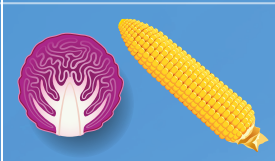
GET TO KNOW GMOS: SEED IMPROVEMENT

How do we create new and improved varieties of plants? It starts with the seed. Plant breeders and scientists work together to create new varieties to address evolving challenges to farming and changing consumer preferences. Humans have been central in seed improvement for over 10,000 years, and in the last 100 years our understanding of genetics has accelerated and enabled new seed improvement techniques. Compared to earlier methods, breeders can now make improvements to seeds by moving more precisely one or a few genes into a seed.

The chart below compares and contrasts modern methods of seed improvement.

SEED IMPROVEMENT TECHNIQUE	SELECTIVE BREEDING 10,000 years ago to today	INTERSPECIES CROSSES late 1800s to today	MUTAGENESIS 1930s to today	TRANSGENESIS (GMOs) 1990s to today
What is it?	Combining traits from similar and dissimilar plants by crossing into one genetic background with improved traits	Breeding and tissue culture techniques that permit genetic exchange between plants not crossing naturally	Using chemicals or radiation on seeds to change DNA and occasionally induce a favorable trait	Adding a specific, well-characterized gene to a new seed to transfer a specific trait
Examples	 Almost everything we eat	 Pluots, tangelos, some apples, rice and wheat	 Many plants and fruits including pears, apples, rice, yams, mint, some bananas	 Alfalfa, apples, canola, corn (field and sweet), cotton, papaya, potatoes, soybeans, squash and sugar beets
Improved by breeding?	YES	YES	YES	YES
How many genes are affected?	10,000 to 300,000+	10,000 to 300,000	Random and unknown, likely thousands	1 to 3
Do we know which genes in the seed are affected?	NO	NO	NO	YES
Research and development time?	5 to 30 years	5 to 30 years	5+ years	5 to 10 years
Reviewed and approved by regulatory agencies to ensure safety for people, animals and the environment?	NO	NO	NO	YES
Can the seeds be patented?	YES	YES	YES	YES
Approved for non-GMO and organic farming?	YES	YES	YES	NO
Are people asking for labeling?	NO	NO	NO	YES

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