Working with farmers to control sweet potato virus disease in East Africa

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Sweet potato is among the most important food staples grown in sub-Saharan Africa, particularly in East Africa. This project increased the productivity of sweet potato in East Africa by enabling farmers to grow the crop without the constraint of sweet potato virus disease and other pests and diseases. Farmers participated in selecting superior resistant varieties and seedling accessions, identifying appropriate cultural control measures and developing training tools and materials. Farmers and extensionists received resistant varieties and training in disease control methods.

ISSUES

With good husbandry, sweet potato is among the most productive crops, but it can also yield on relatively poor soils. It requires few inputs except labour, and its ability to yield rapidly, and over a long cropping season, if harvested piecemeal, provides the flexibility to fit into a range of cropping systems. It produces a yield even when the rainfall pattern is irregular. Consequently, it is an important daily food for many farmers and their families in Africa, particularly resource-poor farmers growing food on a restricted area of marginal land. It can be important in disaster relief when other crops fail. Sweet potato is a cheap food for the urban poor in the growing conurbations of Africa, yet is also purchased by the growing middle class from supermarkets. By 2020, it is predicted that root crops will have an even more important role in food production in Africa than now and will be used in a more diverse range of products. Sweet potato virus disease (SPVD), a complex disease caused by synergism between a whitefly and an aphid-borne virus, is the most important disease of the crop throughout Africa. This CPP project on sweet potato viruses built on previous DFID and EU research investments and used participatory varietal selection methods as promotional channels.

ACHIEVEMENTS

The project was based at national agricultural research institutes: Namulonge in Uganda and Maruku in Tanzania. Through collaboration

Symptoms of sweet potato virus disease (front) contrasted with healthy plants

SELECTED PUBLICATIONS

BYAMUKAMA, E., GIBSON, R.W., MWANGA, R.O.M., MPEMBE, I. and KAYONGO, J. (2004) Effect of shading and intercropping in management of sweetpotato virus disease in Uganda. Paper presented at the 9th Triennial Symposium of the International Society of Tropical Root Crops, October–November 2004, Mombasa, Kenya.

RWEGASIRA, G.M., MARANDU, E.F., GIBSON, R.W. and KAPINGA, R.E. (2004) Control of sweetpotato virus disease through farmer field schools approach in Kagera region, Tanzania. Paper presented at the 9th Triennial Symposium of the International Society of Tropical Root Crops, October–November 2004, Mombasa, Kenya.

with farmer groups (seven in each country), training was provided for facilitators and farmers through project staff, project-trained facilitators and exchange visits among the groups. This training process included knowledge of the causes of SPVD, how to control it by cultural methods, and the use and development of resistant varieties. The training also provided a test-bed whereby the project developed and validated training tools and materials.

Participatory varietal selection was conducted with farmer groups in both countries, testing nine and 11 cultivars in Uganda and Tanzania, respectively. These cultivars included high-yielding, SPVD-resistant and high-vitamin A orange-fleshed ones (see R8040, page 23). Farmers generally considered all varieties were useful: what did well in one location and one season did not necessarily do well in other situations. There were trends, however: the variety Naspot 1 yielded highly in most places and most situations; Naspot varieties were all generally very SPVD-resistant but some were *Alternaria*-susceptible. SPK004 was the most SPVD-resistant of the orange-fleshed cultivars. The project also identified more orange-fleshed local varieties as a contribution to the VITA A project (see page 23).

Interviews suggested that varietal resistance is the farmers' control strategy of choice, apparently requiring no change in work other than a new variety. Farmers were keen to receive a 'basket' of varieties to select from. However, in practice this is over-simplistic as the 'perfect variety' is elusive. Farmers are also all individuals with different preferences, priorities of use and customers. Good cultural control practices can help here by enabling farmers to grow more than just highly resistant varieties.

Farmers traditionally select healthy planting material, so the main cultural control tested was roguing.

Sweet potato storage root derived from an accession selected by the participatory breeding process

This was demonstrably effective, decreasing virus spread, increasing yield and improving the health of planting material. Isolation by distance and by a crop barrier was also tested. While both helped to control SPVD, isolation by distance was unsatisfactory because of land shortages and vulnerability of isolated crops, and the sorghum barrier seemed to reduce the yield of protected sweet potato. Simple phytosanitary guidelines (see below) were developed for extension and produced in poster form.

Until recently all sweet potato varieties grown in East Africa were landraces derived from occasional chance seedlings. Working with three farmer groups in Uganda and three in Tanzania, the project has made farmers aware of how new varieties develop. Farmers are involved in growing seedlings of superior families and then selecting them, with national programme breeders, through clonal generations in communal participatory breeding trials. They have also taken material to their own gardens to experiment. Farmers and scientists retain a small number of clones which appear to be high yielding, resistant to SPVD and *Alternaria*, and are monitoring them closely for other necessary quality attributes.

One general constraint highlighted by the close collaboration with farmers was the importance of drought resistance in sweet potato. Drought destroyed several

Phytosanitation guidelines for controlling SPVD

- If possible, choose a variety or local cultivar that is not much affected by the disease.
- Collect cuttings for new crops from healthy plants.
- Select cuttings from healthy plants in crops in which few other plants have the disease; avoid collecting cuttings from very old crops because SPVD is less easy to see here than in vigorously growing crops.
- Remove any diseased plants as soon as they appear, especially in young crops.
- Plant new crops away from old crops.
- Avoid planting new crops where sweet potato was grown last season – storage roots and cuttings from old, diseased plants surviving in the soil will produce diseased plants from which infection will easily spread to your new crop.
- Ensure trash from old harvested crops, including unwanted storage roots, is destroyed.

All these treatments will work better the larger the area in which they are used – so – work together with your neighbours.

Farmers in Luwero discussing whether or not to retain a particular accession

participatory varietal selection and cultural control trials, and was identified as a major reason why some farmers did not continue growing the released varieties. It also severely affected the participatory breeding trials. One outcome of this is that the surviving selected accessions are likely to be drought- as well as disease-resistant.

In both Uganda and Tanzania, posters and leaflets explaining in different languages how to control SPVD were developed and used in training programmes for extensionists; a section on SPVD control was also included in a general farmer field school technical manual (see R8167, page 26). Extensive training was provided to extensionists in Tanzania, especially through a collaboration developed with Norwegian People's Aid. Planting material of superior varieties was also disseminated to refugee-affected areas in Kagera, Tanzania, and to refugees in Uganda.

The project has sustained the livelihoods of poor farmers in East Africa through a variety of measures, working directly with small-scale farmers, mostly women, and including refugees, farmers in refugee-affected areas, and families affected by HIV-AIDS. Planting material of superior varieties has also been provided to such groups.

Through a participatory approach, the project has validated the provision to farmers of a basket of superior, disease-resistant varieties, backed up by selecting healthy planting material and roguing of young crops. Participatory breeding has been tested for sweet potato in Africa for the first time, using a protocol developed to enable scientists and farmers each to contribute their own particular skills, resources and knowledge to the process. A few high-yielding, disease-resistant and drought-tolerant accessions have already been identified. These accessions show signs of being particularly well adapted to the low fertility evident in most farmers' fields, due to their selection under this environment. Sweet potato seems particularly suited to participatory breeding: its short generation time means results have been achieved quickly, and its easy vegetative propagation means there is no further variation of chosen accessions and there are ample cuttings to share among farmers.

FURTHER APPLICATION

The project will continue with participatory breeding during an extension (R8457), maintaining close collaboration with national programmes in Tanzania and Uganda to achieve an easy hand-over of selected material. From this basis, the national programme in Uganda is continuing participatory breeding using funds provided by the McKnight Foundation.

The project will continue to work closely with other organisations, particularly in Tanzania, to disseminate project outputs more widely through the CGIAR Systemwide Tropical Whitefly Project.