FLOWER COLOUR IN BIRD-POLLINATED NZ PLANTS

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Flowers which are pollinated by birds often have in common a number of characteristics, usually as a result of coevolution between plants and their pollinators. One of the most striking characters is the red floral colour shared by many bird-pollinated species. Raven has suggested that red predominates because it is easily seen by birds (which see colours much as humans do), but is inconspicuous to non-specialized nectar-robbing insects. A red flower would appear green to a bee and blend in with the background foliage.

Fuchsia excorticata, upon first examination, appears to have many of the characters associated with bird pollination. The flowers are tubular, thick-walled, produce copious nectar, and are a uniform bright red colour. But this red colour appears only in the last half of the life of a flower--flowers start out green and then turn red. This colour change was first noted by Kirk back in 1892 and it has been assumed that the red-phase is the one which the native honeyeaters (bellbirds, tuis, and stichbirds) visit. However, by chance one day I noticed a bellbird visiting flowers of F. excorticata in the PuhiPuhi valley north of Kaikoura, and instead of probing the red flowers, which I could easily see, it was probing the less visible green flowers. Further observations and experiments conducted near Mt. Fyffe and on the Port Hills revealed that bird visitors prefer to visit green-phase flowers and virtually ignore the red-phase flowers. This pattern of visitation is a result of nectar, the reward which the birds are searching for, being produced only in the green-phase. The colour change benefits the birds, by directing them to nectar-rich flowers, and also benefits the plants by directing pollinator visits to receptive and pollen-bearing flowers. The same thing would happen, however, simply by abscising the

floral tube when visits to that flower were no longer of any benefit. So why change colour and maintain the flowers longer? One explanation could be that the red flowers are attracting the birds to the trees. I tested this by removing all of the red flowers from parts of trees and even from whole trees, and found that the bellbirds visited the "non-red" trees just as much as trees with red flowers. So the red flowers are not serving as "flags" for attraction. An alternative explanation is that the flowers need several days in order to abscise and hence a colour change occurs to direct visits away from these abscising flowers. F. excorticata may wait longer and take longer to form an abscission layer than many species, as everything above the receptacle (hypanthium, sepals, stamens, style, and petals) falls off. I plan to test the abscission hypothesis this year.

One thing is already clear however: Fuchsia in New Zealand differ from bird-pollinated plant species (including other Fuchsia) in America as they are not strictly red. In addition, there are several other bird-visited New Zealand plants which do not have red flowers (for example, Sophora spp. which are yellow). This lack of convergence on red for nectar-rich flowers in New Zealand may be a consequence of two factors: 1) Unlike North America's flower visitors (hummingbirds), New Zealand's native honeyeaters are not migratory and have time to learn which species of plants in their territories provide obtainable nectar, and 2) there are no large, native bees in New Zealand able to rob nectar from the large bird-pollinated flowers. So while red is still a viable flower colour for New Zealand bird-pollinated plants, other colours are also possible.