Controlling plant regeneration systems may drive the future of agriculture

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The ability to self-repair damaged tissue is one of the key features that define living organisms. Plants in particular are regeneration champions, a quality that has been used for centuries in horticultural techniques such as grafting. Belgian scientists from VIB and Ghent University have now discovered a key protein complex that controls plant tissue repair. Understanding this mechanism is of great agricultural importance: crops and edible plants might be cultivated more efficiently and made more resistant to parasitic plants. The results are published in the leading journal *Nature Plants*.

In humans and animals, missing or damaged tissue can be replenished by stem cells. These basic, undifferentiated cells can change into more specific cell types and divide to produce new cells that replace the damaged tissue cells. Plants are characterized by a similar system, but their regenerative properties are generally much greater. While this asset has been widely used in grafting and plant tissue culture techniques, the mechanism by which cells are triggered to form new cells after injury remained largely elusive.

Agricultural breakthrough

A team led by professor Lieven De Veylder (VIB-Ghent University) uncovered a novel protein complex controlling tissue repair in plants. One dead plant cell is sufficient to send a signal to the surrounding cells, which activates the protein complex. As a result, these neighboring cells

are triggered to divide in such a way that the newly produced cells can replace the dead ones.

Prof. De Veylder (VIB-Ghent University): "There are also a lot of plants and crops that don't have such swift repair systems, such as rice, wheat, corn, bananas and onions. By fully understanding this regeneration system, we might be able to induce it in those kinds of plants, thereby increasing cultivation efficiency. The same goes for grafting, which is employed in the wine and fruit industries, among others. Our findings may help to drastically reduce graft failure rate."

Harvesting the fruits of evolution

A new ecological strategy to counter parasitic plants is another potential future application of the study's results. These organisms, accounting for approximately 1% of flowering plants, are actually grafts that are able to grow through the mechanism described by the research project. In time, scientists may be able to block the natural grafting of these parasites onto economically important crops.

Prof. De Veylder (VIB-Ghent University): "Our findings illustrate how science can capitalize on the mechanisms of evolution. After all, nature has gradually developed solutions to nearly every biological problem. As scientists, it is our duty to get to the bottom of how these processes function and apply them to the benefit of society. As follow-up steps, we will check whether our results can be extrapolated to crops such as corn, and try to figure out the signals that activate the protein complex."

More information: Jefri Heyman et al. The heterodimeric transcription factor complex ERF115–PAT1 grants regeneration competence, *Nature Plants* (2016). DOI: 10.1038/nplants.2016.165

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