Department of Plant and Soil Science
University of Vermont Extension

Color in Flowers OH 24

Dr. Leonard P. Perry, Extension Associate Professor

The main reason most of us grow flowers is for their colors. The color provided by flowers and their combinations, and the feelings these evoke, is the main reason I and others I know garden. Yet what makes flowers the color they are, and how can you describe these to others?

What may seem simple on the surface is really a lot more complicated than you might think underneath, and in fact, underneath the surface of the leaf. Color we see in flowers is actually the result of reflected light from various plant pigments. A group of compounds called "anthocyanidins" are the basic ingredients. They are named for flowers in which they were first found, such as the scarlet "pelargonidin" from the geranium or *Pelargonium*, the purple "petunidin" from the *Petunia*, or the blue-violet "delphinidin" from the *Delphinium*.

It is these anthocyanidin pigments that biotechnologists are studying to change flower colors. For instance, they've taken the scarlet pelargonidin-producing gene from corn, and placed it into petunias, to give a novel orange color. The gene for delphinidin (blue-violet) has been placed into carnations to make some blue. Other factors within the cell, such as the acidity (pH) and even cell shape, are making the genetic production of blue mums and roses a bit more challenging.

Combine the anthocyanidin compounds with sugar in plants, and produced are the more common "anthocyanin" pigments responsible for our fall leaf colors, among other colors. There are other pigments in leaves as well, such as the flavonols (yellow) and of course chlorophyll (green). Flavonols, and the colorless (to us) flavonoid pigments, can not only affect the color caused by primary pigments ("co-pigmentation", but also by absorbing ultraviolet light they are readily seen by insects.

It is the insects and other pollinators such as moths, for whom flower colors really exist, not for our pleasure. Pollination, and subsequent fruit production, is the main purpose of most flowers. A bee balm that appears red to us, may appear white to an insect. Or white and yellow flowers to us, may appear light blue to insects.

Ever wonder why some flowers such as lungworts (*Pulmonaria*), forget-me-nots (*Myosotis*), or other members of the Borage family seem to change color from pink to blue? Other flowers such as larkspur *(Delphinium*) may also exhibit these changes. This usually indicates to insects a flower has aged, and is past pollination, so move on!

Many flowers may not change color on an individual plant, but may change color, even if slightly, among locations or various conditions. Temperature affects color, hence the often more vivid colors in cool northern gardens than hot summer ones. Plant stress such as from drought, insect attack, or plant nutrition (too much or little) can also cause different levels of pigments in flowers, and so different colors.

But flowers may not "actually" change color, rather the "perception" may change. This can vary with people--men tend to see primary colors such as blue or green, women more distinctions such as turquoise or chartreuse. Perceptions among genders is actually related to differences in genetic eye anatomy.

Perceptions may also vary with light conditions. Seeing flowers in the warm (reds) light of morning or late evening will give them a different appearance than in midday, or on a cloudy day compared to a sunny day, or under the green light of trees compared to the blue light of open sky. Since the color we see is actually the color

of light reflected off the petal or plant surface, anything that can change this reflected light, will change our perception of the color.

So you think color is a bit complicated? Then try describing it. First there is the gender difference already mentioned. Then there are the almost infinite terms for color, many new ones daily it seems arising out of marketing minds. Just look at clothing catalogs and compare various years. A pale blue for instance may be termed baby blue, light blue, powder blue or sky blue.

There have been several systems developed to describe "reflective "colors, a popular one being the Munsell system, developed by Albert Munsell from the United States. For any color it attributes three values. Hue is the major color, like red, yellow and blue. Value is the brightness of the main color. And chroma is the degree of saturation of the color (deep blue for instance). For plants, this system was adapted by the Royal Horticulture Society in England in to a series of color charts which is a standard for describing flower colors. Unfortunately for us, these charts, as the Munsell system, merely have numbers and not definitive names.

The system for color most are familiar with, however, is the artists color wheel. It has six main divisions: the three primary colors red, yellow and blue; and in between the secondary colors orange (from mixing red and yellow), green (from yellow and blue), and violet (from blue and red). But the difference between artists' colors, and reflective colors of plants for instance, is seen with white. Mix all the artists' colors together and you get a muddy grey. Mix all the reflected colors together and you get white light.

Actually if you combine pure red, green and blue lights you will get white light. This is the principle used in color photography and colors on computers. Now, take white light and filter it with the filters that block red, green and blue (magenta, yellow and cyan) and you get no light or black. These terms and "filters" or complements to red, green and blue are the basis for color films and the terms you'll see when you go into computer graphics software to retouch a scanned image.

So by now, if you're not totally confused, you may see how not only what makes color is complicated, but also our perceptions and descriptions of it. Keeping these ideas in mind, here are a few tips when using color in your designs. Color selection can make a flowerbed appear close or distant. A distant planting of bright colors will appear closer if softer shades of the same color are used near the viewer. Using softer colors at a distance and strong colors near the house reverses the effect. Colors can impart a sense of temperature. Red, orange, and yellow are considered warm colors. When used on a sunny patio, they give a sense of warmth. The cool colors are blues, purples, and greens. Use them in shady areas, and they make the shade seem even cooler.

Use one or two compatible colors throughout the landscape to develop a relaxing mood. Pastel or weak colors work better than strong vivid colors for this purpose as this rather monotonous color scheme creates a restful feeling. Using strong, contrasting colors creates an exciting landscape. The eye jumps from one color to the next, creating a busy, exciting feeling. Flower colors should be compatible. Colors that clash can be used in the same bed if they are widely separated. In established perennial gardens, dilute problem color combinations with interplantings of white or pale yellow flowers.