

Researchers describe gene that makes large, plump tomatoes

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Diversity in tomato fruit weight is explained in part by a mutation in the Cell Size Regulator gene that arose during domestication. Credit: Alexis Ramos and Esther van der Knaap, University of Georgia Athens GA 30602

Farmers can grow big, juicy tomatoes thanks to a mutation in the Cell Size Regulator gene that occurred during the tomato domestication process. Esther van der Knaap of the University of Georgia, Athens and colleagues describe this gene variant in a study published in open-access journal *PLOS Genetics* on August 17th, 2017.

When humans first began cultivating the wild tomato in the Andean mountain regions of Ecuador and Northern Peru, they continually



selected plants that produced larger fruits. Now, thousands of years later, tomatoes on the market can weigh 1,000 times more than the fruits of their ancestors. In the current study, researchers investigated a gene they named Cell Size Regulator, or CSR, that boosts <u>fruit</u> weight by increasing the size of the individual cells in the pericarp, which is the fleshy part of the tomato. Compared to wild tomatoes, domesticated varieties carry a mutation in the CSR genes that shortens the resulting protein in tomato <u>cells</u>, and that truncation likely affects its role in regulating cell differentiation and maturation in the fruit and vascular tissues. The variation originated in the cherry tomato but now appears in all large cultivated tomato varieties.

The new study expands on previous research that had identified the location of CSR at the bottom of chromosome 11 as only a small genetic contributor to tomato weight. Now with the cloning of the gene, the finding that most cultivated tomatoes carry the shortened version of the CSR gene suggests that humans selected this genetic variation extensively and that it was critical to the full domestication of tomato from its cherry tomato ancestors.

"CSR is required to create the large tomatoes that are needed for the industry. This is because large tomatoes critically raise the profit margins for farmers. The knowledge of the gene will now open up avenues of research into how fruit size can be increased further without negatively impacting other important qualities such as disease resistance and flavor," says Dr. van der Knaap.

More information: Mu Q, Huang Z, Chakrabarti M, Illa-Berenguer E, Liu X, Wang Y, et al. (2017) Fruit weight is controlled by Cell Size Regulator encoding a novel protein that is expressed in maturing tomato fruits. *PLoS Genet* 13(8): e1006930. doi.org/10.1371/journal.pgen.1006930



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