Researchers uncover new mechanism controlling plant root development

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An international team of researchers, including Kun Yue, Tom Beeckman and Ive De Smet (VIB/UGent), discovered a new cell division regulator that shapes plant root systems, PROTEIN PHOSPHATASE 2A-3 (PP2A-3). Their findings, published this week in the journal *Proceedings of the National Academy of Sciences*, could lead to new techniques to improve root architecture in favor of higher crop yields.

Plant roots grow and branch out, tapping into the soil for water and nutrients. However, knowledge on the mechanisms that control root growth and development is limited. Working on the plant species Arabidopsis thaliana, De Smet and his team set out to find proteins that bind and interact with a known regulator of root systems, the ARABIDOPSIS CRINKLY 4 (ACR4) receptor kinase. Combining different biochemical methods resulted in the identification of PP2A-3 as a phosphorylation substrate of ACR4. Together with ACR4, PP2A-3 was shown to be part of a tightly controlled phosphorylation hub that orchestrates cell division and consequently root architecture. "These findings follow nicely on our previous work on ACR4, the first receptor kinase to be assigned a role in root development", De Smet says. "Discovering a new interaction partner of ACR4 is exciting because we now have more insight in the action mechanism of this important plant growth regulator."

Although the work took place in Arabidopsis, most crop plants have similar genes to ACR4 and PP2A-3. A better understanding of mechanisms governing root development can open the door to new tools

to ensure crop productivity. For example, plants with deeper root networks thrive better because they can access more soil resources, like water and nitrogen. In contrast, more root branching in the top soil allows optimal foraging for phosphate. "More knowledge on root growth can serve as the foundation for the generation of new crop varieties with better developed root systems", De Smet concludes.

More information: PP2A-3 interacts with ACR4 and regulates formative cell division in the Arabidopsis root, www.pnas.org/cgi/doi/10.1073/pnas.1525122113

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