

Scientists unlock secret of what makes plants flower

April 18 2007



A protein acting as a long-distance signal from leaf to shoot-tip tells plants when to flower, says new research published in *Science Express* on Thursday 19 April 2007.

The study reveals the likely mechanism by which the *Arabidopsis* plant flowers in response to changes in day length. Earlier research had shown that plants' leaves perceived seasonal changes in day length, which triggers a long-distance signal to travel through the plant's vascular system from the leaf to the shoot apex, where flowering is induced.

However, the identity of the long-distance signal remained unclear.

This new research, carried out by scientists at Imperial College London and the Max Planck Institute for Plant Breeding Research in Cologne, has led to the proposal that this signal is a protein known as Flowering Locus T Protein (FT protein), which is produced in leaves by the Flowering Locus T gene (FT gene). It travels through the plant's vascular system to the shoot apex, where it activates other genes, causing the plant to flower. The research team were able to track the progress of the protein through the plant by tagging it with a green fluorescent protein originally isolated from jellyfish, allowing it to be detected in living tissues using highly sensitive microscope systems.

The team then grafted two plants together, only one of which contained the gene for the fluorescent version of FT. This allowed them to show conclusively that FT protein moved from where it was produced in the leaves of one plant, across into the other plant.

The FT protein is produced when the FT gene is switched on by another gene known as CONSTANS. This is a key gene expressed in leaves which reacts to changes in day length.

Dr Colin Turnbull from Imperial College London's Division of Biology, who carried out the research, said: "This could be a really important breakthrough in plant science. Since the 1930s when it first became clear that something was communicating the perception of changes in day length in leaves to the shoot apex, and causing flowering, scientists have been trying to work out exactly how this mechanism works.

"Over the past couple of years several labs made exciting discoveries all pointing to the FT gene being central to controlling flowering time. Now that we have been able to track FT protein moving from its source in leaves to its destination in the shoot tip, we have a plausible explanation

for how plants respond to day length. Parallel work in Japan shows very similar mechanisms operating in rice, so there is immediate potential to translate research into practical benefits for food crops. The ability to control flowering is of enormous commercial significance across food and non-food species, for example extending production seasons or designing plants better adapted to changing climate."

Source: Imperial College London

Citation: Scientists unlock secret of what makes plants flower (2007, April 18) retrieved 19 September 2024 from <https://phys.org/news/2007-04-scientists-secret.html>

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