New Tools for Student Training and Gene Discovery/Trait Improvement in Plants

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in a novel variety of rapid-cycling *Brassica rapa* that is useful for student training in genetic and genomic sciences and for gene discovery/trait improvement in agronomically important plant species.

Overview

Enabling students to understand the connection between organismal phenotype and the underlying, DNA sequence-based genotype remains the holy grail of genetics education. As continuing advances in DNA sequencing technology permit more powerful and rapid approaches to gene discovery, it is essential that students understand and learn how to make use of these new approaches in areas from personalized medicine, where a patient's own genomic DNA sequence will aid in diagnosis, prognosis and treatment, to crop improvement efforts needed to feed a growing population in the face of ongoing global climate change.

The Invention

UW–Madison researchers used a selective breeding program to create a self-compatible (can propagate via self-pollination) analog of a self-incompatible variety of *B. rapa*.

Seeds of the self-incompatible variety are used by educators in 88 countries around the world (estimated sales ~15 million seeds/year) to provide students with a hands-on, inquiry-based approach to enhance their understanding of plant biology and general biological principles. However, the obligatory outcrossing reproductive habit of existing plants essentially precludes extension of the biology curriculum to the realms of molecular biology and genomics.

The new self-compatible and highly inbred (hence true-breeding) variety circumvents those limitations while providing a familiar classroom model system whose growth habits—compact stature, rapid progression from seed to progeny seeds, vigorous growth with minimal material inputs—are of high value to educators and plant breeders alike.

With the reference strain in hand, UW researchers have developed a suite of derivative lines and genetic/genomic resources that include:

1. A diverse collection of mutant derivatives whose phenotypes are provocative and clearly distinct from the parental strain, and whose transmission from parental to progeny generations epitomizes fundamental Mendelian genetic principles of inheritance;
2. PCR-based molecular genetic markers that enable localization and molecular characterization of mutant/variant alleles;
3. A DNA sequence assembly that describes the nucleotide sequences of the ~40,000 genes encoded by the *B. rapa* genome;
4. Several RNA-Seq data sets useful to understand genome-wide patterns of gene expression; and
5. Advance Intercross Recombinant Inbred Lines with demonstrated utility for identification of *B. rapa* genes that modify the expression of quantitative genetic traits.

As an integrated collection of resources, this plant model system will be of considerable use to both educators and agricultural biotechnology firms interested in identifying lead gene candidates for enhancement of agronomically important traits.

Applications

- Educational resources for genetics and genomics instruction in K-12 and undergraduate classrooms
- Identification of *B. rapa* genetic variants that may be of value to plant breeders and agricultural biotechnology companies

Key Benefits

- Helps students learn about plant biology, molecular genetics and bioinformatics
- Easy to grow experimental model system
- Rapid flowering and short reproductive cycle (6-8 weeks from parental to progeny seed generations)
- Facile genetic manipulations
- Potential for commercial product (agriculture and biotechnology) development

Stage of Development

All genetic stocks derived from the reference strain are ready for licensing to educational supply companies and to ag biotech companies.

Additional Information

For More Information About the Inventors

- Richard Amasino

Tech Fields

- Animals, Agriculture & Food : Plant biotech
- Education & Training : Educational tools

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842