Researchers identify gene in petunias responsible for controlling how much UV light is absorbed

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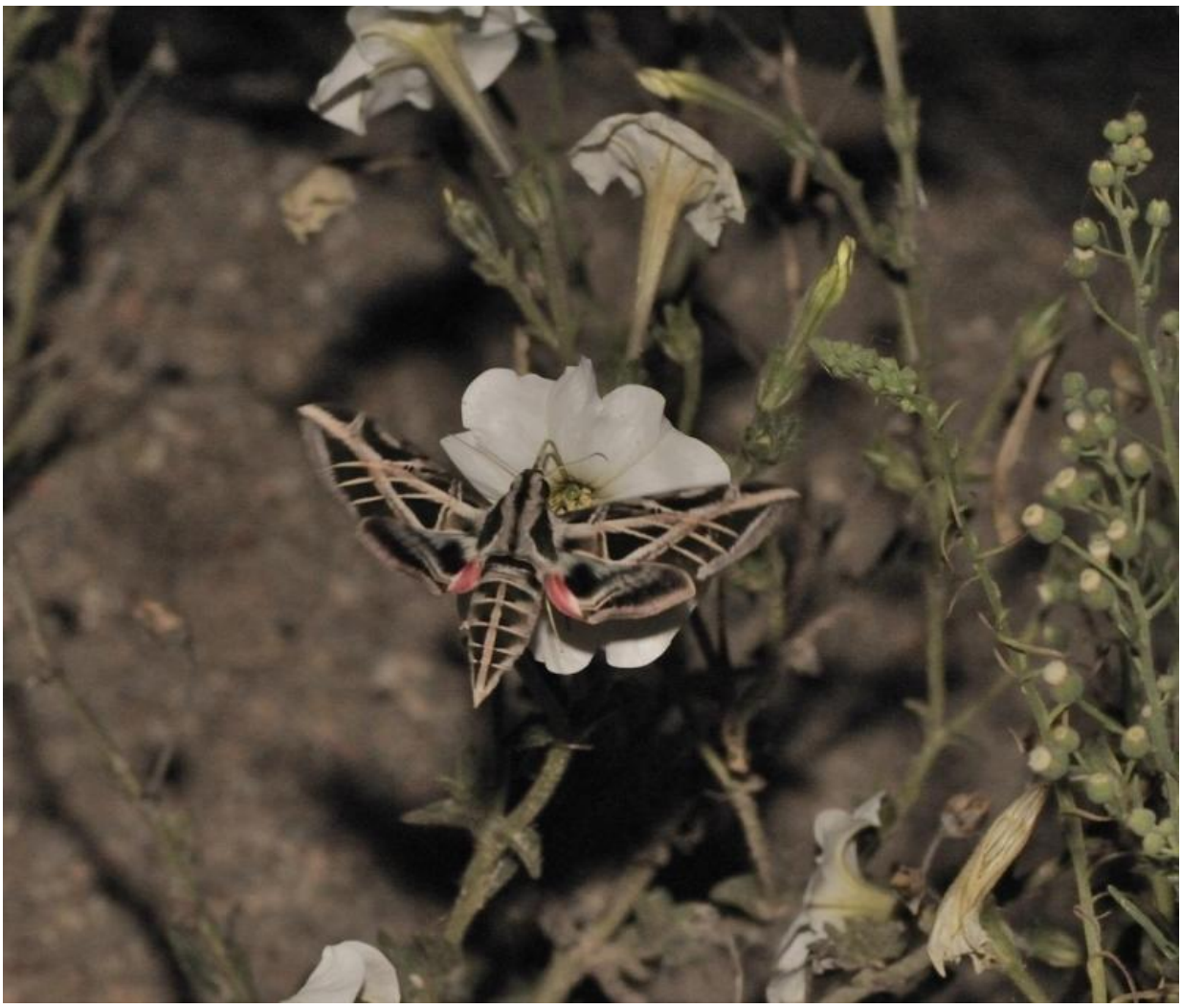

A Hyles lineata moth feeds from a P. axillaris flower. Credit: Alexandre Dell'Olivo

(Phys.org)—An international team of researchers has identified the gene in petunia plants that is responsible for controlling how much UV light the flowers of the plant absorb which in turn has an impact on the types of pollinators that are attracted. In their paper published in the journal *Nature Genetics,* the team describes their genetic study of the plant and why they believe that what they found might help explain how it is that petunias adapt to attract different pollinators.

Petunias are flowering plants that rely on other creatures for pollination—over time, individual species have developed that rely on particular pollinators, but until now, the mechanism by which this has occurred had not been well understood. In this new effort, the researchers looked at the genetic makeup of three different species of petunias that attract bees (*Petunia inflata*), hawkmoths (*Petunia axillaris*) or hummingbirds (*Petunia exserta*).

In studying the three South American petunia species, they noted that the species that attracted hawkmoths absorbed the highest amount of UV light. This led them to narrowing down the genes of the three species until they came upon a single one—MYB-FL—testing showed that mutations to this gene caused the flower of the plant to absorb more or less UV light by causing fluctuations in the production of flavonol. The researchers believe the amount of UV light absorbed has an attraction quality for pollinators. From this they deduced that it was likely natural mutations occurred over time to the MYB-FL gene causing a different pollinator to become more attracted to a certain species—leading to the development of a new species.

Flower shown in visible light. Mutation of the MYB-FL gene by a transposon causes the reciprocal alteration of flavonol and anthocyanin pigments in the petal causing the contrasting sector. Credit: Hester Sheehan

More specifically, they found that it appeared that there was a shift in the long ago past, from bee attraction in one species to hawkmoth attraction, which led to another species developing and which was accompanied by a MYB-FL mutation, which caused an increase in the level of UV absorbing compounds in those flowers. Likewise, they noted there appeared to have been a different mutation that came about at a later time that caused a shift from attracting hawkmoths to attracting hummingbirds, once again leading to the development of a new species.

More information: Hester Sheehan et al. MYB-FL controls gain and

loss of floral UV absorbance, a key trait affecting pollinator preference and reproductive isolation, *Nature Genetics* (2015). DOI: 10.1038/ng.3462

Abstract

Adaptations to new pollinators involve multiple floral traits, each requiring coordinated changes in multiple genes. Despite this genetic complexity, shifts in pollination syndromes have happened frequently during angiosperm evolution. Here we study the genetic basis of floral UV absorbance, a key trait for attracting nocturnal pollinators. In Petunia, mutations in a single gene, MYB-FL, explain two transitions in UV absorbance. A gain of UV absorbance in the transition from bee to moth pollination was determined by a cis-regulatory mutation, whereas a frameshift mutation caused subsequent loss of UV absorbance during the transition from moth to hummingbird pollination. The functional differences in MYB-FL provide insight into the process of speciation and clarify phylogenetic relationships between nascent species.