

## Transgenic potato

Australia's first transgenic plant is a potato destined for use in the snack food industry. The genetically modified Atlantic variety is the result of 2 years' work by a research team at CSIRO's Division of Plant Industry.

Atlantic is a favoured variety for processed food, especially potato crisps. The modified plant is currently undergoing field trials at Gatton Research Station, west of Brisbane, while research is continuing with other varieties, including one of the chief Australian potatoes, Sebago. While the researchers describe the development as 'nothing but sophisticated plant breeding', they say it has important environmental and commercial applications. 'It has the potential to be a significant achievement, in terms of both increased yield and decreased pesticide use,' says Dr Wayne Gerlach, manager of the project.

The transgenic potato contains a synthetic gene, constructed in the laboratory, that makes the plant resistant to potato leaf roll virus, the most serious viral infection of potatoes world-wide. Severe outbreaks in Queensland cause yield losses of up to 50%. The synthetic gene or 'gene construct' is based on one taken from the virus itself. When the gene is switched on, the virus produces a protein that coats and protects the organism. Insertion of the plant equivalent of the 'coat protein gene', as it's known, into the potato allows the plant's cells to produce the same protein.

For unknown reasons, the protein protects the plant against the virus, but the researchers say the modification alters no other characteristic of the potato, such as appearance or taste. The transgenic plant has been approved for release by the government-appointed Genetic Manipulation Advisory Committee.

Two scientists at the Division of Plant Industry, Dr Peter Waterhouse and Dr Paul Keese, conducted the research. Dr Waterhouse is also in charge of the field trials. The technicians, Ms Rosemary Holliday and Ms Jennifer Howe, did most of the tissue-culture work and conducted tests for the presence of the viral gene. Mr Roger Mummy was in charge of the glasshouses. Dr Gerlach says his contribution was to 'initiate the project and co-ordinate research with plans and logistics'.

When Dr Waterhouse and Dr Keese began work on the potato, neither had previous experience of modifying or 'transforming' the genetics of a plant.

Dr Waterhouse said: 'The technology is not new but it has only been done previously with viruses that are easy to purify and have no real commercial application. It has never been done with this type of virus before, and in fact no one in Australia had transformed a potato before.'

'We tried the different methods of transformation that were in the (scientific) literature, and we initially failed. So we had to fiddle around with the hormone conditions and so on, and pick up the skills as we went along. Early on, Paul and I were doing the hands-on work, cutting up the potatoes and putting them on the media. Then Rosemary came in and we really expanded the numbers that we produced.'

'We were never too fazed by it all, because we realised we were novices when we started', he said.

Dr Gerlach says the project was essentially applications-based research with a predetermined goal. Nevertheless the research produced some interesting science. 'For example, we hadn't known before that a gene of this type works better in one (plant) variety than it does in another, and that different varieties will respond differently to the gene construction', he said.

The scientists are now working on no less than eight different gene constructs for conferring virus resistance on the potato plant, and have developed a laboratory technique for evaluating how effectively each method defends the plant from attack. Eventually they will choose one method, or a combination of methods, for widespread use in particular varieties such as Atlantic, Kennebec and Sebago.

The research is funded in part by CCA Snack Foods. The company's former research and development manager, Professor Geoff Wilson, who worked on the potato with CSIRO, said the company had been keen to see whether it was possible to build-in resistance to the virus. He described the CSIRO researchers as 'an excellent team'.

Professor Wilson, now head of the School of Food Science and Technology at the University of New South Wales, said the work may be a forerunner for making potatoes and other crops resistant to a whole range of diseases.



Julie Faulkner

The CSIRO potato team — creators of Australia's first genetically modified plant approved for environmental release. From left: Paul Waterhouse, Paul Keese, Rosemary Holliday, Jennifer Howe and Wayne Gerlach.

