Transgenes in plant, but not in pollen

in

- Terminator Seeds [1]

SOURCE: Weekly newspaper for Wageningen UR, The Netherlands
DATE: 22 Jun 2006

Directed microspore-specific recombination of transgenic alleles to prevent pollen-mediated transmission of transgenes


"The research was supported by a personal OECD Biosafety fellowship (L.M.) as well as by the Dutch Ministry of Agriculture, Nature Management and Fisheries and the Centre of BioSystems Genomics (CBSG, part of the Dutch Genomics Initiative) (J.-P.N.)."

Researchers in Wageningen have developed a new method in which a genetically modified plant destroys its transgenes once it has manufactured its pollen. This makes it possible to avoid the spread of transgenes, and to use plants as molecular factories in a cleaner way.

'It seems to be a very elegant technique. What it comes down to is that, in addition to the genes that we introduce, there is also a gene that ensures that all the transgenes are thrown out once the plant starts to make pollen. To do this we linked the gene to a promoter, a genetic switch, that is only on while the plant is making pollen,' says Dr Jan-Peter Nap of Plant Research International. Together with Dr Ludmila Mlynárova, now at the Molecular Biology Group, and a colleague from New Zealand, they will publish their findings in July in Plant Biotechnology Journal.

Nap is aware that many people will associate this technique with the controversial terminator technology, a genetic modification which prevents transgenic plants from making seed. This enables seed companies to make sure that farmers have buy new improved seed each year, instead of using seed they have collected themselves. 'It is indeed a new kind of GURT - Genetic Use Restriction Technology - which is also what a terminator gene is. But in our case a plant does produce seed, it is only the production of transgenic pollen that is prevented. This is in response to the criticism that transgenes can be transferred to wild relatives or other crops through pollen. In addition, our technique does not require that plants be sprayed with chemicals to turn the switch on or off. We have made the deletion of the transgenes part of the plant's biology,' explains Nap.

The new technique makes use of a cre-gene, which can delete genetic material between two markers, the loxP-sites. By using a genetic switch, the promoter NTM19, which is only turned on during the first phase of
pollen formation, only the transgenes are removed from the pollen.

Nap and his colleagues started by testing the system in tobacco plants, from which the genetic switch comes originally. Only two out of 16,800 seeds (0.024 per cent) produced from pollen from the transgenic plant still contained transgenes. 'That is a surprisingly low percentage,' says Nap. The system is very robust and also works well in the model plant Arabidopsis.

One possible disadvantage is that, because of the absence of transgenes in the pollen, it will be more difficult to maintain pure breeding lines.

Nap expects applications to be found above all in molecular farming, in which plants are used to manufacture pharmaceuticals and health promoting substances. The tobacco plant is very suitable for producing complex substances, but Nap thinks there are opportunities for using crops such as cabbage varieties to manufacture health-promoting omega-3-fatty acids.

Nap does not think that the development will silence criticism from organisations such as Greenpeace. 'It is a very 'clean' process by which the transgenes are removed, but there still are 22 base pairs left over. This is not enough for a plant to manufacture transgenic proteins, but if activists are looking for a target, they will find one in this. After all, it's still genetic modification.'

Source URL: http://nwrage.org/content/transgenes-plant-not-pollen

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