Storing fresh sweetpotato roots
to reduce purée supply chain risks

SASHA
Sweetpotato Action for Security and Health in Africa

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As the consumption of delicious golden bread made with vitamin A rich orange-fleshed sweetpotato (OFSP) purée grows across Kenya, so too does the demand for an all-year-round supply of the fresh sweetpotato roots. A constant supply of OFSP roots can be achieved through a combination of staggered planting and production, purchase from different geographical areas, and the storage of fresh OFSP roots. Our work has focused on the development of solar-powered commercial-scale storage of fresh sweetpotato roots in tropical areas of sub-Saharan Africa (SSA).

Fig. 1 Fresh OFSP sweetpotato roots ready for storage at Organi Ltd (credit T. Stathers)

What is the problem?

Agri-food supply chains, such as that of the nascent orange-fleshed sweetpotato (OFSP) purée used by a Kenyan supermarket chain for producing bread made with OFSP, face a wide range of risks. These include the pronounced seasonality of sweetpotato production and prices, adverse weather conditions, and fluctuation in market-demand particularly during the early stages.

A constant year-round supply of high quality OFSP roots is required to consistently produce the OFSP purée. This constant supply can be achieved through a combination of staggered production, purchase from different geographical areas, and the storage of fresh OFSP roots to cover periods of low supply. However, although sweetpotato roots are stored for up to 9 months in sophisticated purpose-built stores in the USA and South Africa, to our knowledge no commercial-scale storage of fresh sweetpotato roots has yet been successfully managed in tropical areas of sub-Saharan Africa.

What do we want to achieve?

Commercial-scale solar-powered storage of fresh orange-fleshed sweetpotato roots for processing into purée, in a tropical area of sub-Saharan Africa.

Where are we working?

The fresh sweetpotato root storage trial was set-up using two store rooms at the Organi Ltd. sweetpotato processing plant in Homa Bay county, Kenya.

How are we going to make it happen?

A Natural Resources Institute (NRI) postharvest engineer converted two rooms at the Organi Ltd. processing plant into insulated controlled temperature and humidity store rooms, one powered by solar and the other by mains electricity.

Freshly harvested undamaged roots of two OFSP varieties, Kabode and Vita, were placed in wooden crates (Fig. 1) in each of the rooms. The roots were cured at 30°C and 95% relative humidity for five days in the store rooms, prior to reducing the temperature and humidity to support long-term storage. The effect of washing or dry manual removal of soil from the roots prior to storage was also evaluated.

The trial aimed to assess the quality and utility of the stored roots after 2, 4, 6, 8, 13 and 16 weeks storage. At each sampling, several different criteria were assessed, including: weight loss, general appearance, root sponginess and the occurrence of surface moulds, sprouting, Cylas

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- Natural Resources Institute (NRI), University of Greenwich, UK
- International Potato Centre (CIP), Kenya
- Organi Ltd., Homa Bay, Kenya

Fig. 2 Benard Otieno removing a crate of stored sweetpotato roots for sample analysis at Organi Ltd. (credit T. Stathers)

Fig. 3 Unloading a crate of orange-fleshed sweetpotato roots after four months of storage (credit B. Kipkoech)

spp. weevil damage, and rotting (Figs. 2 & 3). At each of the monthly assessments, 25 kg of roots from each treatment were processed into puree and the ease of root preparation, puree sugar content, stickiness, thickness and colour were assessed. Additionally, raw roots and puree samples were sent for beta-carotene content laboratory analysis.

Who are we working with?

These fresh root storage trials were designed and managed by researchers from the NRI of the University of Greenwich, UK and the International Potato Centre (CIP) in Kisumu and Nairobi, in conjunction with staff at the Organi Ltd. OFSP purée processing facility in Homa Bay, Kenya.

What have we achieved so far?

The trial (Fig. 4) showed that solar-powered fresh root storage is one potential way for processors (or other stakeholders) in tropical areas of sub-Saharan Africa to extend and manage the availability and quality of sweetpotato roots for processing into purée. Over 70% of the root weight of all treatments (and >88% for Vita), could be processed into purée after four months of storage at 20-23°C in the solar-powered store.

The weight of the root portion that had to be discarded from the purée chain was greater for Kabode than Vita roots, and the general appearance of the Vita roots remained better (fresher-looking). Weight loss, sprouting, surface mould and rotting were also lower for Vita roots during the 4 months storage period. Roots in the top crates of each stack tended to have deteriorated more than those in the lower crates.

Overall, the process of washing the roots and the two differently powered stores (solar and mains) do not appear to have greatly affected the root portion requiring discarding. However, it should be noted that the trans-beta-carotene content of stored raw roots and their purée decreased by >50% in the first month's root storage, and therefore, bread made from them would have a lower beta-carotene content than that made from fresh OFSP roots.

What's next?

Despite the success of this trial in maintaining the quality of OFSP roots during 4 months of storage in a tropical part of Africa, further work is planned to investigate the impact of cooler temperatures of ≤15°C on root quality during storage. Cooler temperatures are expected to reduce or delay root rotting and sprouting, prevent development of weevil life-stages within roots, and to decrease the loss of trans-beta-carotene. Further work is also needed to better determine the optimal post-harvest curing conditions of African OFSP varieties, and to compare pre- and postharvest curing techniques. Minimising weight loss and quality deterioration during commercial fresh sweetpotato root storage is crucial for ensuring its cost-effectiveness.

Root storage could also be useful for farmers and traders to extend the period when sweetpotato roots are available in markets and in preventing postharvest deterioration and loss during peak root supply periods. Preliminary tests found consumers were willing to buy sweetpotato roots that had been stored for 4 months.

Fig 4 Sorting a crate of orange-fleshed sweetpotato roots during assessment after four months storage (credit T. Stathers)

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