Agroinfiltration

'No strings attached'

To express a gene in a plant, it does not have to be stably integrated into the genome. The expression and protein translation machinery of the cells will do their work also on temporary visitors, such as genes harboured on introduced vectors. This virtue is exploited in *agroinfiltration*, a highly versatile technique that speeds up progress in the research laboratories as well as provides an excellent platform for large-scale production of valuable products in plants. Using recombinant DNA techniques, agroinfiltration leaves the genome of the plant untouched. In most cases, a next generation of plants is also not going to be generated as the plant residuals will be discarded after use.

Benefits

Agroinfiltration is an excellent research tool and can be used for rapid screening and evaluation of genes under investigation. Transgenic plants with stable gene integration often take several months to develop, whereas agroinfiltration allows large-scale screening within a few weeks. The technique can also be used to screen for plants with valuable phenotypes such as disease resistance, since pathogen-specific genes can easily be applied. As a platform for production of high-value, pharmaceutical or other, recombinant proteins, it has the advantage to accumulate proteins very rapidly and in high amounts.

Scientific description

Transient expression through agroinfiltration in plants is a relatively simple and straight-forward procedure. The most time-consuming step is the cloning of a transgene construct into a vector for transient delivery into the plant cells. The vector is commonly harboured in Agrobacterium cells and infiltration can be carried out either directly with a syringe or in a vacuum chamber. Rather than integrating any DNA-string into the genome, the delivered gene will only be transiently expressed in the cells. Two methods can be differentiated: '*sensu stricto'*, where leaves or other non-germline tissues are infected followed by local expression; and *agro-infection*, where similar tissues are infected with a virus-based vector causing the gene to spread in the entire plant.

Image: Chandres

Applications

Developed as a simple tool to study plant-pathogen interactions, protein localisation, protein-protein interactions and biosynthetic pathways, agroinfiltration has been applied extensively in research and breeding for screening and evaluation of genes and phenotypes. Notable examples include screening for disease resistance in potato, tomato, rice, bean, lettuce and rapeseed. As a production platform of vaccines - for hepatitis B and SARS amongst others - tomato, tobacco, white clover and lettuce have been used.

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