Where do our potatoes come from?

Sanette Thiart*, ARC-Roodeplaat

Consumers specifically, generally accept that potatoes will always be available. But where do our potatoes come from? All our potatoes originate from *in vitro* plants which have been tested pathogen-free. This process has to start somewhere.

Long storage cabinet

***In vitro* potato plant**

Potato (*Solanum tuberosum L.*) is conserved *in vitro* in the South African National Potato Cultivar Collection housed at the *In vitro* Genebank facility of ARC-Roodeplaat. This provides a nucleus of authentic and disease-free material that is issued to the South African Potato Industry for the production of plant material. The material is either issued to other tissue culture facilities or to greenhouses that are accredited for mini tuber production within the Seed Certification Scheme.

Seven commercially grown cultivars are kept in this collection namely, BP1, Buffelspoort, Hertha, Mnandi, Pimpernel, Up-To-Date and Van der Plank. These are open varieties which are available to everyone. Nine cultivars that were granted sub-licenses are also kept in this collection. These are varieties that have been bred at Roodeplaat. The Vegetable and Ornamental Plant Institute, ARC-Roodeplaat, is the owner of these varieties. The sub-license collection consists of Aviva, Calibra, Caren, Darius, Devlin, Eryn, Esco, Ronn and Ropedi.

Plant material is also kept in the genebank for specific clients. This material is kept under contract and is only available to the client, unless written permission was granted to issue the material to someone else.

Five clones per cultivar are identified before they are established *in vitro*. These clones must be free of Potato Viruses S, X, M, A and potato leaf roll virus, as well as pathogens, *Ralstonia solanacearum* (Bacterial wilt) and *Erwinia spp.* They must also test negative when grown on an enriched medium for the presence of internal contaminants. A DNA-profile of the commercially grown cultivars is done to ensure that the cultivar is true to type. Once these clones have complied with these requirements, they can be accepted in the National Cultivar Collection.

The plants (*in vitro*) are transferred to a medium containing 50mg/l Alar to inhibit their growth. As soon as the plants have developed a good root system, they can be transferred to cold storage. The plants are stored *in vitro* in growth cabinets. They are grown at 4-7°C at a 16h-day 8h-night regime. Two sets of five plants each per clone, which implies 50 plants per cultivar are stored. These two cabinets are kept in separate buildings, each with their own power supply. This is to ensure the safekeeping of the varieties.

Plants on regeneration medium left (blue caps), Plants on long storage medium right (clear caps)

Of the commercially available open varieties, another set is kept at 18 to 22°C in a growth room. This set consists of ten bottles with five plants each per clone. This working collection allows the facility to be able to produce larger quantities in a shorter time frame.

The accessions in the cabinets are closely monitored for vigor. Each tube and bottle is checked every two months. The type of growth, tuber formation, leaf colour, senescence, rooting as well as contamination are observed. It is important not to lose any accessions. As soon as a decline in vigor and numbers is observed, some of the material is taken out of storage and transferred to fresh regeneration medium. Once they have regained their vigor, they are transferred back to long storage medium. As soon as they have a well-developed root system and are approximately two centimetres high, they are transferred back into cold storage.

It is important to keep the youngest generation possible in storage. When accessions have been taken out of storage for production purposes, the generation after the first cut on regeneration medium will be transferred back to long storage medium in order to keep the generations low.

Plants are produced on request from other tissue culture facilities or greenhouses. Most of the G0 mini tuber facilities have their own tissue culture laboratories, which supplies the greenhouse with plant material. Plants for tissue culture facilities are ordered in relative small quantities to serve as mother stock for their own production. Plants for greenhouses without tissue culture facilities are ordered in larger quantities depending on the requirements of the clients.

The plants received from ARC-Roodeplaat are accompanied with the necessary certificates that will confirm the disease-free status of the material received. Before any material can be traded it has to be tested.

After the final cut for the order was made, an officer from Seed Potato Certification Service will take samples. The samples are usually taken when the plants are ± three weeks old and growing well. One percent of the total order must be sent for bacterial testing and

Mass propagation

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** Sanette Thiart is the laboratory manager of the In Vitro Genebank at ARC Roodeplaat. Apart from maintaining the accessions in the genebank, she is responsible for the mass propagation of potatoes, rose rootstock, strawberries, Haworthia and indigenous bulbs. She can be contacted at sanette@vopi.agric.za*

Operators in laboratory

one percent must be sent for virus testing, with a minimum of ten plants per test. Each clone used for production needs to be tested. It usually takes one week to get the results back. By that time the plants will be ready for delivery.

Plant with mini tubers

The plants received by other tissue culture facilities can be propagated a number of generations. It is extremely important to continue with the numbering of the generations to ensure that the plants are not sub-cultured too many times. The chances of mutations are increased with the number of transfers. It is recommended not to do more than 18 transfers for potato tissue culture.

The *in vitro* plants are then planted in a greenhouse which is accredited by Seed Potato Certification Service for mini tuber production. These greenhouses have to adhere to certain standards and practices as specified by Seed Potato Certification Service. Currently six commercial greenhouse facilities are involved in producing G0 seed potatoes.

The tubers harvested from the *in vitro* plants are known as mini tubers or G0-seed potatoes. This represents the start of the whole Seed Certification Scheme. Seed potatoes will be produced and certified from this material for up to eight generations depending on the disease and variety true-to-type status. After that it is used for consumption or processing.

The National Cultivar Collection is the foundation of the Seed Potato Certification Scheme of South Africa.

Greenhouse for mini tuber production