GARDEN ECOLOGY LAB BRIEFS
A joint effort of 10-Minute University™ and Oregon State University's Garden Ecology Lab

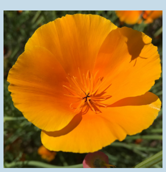
Breeding Native Plants has Ecological Trade-offs

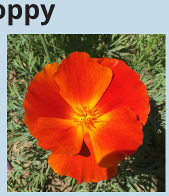
Our research

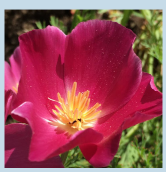
Cultivated varieties (cultivars) of native plants are often found on nursery shelves. Cultivars are often bred for traits like compact habit, larger flowers, and novel flower or foliage colors. We studied the nutritional traits (pollen and nectar) of Pacific Northwest native plants and cultivars to understand how plant breeding might impact the rewards offered by native plants to pollinators. Some traits, like flower color, can result from changes to a single gene, but a single gene may be linked to multiple plant traits. This phenomenon, called pleiotropy, can result in unintended tradeoffs when native plants are bred for ornamental traits. In this brief we use California poppy (which doesn't produce nectar) and farewell-to-spring as case studies for changes in pollen and nectar.

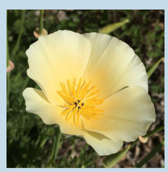
What we found

California Poppy


Eschscholzia californica

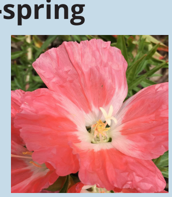

'Mikado'

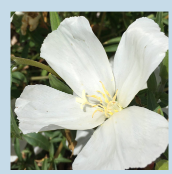

'Purple Gleam'

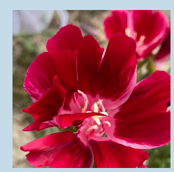

'White'

Farewell-to-spring


Clarkia amoena


'Aurora'

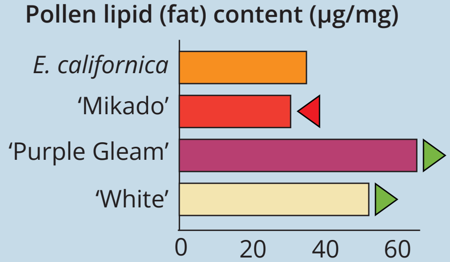

'Dwarf White


'Scarlet'

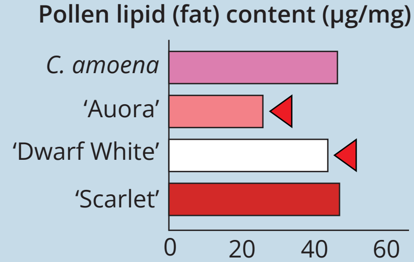
▷ Cultivars with significantly greater values than the native plant
◁ Cultivars with significantly lower values than the native plant

Italic name = wild-type native
'Name in quotes' = cultivar

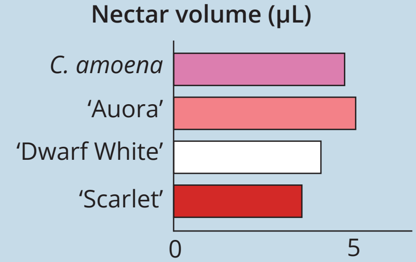
Pollen lipid (fat) content (µg/mg)



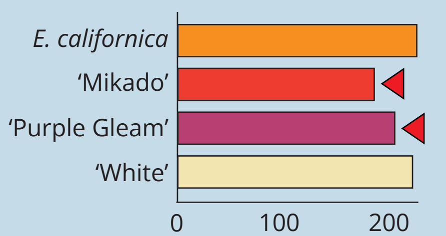
Pollen lipid (fat) content (µg/mg)



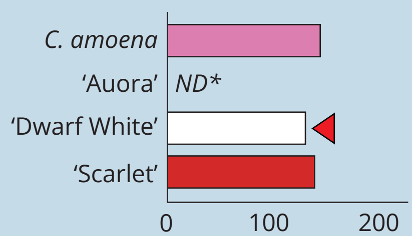
Nectar volume (µL)



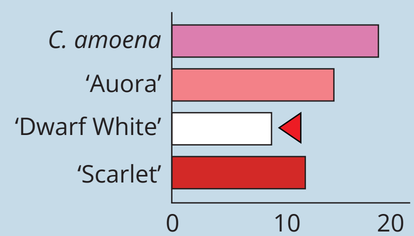
Pollen protein content (µg/mg)



Pollen protein content (µg/mg)



Nectar sugar content (°Brix)



*Not determined: insufficient pollen for analysis

Breeding Native Plants

Cultivars of California poppy and farewell-to-spring were bred for variation in flower color, but some plants have had their nutritional content impacted. We observed reductions in pollen protein in the 'Mikado' and 'Purple Gleam' poppy cultivars and *C. amoena* 'Dwarf White'. There was an increase in pollen lipids (fats) in 'Purple Gleam' and 'White', but a decrease in 'Aurora' and 'Dwarf White'. These changes may be related to differences in pigmentation, which vary in their biochemical makeup[1]. Nectar may be altered as well: though the four farewell-to-spring plants have similar nectar volumes, the native had the greatest sugar content, and a strong reduction in sugar content was seen in 'Dwarf White'.

How does this relate to your garden?

Nectar is a primary energy source for pollinators and pollen provides developing bee larvae with essential nutrients for growth and development. Though breeding for changes in pollen and nectar is uncommon for many plants, these traits can still be altered when developing other ornamental features. Our study shows that native cultivars might not provide equivalent nutrition to pollinators when compared to wild-type native plants.

When developing gardens for pollinators, we recommend planting wild-type native plant species. Though cultivars can add beauty and variety to garden spaces, it is important to incorporate wild-type native plants to ensure proper nutrition is available for pollinators. Introducing color in native gardens can also be achieved by combining species or choosing native plants that have variation in their natural color forms. For example, meadow checker-mallow (*Sidalcea campestris*) could be paired with rose checker-mallow (*Sidalcea asprella virgata*) to obtain pink flowers of different shades and sizes. Additionally, California poppies can produce morphs that are more yellow or red in hue.

Additional Information

- [1]Wakelin AM, Lister CE, Conner AJ. 2003. Inheritance and biochemistry of pollen pigmentation in California poppy (Eschscholzia californica Cham.). International Journal of Plant Sciences. 164(6):867–875. https://doi.org/10.1086/378825

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Master Gardener™ Advice

- Contact your local extension office for Master Gardener advice, or look for Master Gardeners at local farmers' markets.
- For more 10-Minute University™ handouts, videos, and the class schedule, visit cmastergardeners.org.

This Garden Ecology Lab brief was created with support by members of the Garden Ecology League and Garden Ecology Circle. To learn how you can support garden research and outreach, scan the QR code.

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