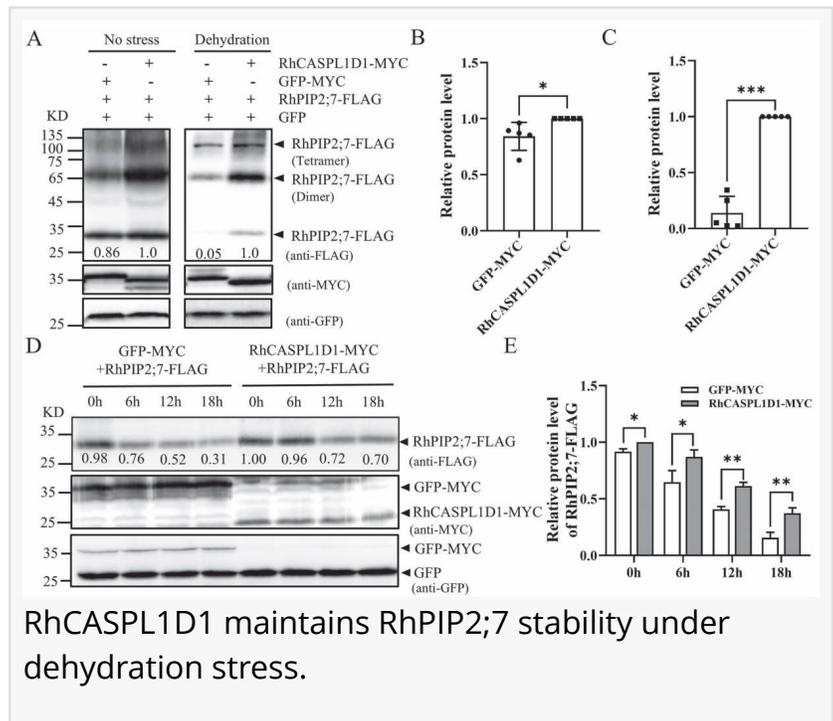


How roses rapidly recover from dehydration stress

GA, UNITED STATES, January 9, 2026 /EINPresswire.com/ -- Water deficit during flowering can severely disrupt petal expansion, water uptake, and reproductive success, yet many plants are able to recover rapidly once water becomes available again. This study identifies a previously underappreciated molecular mechanism that enables flowers to regain hydration and resume opening after dehydration stress. The researchers reveal that a membrane-associated scaffold protein stabilizes water channel proteins at the cell surface, preventing their premature degradation during stress. By maintaining efficient water transport during rehydration, this mechanism promotes rapid tissue recovery and normal flower reopening. The findings highlight how plants actively regulate water channel stability—not just water loss—to ensure resilience during transient drought events.

Plants frequently encounter short-term water deficits caused by drought, postharvest handling, or environmental fluctuations. During flowering, dehydration is particularly damaging, leading to petal wilting, delayed opening, and reduced ornamental or reproductive value. Although [aquaporins](#) are known to regulate water transport across cell membranes, their abundance at the plasma membrane often declines under stress due to internalization and degradation. While this response limits water loss, it may hinder rapid recovery once stress is relieved. How flowering tissues preserve water transport capacity during rehydration has remained poorly understood. Based on these challenges, it is necessary to investigate how plants regulate aquaporin stability to support rapid floral recovery after dehydration.

Researchers from China Agricultural University report new insights into how flowers recover from dehydration stress in a study published (DOI: [10.1093/hr/uhaf119](https://doi.org/10.1093/hr/uhaf119)) on 30 April 2025 in Horticulture Research. Using cut rose as a model system, the team identified a scaffold protein



that plays a key role in post-stress recovery during flowering. The study shows that this protein interacts directly with plasma membrane aquaporins, enhancing their stability and retention during dehydration and rehydration. The findings reveal a previously unknown regulatory layer that helps flowers quickly regain water and reopen after stress.

The study focused on a scaffold protein encoded by the gene RhCASPL1D1, which is strongly induced during flower opening, dehydration, and subsequent rehydration. Gene silencing experiments showed that petals lacking RhCASPL1D1 recovered water more slowly after dehydration and displayed delayed flower opening. In contrast, overexpression of the gene accelerated tissue rehydration and improved recovery performance.

At the molecular level, RhCASPL1D1 was found to localize to the plasma membrane, where it physically interacts with several aquaporins of the PIP2 subgroup. These aquaporins are responsible for high-efficiency water transport across cell membranes. Biochemical and imaging analyses demonstrated that RhCASPL1D1 does not alter aquaporin channel activity directly. Instead, it acts as a scaffold that stabilizes aquaporins, delays their degradation, and prevents their internalization under dehydration stress.

As a result, higher levels of functional aquaporins remain at the plasma membrane during rehydration, enabling rapid water influx into petal cells. This stabilization mechanism allows floral tissues to quickly regain turgor and resume normal opening after transient water loss, highlighting a recovery-oriented strategy distinct from classical drought avoidance responses.

The authors note that plant drought research has traditionally focused on survival during stress, rather than recovery afterward. “Our findings show that flowers actively protect water transport capacity during dehydration so they can rebound quickly when water becomes available,” the researchers explain. They emphasize that scaffold proteins like RhCASPL1D1 provide a flexible regulatory layer, allowing plants to fine-tune aquaporin stability without permanently altering water channel function. This mechanism may represent a general strategy used by flowering plants to cope with short-term water fluctuations.

Understanding how flowers recover from dehydration has practical implications for both agriculture and horticulture. In ornamental crops such as cut flowers, rapid rehydration after harvest is essential for maintaining quality and vase life. Manipulating scaffold-aquaporin interactions could offer new strategies to enhance postharvest resilience without compromising drought tolerance. More broadly, the findings suggest that breeding or engineering crops for improved stress recovery—not just stress resistance—may help stabilize productivity under increasingly variable climate conditions. By preserving water transport capacity during transient droughts, plants may better balance survival, growth, and reproductive success in changing environments.

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Lucy Wang

BioDesign Research

[email us here](#)

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