PENN CENTER FOR INNOVATION

Improved Stress and Nutrient Response in Plants via Root Hair Regulation

This technology is aimed at improving crop production in the era of global climate change and rising fertilizer costs.

Inventor

Brian Gregory, PhD, Assistant Professor of Biology

STAGE OF DEVELOPMENT

Demonstrated in Laboratory Setting

INTELLECTUAL PROPERTY

Provisional pending

REFERENCE MEDIA

Publication in Developmental Cell: A Global View of RNA-Protein Interactions Identifies Post-transcriptional Regulators or Root Hair Cell Fate

APPLICATIONS

Develop crops that are readily able to survive in stressed situations or with the use of fewer nutrient inputs

DESIRED PARTNERSHIP

License

Co-development

LEARN MORE

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Problem

Feeding 7 Billion people is a global concern, and this problem continues to grow year-to-year. A large problem for the agricultural industry is finding a way to grow food on less arable land, while also decreasing expensive inputs (water, nutrients, chemicals, etc…), while still maintaining competitive yields. By identifying plants that can grow in stressed environments as effectively as normal conditions, we can begin to address this problem. A key driver for this will be plants that can more effectively take in water and nutrients, which will allow them to grow successfully in more challenging environments.

Solution

Research within Prof. Gregory's laboratory in the Biology Department at the University of Pennsylvania has led to the discovery of gene regulation opportunities for improving crop plant traits in response to water, heat, and nutrient-stressed situations. The over expression of a particular gene causes an increase in surface area of the root by increasing the number of root hairs. Plants regulate the ratio of root hair to non-hair cells depending on environmental signals.

Studies have shown that increasing the root hair population increases the uptake of nutrients (e.g. phosphate) and water which enhances the plants ability to survive in stress environments; such as heat, drought, or nutrient deficient situations.

Advantages

- Could be designed to promote optimal nutrient uptake in less arable situations or under stress of heat, nutrient deprivation, and/or drought
- Could increase growth and development in plants based on increase in efficiency of absorption of nutrients

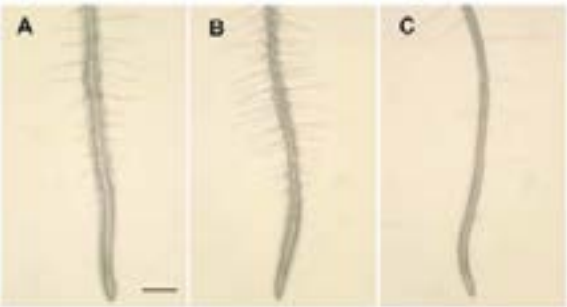

Image Caption:

Images of root hairs with normal in (A), upregulated production in (B), and downregulated production in (C).