Breeding in Africa for Africa

SASHA
Sweetpotato Action for Security and Health in Africa

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The first batch of sweetpotato varieties produced using the new accelerated breeding method were released in February 2011 in Mozambique. This method will speed up the rate at which new improved preferred varieties reach farmers and consumers. Experiments have confirmed the existence of exploitable heterosis for use in sweetpotato breeding, which could substantially boost sweetpotato yields.

A controlled cross being made in Uganda (credit G. Ssemakula)

What is the problem?

Currently national sweetpotato breeding programs in Africa take a long time, 7 to 8 years, to produce a new variety. Frequently those new varieties do not suit the various geographic areas and the preferences of diverse farmers and consumers within a country. Most countries have no real breeding program and rely on testing materials developed elsewhere, which in some cases works well, but not when agro-ecological conditions are quite distinct. Few countries have dedicated sweetpotato breeders.

What do we want to achieve?

We want to revolutionize conventional sweetpotato breeding. We seek to redesign sweetpotato breeding protocols in Africa to produce varieties in fewer years (about 4). We are investing in developing diverse sweetpotato types that will provide national programs with a wide range of "parents" with the preferred combination of characteristics to use in their own breeding programs. Particular attention is paid to preferences of women producers and consumers of all ages. We expect our national program partners to release at least 20 locally adapted sweetpotato varieties by 2015. We want to see a cadre of sweetpotato breeders, trained in the latest techniques, using common protocols, and capable of raising funds to support the development and dissemination of new, improved sweetpotato varieties within their countries.

Where are we working?

Three *Sweetpotato Support Platforms* (SSPs) have been established, with CIP sweetpotato breeders based in national breeding programs in Uganda, Mozambique, and Ghana to provide technical backstopping at the sub-regional level for the 17 countries targeted under the Sweetpotato for Profit and Health Initiative: Uganda, Kenya, Tanzania, Ethiopia, Rwanda, Burundi, and DR Congo in East and Central Africa; Mozambique, Malawi, Zambia, Angola, South Africa, and Madagascar in Southern Africa, and Ghana, Nigeria, Benin, and Burkina Faso in West Africa.

How are we making it happen?

We are developing a new way of breeding sweetpotato using a combination of methods: First, in "accelerated breeding", we rapidly multiply new breeding lines to evaluate them at more than one site, from the initial stage of selection, in contrast to the conventional approach of using one site for two or more initial evaluations. Second, we are creating very distinct sweetpotato populations for each sub-region, which, when crossed, should result in major improvements of characteristics such as yield and disease resistance, due to heterosis.

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Key Partners

The major partners in the project to date are the national sweetpotato programs in the target countries. The Sweetpotato Support Platform (SSP) for Eastern and Central Africa is based at the National Crops Resources Research Institute (NaCRRI) in Uganda and the Kenyan Plant Health Inspection Service (KEPHIS). For Southern Africa, the SSP is based at the Agrarian Research Institute of Mozambique (IIAM) in Maputo. The West African platform is located at the Crops Research Institute (CRI) in Kumasi, Ghana.

Storage root and leaves of one of the newly released orange-fleshed sweetpotato varieties in Mozambique, named Sumaia.

Third, we are developing molecular markers to apply to speed up the process of identifying and selecting plants that have resistance to viruses, the most important disease of sweetpotato in SSA.

Each sub-regional SSP is developing a program to carry out and support the research in breeding, seed systems, and other areas targeting specific needs of each region. This is a collaborative effort with institutional partners in each sub-region, working in close collaboration with the Alliance for a Green Revolution in Africa (AGRA) to build capacity in conventional sweetpotato breeding. Sweetpotato "*speedbreeders*" meet annually to learn new techniques and share knowledge, with the goal of building a vibrant community of practice.

Our breeding effort is drawing on the genetic diversity of African sweetpotato germplasm, exploiting its genetic potential and increasing and diversifying forms of use, to produce new locally adapted sweetpotato varieties in Africa. We also draw on CIP's extensive global germplasm bank to provide parental material for the Africa-based population development program. We are breeding in Africa for Africa, with a focus on creating populations with major target traits demanded by each sub-region, namely: 1) Sweetpotato virus disease (SPVD) resistance and high beta-carotene content in storage roots (Eastern and Central Africa); 2) Drought tolerance and high beta-carotene in storage roots (Southern Africa), and 3) High dry matter and low sweetness to align with consumer taste preferences (West Africa).

These population improvement programs are linked to national variety development programs, conducted by National Agricultural Research Systems (NARS) breeding programs. Farmers are active partners in the process of selecting materials to meet their conditions and preferences. We also expect that varieties and improved populations from each sub-region will have value in other sub-regions and are taking steps to evaluate this.

What have we achieved so far?

These have been the major sweetpotato breeding achievements to date:

a) We have demonstrated experimentally that heterosis can be applied in sweetpotato breeding to dramatically improve storage root yield.

b) Building on previous investments by AGRA and HarvestPlus, the release in Mozambique in February 2011 of 15 drought tolerant orange-fleshed sweetpotato varieties after four years of evaluation is evidence that accelerated breeding can be applied in SSA.

c) Six national sweetpotato breeding programs have obtained AGRA grants and they are implementing accelerated breeding principles.

d) Two separate populations have been characterized using molecular markers for virus-resistance breeding in Uganda.

e) An easy-to-use Excel-based program, CloneSelector, has been developed to greatly facilitate the implementation of routine breeding tasks such as planting trials, and analyzing data. These tools, and our regional community of sweetpotato breeders, will greatly increase the power and efficiency of sweetpotato breeding for Africa in Africa.

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Farmers engaged in selecting the best among the clones - Uganda (credit R. Mwanga)