Streptocarpus Color Genetics

The Genus Streptocarpus

- subgenus Streptocarpus
- subgenus Streptocarpella
  - section Streptocarpella
  - section Saintpaulia

Flower Shape Genes

- Double blossoms
- Ruffles
- Peloric (star-shaped) flowers
- Flowers per stalk
- Flower stalks per leaf

Flower Shape Genes

Double blossoms: 3 kinds of mutations

- Convert anthers into more petals
- Convert pistil into more petals
  - These both result in partially or fully sterile blooms, since some of the sexual parts are now petals instead
  - In both cases, the development process fails at a differentiation step: tissue that should have switched from “petal” to anther or pistil tissue continues to develop as extra petals
- “Make two of everything”
  - Here, you get a “Siamese twins” effect where two pistils are fused partially together, twice as many (half-sized) anthers are formed, and twice as many petals form from the same base tissue
  - This often has partial or full sterility also
- All three kinds are dose-dependent: double dominants will be more double than plants with one dominant allele and one recessive allele

Flower Shape Genes

- Ruffles
  - Also dose-dependent, so crossing two ruffled parents should result in (at least some) more-ruffled offspring
  - But there may also be fertility issues, since ruffles seem to be related to the doubling (growing twice as much tissue in the petals)

Flower Shape Genes

- Peloric (star-shaped) flowers
  - May be related to Saintpaulia “star” gene
  - In Saintpaulia, this is a single-locus recessive (two stars always give you stars)
  - In Streptocarpus, I have seen occasional peloric flowers on otherwise normal plants, so this may involve a different mutation in the two subgenera

Flower Shape Genes

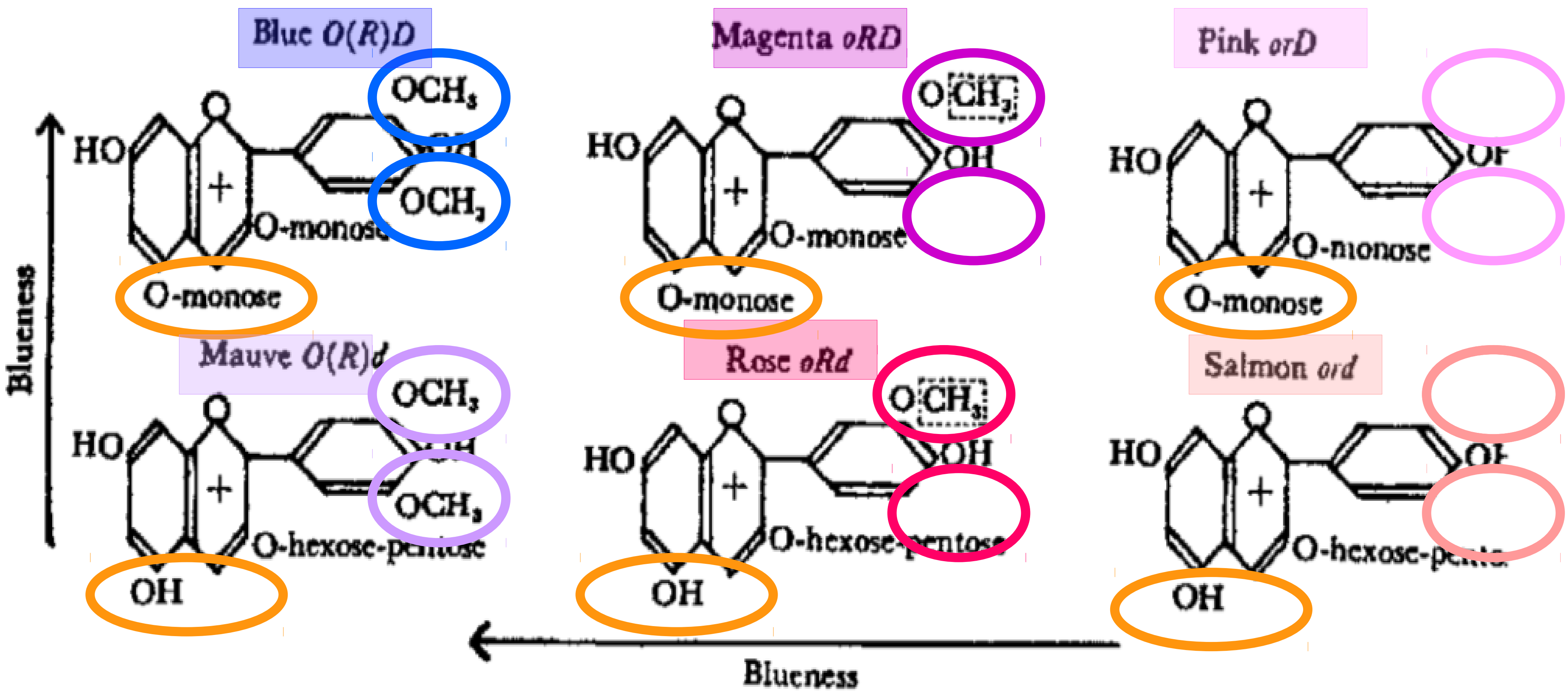
- Flowers per stalk and stalks per leaf
    - Treated as a complex trait (like height in humans), rather than an easily selectable yes/no
    - Choose plants that have many flowers per stalk in their first two bloom cycles
    - Choose plants with higher numbers of stalks per leaf in their first bloom cycles

Flower Color Genes

Overall, colorless anthocyanin precursor molecules are decorated with methyl groups and sugars that cause pigmentation

Several different steps are required to reach the wild-type blue, and mutations that “break” any of these synthesis steps will result in non-blue colors

Flower Color Genes



Flower Color Genes

- The genes that causes the previous color sequence are called the ORD triple
- D causes the (orange-circled) second sugar to get added, resulting in the pink/magenta/blue series
- R adds a methyl group to pink or salmon pigments (leading to magenta or rose)
- O adds a second methyl group to magenta or rose, resulting in blue or mauve
- These are equivalent to the Saintpaulia pigment synthesis sequence, although the genes have different names in the two groups.

Flower Color Genes

Overall, colorless anthocyanin precursor molecules are decorated with methyl groups and sugars that cause pigmentation

Several different steps are required to reach the wild-type blue, and mutations that “break” any of these synthesis steps will result in non-blue colors

Another gene controls a “bluing factor”, a colorless copigment which intensifies blue in the blue/magenta/pink series but muddies the salmon/rose/mauve colors (and the equivalent coral pink/coral red/coral blue series in Saintpaulia)

Flower Pattern Genes

- Streps have retained several flower-patterning genes that Saintpualia no longer express.
- This is probably due to Saintpaulia's switch to pollen-fed pollinators: they no longer have long-tube flowers with nectaries, and thus no longer need nectar-guiding patterns to show their pollinators where to aim.
  - (Wild-type) Saintpaulia use the bright yellow pollen sacs centered in flat blue flowers as a “bulls-eye” target for their pollinators
  - Streps use guidelines, yellow throat patches, and dark blotches to guide their pollinators to the flower tube center

Flower Pattern Genes

- Yellow throats (“Y” gene, for yellow)
- Guidelines (“L” gene, for lines)
- Darker patches of overall color in the center of the lower petals (“B” for blotch)
- There are also two genes that allow expression of any pigment (“V” and “F”)
- And a final gene for Intensity (“I”) of color expression (dilute, saturated, or medium)

Flower Pattern Genes

Yellow throats (“Y” gene, for yellow):

- This is a pair of genes (Y1 and Y2) closely linked
- They inherit along a mostly Mendellian model, which means you can treat them as a single on-off switch most of the time

Flower Pattern Genes

Guidelines (“L” gene, for lines):

- These lines are independent of the Blotch and petal coloring
- Their purpose in nature is to serve as literal guidelines: in UV photographs, they show up as bold lines against the flower background, pointing insects and birds toward the tube center where the pollen and nectar are.


FR
Guidelines
x self
Seedling
3.00

Flower Pattern Genes

Darker patches of overall color in the center of the lower petals (“B” for blotch)

- This gene expresses as an intensification of whichever color is already present: more pink pigment in pinks, more blue pigment in blues, etc
- Like the guidelines, its purpose is to add emphasis to the center of the flower

Flower Pattern Genes

There are also two genes that allow expression of any pigment (“V” and “F”), and a final gene for Intensity (“I”) of color expression (dilute, saturated, or medium)

- Intensity is a dose-effect gene, so II is most saturated, Ii is medium pigmentation, and ii is pale pigment
- V and F are probably genes that build the colorless precursor anthocyanins, which have been found in “v” and “f” forms in some wild species that have white flowers.

Citations

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- The Gesneriad Reference Web: http://www.gesneriads.info
- The Gesneriad Society's web page, especially the registry of varieties and the reference pages

- (Photos are from the GWGS 2018 show, taken by Sarah Ingalls)