Centre for Tropical Crops and Biocommodities

Virus-resistant bananas

Bananas are one of the top 10 food crops in the world. The fruit is not only an important cash crop but are also becoming increasingly important as a food security crop in some African countries. Diseases are a major production constraint wherever bananas are grown.

Banana bunchy top virus (BBTV) is the most devastating banana plant disease as infected plants seldom produce fruit. It is transmitted by the banana aphid and infected planting material. The disease moves rapidly through plantations and quickly renders them unproductive.

Bunchy top occurs in Australia, is widespread in Asia and is moving aggressively through Africa where it recently destroyed the smallholder-based Cavendish industry in Malawi. The disease cannot be controlled by chemicals. Strategies other than resistance have either been ineffective or are not appropriate in a smallholder developing country context. Since all accepted banana cultivars are susceptible to BBTV, genetic modification is the most attractive strategy to generate resistant plants.

With funding from the Bill & Melinda Gates Foundation, QUT scientists are collaborating with African researchers to develop locally accepted banana cultivars with BBTV resistance. Both proven (RNAi) and novel (virus-activated) strategies are being used to not only generate resistant plants, but control the banana aphid and minimise the spread of disease. The outcome of this research will be strengthened food security in the African region through increased production of this staple food crop.
Bananas are grown in almost all countries with wet and sub-tropical conditions. As a food source, bananas are ranked fourth most important crop in the world. In the west, bananas are a popular dessert fruit but in developing countries range from staple food to an important dietary component. Banana crops are increasingly becoming key to food security, however production worldwide is threatened and constrained by a small number of serious diseases.

Banana bunchy top virus (BBTV) infected plants become stunted and do not usually produce a fruit resulting in 100 per cent yield loss. The disease is caused by a DNA plant virus spread by the banana aphid, Pentalonia nigronervosa, and through infected planting material. There are no identified immune banana cultivars which precludes the use of conventional breeding to generate resistance.

Genetic modification is one appropriate strategy to incorporate BBTV resistances into currently accepted cultivars. The ‘virus-resistant bananas’ project brings together wide experience in banana biotechnology, banana genomics and banana field research from three core institutions over two continents (Australia and Africa):

- QUT
- Malawi Department of Agricultural Research Services
- International Institute of Tropical Agriculture

Researchers at QUT routinely use technologies for modifying bananas and useful genes are becoming increasingly available. Virus resistance through genetic modification is commonly achieved using RNA interference (RNAi) strategies. Several virus-resistant genetically modified crops (papaya and squash) were generated using this approach and have already been commercialised.

Outcomes

Communities in Malawi and Nigeria, Africa and Australian consumers will initial benefit from the outcomes of the ‘virus-resistant bananas’ project. More broadly, areas experiencing wide-spread BBTV infection, including Asia, will benefit from reduced threats to banana production and food security.

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