be dandelion.

The Japanese Indigo seedling leaves were partially eaten and some completely removed by predators possibly sow bugs or earwigs) that were able to go under the sheer protective cover. I added a barrier (a 4" plastic pot with bottom cut out) around each seedling to protect them. I also sprayed Garlic oil repellent for protection and continued to use a sheer cover secured over seedlings.

August 21, 2014 In addition to the drip irrigation, I began manual watering of the Japanese Indigo plants once a week with a fine mist. In one bed, more than ½ the plants showed signs of being eaten by pests (possibly sow bugs or earwigs) while the plants in the other bed appeared healthy with most leaves intact.

September 4, 2014 I combined the plants from the 2 Japanese Indigo beds into one bed, the one with the healthy plants; the 14 plants appeared healthy and seem to be thriving.

September 18, 2014 The plants in the Tickseed bed were dandelions and were removed. The Tickseed trial ceased at this point.

Japanese Indigo plants were almost a foot tall and thriving.

October 2, 2014 Japanese Indigo plants continue to thrive. I removed the protective sheer cover from the Japanese Indigo so the plants had more room to grow.

October 9, 2014 Japanese Indigo plants generally appeared healthy. I noticed some leaf curl and sunburn which happened after I removed the sheer protective cover. The removal created an increase in sunlight/temperature. Flower stems were starting to appear on most plants.

December, 2014 Japanese Indigo plants in full bloom.

1 Japanese Indigo Plants in Full Bloom

January, 2015 I harvested the Japanese Indigo seed by pruning the plant which was mostly dried. I took the dried flower shafts which held the seed and shook the seed heads into a large, brown bag. I then saved the dried seed in a mason jar.

Results

The **Tickseed** seeds failed to germinate on both attempts. Possible reasons for this failure to germinate could be: (1) soil too rich; (2) seed not viable; (3) overwatering; and (4) planted too late in the season.

The **Japanese Indigo** seedlings got off to a rough start and we lost approximately 1/3 of the seedlings. Some unseen and undetermined pest ate the leaves and some stems. However, the remaining seedlings proved robust and thrived producing a healthy harvest of seeds that were collected and saved for future use. The dark green leaves were attractive and numerous while the miniature pink flowers were eye catching. I harvested the Japanese Indigo seed by pruning the plant which was mostly dried. I took the dried flower shafts, which held the seed, and shook the seed heads into a large, brown bag. I then saved the dried seed in a mason jar that stayed in the dry, shaded garden shed.

Table 1

Variety	**Days to Germination**	**Days to Harvest**
Tickseed	Failed to germinate	n/a
Japanese Indigo	7-14 days	**Leaves** – approx. 165 days **Seed** – approx. 210 days

Table 2

Variety	**Vitality/Disease Resistant**	**Productiveness**	**Appearance**
Tickseed	n/a	n/a	n/a
Japanese Indigo	Good once established	Good	Dark green, luscious leaves with attractive miniature pink flowers

Conclusion

I recommend growing Tickseed again with the following conditions: (1) planting in poor, sandy soil; (2) using other seed sources; (3) watering less; and (4) planting seeds earlier in the spring since the normal flowering period is July to August. The Japanese Indigo seeds started in the greenhouse and transplanted into a covered bed yielded healthy and productive plant leaves and seed. The leaves of the Japanese Indigo can be harvested and used to dye yarn a color between blue and violet, indigo. The pink flowers can be allowed to die off and then the seed can be collected by shaking the dried stalk and seed head into a large bowl or paper bag. Use the seed to plant Japanese Indigo next spring. Please refer to the dye recipes that follow. Tickseed uses the flower for dye while Japanese Indigo uses the leaves for dye.

Addendum

In April and May I seeded a flat each of the harvested Japanese Indigo seed from January in hopes of having plants for Elkus for Sheep to Shawl. However, only one plant made it from the April flat and 4 plants made it from the flat planted in May. Approximately 30 seeds were planted in each flat. The seed was not viable possibly due to planting and harvesting it late.

For more information, please contact the Master Gardener Help Line at (650) 726-9059 ext. 107 or email your inquiry to: mgvhelpline@ucdavis.edu

Japanese Indigo Dye Recipe by Rita Buchanan

Strip the leaves from stalks and cram them into a gallon glass jar (or a plastic bucket or a stainless steel or enamel pot -- any non-reactive container). Fill the jar with water and place it in another pot on a trivet or some jar lids (you are creating a double boiler). Over the course of one hour (or longer), slowly bring the temperature to 160 degrees F. Do not (ever) exceed 180 degrees F.

Strain out and compost the leaves, pour the brown liquid into a bucket or other large non-reactive container. Add ammonia (buy the NON-sudsing kind) at the rate of 1 fluid oz/gallon of dye liquid to make the vat alkaline. The goal is to maintain a pH of 8-9 throughout. Now pour this liquid back and forth between 2 buckets for 5 minutes to get as much air into the vat as possible. The liquid will turn blue and a bit foamy. Allow the vat to cool some and return it to the double boiler (which is itself cooling). The goal from here on out is to maintain a temperature of 110-130 degrees F.

There is one more step before you can dye. The vat must be reduced (the air removed) and turned to "indigo white" which is actually a sort of chartreuse green. To do this, add Sodium Hydrosulfite (you can buy this as Rit Color Remover from the grocery store or a craft store – once opened it goes bad from exposure to air and moisture) at the rate of 1/2 teaspoon/gallon of dye liquid. Stir gently, remembering not to get more air in the vat. It might take another hour to reduce, you will see the vat change color.

Pre-wet your yarn or fabric. It should be thoroughly saturated, then the excess water squeezed out. Now you may slide skeins or fabric into the vat (still, no air), swish them around gently under the surface and leave them for about 20 minutes. Draw the yarn or material out of the vat (gently squeezing out the excess but not splashing --no air into the vat), and shake it around to oxidize. Magically, before your eyes, it will turn to yellow to green to blue. For darker shades repeat the process (oxidize for 1/2 hour between dips) until the vat is exhausted. You may want to add more ammonia to maintain the pH, or more hydrosulfite if you get too much air into the vat, or more heat to maintain the temperature.

Buchanan, R. (1995). The Dyer's Garden: from Plant to Pot, Growing Dyes from Natural Fibers. Colorado: Interweave Press.

Coreopsis Dye Recipe by Rebecca Burgess

(The author, Rebecca Burgess, uses a solar oven for all coreopsis dye making. The sun-oven always cooks the flowers and fiber within a day; it is a reliable, simple, and efficient tool.)

Ratio of 1:1, fresh flower weight to fiber weight

Fibers premordanted in alum

Start the dye making early, before 10:00 AM, to ensure that the strongest sunlight of the day will be captured. Add flowers to a glass jar and cover them generously with hot tap water. You will begin to see the clear water change to yellow in the first five minutes. Place your jar in direct sunlight in an outdoor environment. As the light changes throughout the day, make sure to move the jar accordingly. Fiber, yarn, or bits of fabric can be added to the dye bath once the color of the solution has turned orange (this can take anywhere from 2 to 4 hours in direct sunlight).

Keep your fibers in the jar, with the lid on, for the rest of the day. The outdoor temperature determines the speed at which the dye will set—the warmer the air, the faster the processing time. Check the color periodically throughout the afternoon and remove the fibers when you observe a strong orange or yellow/orange color, based on your preference. Once removed hang the yarns until they are room temperature. Then, gently rinse them in warm or cool water and hang them to dry completely. Leaving the fibers in overnight or over a period of two days will strengthen the color.

Burgess, R. (2011). *Harvesting color: How to find plants and make natural dyes*. New York: Artisan.