New approach to unlock the genetic potential of plant cell wall

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Researchers from the University of York and the Quadram Institute have unlocked the genetic secrets of plant cell walls, which could help improve the quality of plant-based foods.

Recent developments in genome sequencing technology have provided detailed information about the genetics of crop plants, but what has been lacking to date is the technology needed to collect comparable cell wall data to locate, assign and signpost these important genes for plant breeders.

Using a microarray, sometimes called a lab-on-a-chip, the team were able analyse thousands of plant cell samples simultaneously and harvest a large amount of data relevant to the arrangement of the cell.

They then linked this information back to particular changes in genetic information between the different varieties of plant cell, using a technique called association mapping.

Dr Ian Bancroft from the University of York's Department of Biology said: "Plant cell walls are made up of sugars, which can be arranged into a myriad of different carbohydrates that determine cell wall properties in subtly different but significant ways.

"Variations in these sugars alter the properties of the plant, by affecting how it grows, or how it defends against pests and diseases. They also affect the properties of materials that we derive from plants, such as the nutritional quality and usability as biofuel products.

"With a better understanding of the genetic controls of plant cell wall synthesis we can make more effective improvements to support agricultural industries and the bioindustry."

The microarray technology helped identify genetic markers in specimens that tended to contain more, or less of a specific component. The highlighted markers tell breeders when the good gene variant is present and tell scientists the likely position, and therefore identity, of a relevant gene.

Professor Keith Waldron, from the Quadram Institute, added: "This work tells us what genes are really important to a particular trait. As we were able to gather a large amount of data, we can identify the best traits for breeders with a good degree of accuracy.

"Using the genetic markers identified using this new technique, breeders will be better able to breed for varieties that may be more nutritious, or enhance how waste parts of the plant could be converted to biofuels or other biopolymers."

The authors are already exploiting their approach to open new opportunities for cell wall improvement in plants and other organisms with carbohydrate-rich cell walls.

More information: Ian P. Wood et al, Carbohydrate microarrays and their use for the identification of molecular markers for plant cell wall composition, *Proceedings of the National Academy of Sciences* (2017). DOI: 10.1073/pnas.1619033114

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