Sniffed out: The 'gas detectors' of the plant world

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The elusive trigger that allows plants to 'see' the gas nitric oxide (NO), an important signalling molecule, has been tracked down by scientists at The University of Nottingham. It is the first time that a central mechanism for the detection of NO in plants has been identified.

Led by Professor Michael Holdsworth in the School of Biosciences, a team of experts, including researchers from UK and EU Universities and government research institutes, have found the 'master regulators' that control the detection of NO by plants and that regulate many important aspects of plant growth and response to environmental stress.

Their research "Nitric oxide sensing in plants is mediated by proteolytic control of GroupVII ERF transcription factors" is published on Thursday January 23 2014 in the academic journal *Molecular Cell*.

Plants fine-tune their growth and survival in response to various signals, including internal hormones and external factors such as light or temperature. Nitric oxide gas is one such signal.

Professor Holdsworth said: "In plants, NO regulates many different processes throughout the plant's lifetime from seeds to flowering and responses to the environment. Although the effect of NO on plants has been known for many years, a general mechanism for the initial sensing of this important molecule has remained elusive. We have identified a small number of key proteins, called transcription factors, which act as 'master sensors' to control NO responses throughout the plant life cycle."

A specific structure at the beginning of these proteins means that they are rapidly degraded in the presence of NO. However, when NO is absent they become stable, resulting in changed growth and development. This mechanism allows plants to sense the NO signal and alter its growth accordingly.

Interestingly, these proteins had previously been shown to control the plant response to low oxygen stress, which occurs when plants are flooded. Therefore they appear to act as central "gas detectors", providing plants with an inbuilt mechanism for sensing and responding to different gas signals.

Due to the importance of both NO and oxygen in plant development and stress responses, these proteins represent promising targets in the development of crops that have improved agricultural traits, particularly in relation to climate change.

The work was carried out by Professor Holdsworth and his team in the School of Biosciences in collaboration with researchers at the Universities of Sheffield, Warwick, Vienna, Rothamsted Research in the United Kingdom and CSIC-IBMCP in Valencia, Spain.

Provided by University of Nottingham