Efficient Induction of Parthenogenesis in Crop Plants

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ABSTRACT

Researchers at the University of California, Davis have developed a technology enabling hybrid crops to reproduce cloned seeds, boosting yield and stability.

FULL DESCRIPTION

The large-scale use of hybrid seeds over the past century has contributed to a revolution in agriculture. Hybrid crop plants produce high yields, but due to genetic segregation, their progeny have variable and frequently low yields. This means that hybrid seeds have to be generated afresh for every season, using labor-intensive methods such as hand pollination, resulting in substantially higher costs. Consequently, hybrids are underutilized for many crops, especially by farmers in developing countries. Recently a technology called synthetic apomixis has been developed to enable hybrid rice plants to produce seeds that are genetic clones of the parent plant, such that the progeny can produce the same high yields as the parent plant. The method mimics a process called apomixis that occurs naturally in many asexual plant species, and utilizes genome editing together with manipulation of gene expression to bypass both genetic segregation and fertilization.

Researchers at the University of California Davis have developed an efficient strategy for stable parthenogenic rice plants, these plants produce seeds that are genetic clones of the parent plant. The technology utilizes genome editing along with manipulation of gene expression to bypass genetic segregation and fertilization resulting in parthenogenesis frequency as high as 90% through the expressional combination of two transcription factors, BBM1 and WOX9A.

APPLICATIONS

- Application in large-scale agriculture, especially in hybrid crop production.
- Could be used in genetic engineering research and applications.
- Potential applications in other cereal crops such as maize, wheat, and barley and possibly in dicot crops like canola and tomato.

FEATURES/BENEFITS

- Produces high-yield crops through cloned seeds.
- Significantly reduces the costs associated with hybrid seed production.
- Increases parthenogenesis efficiency significantly to 90%, a critical threshold for practical utility.
- Has potential applications in other cereal crops and possibly in dicot crops.
- Addresses the issue of the high cost of producing hybrid seeds every season.
- Solves the problem of genetic segregation and fertilization in seed production.
- Eliminates the limitations in applying technology for agricultural production of hybrid crops by increasing the parthenogenesis frequency.

PATENT STATUS

Patent Pending

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OTHER INFORMATION

KEYWORDS

parthenogenesis, synthetic apomixis, transcription factor, mitosis, genetic segregation, genome editing, transgene, cereal crops, haploid progeny, embryogenesis

CATEGORIZED AS

- **Agriculture & Animal Science**
  - Plant Traits
  - Plant Varieties
  - Transgenics
- **Biotechnology**
  - Genomics

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