



flowering blooms on an Ohio Buckeye

Colour Changing Flowers: An Unsolved Mystery

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If you've taken a stroll through The Arboretum lately, you may have heard the bees buzzing and have seen the butterflies fluttering because many plants, shrubs and trees are flowering. On our Wednesday Noon Hour Walk two weeks ago, we walked by the Ohio Buckeye (*Aesculus glabra*) and we found that some flowers in bloom were yellow and some were red/pink. Shortly after, we came across the Yellowhorn (*Xanthoceras sorbifolium*) and again noticed the same phenomenon. Wracking my brain, I remembered that the flowers of the Horse Chestnut (*Aesculus hippocastanum*) are known to change color after being pollinated - perhaps this was the phenomenon we were observing! Though it's quite the interesting fact, a bit more thought led to a slew of questions; what is the mechanism behind the colour changes we see? Is it really triggered by a pollinator's visit? What other flowers change colour? Why those colours in particular? What adaptive or functional purposes come with changing colours?

According to my research, there are currently over 70 families of flowering plants that are found to change colour and there have only been a handful of studies that have investigated why flowers change colour and their relationship with pollinators. Some plants with colour changing flowers that can be found here at The Arboretum include Lungwort, Forget-me-nots, Lupines, White Trilliums as well as the Ohio Buckeye, the Yellowhorn and the Horse Chestnut as mentioned.

Why do the colours change?

The mechanisms behind these colour changes are due to different pigments, namely anthocyanins, carotenoids (which is the colour we see in carrots) and betalains. Studies have found that the changes in colour, which usually go from a lighter colour, such as a white or yellow, to a darker colour like purple or red, could be dependent on the surrounding temperature, changes in the acidity (pH) of the plant or in the soil, aging, stress and also exposure to light. But is it ever directly triggered by a pollinator's visit? One scientific article suggests that pollination appeared to cause a chain reaction that would lead to the reddening in the genus *Lupinus*. But overall, most studies have not directly attributed the color change in most flowers to a pollination event. We may have many different hypotheses and guesses when it comes to understanding the colour changes in certain flowering plants, but it's all still quite a mystery!

So what about the pollinators?

Whilst the exact trigger of floral colour change remains unknown, research has tried to explain the functional aspect of these colour changes, and much of it is suspected to do with the pollinators. For one, the colour change is thought to be a 'nectar guide'; a visual indicator of which flowers have a greater nectar reward. Lighter coloured flowers, which are usually the younger flowers, are found to have more nectar and therefore insects may learn to discriminate between the two colours. Not only that, but some flowering plants such as the horse chestnut have "candles" which are the large pyramidal flowering structures (see image). Scientists think that these large visible structures are used to attract pollinators from a distance before they see the localized colour changes on the flower. By attracting pollinators, it is a win-win situation; the tree gets pollinated and the pollinators receive nectar. It has also been observed that in the Horse Chestnut, the odour of the flower also changes with the colour which is an added advantage, catering towards how some insects, especially beetles, discriminate flowers by their sense of smell.



We often walk by trees and shrubs without really knowing what they are really up to. I encourage you to take a look at some of these unique plants that have colour changing flowers the next time you come for a walk. "But The Arboretum is huge! How will I find them"? one may say. Not to fear, let me introduce you to Arboretum Explorer, an online interactive database that helps you locate the shrubs and trees we have in our collections here on our grounds! Simply follow this link; <https://guelph.arboretumexplorer.org/>, enter in the common / scientific name of the tree you want to find and watch for the yellow circle that reveals the location of the desired tree/shrub on the map! If you're on the grounds, be sure to take advantage of Arboretum Explorer!

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