

Sweetpotato: Acclimatization of Tissue Culture Plants

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Synopsis:

Tissue culture plants ensure disease-free planting materials. They require a transitional period of growth and acclimatization before transplanting to the bed, which is explained in this fact sheet.

Vegetable Horticulture Program:

Our program focuses on sustainable production systems and includes a wide range of projects such as screening new crops and breeding lines for suitability for production in Western Washington, testing new products such as soil-biodegradable mulch, and assessing production practices such as vegetable grafting.

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Sweetpotato production is limited in northern regions due to the perceived barriers of a short growing season and relatively cool summer temperatures. Yet, recent studies have shown sweetpotatoes grown with plastic mulch in northern regions produced greater yield than the national average (11 tons/acre) due to the longer photoperiod during the growing season. Thus, in areas such as Mount Vernon, WA where day length is 16 h on average in June and July, rapid growth during establishment of healthy transplants likely contributes to higher yields. In a preliminary study at Northwestern Washington Research and Extension Center, Mount Vernon, WA, the yield of some sweetpotato accessions ranged from 14-26 tons/acre in 2020. The keys to successful production are suitable cultivars, healthy slips, planting into warm soil, appropriate plant spacing, and maintaining warm soil throughout the growing season.

Hardening off tissue culture plants

Sweetpotatoes are propagated vegetatively on a large commercial scale by slips or vine-cuttings. However, disease-causing pathogens and pests can be easily transferred from one genera-



Fig. 1. Tissue culture sweetpotato plants.

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tion to the next by vegetative propagation. Moreover, sweetpotatoes are greatly susceptible to mutations that pass through generations. When the same genetic stock is used for several years, off-type planting materials can be propagated and cause reduction in yield. Therefore, it is advised to replace the seed stock with new certified disease-free stock for slip production every three years. Tissue culture plants ensure disease-free planting materials but require greater attention to prepare for transplanting to the bed. Plant tissue culture is carried out under sterile and controlled conditions of light, temperature, and humidity. Thus, a transitional period of growth and acclimatization is required before transplanting.

Protocol for receiving and managing tissue culture plants:

- Receive the packing box in a clean and disinfected area to reduce the possibility of contamination. Wipe the counter surface with 70% ethanol where the box will be placed and also wipe the outside of the box before opening the box.
- Wear sterile latex gloves to remove the culture tubes from the packing box.
- Place the tubes at room temperature 22-24 °C with 1000 lux illumination to allow the plants to recover from potential detrimental effects of darkness and transportation during shipping (Fig. 1).
- Autoclave commercial potting mix and sterilize new 4-inches pots (submerge in 10% bleach solution, rinse with tap water). Place potting mix in pots and place in the greenhouse.
- After 2-3 days, open the lids of the tubes gradually to equate the relative humidity (RH) with the ambient environment: open lids of the tubes half-way for 2 hours and then fully open for 1 hour. Move plants to the greenhouse.
- In the greenhouse, remove the tissue culture plants from the culture tubes and gelling agent by gently pulling them out using forceps (Fig. 2). Dip plants in deionized water to remove any traces of solidified agar media (Fig. 3). Wear latex gloves disinfected with 70% ethanol to avoid potential contamination of the plants.
- Treat the plants with liquid fungicide(s) (e.g. 2% dithane M-45) by lightly dipping the root base for



Fig. 2. Removal of tissue culture plants from culture tubes.



Fig. 3. Tissue culture plants after cleaning.

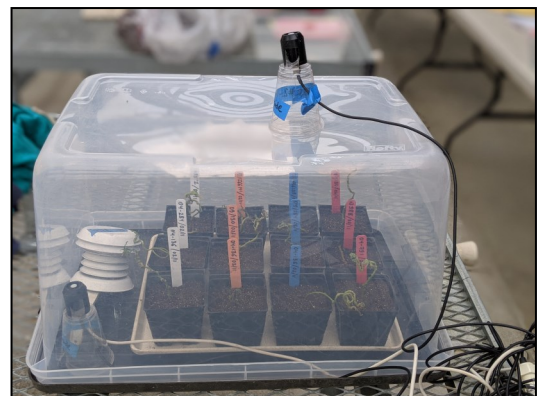


Fig. 4. Placing tissue culture plants into a humidity box in the greenhouse.

2-4 minutes to avoid pathogenic infection.

- Insert each plant, holding by the stem, into a pre-formed hole in the potting mix, and press potting mix lightly around the base for the plant to hold firm and upright.
- Place pots inside a humidity box with 25-27 °C and 80-85% RH in the greenhouse (Fig. 4). To avoid direct sunlight, cover the humidity box with shaded cloth to maintain 50-70% light. Mist plants and inside of the box before closing the box.
- Gradually open the humidity box by first removing a quarter of the cover after 2-3 days, half on day 4, three-quarter on day 6, and fully uncover on day 8. Monitor the plants daily in the box and mist the plants if needed, but do not water directly.
- Place plants on a greenhouse bench and water lightly (Fig. 5).
- After 3-4 days, place the plants in an open-ended hardening-off tunnel for about 1 week (Fig. 6).
- Transplant the plants to the bed (Fig. 7).

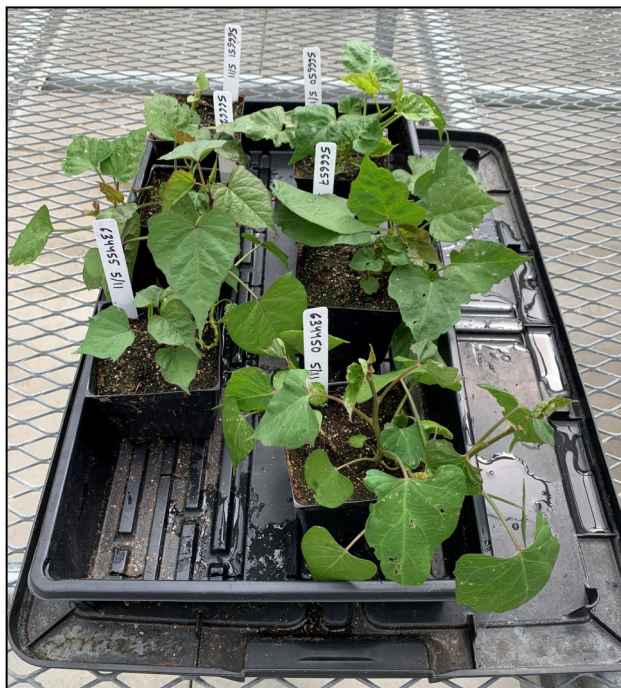


Fig. 5. Placing tissue culture plants on the greenhouse bench.



Fig. 6. Plants in open-ended hardening-off tunnel.



Fig. 7. Tissue culture plants ready to transplant to the bed.