

# New understanding of how plants respond to environmental stresses

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Plant adaptive response, CAR proteins

Researchers from the Spanish National Research Council have uncovered a family of proteins that play a vital role in coordinating the cellular response of plants to various environmental stresses, in particular drought and temperature fluctuations.

A collaboration between the Institute of Molecular and Cellular Plant Biology (IBMCP), of the Universitat Politècnica de València (Polytechnic University of Valencia, UPV) and the Spanish National Research Council (CSIC), and the Rocasolano-CSIC Institute of Physical Chemistry (IQFR-CSIC), the findings were published in the *Proceedings of the National Academy of Sciences* and could help improve

the defensive processes of plants in the driest regions of the Mediterranean Basin.

Cellular membranes are the point of contact between the cell and its external environment. A large number of receptor systems are concentrated here that process the ever-changing signals received from the outside world. Be it heat, cold, drought, etc., the cells must respond adequately to each of these [environmental stresses](#) in order to maintain the plant's vital functions. In [plants](#) these processes are constantly 'on'; being rooted in the ground, they have no other response to stresses deriving from changing weather conditions, or the simple passage of night to day.

This study has identified a family of proteins, the CAR proteins, which cluster together to create a series of points throughout the membrane that can be used by key signalling proteins to carry out their respective adaptive functions. CSIC researcher Pedro Luis Rodriguez from the IBMCP explain: "These [CAR] proteins form a kind of landing strip, acting as molecular antennas that call out to other proteins as and when necessary to orchestrate the required [cellular response](#)".

"In a medium-sized cell, the distance a molecule must travel from the point at which it synthesises to the membrane itself is comparable, relatively, to the distance between Madrid and Cádiz. For this journey there are mediators, both during and at the point of arrival, where they carry out a fundamental role in docking the signalling proteins in the appropriate cellular context", adds fellow CSIC researcher, Armando Albert, from the IQFR.

CAR proteins are one such mediator, playing a central role in the regulation of the plant's adaptive response to environmental stresses.

This research sheds light on an as yet not fully resolved question in plant

biology, and could lead to interventions to improve resistance to drought, for instance.

**More information:** Maira Diaz et al. Calcium-dependent oligomerization of CAR proteins at cell membrane modulates ABA signaling, *Proceedings of the National Academy of Sciences* (2016). [DOI: 10.1073/pnas.1512779113](https://doi.org/10.1073/pnas.1512779113)

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