

## Male Sterility in Plant Breeding

Male sterility is characterised by non – functional pollen grains, while female gametes function normally.

# Types of Male sterility :

- 1. Genetic male sterility**
- 2. Cytoplasmic male sterility**
- 3. Cytoplasmic – Genetic Male Sterility.**

# 1. Genetic male sterility

This is produced by a recessive **nuclear gene**,  $ms$ . The dominant alleles  $Ms$  produces male fertility. It may arise naturally or can be included.

## Use in plant breeding

- Genetic male sterility can be used in hybrid seeds production.
- In USA, it is successfully used in castor.
- In India, it is used for the production of hybrid variety of **cajanus cajan**.
- This method is not widely used because of some practical difficulties.

## 2. Cytoplasmic male sterility

- **This is caused by the genes in the cytoplasm (in mitochondria).**
- The genes for cytoplasmic male sterility is located in mitochondria (eg: in maize).
- Cytoplasmic male sterility is found in many plants like maize (*Zea mays*), tobacco (*Nicotiana tabacum*), wheat (*Triticum aestivum*), cotton (*Gossypium hirsutum*) etc.

### Use in plant Breeding :

- cytoplasmic male sterility can be used for the production of hybrid seeds in certain ornamental species or in species where a vegetative part is of economic value. eg **tobacco (*Nicotiana tabacum*)**
- But in those crop plants where seed is the economic part , it is of no use because the hybrid progeny would be male sterile.

# 3. Cytoplasmic – Genetic Male Sterility

- This is a case of cytoplasmic male sterility where a nuclear gene for restoring fertility in the male sterile line is known.
- The fertility restorer gene, R is dominant and is found in certain strains of the species (eg: in wheat).
- This gene restores male fertility in the male sterile line, hence it is known as restorer gene.
- This system is known in maize, sunflower, rice, wheat etc.

## **Use in Plant Breeding**

The plant cytoplasmic - genetic male sterility is used commercially to produce hybrid seed in **maize**. This system is the most widely used method in hybrid seed production

# Uses of male sterility in large scale production of hybrids

- Male sterility is used for commercial hybrids seeds production.
- This include utilization of cytoplasmic – genetic male sterility, cytoplasmic male sterility and genetic male sterility.
- cytoplasmic – genetic male sterility system is the most widely used method in hybrid seed production

# Corn or maize

Tassel – male flower producing pollen at the top

Silk – Female flower

hybridization – Detasseling of female parent to prevent self pollination

Detasseling- removal of Tassel – male flower producing pollen at the top

## How corn pollinates

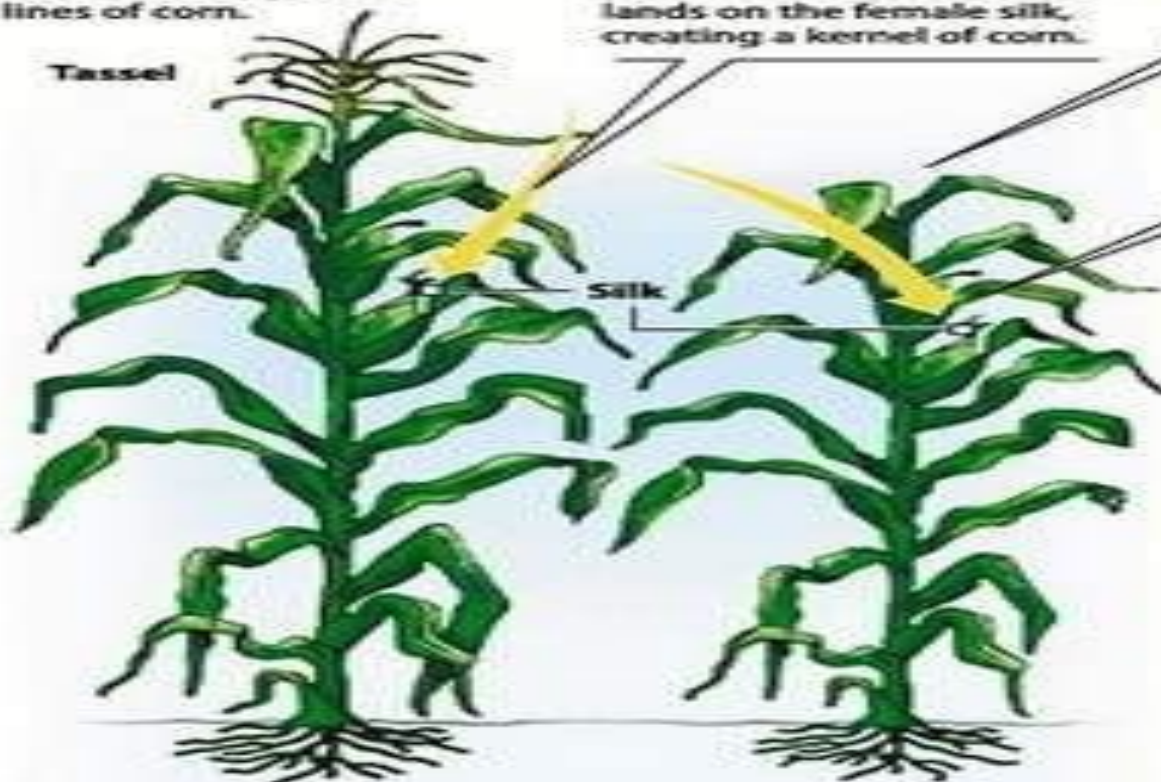
The tassel on top secretes pollen that falls to the silk on the leaf below, which in turn develops into an ear of corn. Pollination for hybrid crossbreeding is controlled either through detasseling or new male-sterile varieties of corn.

A seed field contains two different parent lines of corn.

Pollination occurs when pollen from a male tassel lands on the female silk, creating a kernel of corn.

Detassellers walk or ride down rows of corn, pulling tassels from plants and effectively rendering them female.

Detasseled plants must rely on pollen from the neighboring line of corn for pollination, resulting in seed corn that combines the genetics of both lines.



### How the new technologies work

Seed companies would put the new strains of corn plants — which are incapable of self-pollination — in their fields next to corn with tassels. The seed companies would continue their crossbreeding without having to remove the tassels on the female corn. See an animated schematic of how corn pollinates at [www.livinghistoryfarm.org/farminginthe30s/crops\\_03.html](http://www.livinghistoryfarm.org/farminginthe30s/crops_03.html).