

# Scaling new heights with new research showing how plants can grow at altitude

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Image taken during research of plants growing at altitude in Ecuador. Credit: Cristian Miño

A new study has found that plant species are adapted to the altitude where they grow by 'sensing' the oxygen levels that surround them.

Altitude is an important part of plant ecology with at least 30% of plant [species](#) diversity contained in mountains and [climate change](#) is leading to the retreat of alpine species and some crops to higher altitudes.

Research led by scientists at the University of Nottingham has identified a mechanism through which plants can sense [atmospheric oxygen levels](#) (that decrease with altitude) that will help to understand how plants live at [high altitude](#). The work was carried out in collaboration with scientists in Spain and Ecuador and was funded by the Leverhulme Trust. Their findings have been published today in *Nature*.

Researchers analyzed plants growing at low and high-altitude locations. The team, working in Nottingham, Ecuador and Spain was able to identify how oxygen-sensing controls the pathway of chlorophyll synthesis, permitting plants to match the levels of a key toxic chemical to surrounding oxygen levels.

Climate change is leading to the displacement of wild species and crops (for example coffee) to higher altitudes, this research offers new insights into the underlying [genetic mechanisms](#) controlling their ability to survive at different altitudes. This new understanding of the genetic changes plants go through at altitude could lead to approaches to help plant breeders enhance the capacity of crops to grow at higher altitudes.

The research was led by Professor Michael Holdsworth from the University of Nottingham in collaboration with Professor Karina Proaño at ESPE University in Sangolquí, Ecuador and Professor Carlos Alonso Blanco from the Spanish National Center for Biotechnology CSIC.

Professor Holdsworth commented: "Altitude is a key component of ecology with different altitudes subjecting plants to changing environments, some components of which are fixed by altitude and others that are not. For life at high altitude, it was previously considered

that plants need to adapt to many variables, including high UV light and [lower temperatures](#) usually present at high altitude but this study is the first time that perception of atmospheric [oxygen levels](#) has been shown to be a key determinant of altitude adaptation in plants. "

He continues: "Exploring this novel finding allowed us to show that atmospheric oxygen level is the key determinant of altitude perception. We define the molecular pathway through which oxygen-sensing results in an adapted phenotype and we find that [distinct species](#) of flowering plants are adapted to absolute altitude through conserved oxygen-sensing control of chlorophyll synthesis and hypoxia gene expression. Showing that this mechanism works in diverse species provides a new paradigm for plant ecology."

**More information:** Michael Holdsworth, An oxygen-sensing mechanism for angiosperm adaptation to altitude, *Nature* (2022). [DOI: 10.1038/s41586-022-04740-y](#).  
[www.nature.com/articles/s41586-022-04740-y](https://www.nature.com/articles/s41586-022-04740-y)

Provided by University of Nottingham

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