

# Research reveals plant roots change shape and branch out for water

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Researchers have discovered how plant roots adapt their shape to maximize their uptake of water, pausing branching when they lose contact with water and only resuming once they reconnect with moisture,

ensuring they can survive even in the driest conditions.

Plant scientists from the University of Nottingham have discovered a novel water sensing mechanism that they have called "Hydro-Signaling," which shows how hormone movement is linked with water fluxes. The findings have been published today in *Science*.

Water is the rate-limiting molecule for life on earth. The devastating impact of [climate change](#) is enhancing the effects of water stress on global agriculture. Climate change is causing rainfall patterns to become more erratic, impacting rain-fed crops in particular.

Roots play a critical role to reduce the impact of water stress on plants by adapting their shape (such as branching or growing deeper) to secure more water. Discovering how [plant roots](#) sense and adapt to water stress is vital importance for helping "future proof" crops to enhance their climate resilience.

Using X-ray micro-CT imaging researchers were able to reveal that roots alter their shape in response to external moisture availability by linking the movement of water with plant hormone signals that control root branching.

The study provides critical information about the key genes and processes controlling root branching in response to limited water availability, helping scientists design novel approaches to manipulate root architecture to enhance water capture and yield in crops.

Dr. Poonam Mehra, postdoctoral fellow, from the School of Biosciences is one of the lead authors and explains, "When roots are in contact with moisture, a key hormone signal (auxin) moves inwards with water, triggering new [root](#) branches. However, when roots lose contact with moisture, they rely on internal water sources that mobilizes another

hormone signal (ABA) outwards, which acts to block the inwards movement of the branching signal. This simple, yet elegant mechanism enables plant roots to fine tune their shape to local conditions and optimize foraging."

Professor Malcolm Bennett, co-lead on the research adds, "Our plant research is vitally important for understanding how we can futureproof crops and find ways to ensure successful crop yields even in the most challenging climates. We are already experiencing a hotter climate and designing plants that can still access [water](#) in these conditions is vital and this research is an all important step in understanding how to do this."

He continued, "These new discoveries were only possible because of the cutting-edge tools and collaborative approaches of the authors, which involved an international team of scientists based in the U.K., Belgium, Sweden, U.S. and Israel."

**More information:** Poonam Mehra et al, Hydraulic flux-responsive hormone redistribution determines root branching, *Science* (2022). [DOI: 10.1126/science.add3771](https://doi.org/10.1126/science.add3771).  
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Provided by University of Nottingham

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