

FLOE1: Molecular Control of Seed Viability, Longevity, and Germination

Stanford inventors have discovered a single plant protein, FLOE1, that controls a variety of processes that are crucial to timely and robust germination of seeds. They have not only demonstrated this protein's key role in seed biology in *Arabidopsis thaliana*, but they have also discovered several methods, including regulation and mutation of the gene, that allow scientists to control the timing of seed germination and improve seed longevity.

Seeds can lay dormant until the environmental conditions are right to begin growing into a plant, a process called germination. This process has long been a mystery to scientists as it was not known how seeds sense their environment to trigger germination. By studying the model plant *Arabidopsis thaliana*, scientists at Stanford have discovered a key player responsible for controlling seed germination they termed FLOE1. They determined that FLOE1's unique biochemical structure gives it the ability to sense water and discovered several FLOE1 mutations that can either speed or slow germination depending on the desired result. Simply overexpressing the protein also increases seed viability overall. This protein has homologs throughout the plant kingdom and the researchers also show that, biochemically, these homologs behave similarly to *Arabidopsis* FLOE1, an exciting prospect for increasing seed viability and streamlining seed germination in crop species.

Applications

- Control seed germination rates in crops under normal conditions
- Control seed germination rates in crops under water stress, a condition increasingly likely with climate change
- Improve seed viability

Advantages

- **Novel plant molecular biology:** This technology represents one of the first ever opportunities for molecular control over seed germination and seed longevity
- **Non-GMO control possible:** The inventors believe they can use this approach without the need to invoke GMO-regulated technology in crops
- **Robust germination control:** Potential to speed seed germination up to 20X where desired or slow to wait for improved conditions
- **Improved seed bank viability:** One simple method can potentially improve the viability of a new or existing seed bank crops

Publications

- [A prion-like protein regulator of seed germination undergoes hydration-dependent phase separation](#) Dorone et al, Cell.

Patents

- Published Application: [20230416772](#)

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