

Crop Improvement and Plant Biotechnology

Chapters 20 and 21

Objectives

- Understand the goals _____
 - Describe _____ plant breeding methods
 - Describe how _____ are developed relative to _____ breeding processes
 - Understand _____ and _____ of transgenic crops
-

Crop improvement

- Developing plants with _____ that increase _____ and _____ of _____ production in a given _____
 - Two areas:
 - Plant _____
 - Plant _____
-

Plant breeding

- The _____ and _____ of
_____ plant improvement
-

Plant genetics

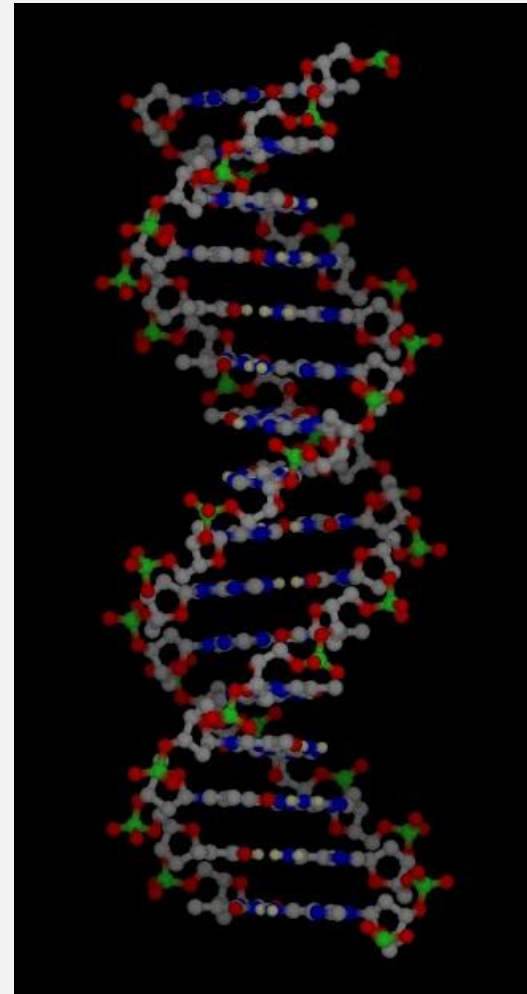
- The study of _____ of _____
in plants
-

Traits

- Traits are the result of _____
 - Genes are composed of _____
-

DNA

- _____
- The _____ for an organisms _____ and _____



Central dogma of molecular biology

_____ → _____ → _____

_____ determines _____

Genotype

- All of the _____
within an organism
-

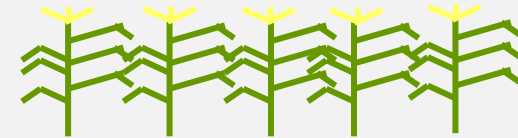
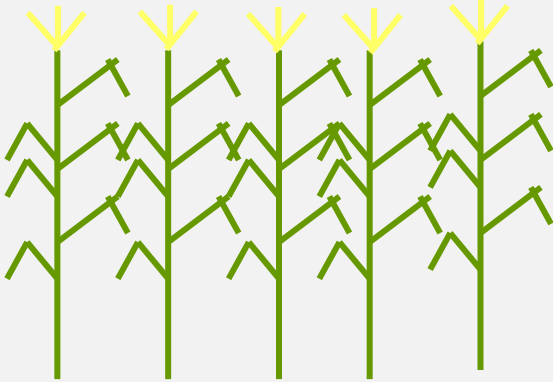
Phenotype

- The _____ of an organism
 - Result of _____ between _____ and _____
-



Environment

DNA → RNA → Protein → Phenotype



Necessary information for crop improvement

- The extent to which a given _____ is influenced by _____ and by _____
 - If trait is controlled by _____ or by _____
 - The most common method of _____ for the plant
-

Plant breeding process

1. Identify the _____
 2. Collect genetic _____
 3. Make new _____
 4. Select _____ combinations
 5. _____ selections
-

Identify the objective

- Improve _____
 - _____ resistance
 - _____ or _____ tolerance
 - Improved _____
-

Collect genetic variation

- Adapted _____
 - _____ seed
 - Plant _____
 - Induced _____
-

Make and select new combinations

- Mass selection
 - Pure lines
 - Hybrid crosses
-

Mass selection

- Select all _____ that contribute to a _____
 - Useful in _____-pollinated crops
-

Pure lines

- A “pure line” is a plant that has been bred by _____ of a single plant
 - More _____ than a cultivar developed by mass selection
-

Hybridization

- The _____ pollination of two genetically _____ plants (often _____ plants)
- Hybrid vigor
 - only in first generation



Evaluate selections

- Compare the new selection to

_____ selections

- _____ testing

Limitations of traditional plant breeding

- _____
 - Limited selection of _____
 - Low _____
-

Genetically modified organisms

- Genes are _____ from one organism to another
 - More correctly called _____
crops
-

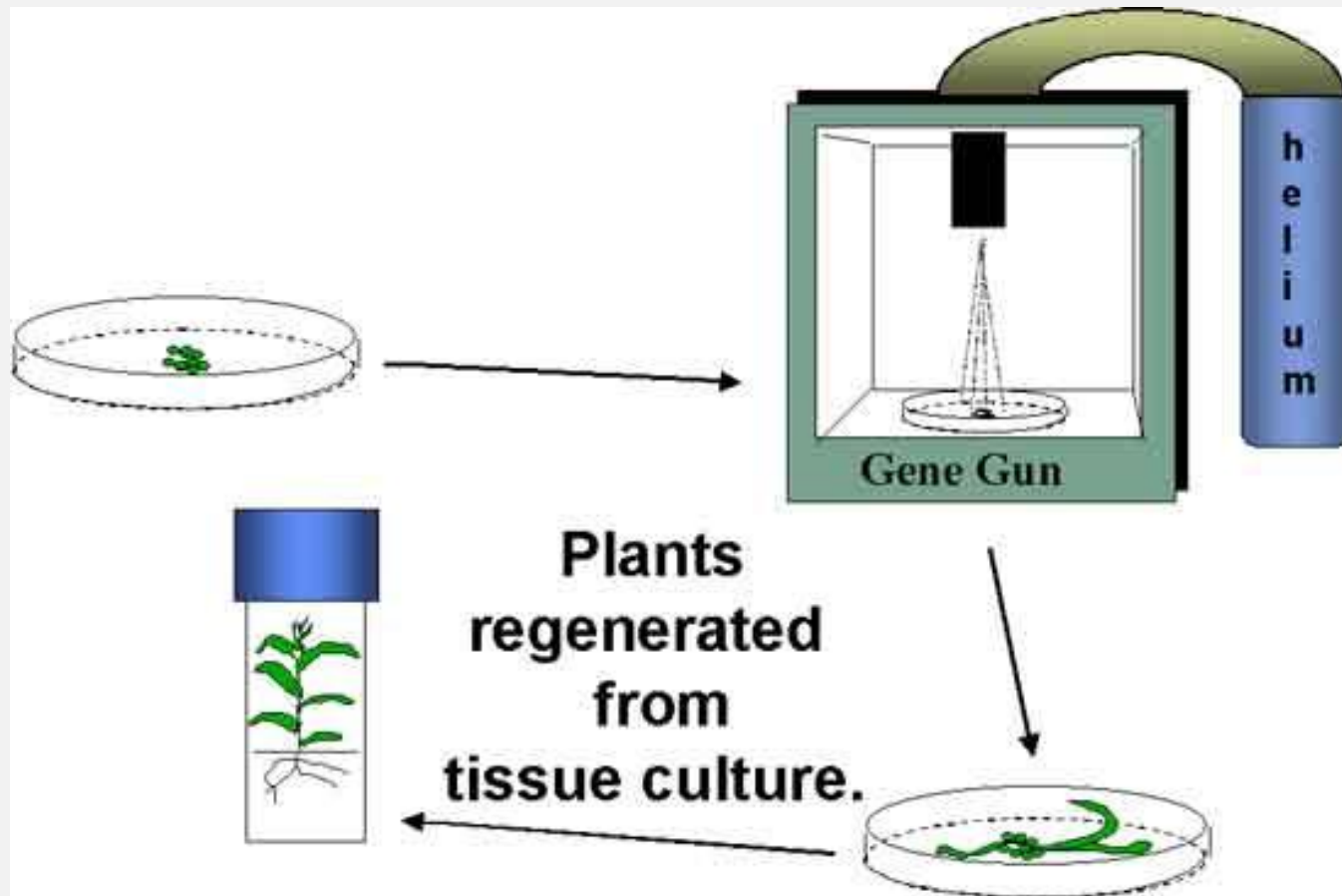
Biotechnology & Genetically modified organisms

- The “truth” about biotechnology and GMOs:
 - _____ of agriculture involve “biotechnology”
 - _____ are “genetically modified”
-

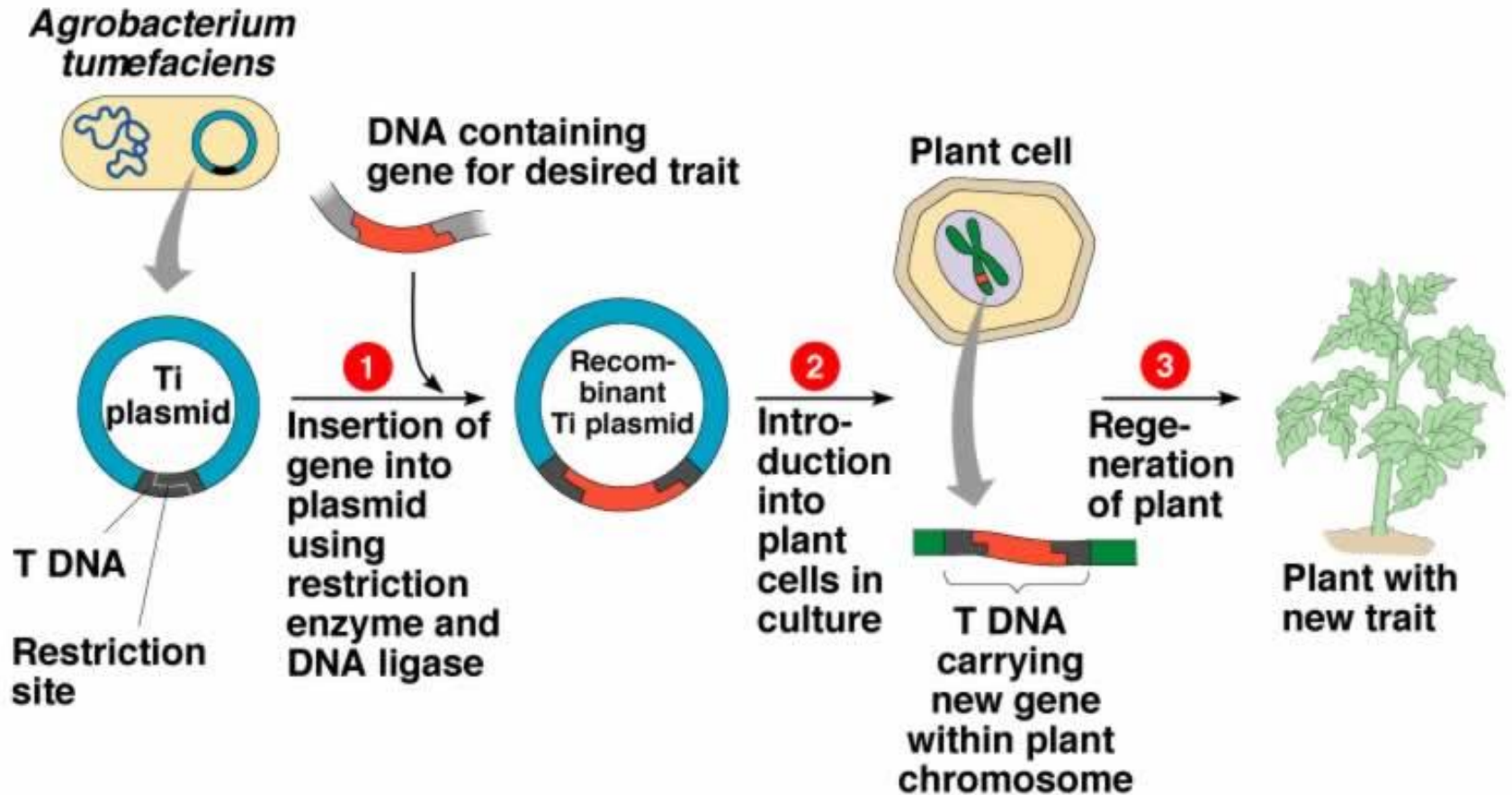
Some currently available transgenic crops

- _____ – herbicide tolerant, altered fatty acid composition
 - _____ – Bt, herbicide tolerant
 - _____ – Bt, herbicide tolerant
 - _____ – Provitamin A, herbicide tolerant
 - _____ – herbicide tolerant
 - _____ – FlavrSavr
-

Transformation



Transformation



Transgenic crop controversies

- What is the benefit to the _____?
 - What is changing _____ the desired trait?
 - How do we keep transgenic and conventional crops _____?
 - What happens to the _____?
-

