

## Study finds rapid evolution in foxgloves pollinated by hummingbirds

April 12 2021



Credit: Flickr, F Delventhal

Researchers have found common foxgloves brought to the Americas have rapidly evolved to change flower length in the presence of a new pollinator group, hummingbirds. The findings are published in the British Ecological Society's *Journal of Ecology*.

Researchers from the University of Sussex, Universidad de Los Andes



(Colombia) and Universidad de Costa Rica, studying the common foxglove Digitalis purpurea, a bumblebee pollinated species native to Europe, have shown for the first time how rapid physical changes can occur in flowers following a change in environment and the presence of a new pollinator.

The researchers compared foxgloves in the UK, which are pollinated by bumblebees, with foxgloves introduced in two independent events to Costa Rica and Colombia around 200 years ago, which are pollinated by different species of bumblebees and also hummingbirds. They found the base of the cone structure of the flowers, called the proximal corolla tube, was 13-26% larger in populations in the Americas.

Foxgloves have long, narrow proximal corolla tubes. This part of the flower holds the nectar and by being this shape, they restrict floral visitors to those with long mouthparts such as long-tongued bumblebees.

"We found foxglove populations in Costa Rica and Colombia now have flowers with longer tubes at the base, when compared to native populations. There is also substantial natural selection on this floral characteristic in the naturalised populations." said Dr. Maria Clara Castellanos at the University of Sussex and one of the authors of the study.

"Long corollas are a common feature in many hummingbird-pollinated plants, likely because this improves the precision of pollen transfer during the pollination interaction. It is also possible that long corolla tubes exclude other pollinators that are less effective."

Because foxgloves are biennial (meaning each generation takes two years) these changes have occurred in around 85 generations, indicating a rapid evolutionary change.



In the study the researchers also confirmed that hummingbirds are effective foxglove pollinators. "We counted pollen grains deposited in flowers and found that after a single visit they can bring in more pollen than a bumblebee." said Dr. Castellanos.

The study also confirms how invasions can be used to understand evolution of floral structures. The researchers say that scenarios like this are likely to happen often as humans influence the range of plants and pollinators.

Dr. Castellanos said: "Our research shows how rapid evolutionary change in a new environment can be an important force behind the extraordinary diversity of flowers."

Foxgloves are now naturalised in many areas of the world. They were introduced to Colombia and Costa Rica in the 19th Century, most likely by English architects and engineers. In these new tropical environments, foxgloves grow at high altitudes above 2,200 meters where temperatures are broadly similar to those in their native European range. Because there are no seasons, populations flower at different times of the year.

In the study, the researchers looked at both native UK foxglove populations and populations in mountainous areas in Colombia and Costa Rica. They compared the shape of the <u>flowers</u> and the reproductive success of the plants. They also recorded the pollinators in each location and how effective each pollinator was at transferring pollen.

The authors caution that although the changes they observed are consistent with natural selection hummingbirds have imposed during the evolution of native plants they pollinate, the study doesn't prove the changes to foxgloves have been directly caused by hummingbirds.



To do this, the researchers are planning to experimentally exclude pollinators from foxgloves in the field and record the consequences for the <u>plants</u>. They are also studying the genetic basis of the traits both in the greenhouse and using genomic approaches.

The researchers emphasise the importance of studying other plant groups in this context. "Plants around the world are experiencing changes in their pollinators and it is important to understand the evolutionary implications of this" said Dr. Castellanos.

**More information:** Christopher R. Mackin et al, Rapid evolution of a floral trait following acquisition of novel pollinators, *Journal of Ecology* (2021). DOI: 10.1111/1365-2745.13636

Provided by British Ecological Society

Citation: Study finds rapid evolution in foxgloves pollinated by hummingbirds (2021, April 12) retrieved 27 April 2024 from <u>https://phys.org/news/2021-04-rapid-evolution-foxgloves-pollinated-hummingbirds.html</u>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.