

Cisgenesis

as safe or as risky as classic breeding?

The advocates of cisgenesis won a victory in Brussels in February. The food watchdog EFSA declared the technique for building species-specific resistance genes into crops as safe as classic breeding techniques. Opponents of the technique are not convinced.

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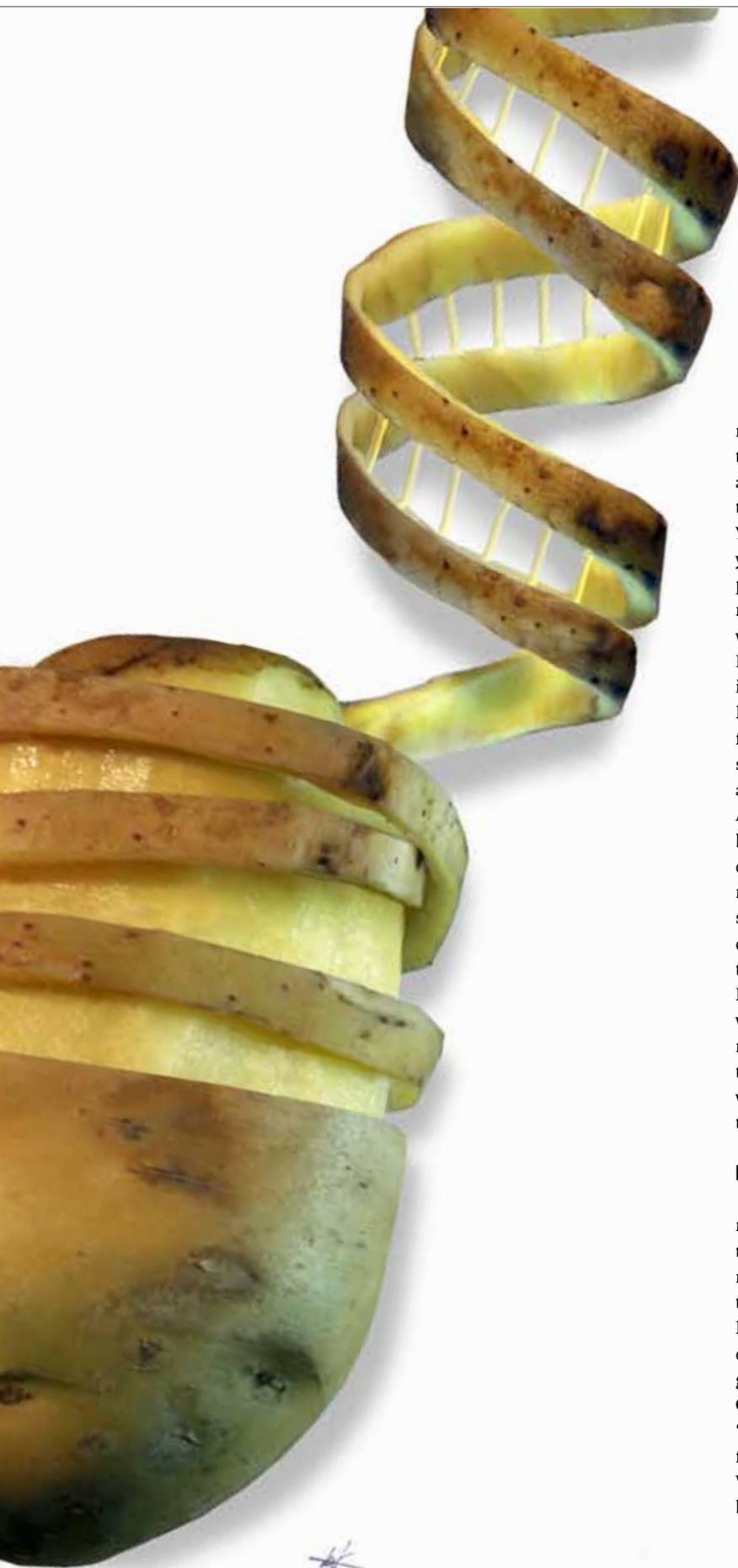
Giving an apple genes from a bacterium or from an octopus under laboratory conditions is genetic modification, but using the same technique to give an apple a gene from a wild apple is something else entirely, argue many plant breeders in Wageningen. Plant breeder Henk Schouten came up with a term for tinkering with species-specific genes ten years ago: cisgenesis. The opposite of transgenesis. Earlier this spring, the advocates of cisgenesis received the support of the EFSA, the European Food Safety Authority, when it declared that cisgenesis crops carry no more health risks than crops developed using classic plant breeding methods. The EFSA reached this conclusion after a study of the genetic chaos that results from normal plant reproduction. Which is not inconsiderable. Besides the slip-ups which cause errors to creep into the DNA, there are also things called transposons – ‘jumping’ bits of DNA that can settle randomly somewhere in the genetic material, switching off genes as they do so. The white grape is the product of a transposon which switched off a gene for producing the pigment in purple grapes. By equally natural processes, pieces of DNA can disappear, acci-

dentially get doubled or turn up in descendants’ DNA in the opposite order.

NO NEW DANGERS

Plant breeders have been exploiting this naturally occurring variety for centuries, as well as developing an arsenal of additional techniques such as using radiation or the changes to DNA that can be brought about by cultivating tissue cells. And all these techniques are at least as unpredictable as cisgenesis, says the EFSA. There is therefore no reason to anticipate new dangers justifying extra safety measures for cisgene crops. Cisgenesis is a Wageningen baby. Plant breeders Henk Schouten of Plant Research International and Evert Jacobsen of Wageningen University, both parts of Wageningen UR, have been campaigning since 2004 to get the technique recognized as safe and cisgene crops exempted from the regulations for genetic modification. The EFSA report is grist to their mill, says Euro MP Peter van Dalen of the Christian Union. His party is the strongest supporter of cisgenesis in the Netherlands, and indeed in Europe. ‘We see big advantages. It enables you to make crops





resistant to diseases quickly, whereas doing that by traditional breeding methods sometimes takes decades. We consider it to be fundamentally different to transgenesis because no exogenous DNA is introduced. You are still within the range of changes to DNA that you can achieve with ordinary cross-breeding, and that puts it within the natural order of creation. To us, this makes all the difference compared with transgenesis, which we are against', explains Van Dalen.

Recognition of cisgenesis as a safe technique is very important to the Netherlands economically, in Van Dalen's view: 'We are a big exporter of vegetables and fruit and we have a strong plant breeding sector, which stands to benefit from cisgenesis because it would enable it to stay competitive on the world market.'

A positive verdict from the EFSA was a condition set by the European Commission for a decision on cisgenesis. Van Dalen intends to urge the Commission to reach a decision as soon as possible. Once it has done so, ratification by the European Parliament is still required. 'I would expect the parties of the centre and of the right to be positive in their attitude to cisgenesis. It is especially the greens and the socialists who are wary of everything that has anything to do with genetic modification. But cisgenesis is not the same thing as transgenesis; I will try to explain that too. It is not always easy. It is an idea that you need to take some time to get to grips with.'

RELATED TO TRANSGENESIS

Linda Coenen of the Aseed campaign does not think much of the distinction drawn between cisgenesis and transgenesis. 'To us they are both forms of genetic manipulation. Cisgenesis is more closely related to transgenesis than it is to traditional breeding methods. In both cisgenesis and transgenesis you do not know exactly what the consequences of introducing a new gene will be.'

Coenen is not impressed by the EFSA report either. 'Look who they asked for advice: Anton Haverkort from Wageningen, someone they knew to be in favour. Why not Edith Lammerts van Bueren, who is known to be far more critical of the technique? By asking the >



PHOTO HOLLANDESE HOOGTE

PETER VAN DALEN
Christian Union Euro MP

‘Cisgenesis is within the natural order of creation’



PHOTO GUY ACKERMANS

EDITH LAMMERTS VAN BUEREN
Extraordinary professor of organic Plant Breeding, Wageningen University

‘A plant is not a Lego set to build whatever you want with’

right advisors you can steer towards the conclusion you want.’ In any case, explains Coenen, Aseed is not keen on resistance genes, whether they are built in with genetic techniques or bred in through standard breeding methods. ‘It is tackling symptoms. The diseases are caused by the way potatoes and other crops are grown in large monocultures. We favour a more natural approach to food production in which crops are grown on a much smaller scale in a well-functioning ecosystem such as you find in agro-ecology or organic-dynamic farming. What is more, we are talking about techniques and products that get patented. This form of protection of intellectual property leads to a concentration of power in the hands of big companies such as Monsanto and BASF. The smaller breeding companies in the Netherlands will go under.’

FEAR-MONGERING

Evert Jacobsen, professor of Plant Breeding, stands his ground. ‘Fear-mongering’ is what he calls the discussion about the possible dangers of introducing new genes. ‘Opponents of cisgenesis always seem to forget that more than 2000 tons of pesticides are sprayed on Dutch potatoes every year. You can only leave that out of your calculations if you believe that it is risk-free.’ It will be good for the debate, in Jacobsen’s view, that the European Union has established a definition of cisgenesis. ‘For example, they have laid down the maximum amount of exogenous DNA apart from the gene that can be introduced into a plant before it counts as transgenesis. You are allowed 20 base pairs’, explains Jacobsen. ‘The reasoning behind this is based on probability theory. A random fragment of 20 bases is highly likely to occur anyway at other places in the DNA of an organism. So you could say that no exogenous pieces of DNA have been introduced into the plant.’

The hostility towards genetic techniques is partly a product of ignorance about the degree of genetic variety that occurs naturally, Jacobsen believes: ‘People



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wrongly imagine that plant varieties do not change. That is not the case. It is not for nothing that the field of plant breeding includes the topic of ‘maintenance breeding’. It is not easy to protect a breed against changes. There has been some research on the genetic stability of the model plant *Arabidopsis*, for example, in which the researchers bred 20 generations of the plant and studied the genetic changes that occurred. It turned out there were a lot of changes, and they were not just small mutations either. Dynamism and change are natural.’

GENE OUT OF CONTEXT

That may be so, but that is not what cisgenesis is, re-torts Edith Lammerts van Bueren, extraordinary professor of Organic Plant Breeding at Wageningen University. This technique certainly does not stand a chance of being accepted by organic farmers, she says: ‘They assess processes, not just the product. Cisgenesis makes use of the same technique as transgenesis, so it is not appropriate for organic farmers. Quite apart from the question of whether the technique is compatible with organic farming, it is a travesty of the truth to say that cisgenesis delivers the same results as classic breeding. In cisgenesis you take a gene out of its context and introduce it at a location which is almost certainly unlike the position it had in the genome you took it from. In classic breeding a significant part of the chromosome moves with the gene. Opponents present that as a risk because you don’t know which genes you are taking along. That is true but we have far more experience with classic breeding. Our long experience has taught us how to select plants. That is not the case with cisgenesis.’

‘A plant is not a Lego set,’ adds Lammerts van Bueren, ‘for you to pick the blocks you need and build whatever you want with them. That is much too simplistic a view of things. By taking the genes out of their context, you get a completely different plant to the one you would create with classic breeding. I am not saying the risks will be bigger, and I don’t mind if the admission procedure for cisgenesis is made a bit easier, but do be honest about the fact that it is a transformation technique. ■



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LINDA COENEN

Publicity officer at Aseed

‘With the right advisors you can steer things towards the conclusion you want’



PHOTO GUY ACKERMANS

EVERT JACOBSEN

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‘Dynamism and change are natural’