

Candidate Genes for Inducing Apomixis in Plants by Genetic Engineering

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Food & Agriculture

Abstract

USU researchers have identified specific genes that promote apomictic seed set in plants. This allows crops to propagate themselves asexually, creating cost effective, efficient, and high yielding plants.

Problem

With rapid population growth, improving agricultural techniques is critical. The best crops on the market produce 15-35% less than their genetic potential yield and require excessive time and resources to propagate.

Solution

Using three newly identified genes, this technology promotes apomictic seed set by suppressing meiotic trajectory to produce genetically homozygous crops with superior yields.

Value Proposition

Apomictic seed set induction creates superior yielding hybrid plants that produce identical offspring which creates a lineage of superior crops while reducing costs and resources.

Benefit

As the world population continues to grow exponentially, providing food for this growing population proves difficult. Superior yielding plants can only be produced by meticulously hand pollinating carefully bred parent lines to produce hybrid plants. This requires time and resources. For most crops, cost efficient methods of producing field production quantities of hybrid seed do not exist. The genetic yield potential of varietal crops including wheat, barley, rice, soybean, and cotton is 15-35% higher than the best varieties of these crops produced in the world today. There is no method available that generates the highest producing crops while reducing costs, using fewer resources, and increasing efficiency.

This technology proposes a way to modify plant gametes so that they self-propagate. Three genes have been identified that have been proven to induce apomictic seed set in plants. These genes suppress the meiotic trajectory and induce apomeiotic trajectory in ovules, creating genetically homozygous seeds. This means the best plants can be replicated exactly and more efficiently than when hand pollination is required. This technology makes engineering crops that require less time and resources for breeding while yielding the highest percentages possible.

Apomictic breeding allows for the fixation and propagation of any desired genotype, creating plants that are more efficient and reliable for large scale agricultural production. More crops can be produced with less land area and fewer resources. The successful implementation of apomixis in agriculture will revolutionize food production and the agriculture industry, thus drawing the attention of scientific and industrial sectors interested in crop improvement.

Market Application

This technology could be applied in the Agricultural and Environmental Technologies sector of the Global Biotechnology market as a method of increasing plant yield through the creation of apomictic seed set induction.

Inventor

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Intellectual Property

Pending US Non-Provisional Patent Application filed August 2024, titled "Methods of Inducing Unreduced Aposporous or Diplosporous Embryo Sac Formation in a Sexual Angiosperm", Publication No. US2025/0151686A1. Priority Date February 14, 2022.