

Scientists reveal genetic 'wiring' of seeds

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The genetic 'wiring' that helps a seed to decide on the perfect time to germinate has been revealed by scientists for the first time.

Plant biologists at The University of Nottingham have also discovered that the same mechanism that controls germination is responsible for another important decision in the life cycle of plants - when to start flowering.

Their discovery throws light on the genetic mechanisms that plants use to detect and respond to vital environmental cues and could be a significant step towards the development of new crop species that are resistant to climate change and would help secure future food supplies.

Seeds in the soil sense a whole range of environmental signals including temperature, light, moisture and nutrients, when deciding whether to germinate or to remain dormant.

To ensure that the decision for a seed to germinate is made at the perfect moment to ensure survival, evolution has genetically 'wired' seeds in a very complex way to avoid making potentially deadly mistakes.

The breakthrough has been made by scientists at Nottingham's Division of Crop and Plant Sciences who collaborate within one of the University's Research Priority Groups, Global Food Security. The team compiled publicly available gene expression data and used a systematic statistical analysis to untangle the complex web of genetic interactions in a model plant called *Arabidopsis thaliana* or thale cress. The plant is commonly used for studying plant biology as changes in the plant are easily observed and it was the first plant to have its entire genome sequenced.

The resulting gene network - or SeedNet as it was dubbed - highlighted what little scientists already know about the regulation of seed germination while being able to predict novel regulators of this process with remarkable accuracy.

The work was led by Dr George Bassel who joined The University of Nottingham on an NSERC PDF fellowship from the Canadian government to work with Professor Mike Holdsworth on research into seed germination. He has since been awarded a prestigious Marie Curie International Incoming Fellowship.

Dr Bassel said: "To our surprise, the seed network demonstrated that genetic factors controlling [seed germination](#) were the same as those controlling the other irreversible decision in the life cycle of plants: the decision to start flowering. The induction of flowering, like germination, is highly responsive to cues from the environment."

Another key finding from SeedNet was that the same genes that leaves and roots use to respond to stress are used by seeds to stop their germination. Given that seeds were evolved long after plants developed their ability to withstand environmental stress, this indicated that [plants](#) have adapted existed [genes](#) to fulfil a different role. The work could lead to identifying important factors controlling stress response in seeds and the plant itself, contributing towards the development of new crops producing increased yields under extreme environmental conditions such as drought or floods.

More information: The work is being published in the *Proceedings of the National Academy of Sciences* Online Early Edition this week.

Provided by University of Nottingham

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