

Not the Same Old Genetic Modification: How Fine-Tuning Gene Expression in Plants Might Feed the World



By Julianna LeMieux — April 6, 2016



With the number of people on this Earth expected to reach

eight billion within the next 20 years – there is a birth every eight seconds in the United States alone – one of the questions “cropping” up more and more is how are we going to produce enough food for everyone?

There are many obstacles to increasing crop production, which include increasing temperatures, drought, limited space and salinization, or increased salt content in soil. With these challenges, new solutions that result in increased food production are becoming more critical. Also, existing solutions, such as increasing the amount of fertilizer used, can have negative effects on both the plants and the environment.

Using an innovative approach, researchers [have developed a way to “turn up” a gene in plants so that they are not only better able to grow in more varied environmental conditions](#) [1], but can use water and nutrients more effectively during photosynthesis.

The overexpression of the gene [type 1 H⁺-PPase](#) results in different benefits to the plant, including enhanced drought resistance and being able to grow in higher salt conditions. Additionally, there is an increase in the biomass of shoots and roots. More roots means stronger growth with less water and less fertilizer. Lastly, and of utmost importance, is that this gene is found widely across many different types of plants, and these benefits have been seen in primary crops such as rice, barley, corn, wheat and cotton.

This work presents a new way of thinking about genetic modification, showing that multiple different traits of an organism can be dramatically altered by tweaking how much protein is made from an existing gene – or in other words, changing the gene’s level of “expression.”

Although there has to be some manipulation in order to do this, there are no new genes introduced into the genome and no new proteins produced by the organism – a watered-down version of a more traditional genetic modification that even the harshest anti-GMO activist would have a hard

time criticizing.

Citation: Roberto A. Gaxiola, Kamesh Regmi, Kendal D. Hirschi, Moving On Up: H⁺-PPase Mediated Crop Improvement, Trends in Biotechnology (in press, corrected proof) DOI: [10.1016/j.tibtech.2015.12.016](https://doi.org/10.1016/j.tibtech.2015.12.016) [2]

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[1] [http://www.cell.com/trends/biotechnology/abstract/S0167-7799\(16\)00002-0](http://www.cell.com/trends/biotechnology/abstract/S0167-7799(16)00002-0)

[2] <http://dx.doi.org/10.1016/j.tibtech.2015.12.016>