Definitions

Meristem: The region of actively dividing stem cells in a plant.

Shoot apical meristem: The growth region at the tip of the shoots of plants.

Apical: At the tip or apex.

Axillary: In the angle between the leaf and the stem.

Stem cell: An unspecialized cell capable of differentiating into specialized cells, such as those in roots, leaves, or flowers.

Negative feedback loop: A connection between an input and output, where the output blocks or stops the input, such as a thermostat set to a temperature.

Wild type / WT: The typical form or one that occurs most in nature.

Gene: A region of DNA that encodes a protein that serves a specific function.

Allele: A version of a gene that can differ from other versions in performing a gene's function.

Mutant: A change in the DNA sequence of an allele. Mutations can be naturally occurring, or artificial.

Selection: The process of increasing the frequency of beneficial alleles and removing poor alleles. This can be naturally occurring, or facilitated by humans as in plant breeding.

Improvement: The process of breeding and modifying crops with specific traits to improve performance in the field.

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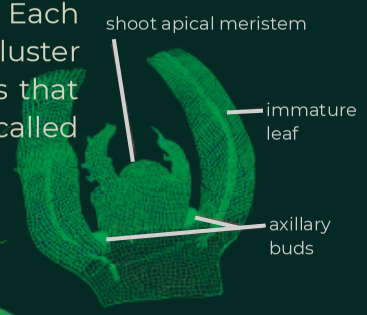
STEM CELLS IN AGRICULTURE

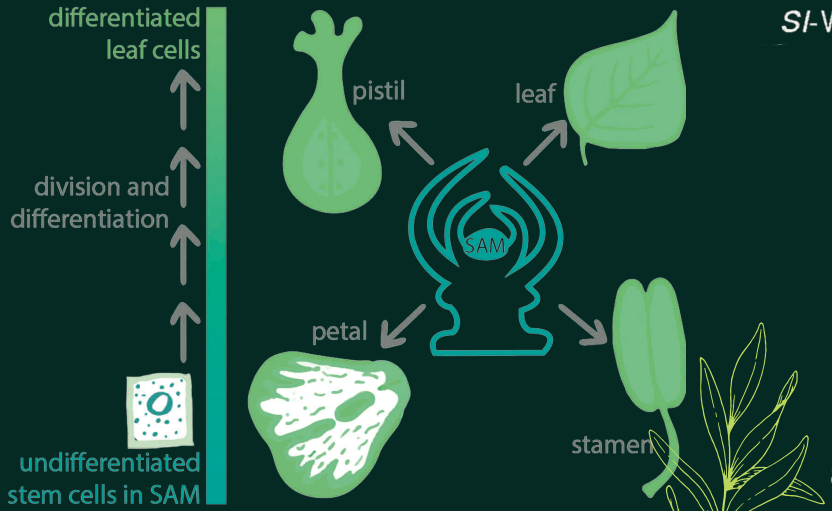
The Bartlett Lab

What are meristems?

Meristems are centers of plant development. Each meristem contains a cluster of non-specialized cells that are actively dividing, called **stem cells**.

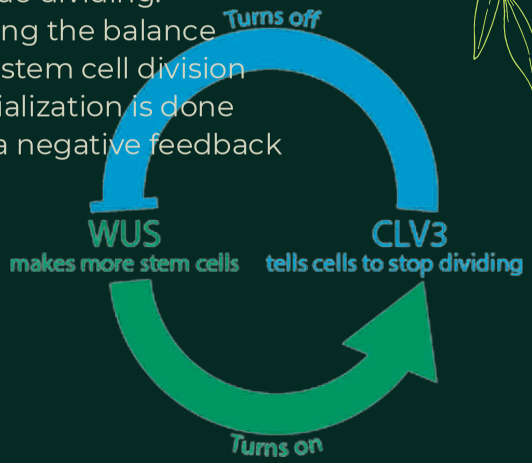


Stem cells can become specialized, forming different types of plant cells and new plant organs, such as leaves and branches. A plant's organs - like roots and leaves - originate at its meristems.

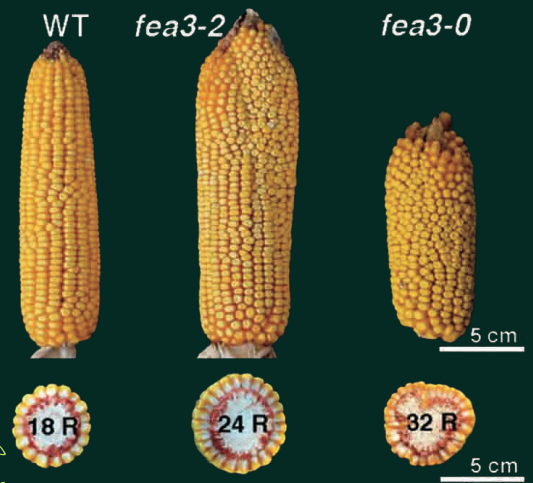


What regulates meristem size?

Stem cells depend on signals from other parts of the plant to continue dividing. Maintaining the balance between stem cell division and specialization is done through a negative feedback loop.

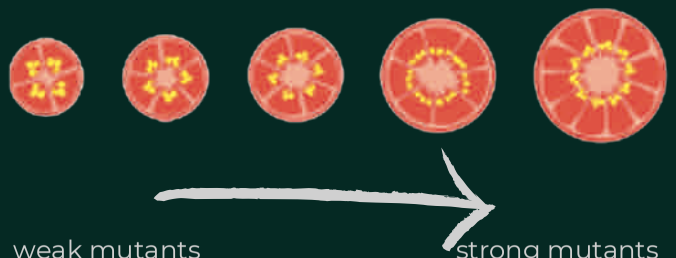


Mutations in some genes can lead to increased production of stem cells, giving rise to larger meristems that can then become larger fruits.

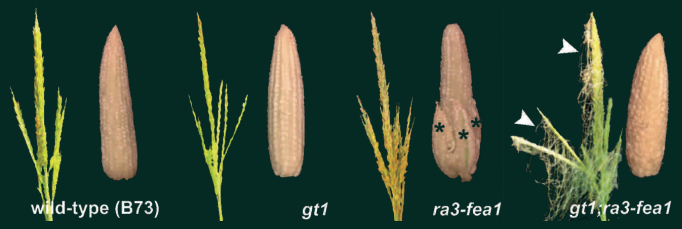


Meristems in Agriculture

With meristems, too few stem cells leads to no plant growth, while too many can lead to deformed organs. Mutations that fall between these extremes are the most useful in agriculture, because they lead to plants with more, bigger fruits that are otherwise normal.



The Bartlett lab uses genetics to understand the genes controlling meristems and plant development. Scientists can use this knowledge to fine-tune the function of these genes, and uncover what mutations will be useful for crops and agriculture.



The genes *gt1* and *ra3* regulate branching in tassels and ears, and the growth of silks from flowers. These are both important in agriculture.