Genetics of the compact growth habit trait

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Compact growth habit in tomatoes?

Tomatoes with a determinate plant type, shortened internodes and spreading characteristics of side branching

Fruits above the ground without the requirement of typical manual practices
Primary goals of plant breeding have aimed at improved traits of commercial value.

**Introgression** of one or a few genes (traits) into a current elite cultivar (breeding line) is a common plant breeding practice.

Let’s focus on methods for "**introgression**".
Method 1. Crossing

Method 2. Tissue culture

Method 3. Genome engineering technologies
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<th><strong>Crossing</strong></th>
<th><strong>Editing genes</strong></th>
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<tr>
<td>Changes in genetic background</td>
<td>High (Whole genome)</td>
<td>Low (very precisely)</td>
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<td>The length of time necessary to complete</td>
<td>Years (on breeders)</td>
<td>Yet, requires cycle(s)</td>
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<td>Technical limitation</td>
<td>Not favorable for wild relatives</td>
<td>Currently, inactivation of gene(s)</td>
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How new technologies positively impact the breeding paradigm for breeders to introgress the compact growth habit trait?

A better understanding of genetic information about the trait is crucial.
Genetic information $\approx$ gene(s)
A gene or cluster of genes make phenotype(s).

Tomato has approximately 35,000 genes.
~35,000 genes are here
Tomato chromosome view

Genetic information (Gene)

Compact Growth Habit 1
Compact Growth Habit 2
Normal plant 1
Normal plant 2
New sources of the compact growth habit trait?

*S. lycopersicum* accessions with morphology data

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Heinz 1706
Our compact growth habit plant
Negative control
Future works

1. Identification of gene(s) mediate the trait

2. Integration of recent advances in genome engineering technologies

3. Provide basic information about genetic diversity
Correction of a pathogenic gene mutation in human embryos

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