

Spring's rising soil temperatures see hormones wake seeds from their winter slumber

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Dormant seeds in the soil detect and respond to seasonal changes in soil temperature by changing their sensitivity to plant hormones, new research by the University of Warwick has found.

This sensitivity alters the depth of dormancy, indicating to the seed when it is the right time of year to germinate and grow.

The seeds of common weeds can survive in the [soil](#) in a dormant state for years, in some cases decades, spelling issues for food security when they emerge to compete with crops.

New DEFRA-funded research by the University of Warwick sheds light on how hormones regulate the dormancy cycle of seeds in the soil using seeds of *Arabidopsis* - commonly known as Thale Cress - a close relative of many common weeds and [crop species](#).

The new insights, which come from combining modern [molecular biology](#) with traditional seed ecology, could be of long-term help in reducing the use of herbicide on farms.

It is also of interest to those working to ensure biodiversity by understanding how dormancy and germination in [wild plants](#) is regulated.

Despite the importance of dormancy cycling in nature, very little is

known about its regulation at the molecular level.

Professor Bill Finch-Savage and Dr Steve Footitt in the University of Warwick's School of Life Sciences looked at [gene expression](#) over the dormancy cycle of Arabidopsis seeds in field soils to see how it is affected by the seasons.

They found that gene sets related to dormancy and germination are highly sensitive to [seasonal changes](#) in [soil temperature](#).

A balance between the hormones abscisic acid (ABA) and gibberellic acid (GA) is thought to be central to controlling dormancy and germination,

One set of genes is regulated by ABA, which is linked to dormancy, whereas GA controls genes which act to increase the potential for germination.

Using an Arabidopsis strain whose seedlings emerge in late summer and early autumn, they found that as the soil warms up, seeds become less sensitive to ABA and more sensitive to GA, which brings them out of dormancy and spurs them towards germination.

Once dormancy starts to recede, increased sensitivity to light, nitrate and the differences between day and night temperatures play a bigger role in signalling that it is the right time to germinate.

Dr Footitt said: "Many will have seen how the amount of weeds in their garden differs with the weather from year to year.

"Understanding how this happens will help us to predict the impact that future climate change will have on our native flora and the weeds that compete with the crops we rely on for food."

"Our research sheds new light on how genetics and the environment interact in the dormancy cycling process.

"By looking at seeds over an annual cycle we now have a clearer idea of how [seeds](#) sense and react to changes in the environment throughout the seasons so they know the best time to emerge into plants."

The research is published in the *Proceedings of the National Academy of Sciences*.

Professor Finch-Savage and Dr Footitt have been awarded a BBSRC grant to investigate further how climate has an impact on dormancy cycling and how genetics and the environment interact in the dormancy cycling process.

More information: The paper, entitled Dormancy cycling in Arabidopsis seeds is controlled by seasonally distinct hormone-signaling pathways, can be found at www.pnas.org/content/early/2011/05/11/1010201111.pdf+html?with-ds=yes).

Provided by University of Warwick

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