Weevil resistant sweetpotato through biotechnology

SASHA
Sweetpotato Action for Security and Health in Africa

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With the aim of "feeding the people, not the weevils" this project is combining conventional breeding and biotechnology to combat the pernicious and devastating consequences of sweetpotato weevil. Results to date include the identification of three insecticidal proteins and the introduction of putative resistance genes into sweetpotato varieties. The resistance levels will be measured in the following months, with continuation to field trials if those levels are significant.

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Sweetpotato weevil magnified, *Cylas brunneus*

What is the problem?

Weevils can destroy 60% - 100% of sweetpotato crops during periods of pronounced drought. As sweetpotato is at times the only food available, this can be quite devastating. The impact of weevils can a□ect not only food security, but also sweetpotato production, marketability, and sustainability, especially in areas experiencing longer dry periods.

With climate change predictions for Sub-Saharan Africa (SSA) foreseeing an expanding dry season, the threat and impact of weevils may increase further. Adapting conventional integrated pest management practices among smallholder farmers does not work because of the great di□culty associated with controlling field sanitation in small-scale subsistence production systems. In addition, the common practices of in-ground storage, piecemeal harvesting, and strip harvesting mean that sweetpotato crops are exposed to weevils throughout a significant part of the year. Extensive e□orts to develop weevil-resistant sweetpotato through conventional breeding methods have failed in spite of considerable investment for decades. As a result, there is currently little farmers can do when weevils infest their fields, other than quickly trying to harvest and salvage what is left of their crop.

What do we want to achieve?

The aim of this project is to "feed the people, not the weevils" by developing weevil-resistant sweetpotato varieties through combined breeding and biotechnology. *Bacillus thuringiensis* (Bt) is a soil bacterium that is well-known for its crystal proteins with insecticidal activity against pests. Genes that produce such proteins can be made to resemble a native gene of the crop to protect from the pest and then introduced into the target plant to confer resistance. For example, Bt technology has been used successfully to increase resistance to bollworm in cotton and rootworm or stem borer in maize. The result has been decreased need for pesticide use and increased yields in those crops. In addition, there is well-documented evidence that they are safe for humans and confer positive environmental impacts.

Farmers, including small-scale producers, have been the primary beneficiaries of Bt technology. In the case of Bt sweetpotato, women would stand to gain back considerable time currently spent removing weevil infected sections in roots prior to cooking.

Partners include:

- National Crops Resources Research Institute (NaCRRI) and Kawanda Research Station (KARS) of NARO - [Uganda] for developing and testing resistance to weevils in sweetpotato plants, including a confined field trial
- Biosciences east and central Africa (BecA), Kenyatta University (KU) - [Kenya] for developing and testing resistance to weevils in sweetpotato plants
- University of Puerto Rico Mayagüez, Donald Danforth Plant Science Center - [USA] for testing resistance to weevils in sweetpotato plants including a confined field trial and for guidance and oversight in the development of regulatory dossier, respectively
- University of Valencia - [Spain] for understanding the mode of action of these crystal protein and producing these for safety studies
- University of Gent - [Belgium] for capacity building of African scientists and developing communication products.