Improved Curing for Improved Shelf-life

In-ground curing for 3-5 days prior to harvest has been shown to extend shelf-life of harvested sweetpotato roots in good condition for about 40 days after harvesting.

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In-ground curing for 5 days after cutting foliage off (credit G. Kyalo)

What is the problem?

Sweetpotato roots are considered "perishable" once they are harvested because they do not store as easily as grain crops. Fresh roots have a high respiratory rate and can be damaged easily by cuts or bruising during harvest and post-harvest handling. Cuts and abrasions become entry points for disease micro-organisms that can cause rots and loss of moisture and subsequently weight. Poor handling can severely reduce the time they can be successfully stored once harvested ("shelf-life"). Curing is a process commonly used with root and tuber crops to heal wounds in the outer layer, protecting them against disease, reducing shrinkage and extending storage. Pre-harvest curing consists of removing the foliage 2-4 days before harvesting the roots, which strengthens the skin, helping to prevent damage. Post-harvest curing is commonly used in countries with commercial levels of sweetpotato production. It consists of keeping carefully harvested sweetpotatoes at moderate temperatures of 25-30°C and high humidity (85-95% relative humidity) for 4-7 days during which a toughening of the skin of the roots occurs, which helps heal any existing wounds reducing the risk of post-harvest disease infection. Ironically, these types of climatic conditions are often found in tropical countries, yet most African farmers are not aware of in-ground (pre-harvest) and out-of-ground (post-harvest) curing techniques.

Sweetpotato roots harvested without curing have limited shelf-life under tropical conditions, typically 3-10 days, depending on how carefully they are harvested. Currently most farmers harvest small amounts of sweetpotato as needed ("piecemeal") and do not apply any curing techniques, so cannot store harvested roots for extended periods. Some farmers do leave harvested roots in the field in the sun for several hours to help increase shelf-life. Post-harvest losses due to injuries caused during harvesting and handling, and decay in storage are high (>30%) and common. However, if traders and consumers appreciate longer shelf-life and appropriate harvesting and curing techniques for local conditions are disseminated widely to farmers, significant improvements in shelf-life and overall root quality would result.

What do we want to achieve?

We would like to demonstrate to commercially oriented smallholder farmers and traders the benefits of curing for long term storage and marketing of harvested sweetpotato roots. To do so, we will conduct participatory research with farmers, to compare proposed improved curing methods to farmers' current practices. We expect to demonstrate that post-harvest losses due to injuries caused during harvesting and handling and decay in storage can be reduced significantly by curing and improved storage methods. We also want to understand how the curing process may affect different varieties, comparing dominant local landraces with bred varieties from the national program in Uganda. Improved storage offers more benefits for food security as families can access food three months after harvest. This research is a component of

SPHI Sweetpotato for Profit and Health Initiative
Reaching 10 million African households by 2020

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- Community Enterprises Development Organization (CEDO)

the HarvestPlus led project Developing and Delivering Biofortified Crops in Uganda, which is seeking to reach over 300,000 households with improved orange-fleshed sweetpotato (OFSP) by 2018.

Where we are working!

Experiments and demonstrations on curing have been setup with commercial oriented smallholder farmers in Mukono, Rakai, Masaka districts (central Uganda) and Soroti district (eastern Uganda).

How are we making it happen!

Starting in 2012, curing experiments and demonstrations were set up in Mukono, Rakai and Masaka districts in Uganda using improved varieties NASPOT 10 O (Kabode), NASPOT 9 O (Vita) and local check varieties selected by the farmers. In 2012, curing experiments were set up using saw dust compared to polythene bags at about 300C and a RH of 90-95% for post-harvest curing during 7 and 14 days, and in-ground curing by cutting foliage for 7 and 14 days prior to harvest, compared to farmers' practice of leaving the roots in the open after harvest. We recorded temperature and relative humidity in polythene and sawdust. Because it was difficult to attain the favorable temperature and relative humidity for curing in polythene and saw dust, and also because saw dust is not readily available to farmers, we modified in-ground curing for the 2013 trials, adding dry sand. In 2013, curing demonstrations were set up by in-ground curing by cutting foliage at 2, 3, 4, 5 and 7 days prior to harvest. In 2012, all cured roots were stored in polythene bags in the open for 14 days, while in 2013 the cured roots were stored in open polythene bags under farmers' conditions until they deteriorated in quality. Roots were also stored in layers of dry sand until they began to rot. Stored roots were periodically assessed for rotting, shriveling, sprouting and weighed to determine weight loss. For all trials, farmers were instructed on how to harvest carefully to avoid damage to the roots.

Curing sweetpotato roots in polythene and saw dust in baskets (credit G. Kyalo)

What have the results shown so far?

1. **Our 3 rounds of testing indicate that in- ground** curing of sweetpotato roots for 3-5 days is showing the best prospects for prolonged shelf-life in storage.
2. The results have so far proved that in-ground curing can prolong shelf-life of roots in storage for up to 40 days. The stored roots at 40 days after harvest still had a pleasing appearance and tasted good when cooked, whereas uncured roots were completely shrivelled.
3. In-ground curing for 3 days results in the least weight loss (17%) among the storage roots.
4. In-ground curing for 14 days was too long. The roots sprouted.
5. In general, in-ground curing for 3 and 5 days resulted in less weevil infestation in storage than in-ground curing for 7 and 4 days.
6. There are varietal differences in curing ability. To date, NASPOT 8 and NASPOT 10 O responded better to in-ground curing than NASPOT 1 and the local variety Soccadido.
7. NASPOT 10 O and NASPOT 1 sprouted more than the other two varieties after 41 days of storage.
8. Post-harvest root curing in polythene bags for 7 and 14 days does not help the process of curing as the roots sprouted.
9. Curing sweetpotato roots in saw dust was effective in 2012 but not in 2013.
10. Storing roots in dry sand for 60 days (no prior in-ground curing) maintained good quality and had less weight loss (7-24%) compared to roots left in the open which had lost up to 75% weight.
11. Roots stored in sand had less weevil infestations compared to those left in the open.

What's next?

Farmers who participated in the experiments are excited by the results and have expressed a willingness to adopt an improved curing technique. It is obvious that proper harvesting techniques which minimize injuries to sweetpotato roots at harvest are key to prolonging root shelf-life in storage. In the coming year we plan to disseminate more widely the in-ground curing practice of cutting foliage 3-5 days before harvest, while continuing to research improved post-harvest curing techniques appropriate for Eastern, Central and Northern Uganda.

CONTACTS : **Gerald Kyalo (CIP)** • g.kyalo@cgiar.org