

Adapting to climate change: Researchers find natural gene variant that allows barley to flower earlier

June 20 2023



On the right, plants with the special gene variant are growing - ears of barley are already visible. On the left, plants at a slower pace and their ears are not visible yet. Credit: Uni Halle / Tanja Zahn

A tiny mutation in the genetic material of barley ensures that those plants develop faster and thus flower earlier than established barley varieties. At the same time, plant yields remain the same, a team from Martin Luther University Halle-Wittenberg (MLU) reports in the *Journal of Experimental Botany*. According to the researchers, this is advantageous as the plants could potentially adapt better to the effects of climate change and continue to produce stable harvests.

Plants have adapted their development to their surroundings over the course of several million years. However, global warming is happening at a much faster rate, so [plants](#) have little time to adapt to the new conditions. "The genetic diversity of current [barley](#) varieties is limited, which means they can only moderately adapt to changing [environmental conditions](#) in the course of climate change," explains the leader of the study, Dr. Andreas Maurer from the Institute of Agricultural and Food Sciences at MLU. This prompted the researchers to look for ways to better adapt crops to these new conditions in the future.

They found what they were looking for in the EARLY FLOWERING3 (ELF3) gene, which was already known to play an important role in plant development. ELF3 is an essential component of a plant's so-called circadian clock. This is a whole network of genes and proteins that control various processes in plants so they can, for example, react to the day-night rhythm and the seasons.

As part of extensive field trials and greenhouse experiments, the team investigated different natural variants of the ELF3 gene in almost genetically identical plants by crossing an established barley variety (Barke) with various wild barleys. The researchers discovered a variant with special properties. Even though its [genetic code](#) differed only at a single point compared to the established ELF3 variant, the plants developed significantly faster.

Compared to plants carrying the established ELF3 variant, these plants flowered up to 18 days earlier in the greenhouse trial and up to four days earlier in field experiments. Depending on the weather, even those four days can greatly impact yields, as the plant can complete important stages of its development before possible harmful events happen. "Crossing with natural variants of wild barley is often accompanied by yield losses. Remarkably, this wasn't the case in our study," adds Maurer. The barley with the special natural ELF3 variant produced comparable yields.

The findings of the study could help to create new, climate-resilient barley. "By crossing with the natural [variant](#), we found that barley could flower before a dry period sets in and thus deliver a higher yield than later-flowering varieties. Such adaptations are necessary in order to secure the world's food supply in the face of [global warming](#)," says agricultural and food scientist Tanja Zahn, who is pursuing her Ph.D. at MLU.

More information: Tanja Zahn et al, Novel exotic alleles of EARLY FLOWERING 3 determine plant development in barley, *Journal of Experimental Botany* (2023). [DOI: 10.1093/jxb/erad127](https://doi.org/10.1093/jxb/erad127)

Provided by Martin-Luther-Universität Halle-Wittenberg

Citation: Adapting to climate change: Researchers find natural gene variant that allows barley to flower earlier (2023, June 20) retrieved 6 May 2024 from <https://phys.org/news/2023-06-climate-natural-gene-variant-barley.html>

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