

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

**(OTT ID 1459)**

**Inventor:**

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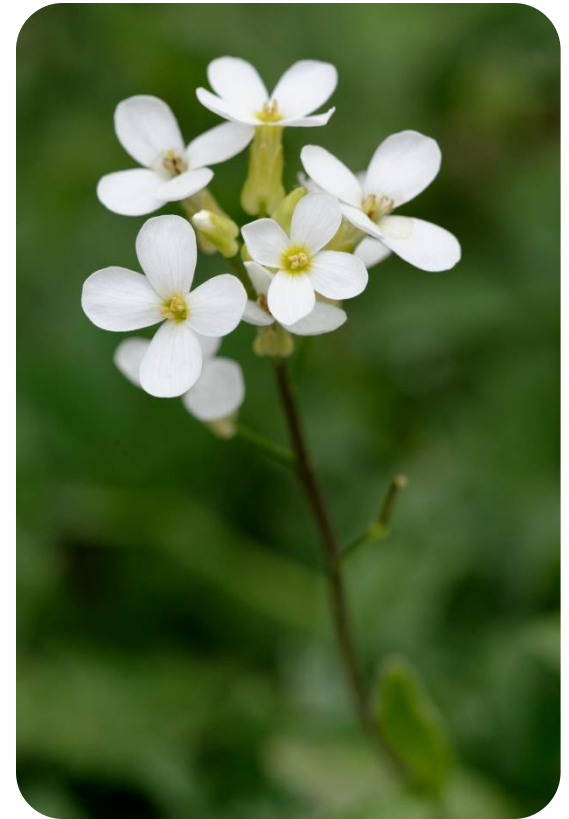
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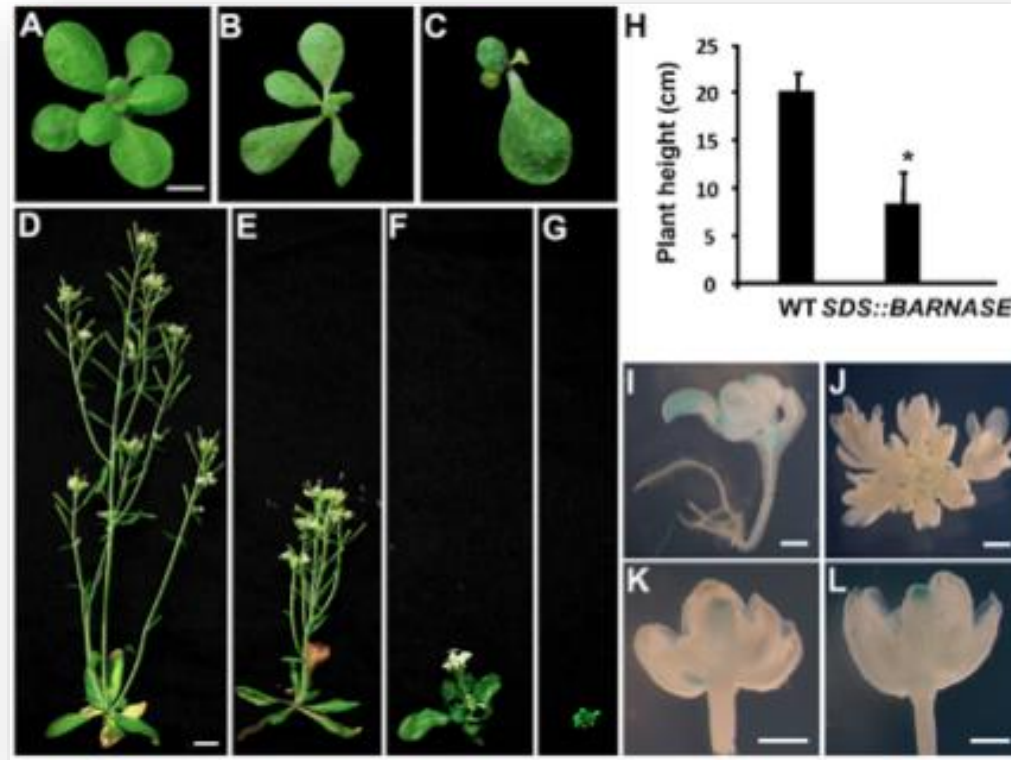
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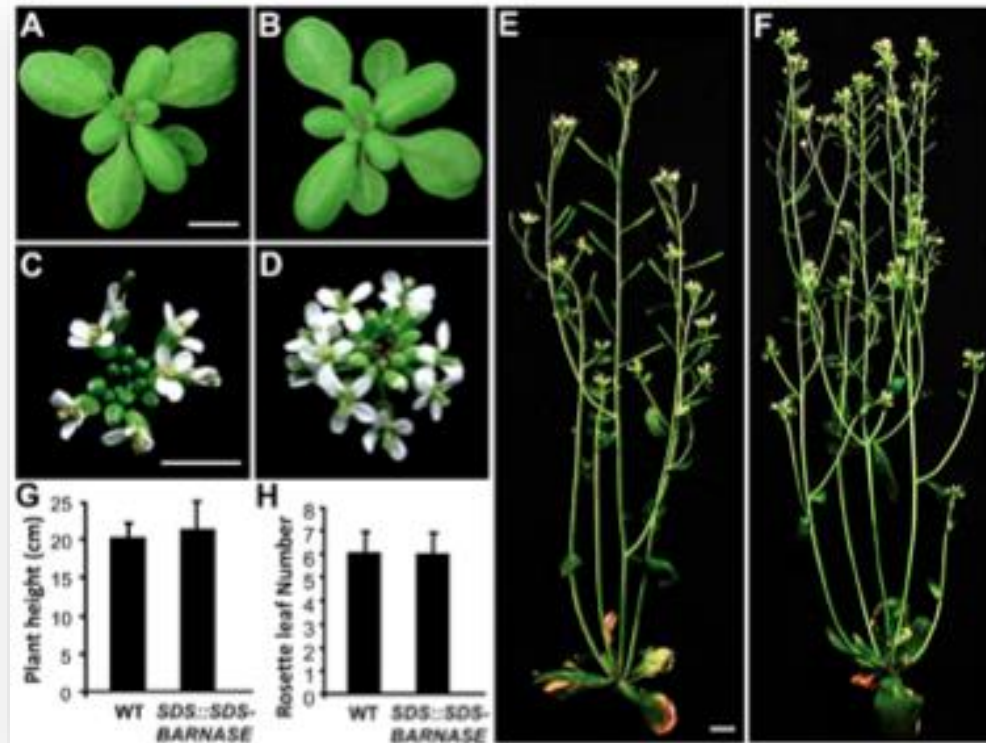
- Unique and efficient strategy to create both male and female sterile *Arabidopsis* and tobacco plants.
- Method includes the SDS::SDS-BARNASE system which can specifically ablate pollen and megaspore mother cells.
- Allows for restoration of plant fertility by using an artificial microRNA system.
- Research will make commercial uses of transgenic plants possible.



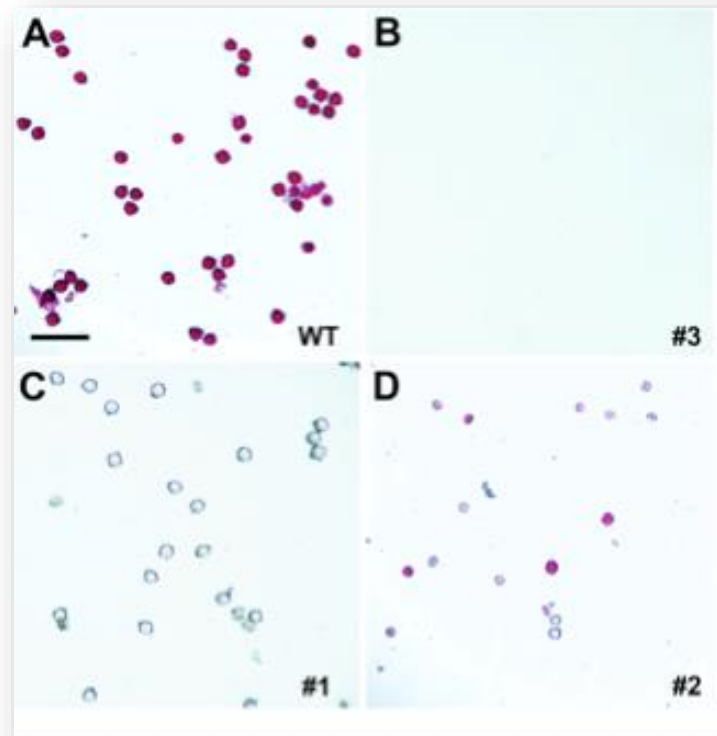
# Problem with Current Method



- 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

- 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 hectareage growth was US with 3 million hectares. In summary, during the period of 1996 to 2014, biotech crops have been successfully grown in accumulated hectareage of 1.78 billion hectares (4.4 billion acres).

## Intellectual Property

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

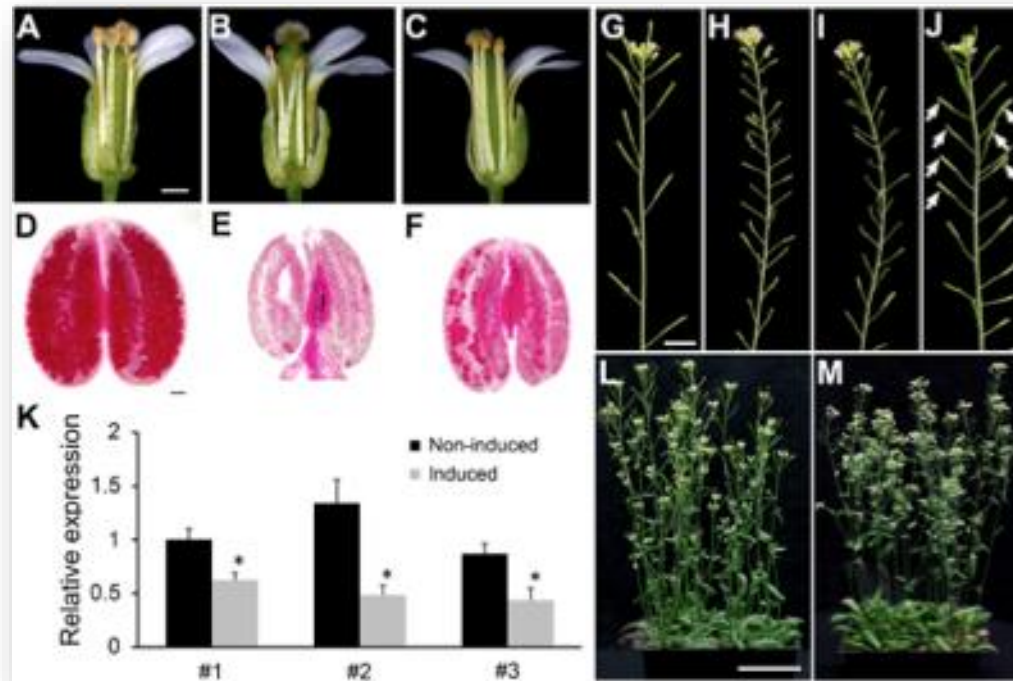
## Partnering

- 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.

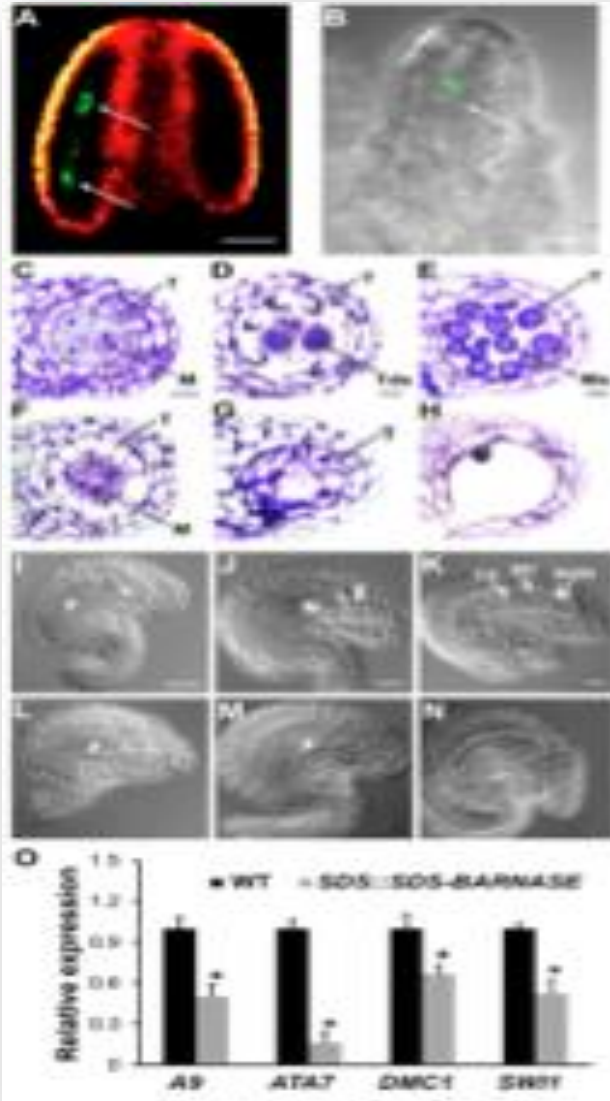


# Sterile to Fertile Reversal

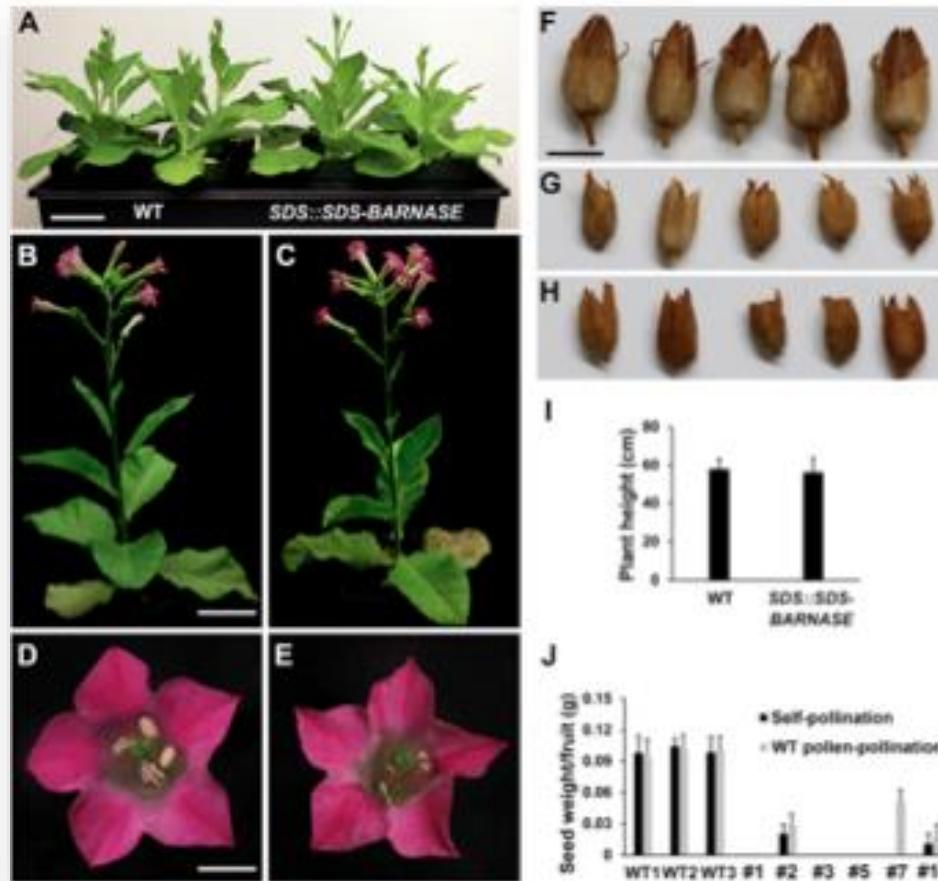


- Shows lack of pollen in B versus wild type in A. Wild type is the natural plant.
  - In C, they induce fertility again, you can see some pollen.
- G is normal plant, H and I are sterile, and J is induced to be fertile again.
- L is wild type plant and M is a sterile offspring from plants that were induced to be fertile again.

# Ablation of Gametes



- 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 Arabidopsis construct and resulted in no change of size or flowering.

- 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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