## Comparing Methods of Genetic Modification in Plants

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| **Cross Breeding**  | • Widely accepted method of plant breeding.  
                        • Takes place in nature without scientific intervention, but can be manually carried out to provide more predictable results. | • Limited to the genes already found in the genome of a species.  
                                                                                       • Laws of inheritance may limit the inheritance of a trait, especially if it is recessive.  
                                                                                       • Limited ability to select individual traits. While selecting for one specific trait, other traits may also be adopted that could be negative, positive, or of no significant consequence. |
| **Mutagenesis**     | • Creates random variation in the genes by promoting gene mutations. | • Traits produced are random, not selected in any way. There is little to no control over the traits that are produced.  
                                                                                       • Need to screen large populations of plants for a given trait to find a desired mutation.  
                                                                                       • Do not know how many mutations have actually been made in the genome. |
| **Polyploidy**      | • Plants have the general advantage of heterosis and gene redundancy.  
                        • Plants can become sterile. In the case of a seedless watermelon, this is a desired trait. | • If plants are sterile (do not produce viable seeds), extra time and money is required by the farmer to produce plants.  
                                                                                       • With the increased genetic material of a polyploid, cells can be larger and may result in watery fruit with less flavor in some plant species. |
| **Protoplast Fusion** | • Helps create new hybrid plants and new plant varieties.  
                                • Allows cross breeding of two species. | • Doesn't always produce viable offspring plants that can reproduce. |
| **Transgenesis**    | • Allows specific and defined changes to a genome to add or delete a trait or traits.  
                                • Can use genes found in other organisms as-is, or can make specific changes to them in a laboratory first. | • The desired gene often originates in another organism.  
                                                                                       • The science is rejected by some consumers. |
| **Genome Editing (CRISPR)** | • Allows specific changes to a genome by making additions, deletions, or specific changes to a DNA sequence (trait).  
                                • No need for transgenes (genes acquired from another species/genome). | • Although no foreign DNA is used, some consumers may still be concerned about the concept.  
                                                                                       • Due to the fact that the technology is new in the agricultural context, there isn't any food on the market that was developed using CRISPR. |