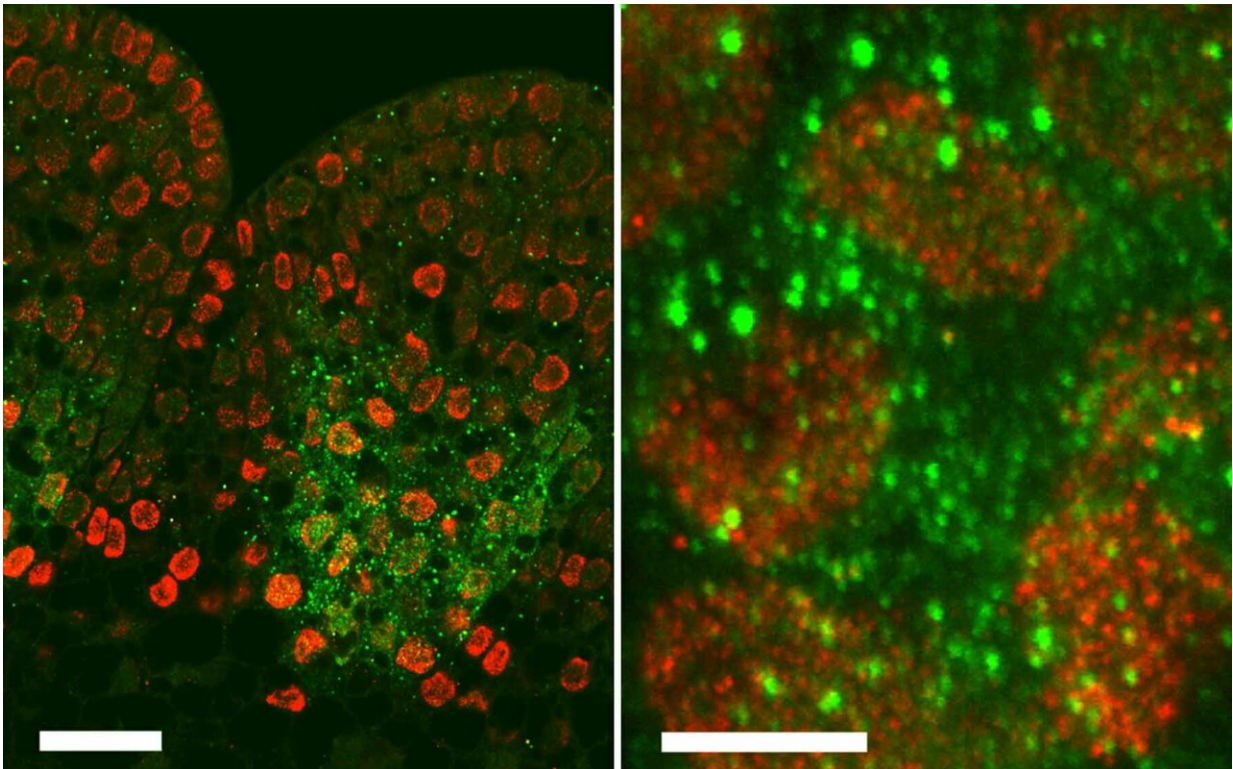


Crop yield in maize influenced by unexpected gene 'moonlighting'

April 2 2019, by Charlotte Hu



RA3 gene activity was detected and traced to presence in nucleus and cytoplasm of developing cell in maize ear. RA3 is in green and nuclei are counterstained in red. Credit: Jackson lab/CSHL

Maize is a staple crop that came from humble beginnings. If you look at its wild ancestor, teosinte, the plant looks nearly unrecognizable. Human

selection has persuaded the maize plant to grow in a way that produces higher yields and can be more efficiently harvested. But scientists and farmers are looking for ways, in the face of climate change, population growth, and other factors, to even further optimize maize yields.

Now, researchers at Cold Spring Harbor Laboratory (CSHL) have identified a relationship between crop yield in the [maize plant](#) and specific genetic activity associated with one of the plant's metabolic pathways. The discovery has implications for [plant breeding](#), potentially opening the door for increasingly resilient, higher-yield [maize](#) plants.

CSHL Professor David Jackson and his team have connected the RAMOSA3 gene to branching, which can affect its yield. When a maize plant has too many branches, it will expend more energy towards making those branches, and less towards making seeds. More branches often means lower or less efficient yields.

Ears, the part of maize that we eat, are normally not branched at all—they just form one straight cob. But maize mutants that don't have the RAMOSA3 gene can end up with gnarly-looking branched ears.

Jackson and his team initially hypothesized that the enzyme that RAMOSA3 encodes, called TPP, and a sugar phosphate called T6P which TPP acts on, are likely responsible for the ear-branching. Although the precise function of T6P remains "largely elusive," the scientists believe that it has signaling properties.



Representative mature ears of genetically unaltered maize, maize with the *tpp4* gene blocked, maize with the *ra3* gene blocked and maize with both the *ra3* and *tpp4* genes blocked. Branching in the ear was observed when researchers blocked vital genes as compared to the normal unaltered maize. Credit: Cold Spring Harbor Laboratory

Then, in a surprising twist, they found that a related gene, *TPP4*, also helps to control branching, but that gene's effect was unrelated to its enzymatic activity. They wondered if the same might be true for *RAMOSA3* and its own enzymatic activity. To follow up on this, they blocked only the enzyme activity associated with *RAMOSA3*, and not the gene itself, and got normal-looking ears of maize. This indicates that although *RAMOSA3* controls the activity of the enzyme, it seems the [enzyme activity](#) is not responsible for controlling branching. Thus, the gene may be "moonlighting" with a hidden activity, explains Jackson. The question of what that moonlighting may entail is a launching-off point for [future research](#).

The team's findings were published in *Nature Plants*. Their work could lead to better crop yields and more efficient harvesting for the maize plant, as well as for other crops, like rice and quinoa.

More information: Hannes Claeys et al, Control of meristem determinacy by trehalose 6-phosphate phosphatases is uncoupled from enzymatic activity, *Nature Plants* (2019). [DOI: 10.1038/s41477-019-0394-z](https://doi.org/10.1038/s41477-019-0394-z)

Provided by Cold Spring Harbor Laboratory

Citation: Crop yield in maize influenced by unexpected gene 'moonlighting' (2019, April 2) retrieved 29 April 2024 from <https://phys.org/news/2019-04-crop-yield-maize-unexpected-gene.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.