New Methods For Creating Male and Female Sterile Plants as well as Restoring Fertility

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Inventor:

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• Unique and efficient strategy to create both male and female sterile Arabidopsis and tobacco plants.
• Method includes the SDS::SDS-BARNASE system which can specifically ablate pollen and megaspore mother cells.
• Allows for restoration of plant fertility by using an artificial microRNA system.
• Research will make commercial uses of transgenic plants possible.
Current methods on the market for sterility cause plant growth to be stunted and flower development to be interrupted.
New method shows no signs of stunted growth (B,D), through use of the SDS::SDS-BARNASE system.
• Some lines did produce a few functional pollen grains (no grains in A, dead grains in B, a few functional red grains in C).
• The tobacco SDS gene is expected to be more efficient to create absolutely male and female sterile plant.
• Wild type viable pollen grains in red color
Market For GM Plants

• In 2014, the global area of biotech crops continued to increase for the 19th year at a sustained growth rate of 3 to 4% or 6.3 million hectares (~16 million acres), reaching 181.5 million hectares, or 448 million acres.

• In 2014, a total of 18 million farmers planted biotech crops in 28 countries, wherein over 94.1% or greater than 16.9 million were small and resource-poor farmers from developing countries.

• The highest increase in any country, in absolute hectarage growth was US with 3 million hectares. In summary, during the period of 1996 to 2014, biotech crops have been successfully grown in accumulated hectarage of 1.78 billion hectares (4.4 billion acres).
Intellectual Property

• A United States Provisional Patent has been filed for this invention.

Partnering

• Looking to test this system in a tree model and other relevant GM crops. This technology is available for research support and licensing.
• **Male and Female Plant Sterility** – This system allows for sterility of both sexes.

• **Reversible** – Restored as needed.

• **Uninterrupted Growth** – No stunting of plant growth or flower structure.

• **Non-Toxic** – Specific to pollen mother cells and does not cause toxicity in other tissues.

• **Versatile** – Can be utilized in specific transgenic crops or ornamental plants where fruit production is unwanted.
Sterile to Fertile Reversal

- Shows lack of pollen in B versus wild type in A. Wild type is the natural plant.
  - In C, they induce fertility again, you can see some pollen.
  - G is normal plant, H and I are sterile, and J is induced to be fertile again.
  - L is wild type plant and M is a sterile offspring from plants that were induced to be fertile again.
• Microscopic images of the ablation of male and female gametes using our technology compared to wild type.
• Sterile tobacco plants were also tested using the Arabdopsis construct and resulted in no change of size or flowering.
Summary

• Numerous advantages over current methods, including: sterility of both sexes, sterility reversal and uninterrupted growth and flower structure.
  • Large, growing market, especially in the U.S.
  • Provisional patent filed.
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