Green vaccination: boosting plant immunity without side effects

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(Phys.org) —A team of international researchers has uncovered a mechanism by which plants are able to better defend themselves against disease causing pathogens.

The work led by Dr. Jurriaan Ton and Dr. Estrella Luna at the University of Sheffield in the UK and including scientists from The University of Western Australia, the University Jaume I in Spain and Utrecht University in The Netherlands, has been published in the international journal *Nature Chemical Biology*.

The scientists identified the key receptor binding a chemical called BABA (β-aminobutyric acid), which is boosting plant immunity.

BABA has long been known for its protective effects against devastating plant diseases, such as potato blight, but has so far not widely been used in crop protection because of undesirable side effects.

"We have found that the plant receptor binding BABA is an 'aspartyl tRNA synthetase' which we have called IBI1. This class of enzymes play a vital role in primary metabolism of all cells, but had never been linked to immune responses in plants. Binding of the chemical to this protein triggers a secondary function that 'primes' the plant immune system against future attacks by pests and diseases," Dr Luna said.

Dr Oliver Berkowitz, a Research Associate in the ARC Centre for Excellence in Plant Energy Biology and the School of Plant Biology at UWA was also involved in the research.

"Importantly, our study also revealed that the undesirable side effect of this vaccination, a reduction in growth, can be uncoupled from the beneficial immune reaction," Dr Berkowitz said.

"Since plant immunisation by BABA is long-lasting, primed crops would require fewer applications of fungicides, thereby increasing sustainability of crop protection. Furthermore, immune priming boosts so-called 'multi-genic' resistance in plants. Plant immunity that is controlled by a single resistance gene, on which most conventional breeding programs are based, is comparably easy to overcome by a pathogen. By contrast, priming of multi-genic immunity by BABA is difficult to break, thus offering more durable crop protection," Dr Ton said.

Although their research has been performed in a weed called 'Arabidopsis thaliana', the work horse of plant geneticists, the team is confident that their discovery can be used for the protection of crops from their enemies. Proof-of-concept experiments have already shown

that BABA is detected in a similar manner by tomato.

More information: Plant perception of β-aminobutyric acid is mediated by an aspartyl-tRNA synthetase, Estrella Luna, Marieke van Hulten, Yuhua Zhang, Oliver Berkowitz, Ana López, Pierre Pétriacq, Matthew A Sellwood, Beining Chen, Mike Burrell, Allison van de Meene, Corné M J Pieterse, Victor Flors & Jurriaan Ton, Published online: 28 April 2014, DOI: 10.1038/nchembio.1520

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