

# South African potato cultivar resistant to potato tuber moth

**Adri Veale and Lynelle van Emmenes, ARC-Roodeplaatt**

Adri Veale and Dr Lynelle van Emmenes are involved in the genetic manipulation of several crops at the Vegetable and Ornamental Plant Institute, ARC Roodeplaatt, of which the Bt potato project is one of the most important projects. Lynelle is mainly responsible for the project management, whereas Adri is the transformation specialist. Lynelle and Adri are further involved in the genetic improvement of crops such as sweet potato, tomato and *Ornithogalum*.

Researchers at the ARC Roodeplaatt Vegetable and Ornamental Plant Institute have developed a South African potato variety that is resistant to potato tuber moth. This is further progress from the Bt Spunta research reported last year (CHIPS pp. 34 – 36, Jan./Feb. 2005). The Bt insect-protection gene has been transferred into the South African potato variety, Mnandi. Mnandi is mostly cultivated by small-scale farmers because it exhibits natural resistance to late blight. This cultivar was chosen for the introduction of insect resistance in order to make its cultivation more sustainable for small-scale farmers who will require fewer chemical pesticides to grow these potatoes. This modification is part of a pipeline of improved potato cultivars planned for local potato breeding programmes.

Researchers transferred the Bt gene into Mnandi and selected seven lines to test for resistance to the potato tuber moth. Potato tuber moth larval feeding studies were performed on the leaves and tubers of these potato lines under contained use conditions. This research was carried out with permission from the Registrar of Genetically Modified Organisms Act. Conventional potato plants without insect resistance were used as controls. For the feeding studies, leaves from each line were removed from the plants and infested with potato tuber moth larvae in a containment greenhouse. The larvae were left on the leaves for one week before the results were assessed. The results showed that conventional potato leaves were consumed, while transgenic

leaves were not damaged by the potato tuber moth larvae (Fig. 1).

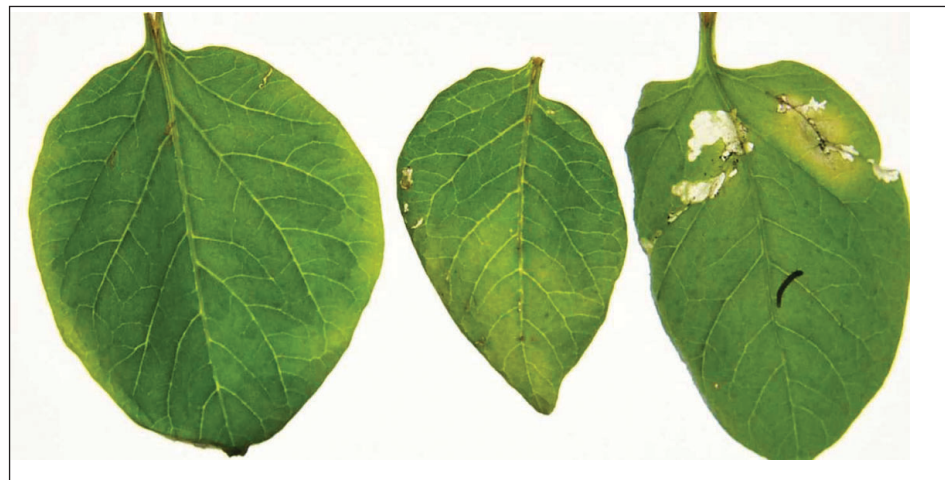
Greenhouse plants were allowed to develop tubers, which were harvested for further studies. 'Free-choice' and 'no-choice' feeding studies were performed on the



**Adri Veale.**

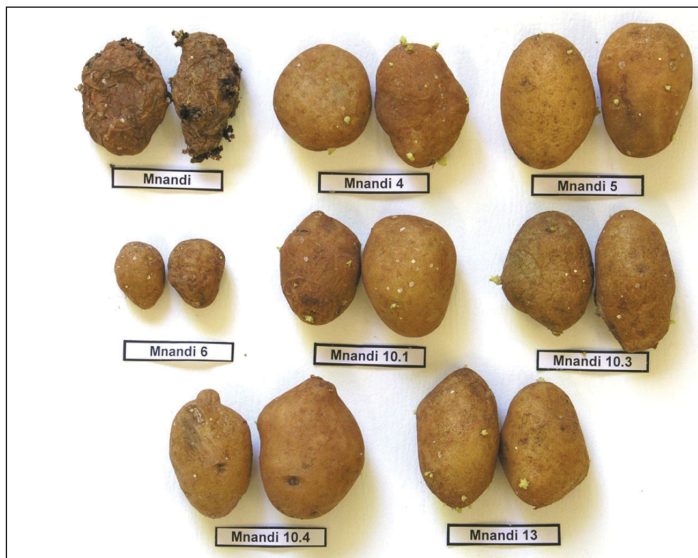


**Dr Lynelle van Emmenes.**



**Figure 1: Leaves from Mnandi lines containing the Bt gene. The leaves on the left and centre are from transgenic insect resistant lines. The leaf on the right is from a conventional line and shows feeding damage. (Photo: Adri Veale).**

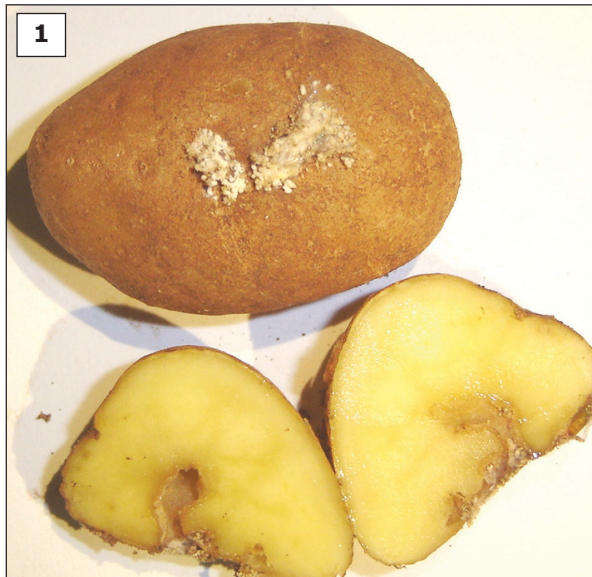
**Figure 2: Free-choice tuber trial: The tubers of the seven transgenic lines and the conventional line (top left). The transgenic lines do not exhibit larval feeding damage, whereas larvae have damaged the conventional line. (Photo: Adri Veale).**



tubers. For the free-choice study, four potato tubers of each line were placed in open containers inside an enclosed insect cage. Potato tuber moth pupae were placed in the middle of the insect cage. Once the moths eclosed from the pupae, they had a free choice to lay their eggs on any tuber inside the cage. For the no-choice study, four potato tuber moth larvae were placed on a tuber. In this study, the larvae were compelled to feed on the tubers they were placed on. The results from both of these studies showed that the feeding larvae damaged the conventional tubers, whereas the transgenic tubers showed no evidence of larval feeding damage (Fig. 2 and 3). The conventional potatoes shriveled and exhibited tuber damage when cut open.

The next step in research assessment of these lines is to test the level of potato tuber moth resistance in field trials. If these lines perform well and are stable and uniform over several generations in several locations, one or two may be chosen for commercialization.

Data will be gathered on tuber moth leaf damage, damage to harvested and stored tubers, the general growth and performance of the transgenic Mnandi lines compared to conventional Mnandi. These lines will undergo extensive environmental, food and feed safety testing before being submitted to the Registrar of Genetically Modified Organisms Act for general use approval. The evaluation and safety testing process can take 4 to 7 years.



**Figure 3: No-choice tuber trial: (1) The control, conventional potatoes after 1 week exposure to potato tuber moth larvae show feeding damage. (2) Transgenic potatoes after 1 week exposure to potato tuber moth larvae show no feeding damage. (Photo: Adri Veale).**

