A Santa Cruz Compendium of Plant Dyes

This endeavor will identify the most important dye plants within the general vicinity. The task will be a continuous project although at present it is limited to the winter quarter of 2021. These extractions demonstrate the color results of early springtime growth. Considering the seasonal aspect of potential colorants, fresh material is known to have the best color quality. However, several local dyestuffs collected over the years will be useful to study. This project will involve an ongoing effort to size up an array of materials which will be documented at later dates. Re-establishing the UCSC Dyers' Garden might involve transplanting local plants along with the purchase of traditional dyestuffs. I will be interested in pursuing this endeavor beyond my academic coursework. My ultimate idea for the final project will be an illustrated botanical accordion book with a narrative on the swatch colors defined by mordants and conditioners. Again, the project could be open ended because the book can be extended indefinitely.

An alternative creative venture is the of design a watercolor palette using historical dyestuffs. This would invariably involve some testing for best results. Yet with a limited palette in green, yellow, red, blue, purple, and black I will recreate an historical botanic illustration from the late eighteenth century Royal Botanical Expedition to New Spain (Mexico).

The following citations are used in the corroboration of this ongoing color research.

Specific plant localities

Invasive species †

Calflora https://www.calflora.org/mindex.html
Locations of known species in Santa Cruz County in green text.

Species identifications

Linda H. Beidleman and Eugene N. Kozloff 2014. ***Plants of the San Francisco Bay Region Mendocino to Monterey.*** University of California Press | 2014
DOI: https://doi-org.oca.ucsc.edu/10.1525/9780520958234
Page numbers listed below in black text.

Dye and mordanting information

Cannon, John and Margaret 1994. ***Dye Plants and Dying***. Ill. G. Dalby-Quenet. Timber Press, Portland Oregon.
Page numbers listed below in blue text.

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1 †*Acacia baileyana, A. longifolia,* ***A. melanoxylon****, A. dealbata, A. decurrens* 48, 179, 181-182. 42

Cootamundra wattle, long-leaved wattle, **Australian blackwood,** silver wattle, black wattle.

© 2008 Neal Kramer *A. melanoxylon*

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2 †***Allium cepa*** 19, 29, 62, 319-321. 84. **Commercial onion**.

3 †*Anthemis cotula* 87, 110. 46. Stinking chamomile.

4 ***Berberis aquifolium***, *B. nervosa, B. pinnata* var. *pinnata, B. vulgaris* 46, 122. 78. Mountain grape.

5 †*Carthamus lanatus* 96-97. 92. Woolly distaff thistle.

6 ***Ceanothus thyrsiflorus var. thyrsiflorus*** 12-13, 26, 288. **Blue blossom**.

IRON - silk

ALUM - linen

COPPER - linen

7 †***Cosmos sulphureus, C. bipinnata*** 40. **Cosmos**.

applewoodseed.com *Cosmos sulphureus*

edenbrothers.com *Cosmos bipinnatus*

COPPER

ALUM

IRON

TIN

GALLIC ACID

GALLIC / ALK

8 †***Cytisus scoparius***, *C. striatus* 17, 189, 174. 38. **Scotch broom**, Portuguese broom.


© 2011 Vernon Smith


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9 †***Dahlia imperalis***, ***D. pinnata***, *D. rosea, D. coccinea*


easytogrowbulbs.com Yellow Star


© 2008 Eric Hunt *D. imperialis*


mundoecologia.com.br *D. Pinnata*


anniesannuals.com *D. coccinea*

10 †***Eucalyptus globulus***, *E. sideroxylon, E. viminalis* 43. 48. 229. 52. **Blue gum**, red iron bark, manna gum.

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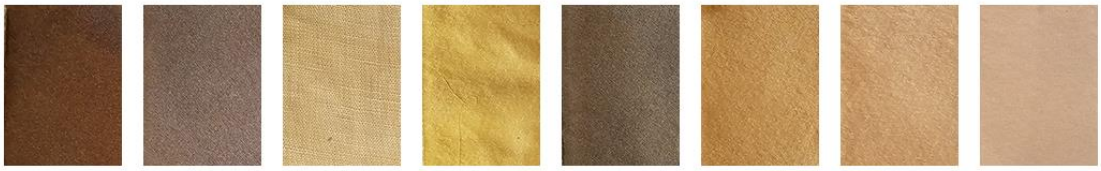


- Red flowering gum - Eucalyptus ficifolia Scientific classification: *Corymbia ficifolia*.

LaboratorTEBA

11 †*Fallopia convolvulus, F. japonica* 274. 70. Buckwheat, Japanese knotweed.

12 *Frangula californica* California coffeeberry.

13 †*Genista monosperma, G. monspessulana* 13, 179, 184. 38, 48. French Broom, Bridal broom.

14 †***Ginko biloba*** {inner bark} **Ginko**.

15 †***Hedera helix***, *H. canariensis* 39, 83-84. 68. Ivy, English.

16 *Hypericum anagalloides* 16, 62, 205-206. 96. St. John's wort.

17 *Juglans hindsii* 16, 47, 206-207, 306. 30. Northern California black walnut.

18 †*Matthiola incana* 134, 144. 108.

19 †*Nymphaea odorata* 231. 110.

20 ***Oxalis californica***, *Oxalis pilosa*, †*O. pes-caprae* 64, 224, 244-245. 16. **California wood sorrel**, hairy wood sorrel, and Bermuda wood sorrel.

atozflowers.com

21 †***Persea americana*** Avocado.

22 *Polygonum paronychia, P. hickmanii* 9, 20, 274-275. 70. Dune knotweed.

23 *Populus fremontii*, †*P. nigra* 'Italica' Cottonwood. Lombardy Poplar.

24 *Pteridium aquilinum, P. aquilinum var. pubescens* 31. 21. Bracken.

25 *Quercus agrifolia, Q. chrysolepis, Q. parvula, Q. parvula var. shrevei, Q. kelloggii, Q. wislizeni, Q. dumosa* 195-198. 28. Coast live oak, gold cup live oak, Santa Cruz Island oak, Shreve's oak, California black oak, interior live oak, shrub oak.

26 *Rhamnus californica* 26, 40, 285. 88. Buckthorn. [see *Frangula californica*]

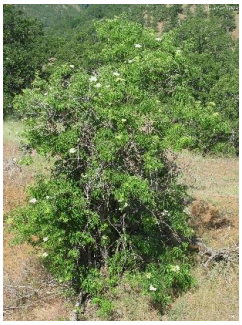
27 *Rhus ovata* 118. UCSC Arboretum. Sugar sumac.

28 †***Rubus armeniacus***, †*R. ulmifolius* 12, 27, 46, 290, 294. 34. Bramble (Blackberry)

29 *Salix exigua, Salix lasiandra*, *Salix laevigata, Salix lasiolepis* 298-300. 58. Willow.

30 ***Sambucus nigra* ssp. *caerulea***, *S. nigra* 50. **Blue elderberry**, black elderberry.

© Trude Hurd 2009 Flickr Blue elderberry



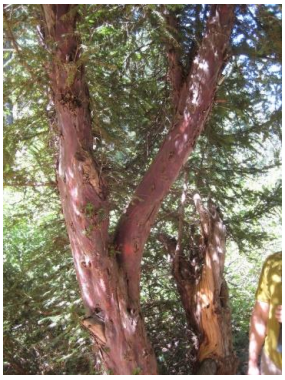
© Paul Slichter 2009

© Flit 2008 Flickr Blue elderberry

31 †*Scabiosa atropurpurea* 169, II. 100. Pin cushion flower, Honeysuckle.

32 †***Targetes patula, T. erecta* 116, 264. 54. Marigold, cempasúchil.**

33 *Taxus brevifolia* 2. 34. 38. 116. California yew.



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33 *Urtica dioica* **ssp. *gracilis*** 59, 65, 311. 82. **Nettle**.


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WATERCOLORS FROM DYESTUFFS

Extraction

Water soluble dyestuffs are brought to a boil with finite quantities of mordents added to achieve specific hues. Flowers are softened by boiling with or without mordant and the liquid expressed from the pulp. Fruits containing sugars provide nutrients for biological organisms and should be fermented into an alcohol or vinegar, then struck on an appropriate base. Fermentation may produce stronger color in some dyestuffs, alcohol being another solvent for organic colorants. Indigoids are insoluble in water once dry; however, the solute may be painted onto a substrate or struck on a base, while dried indigo is made soluble in alkali.

Mordant

The mordant forms a base for lake pigments while altering the hue of organic colorants by molecular coordination and pH. Although some of these compounds will prove less stable, the basic chemical types include oxides, carbonates, sulfates, nitrates, chlorides, alkalis, and acids.

HISTORIC MORDANTS AND CONDITIONERS

Al ... **ALUM** $KAl(SO_4)_2 \cdot 12H_2O$ [Hydrous potassium aluminum(III) sulfate] Alunite. Sp. *Alumbre.*

The most common mordant used for clear, bright colors.

Fe ... **FERROUS SULFATE** $FeSO_4 \cdot 7H_2O$ [Hydrous Iron(II) sulphate] (green vitrol) Melanterite. Sp. *Alcaperrosa verde.*

Hydrotrollite $FeSO_4 \cdot n\ H_2O$; and Pyrites FeS^{-} (Sp. *Margasita*). Saddens colors: darkening toward black.

Cu ... **CUPEROUS SULFATE** $CuSO_4 \cdot 5H_2O$ [Hydrous copper(II) sulphate] (blue vitrol) Calcanthite. Sp. *Alcaperrosa azule.*

Used for blues and to blue the colors.

Sn ... **TIN** SnCl [Stannous(II) chloride] Sp. *Estaño*. Tin oxide treated with muratic acid was used to intensify colors from 1630.

Pb ... **LEAD ACETATE** $Pb(C_2H_3O_2)_2$ [Lead(II) ethanoate] (sugar of Saturn) Sp. *Plomo*. Used from medieval times in Europe.

Ca ... **Calcium acetate** $Ca(CH_3COO)_2 \cdot H_2O$ [Calcium(II) acetate] Made historically from eggshells ground in vinegar.

CaO ... **Lime** CaO [Calcium oxide] Sp. *Cal*. Burnt calcium carbonate; calcite, chalk, limestone or marble heated to 770° C.

When added to water this becomes calcium hydroxide or slaked lime, but when dry it is the mineral portlandite $Ca(OH)_2$.

Na ... **Soda** $Na_2CO_3 \cdot H_2O$ [Sodium carbonate] Natron. Sp. *Tequesquite*. An arid alkaline efflorescence that intensifies color.

K_2 ... **Potash** K_2CO_3 [Potassium carbonate] (lye) Sp. *Lejía*. An alkali from evaporated lixivium of vascular plant and wood ashes.

KN... **Saltpeter** KNO_3 [Potassium nitrate] Niter. Sp. *Nitro*. Including Soda niter $NaNO_3$ [Sodium nitrate]. Used for bright color, yet sometimes confused with natron, the more common mineral efflorescence.

Ua ... **Uric acid** $C_5H_4N_3O_3$ From urea comes an odorless tasteless crystalline compound, forming ammonium NH_4 when stale.

Aa ... **Acetic acid** $HC_2H_3O_2$ (vinegar - citric acid) Created from alcohol or occurring in fruits, especially limes (Sp. *Lima*).

Tn ... **Tannic acid** $C_{76}H_{52}O_{46}$ Sp. *Tanino*. Tannin from the bark, wood, leaves and seed pods of oaks, redwoods or logwoods.

Gc ... **Gallic acid** $C_7H_6O_5$ Gallnut. Sp. *Chompas, Espuma*. A foam gall produced by oak leaves in defense of an insect bite.

Tt ... **Tartaric acid** $HOCC(CHOH)_2COOH$ (cream of tartar) Sp. *Tartaro.* Purified wine sediments used to brighten color.

Lake Base

Along with the metallic mordants, some of the early substrates used for lakes included calcite, gypsum, white lead and powdered cuttlefish bone. Clay may also form the base for lake pigments and attapulgite, bentonite, illite, kaolinite, montmorillionite, palygorskite, saponite and sepiolite have all been used for the purpose. Clay minerals are generally composed of hydrous magnesium and/or aluminum sheet silicates. In addition to serving as a base for lakes, clay enhances viscosity while imparting an unctuous quality to the paint. Due to the lower light refraction of minerals in media, the color may dull, and so only a very small amount of base will produce the best quality lakes.

Media

Acting as an adhesive and protecting agent, the media can improve flow, rendering a colorant more sympathetic to brushing. A general list of natural adhesive substances used for painting includes gum, resin, latex, wax, oil, albumen, protein, collagen and gelatin. From pre-Renaissance times in Europe, gum Arabic wa

s added to the dye bath of the organic lakes used in manuscript painting.

Intaglio print of *Datura metel* S&M painted with historical watercolors.