Improving crops from the roots up

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Research involving scientists at The University of Nottingham has taken us a step closer to breeding hardier crops that can better adapt to different environmental conditions and fight off attack from parasites.

In a paper published in the Proceedings of the National Academy of Sciences of the United States of America (PNAS), the researchers have shown that they can alter root growth in the plant *Arabidopsis thaliana*, or thale cress, by controlling an important regulatory protein.

Dr Ive De Smet, a Biotechnology and Biological Sciences Research Council (BBSRC) David Phillips Fellow in the University's Division of Plant and Crop Science, said: "The world's population is increasing, and a new green revolution is even more pressing to deliver global food security. To achieve this, optimising the root system of plants is essential and these recent results will contribute significantly to our goal of improving crop growth and yield under varying environmental conditions."

The work was carried out by an international team of researchers. Led by scientists from the Plant Systems Biology Department in the life sciences research institute VIB in Flanders, Belgium, and Ghent University, the study also involved experts from Wake Forest University in the US and the Albrecht-von-Haller Institute for Plant Sciences in Germany.

Plant root biology is essential for healthy plant growth and, while the so-called hidden half of the plant has often been overlooked, its importance

is becoming increasingly recognised by scientists.

Despite this, particularly in view of the critical role plants play in global food security, improving plant growth by modulating the biological architecture of root systems is an area which is largely unexplored.

In this latest research, the scientists modulated levels of the protein, transcription factor WRKY23, in plants, analysed the effects on root development and used chemical profiling to demonstrate that this key factor controls the biosynthesis of important metabolites called flavonols.

Altered levels of flavonols affected the distribution of auxin, a plant hormone controlling many aspects of development, which resulted in impaired root growth.

The results of the research can now be used to produce new plant lines, such as crops which are economically valuable, which have an improved root system, making them better able to resist environmental changes which could lead to plant damage or poor yield.

In addition, WRKY23 was previously found to play a role in the way plants interact with types of nematode parasites, which could lead to further research into how to prevent attacks from the creatures during the early stages of plant growth.

More information: The paper 'Transcription Factor WRKY23 Assists Auxin Distribution Patterns During Arabidopsis Root Development Through Local Control on Flavonol Biosynthesis' featured in the online Early Edition of the *Proceedings of the National Academy of Sciences.* www.pnas.org/

Provided by University of Nottingham