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Modified genes spread to local maize

Transgenes from genetically modified (GM) maize (corn) crops have been found in traditional 'landrace' maize in the Mexican heartland, a study says. The work largely confirms a similar, controversial result published in *Nature* in 2001 (ref. 1) and may re-ignite the debate in Mexico over GM crops.

The paper reports finding transgenes in three of the 23 locations that were sampled in 2001, and again in two of those locations using samples taken in 2004. Written by a team led by Elena Álvarez-Buylla of the National Autonomous University of Mexico (UNAM) in Mexico City, the study will be published in the journal *Molecular Ecology*.

In 1998, the Mexican government outlawed the planting of GM maize to protect its approximately 60 domesticated landraces and their wild relatives. But newspaper reports suggest that farmers have planted at least 70 hectares of GM maize crops in the northern state of Chihuahua, and it is unclear what repercussions this may have.

Only about 25% of the maize planted in Mexico comes from commercially sold seed; the majority is saved from harvest to harvest. That's why, says Álvarez-Buylla, researchers need to pin down whether transgenes really have made it into local crops. "It is urgent to establish rigorous molecular and sampling criteria for biomonitoring at centres of crop origination and diversification," the team writes.

Allison Snow, a plant ecologist from Ohio State University in Columbus, led a team that reported² in 2005 it could not detect transgenes in maize from regions sampled by the original *Nature* paper. She calls the new work "a very good study, with positive signs of transgenes".

"It is good to see this," adds Ignacio Chapela, the ecologist from the University of California, Berkeley, who was senior author on the *Nature* publication. "But it took seven years."

Testing times

The original paper caused a storm of controversy³⁻⁵. Critics pointed out some technical errors, including problems with the type of PCR used to amplify the genetic sequences, although Chapela and his co-author David Quist stood by their conclusions⁶. Others questioned whether the critics were influenced by their association with the biotechnology industry, which they denied. In the end, *Nature* published an editor's note saying there was insufficient evidence to justify the original publication. Advocates of GM crops widely,



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Mexico's ban on genetically modified maize has not stopped transgenes getting into traditional crops.

and erroneously, called this a retraction.

A second round of criticism was sparked in 2005, after the Snow paper reported no evidence for transgenes in Mexican maize. Some criticized this article as being statistically inconclusive and lacking representative samples⁷, which the authors disputed⁸.

Álvarez-Buylla's team set out to resolve the issue by conducting genetic tests on thousands of maize seed and leaf samples for evidence of two transgenes: a gene promoter from the 35S cauliflower mosaic virus, and the nopaline synthase terminator, NOST. The team found transgenes in about 1% of more than 100 fields it sampled, including some sampled by Quist and Chapela in 2001.

Jose Sarukhán, a biologist at the UNAM and a member of the US National Academy of Sciences, recommended the Álvarez-Buylla article for publication in *Proceedings of the National Academy of Sciences*. It was rejected; in a letter to the authors on 14 March this year, the journal's editor-in-chief Randy Schekman, a professor at the University of California, Berkeley, wrote that the biology and genetics didn't warrant publication, and that a reviewer had pointed out the report could "gain undue exposure in the press due to a political or other environmental agenda".

Sarukhán responds: "I saw no reason why it should not be published."

Norman Ellstrand, a plant geneticist at the University of California at Riverside, called the study intriguing. "The importance of the study is not in the impact of the transgenes themselves," he says, "but in the fact that their spread has occurred so easily in a

country where the planting of transgenic maize has not occurred for several years."

However, the new paper doesn't confirm an important conclusion from the original *Nature* paper — whether the transgenes had been integrated into landrace genomes

and passed along to progeny plants. Álvarez-Buylla suspects this may be the case, but she's not interested in pursuing another round of politically charged battles — and will leave that work to others.

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3. Suarez, A. V. et al. *Nature* **417**, 897 (2002).
4. Metz, M. & Futterer, J. *Nature* **416**, 600-601 (2002).
5. Kaplinsky, N. et al. *Nature* **416**, 601-602 (2002).
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7. Cleveland, D. A. et al. *Environ. Biosafety Res.* **4**, 197-208 (2005).
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