

Adapting to climate change: Mutation enables flour beetles to speed up their development

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Credit: Maurijn van der Zee

Leiden biologists have found a mutation in flour beetles that allows them to speed up their development. They think that more insects can change their growth rate, which could help them adjust to climate change. The study has been [published](#) in *Nature Ecology & Evolution*.

Flour [beetles](#) with a particular genomic deletion can grow faster than those without this mutation. Growing fast is useful when food is scarce and the beetles have to mature quickly to fly to find food. But there are drawbacks to this faster development. The fast-growing [flour](#) beetles are

smaller and lay fewer eggs. In stable conditions with plenty of food, it is better for the beetles to grow that bit slower so they can become larger and lay more eggs.

What causes the faster growth?

The biologists studied how some flour beetles develop faster than others. They found that the faster-growing beetles had a deletion in a piece of the genome that regulates the expression of the enzyme CYP18a1. This enzyme is involved in breaking down the hormone ecdysone, which is important to all kinds of developmental transitions, such as from molt to the next larval stage and pupation.

The change in CYP18a1 means ecdysone break downs somewhat slower, which in turn causes a rapid hormone peak. All the flour beetle's developmental stages are faster as a result.

What is unique about the study is that the [biologists](#) know for sure that the deletion that affects the enzyme CYP18a1 causes the faster growth and that no other genetic variations in the flour beetles are responsible. By using the CRISPR/CAS9 technique, they were able to recreate the deletion in half of a genetically identical population. The [flour beetles](#) with the deletion grew faster in the lab than those without the change in the [enzyme](#).

Adapting to climate change

If trees, plants and flowers to flower earlier or later because of [climate change](#), insects will have to adapt to survive. "There is clearly a huge selection pressure on insects to change their developmental time," says Maurijn van der Zee, who was involved in the research. "Our research can help see which other insects can adjust their developmental speed by

growing faster or slower. Then we may be able to figure out which insects we need to worry about and which ones we don't."

Van der Zee finds it reassuring that insects can quickly adapt their developmental rate to changing conditions. But it's not all good news. "It also changes other things, like the size of the [insects](#) and how many eggs they lay, and maybe more that we are not yet aware of."

More information: Shixiong Cheng et al, A life-history allele of large effect shortens developmental time in a wild insect population, *Nature Ecology & Evolution* (2023). [DOI: 10.1038/s41559-023-02246-y](https://doi.org/10.1038/s41559-023-02246-y)

Provided by Leiden University

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