

IMPROVING PHOTOSYNTHETIC PERFORMANCE OF PLANTS

Tech ID: 34242 / UC Case 2026-019-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

Crop engineering is often limited by a poor understanding of plant regulatory architecture and the extreme rarity of natural activating mutations. To address this, UC Berkeley researchers developed a high-throughput pipeline using protoplast-based Massively Parallel Reporter Assays (MPRA) to screen thousands of cis-regulatory mutations simultaneously. This platform identifies specific "cis-genic" modifications - such as precise deletions and substitutions that tune gene expression to enhance complex traits like photosynthetic efficiency. By focusing on modifications that do not involve foreign DNA, this technology enables the rapid development of improved crop varieties that are currently unregulated by U.S. statutes for genetically modified organisms.

SUGGESTED USES

- » Precision engineering of agricultural traits in major monocot crops, including rice, sorghum, and maize.
- » Rapid identification and validation of hypermorphic alleles to increase crop yield and carbon harvest.
- » High-throughput functional genomics for mapping promoter and enhancer activity at scale.
- » Development of non-transgenic, gene-edited varieties that meet existing regulatory standards for field deployment.
- » Quantitative tuning of metabolic pathways by adjusting specific gene expression levels.

ADVANTAGES

- » Screens thousands of potential regulatory variants in a single assay, bypassing the slow timelines of traditional stable plant transformation.
- » Targets cis-genic modifications (deletions, substitutions, and short insertions) that fall outside current U.S. transgenic regulations.
- » Features optimized workflows for high-volume protoplast production in rice and sorghum, with results successfully translated into stable, improved plants via prime editing.
- » Enables the fine-tuning of gene expression rather than simple binary knockouts or disruptive overexpression.
- » Successfully identifies mutations across multiple key rate-limiting genes in photosynthetic pathways.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ [Rubisco Selection System](#)
- ▶ [Compositions and Methods for Genome Editing in Plants](#)
- ▶ [Compression of Genetic Information in Multiple Reading Frames](#)

CONTACT

Terri Sale
terri.sale@berkeley.edu
tel: 510-643-4219.



INVENTORS

- » Savage, David Frank

OTHER INFORMATION

CATEGORIZED AS

- » **Agriculture & Animal Science**
 - » Plant Traits
 - » Transgenics
- » **Biotechnology**
 - » Genomics
- » **Research Tools**
 - » Nucleic Acids/DNA/RNA
 - » Screening Assays

RELATED CASES

2026-019-0

- ▶ 2'-fluoro RNA Activators for Enhanced Activation of Csm6 in RNA Detection Assays
- ▶ Composition and Methods of a Nuclease Chain Reaction for Nucleic Acid Detection



University of California, Berkeley Office of Technology Licensing

2150 Shattuck Avenue, Suite 510, Berkeley, CA 94704

Tel: 510.643.7201 | Fax: 510.642.4566

<https://ipira.berkeley.edu/> | otl-feedback@lists.berkeley.edu

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