Plants 'remember' winter to bloom in spring with help of special molecule

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Texas bluebonnets germinate in the fall and bloom in early spring after the cold temperatures of winter. Sibum Sung and Jae Bok Heo have discovered that a molecule named COLDAIR is required for plants like bluebonnets to "remember" winter and bloom in the spring.

(PhysOrg.com) -- The role a key molecule plays in a plant's ability to remember winter, and therefore bloom in the spring, has been identified by University of Texas at Austin scientists.

Many flowering plants bloom in bursts of color in spring after long periods of cold in the winter. The timing of blooming is critical to ensure pollination, and is important for crop production and for droves of people peeping at wildflowers.

One way for the plants to recognize the spring-and not just a warm spell during winter-is that they "remember" they've gone through a long enough period of cold.

"Plants can't literally remember, of course, because they don't have brains," says Sibum Sung, assistant professor in the Section of Molecular Cell and Developmental Biology. "But they do have a cellular memory of winter, and our research provides details on how this process works."

The process is known as vernalization, whereby a plant becomes competent to flower after a period of cold. And though it is common for many plants adapted to temperate climates, including important crops like winter wheat, it has not been until the past decade or so that scientists have begun to understand the process's genetic and molecular underpinnings.

Sung and postdoctoral fellow Jae Bok Heo have now discovered that a long, non-coding RNA molecule, named COLDAIR, is required for plants to set up a memory of winter.

They published their work on the Arabidopsis plant in *Science Express* on Dec. 2.

This is how it works: In fall, a gene called FLC actively represses floral production. A random bloom in fall could be a waste of precious energy.

But after a plant has been exposed to 20 days of near-freezing temperatures, the scientists found that COLDAIR becomes active. It silences the FLC gene, a process that is completed after about 30 to 40 days of cold. With the FLC silenced as temperatures warm in the spring, other genes are activated that initiate blooming.

COLDAIR helps create a cellular memory for a plant, letting it know it

has been through 30 or more days of cold.

But, how does the cold actually turn on COLDAIR?

"That is one of the next questions we have," says Sung. "How do plants literally sense the cold?"

Answering these kinds of basic questions could lead to crop improvements and will be important to grasp as climate changes alter the length of the winter season, with possible repercussions to vernalization in plants around the world.

More information: www.sciencemag.org/content/ear … 2/01/science.1197349

Provided by University of Texas at Austin