

TWO strands of THOUGHT



A major blow for gene editing in Europe, the European Court of Justice's recent ruling on CRISPR technology casts doubt on its potential for commercial use, provoking anger and applause from two fiercely opposing camps. Ed Leahy hears from both sides of the debate

When Rosalind Franklin first peered into the ghostly helix of DNA on Photograph 51, purple tomatoes and peach-flavoured strawberries were likely far from her mind. Then again, she couldn't have foreseen CRISPR. Touted as a simpler alternative to traditional GM techniques, no foreign DNA is introduced into the genome of the organism, but is rather taken out, or "edited" using the Cas9 enzyme.

CRISPR generated much hype, seen as less scary than its GM counterpart, and holding the potential to create a new generation of fruit and vegetable varieties. Mushrooms that don't brown, extra healthy apples and peach-flavoured strawberries, among others, heralded the future of fresh produce like a new Jeff Koons installation.

Yet most of the anti-GM movement dismissed this as a new spin on an old story and the EU was forced to take a side last month, after a group of French farmers took action against their government, which had exempted gene editing from Europe's GMO directive.

In what was considered something of a shock, the European Court of Justice (CJEU) sided with the French farming groups, announcing their decision on 25 July. The court

affirmed that the risks of CRISPR, described as "new mutagenesis" techniques, were the same as traditional GM, effectively equating it with "the introduction of a foreign gene into the organism". In other words, gene editing would be subject to the same regulation as GM, which is so strict that it is considered a de facto ban.

Industry figures, from universities to large corporations, were blindsided. The German chemical industry association VCI, which represents companies such as Bayer and BASF, described the outcome as "backward-looking and hostile to progress".

One of Europe's best-known plant scientists Ralf Reski doesn't mince his words on the subject. "Of course, this decision is a moral disaster, as is the whole anti-GMO campaign." Penny Maplestone, chief executive of the British Plant Breeders Society, felt it personally. "I am saddened and angry about the decision that has been taken by the CJEU and the wasted opportunity that we had as a plant-breeding industry to do so much good," she said.

Reski accused the courts of muddled

thinking on the gene-editing process. "According to this ECJ ruling, field trials of such gene-edited plants have to be regulated like classical GMO plants. So the process is critical, but not the product, which is like only allowing hand-crafted cars in the streets but not those which are assembled by robots."

He was doubly frustrated that other methods of breeding such as irradiation had been left alone by the courts, saying "it's as if you allow the axe but regulate the scalpel".

Opposition voices pointed out that the CJEU's decision was consistent with its own logic of outlawing transgenic varieties. In Britain, the Soil Association and campaign group GM Freeze welcomed the move, with the former saying "new plant-breeding techniques are GMOs within the meaning of the GMO directive and should be subject to the obligations laid down by that directive."

Emma Hockridge, head of policy at the Soil Association, disputes Reski's claim that the outcome of open pollination techniques are the same as CRISPR. "Years of scientific studies show that

techniques like CRISPR-Cas9, which enable sections of DNA to be removed or rearranged, can cause modifications to the genetic code that were not intended and that therefore have unknown consequences," she says.

The Soil Association cited a study published in the journal *Nature* which showed CRISPR experiments in mice had caused "profound" unexpected mutations and DNA damage. Maplestone objected that no studies on plants had demonstrated any dangerous consequences, and that such effects would not make it to commercial level anyway.

As a result of the ruling "field trials will become very difficult and expensive," says Maplestone, "and the CJEU ruling is indeed a death-blow to the prospects for the results of that scientific research to ever make it onto the market in the form of a new crop variety." Maplestone added that she found it strange organic groups would be

against gene editing as it can reduce the need for pesticides and herbicides.

Hockridge also disputes that CRISPR offers greater speed than open pollination, citing the Golden Rice example, often given as a success story for GM. "In the three decades it took to develop Golden Rice, countries such as Bangladesh and the Philippines have made huge steps in reducing Vitamin A deficiency with food fortification, supplementation and community vegetable garden programmes."

Yet the wrecking ball that is Brexit could still derail this decision for groups like the Soil Association, as in theory Britain will no longer be under CJEU jurisdiction after March 2019. This leaves some space to hope for British proponents of CRISPR, although a soft Brexit would mean goods still remain subject to EU directives. Either way, with technology constantly progressing, one senses this debate is far from over. **FPI**



OPPOSITE—CRISPR offered a new generation of colourful fruit and veg

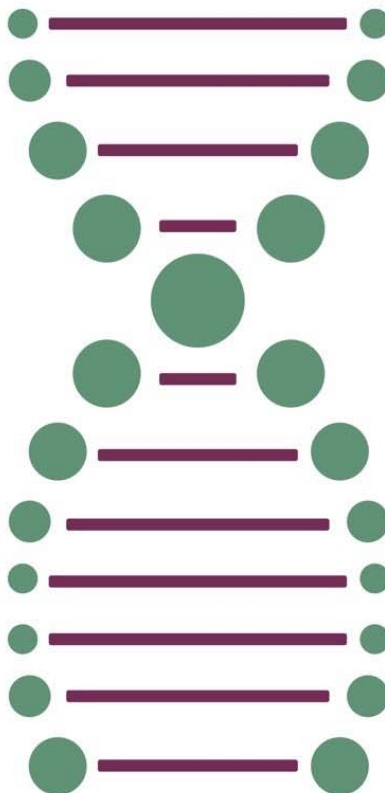
LEFT—Emma Hockridge, head of policy at the Soil Association

BELOW—Ralf Reski, professor of plant biotechnology



EMMA HOCKRIDGE, HEAD OF POLICY AT THE SOIL ASSOCIATION

"The GM industry has been promising for decades that genetically modified crops will revolutionise farming – even solve world hunger. But none of their promises have come to fruition. They've promised higher yields and improved nutritional value, but have failed to produce even one commercially viable example for the UK market. There is nothing to suggest gene editing will be any different."



RALF RESKI, PROFESSOR OF PLANT BIOTECHNOLOGY

"We need new varieties in the wake of climate change and ongoing population growth. Scientifically, everything is in place to move forward. This has come to a halt now in the EU. Other countries are wiser, so that in the long run the EU has to import these products, like they already do with GM soy. This is a threat to our agriculture and horticulture, with millions of jobs at risk. I appeal to the European law makers to change the laws in a way that they are in line with all scientific evidence."