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HILAGE: Haploid Inducer Line for Accelerated Genome Editing (20150117, Dr. Robert Stupar)

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Agriculture & Veterinary/Ag Biotechnology

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IP Status:

- US Patent Issued; Patent #11,193,131
- European Patent Issued; Patent #EP3316676
- Chinese Patent Issued; Patent #107920486
- Canadian Patent Issued; Patent #2991054
- Brazil Patent Pending; Application #BR112017028460-0

Targeted mutations and quick recovery of homozygous mutant plants

HILAGE (Haploid Inducer Line for Accelerated Genome Editing) allows breeders and researchers to induce a targeted mutation and quickly recover a homozygous mutant plant. The HILAGE technology combines a haploid inducer system with one or more gene-editing events to produce haploid individuals with the desired mutation(s) from a single cross. The method utilizes a plant haploid inducer stock line containing one or more endonucleases to combine haploid induction with targeted DNA double strand breaks engineered by the endonuclease, followed by chromosome doubling. The goal is to generate the haploid inducer line with one or more endonuclease(s) that can induce mutations followed by haploidization. Doubling the chromosome numbers of the resulting haploid individuals yields Doubled Haploids (DH), which are fully inbred lines, homozygous for the mutation(s) and ready for testing and commercialization. The technology is cost-effective and fast (less than 1 year) and reduces cost, time, and operational risks associated with intensive backcrossing.

Places targeted mutations directly into elite germplasm

Introducing improved traits (genes) into elite lines of crops is difficult, expensive and time consuming, in part due to the backcrossing process. Currently, targeted mutations are generated in lines that are easily transformed and then backcrossed into elite germplasm. By contrast, this new technology places targeted mutations directly into the elite germplasm. While both double haploidization and targeted gene-editing are already reliable techniques, HILAGE combines these two technologies into a single seamless method. This unique combination represents a fundamental change in how both technologies are used. For example, instead of backcrossing to stack mutation traits together, all targeted mutations can be induced at once, allowing elite lines themselves can be directly mutated. In theory, HILAGE could generate targeted mutations in wheat, oat, maize, barley and other agronomic crops, all without putting a transgene into the host genome.

Phase of Development

- Commercial Validation

Benefits

- Significant cost and time savings by eliminating backcrossing
- Much faster than current breeding techniques (less than one year versus 3-5 years)
- Less expensive: fewer generations of plants, greenhouse space and labor are needed
- Decreased operational risks associated with a shorter pipeline and fewer greenhouse or field growouts required to achieve the desired product

Features

- Uniquely combines double haploidization and targeted gene-editing
- Induces multiple targeted mutations at once
- Places targeted mutations directly into elite germplasm
- Produces haploids with desired mutation(s) from a single cross
- Quickly recovers homozygous mutant plants

Applications

- Introducing gene edited traits into elite germplasm
- Improving maize, oat, wheat, barley and vegetable crops
- Research tool

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Interested in Licensing?

The University relies on industry partners to further develop and ultimately commercialize this technology. The license is for the sale, manufacture or use of products claimed by the patents. Please contact us to share your business needs and licensing and technical interests in this technology.

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