Inducible N-Degron Mediated Haploid Induction

Tech ID: 29877 / UC Case 2016-194-0

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ABSTRACT

Researchers at the University of California, Davis have developed a method of cell-specific degradation of centromeric proteins to induce haploid.

FULL DESCRIPTION

Breeding of diploid plants relies on thorough screening to identify novel and desirable characteristics. Large numbers of progeny from crosses must be grown, inbreed for 8-10 generations and evaluated over several years in order to select one or a few plants with a desired combination of traits. The process can be accelerated by producing haploid plants (or doubled haploid plants) to produce homozygous lines in one generation. Production of haploid plants that can be doubled to generate fertile doubled haploids in only one generation can dramatically improve the efficiency and effectiveness of plant breeding.

Researchers at the University of California, Davis have developed a method to target and degrade cell-specific centromeric proteins using dormant, protease inducible N-degron to produce haploid plants. The method produces plant gametes with uncompetitive chromosomes that are lost during post-fertilization mitosis, halving the chromosome number. This method can use specific centromeric protein depletion in the gamete of one sex but not the other, as well as achieve genome elimination through self-fertilization within the same bisexual flower rather than relying on cross fertilization between genetically different plants. In addition, the depletion of centromeric proteins by protein degradation is more rapid and efficient than depletion by transcriptional or post-transcriptional repression.

Researchers have demonstrated the N-degron induced depletion of centromeric proteins and ongoing tests about germline depletion causing haploid induction when in the gamete of one sex but not the other look promising. Haploid induction by self-fertilization using this method, combined with other manipulations, is advantageous to normal reproductive development. Haploids generated by this process may not be used for breeding as easily as those generated by cross-fertilization but within a cross-fertilization setting, ongoing experiments are testing the method's potential to be more efficient than haploid induction by centromeric protein variants.

APPLICATIONS

- Production of plant gametes with uncompetitive chromosomes to produce haploid plants

FEATURES/BENEFITS

- True-breeding (homozygous) haploid lines in one generation
- Produce plant gametes with uncompetitive chromosomes

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,447,787	09/20/2022	2016-194

Additional Patent Pending

INVENTORS

- Maheshwari, Arundhati

OTHER INFORMATION

KEYWORDS

centromeric, haploid induction, N-degron, gametes

CATEGORIZED AS

- **Agriculture & Animal Science**
  - Plant Traits
  - Plant Varieties
- **Biotechnology**
  - Other

RELATED CASES

2016-194-0

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