

# Gene analysis speeds up race to beat cereal killer

Tom Whipple Science Editor

Stem rust has devastated wheat for centuries. Aristotle complained of it and American farmers in the Depression blamed it for driving them to bankruptcy. Now a virulent strain is spreading from Africa.

Even as wheat crops wither and die in the fields, in the hedgerows alongside them grasses — their wild relatives — proliferate unaffected. Scientists have now developed a way of rapidly exploiting the natural disease resistance of wild crop varieties to protect the domesticated kind and hopefully cut down on pesticides.

They estimated that their genetic engineering technique, described in the journal *Nature Biotechnology*, cuts the cost of developing resistant strains from £1 million to a few thousand pounds, and the time taken from more than a decade to a few months.

Domesticated crops have been bred for millennia to increase yield but along the way they have lost much of their hardiness. Resistant genes are usually bred back into food crops by cross-breeding them with wild varieties known to be immune to diseases. The problem is that this takes time. It requires many generations slowly to whittle down the genetic material

taken from the wild relative, each time having to check that the resistance has been passed on. "It is a bit like crossing a racehorse with a donkey," Brande Wulff, from the John Innes Centre, said. "It takes many, many years to get the best of both worlds."

This is why he and his colleagues pioneered a new technique. Instead of breeding from a single resistant wild strain, they have scanned the genome of hundreds of strains. The key development is that they are as interested in the ones that are not resistant to a particular disease as the ones that are. By comparing the genomes of all of them, they can spot the genetic variant that gives some resistance and then either use genetic technology to edit it into the domestic crop or breed it in more rapidly by conventional means.

Because the sequencing happens only once, researchers can then return to this "library" of wild varieties again and again, to identify new genes conferring resistance to a range of diseases.

Dr Wulff said that the only frustrating thing was that for commercial crops in the UK they are not allowed to use genetic modification (GM) technology that would be much quicker, and have to use standard breeding. "The GM solution is not on the table anytime soon, and that's a real travesty," he said.

Times 5.2.2019