**RRES Press Release 26 Sept 23 Study sheds light on how plant roots branch**

*Sugar signalling mechanism may have potential to boost crop yields*

A sugar molecule common in many plant and bacterial biochemical pathways may be critical in determining when plant roots branch.  Trehalose-6-phosphate (T6P), a simple sugar based on two conjoined glucose molecules, appears to be the vital intermediary between hormone signalling and lateral root development.

It has long been known that plant hormones (known as auxins) are the fundamental controllers of new growth, what has not been clear until now has been how exactly they work to stimulate the development of new lateral roots.

Creating new roots is highly energy intensive. They “cost” the plant in carbon and energy resources deployed but also create new opportunities to access nutrients and water.  What precisely triggers the plant to branch out and commit new resources has not been fully understood to date.

The study team used chemical and genetic techniques, including CRISPR gene editing, to modulate the various signalling pathways in the plant in order to work out the role of T6P. The sugar increases root branching through coordinated inhibition of some enzymes (kinases) and activation of others. Auxin remains the master regulator of lateral root formation but it impacts this T6P function by regulating a  degrader enzyme.

The results reveal a regulatory energy balance network for lateral root formation that links the novel ‘sugar signal’ T6P to the kinases downstream of auxin.

“The work is important in giving us a better understanding of how lateral root growth occurs which is vital for crop yield and resilience,” said Dr Matthew Paul. “In addition, the mechanism may provide a more generic model for how carbon and energy signaling are coordinated with hormonal regulation of growth and ultimately crop yield.

“Knowledge of this mechanism may provide opportunity to modify it for yield and resilience through gene editing, genetic selection and the chemical T6P methodology, now being successfully utilized as a field spray to increase crop yields.”

Publication

**Trehalose-6-phosphate signaling regulates lateral root formation in Arabidopsis thaliana**

… Cara Griffiths, Matthew Paul

**September 25, 2023**

PNAS 120 (40) e2302996120

<https://doi.org/10.1073/pnas.2302996120>