The Case for Passionfruit Tissue Culture & Critical Steps Required for Success

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The Northern Territory Department of Agriculture and Fisheries (DAF NT) developed hybrid passionfruit suited to the Top End through a breeding project. These hybrids were made available for commercialisation, and clean mother plants were vital for this process. To provide disease-free clonal plants, DAF NT used tissue culture technology for propagation.

Tissue culture (TC) is a propagation method that produces large numbers of genetically uniform, disease-free plants. Plant Industries' staff developed a TC system for passionfruit that can generate up to 15 plants from one shoot tip in about 7 months, depending on the hybrid. These plants are pest- and disease-free, genetically identical to the mother plant, and have been validated from the laboratory to nursery through to container growing. Plants have been observed flowering and setting fruit within 7 months post-laboratory.

Nursery Care for TC Plants

The first four weeks after removing plants from culture containers - called deflasking - are critical. During this period, TC plants are vulnerable due to the absence of a protective waxy cuticle on their leaves, making them prone to dehydration. Proper acclimation is essential to prevent dehydration, and to ensure survival and healthy development. This involves gradually introducing the plants to environmental conditions similar to their eventual growing location.

Deflasking of TC plant

Here is a step-by-step guide to the deflasking and acclimation process for TC passionfruit plants.

Step-by-Step Deflasking Process

1. **Clean and Prepare:**
   Wash hands or wear gloves for sterility.
   Work in a clean, cool area out of direct sunlight.
2. **Remove the Plant:**
   Gently open the container and remove the plant using clean fingers or sterile tweezers.
3. **Rinse Away the Gel:**
   Carefully rinse off the gel medium from roots and leaves with clean water. Use a soft paint brush if needed to remove gel from roots.
4. **Inspect the Plants:**
   Check for damage, rot, or disease. Trim off any damaged roots or leaves with sterilised scissors or tweezers.
5. **Planting:**
   Place the plant in a 50 mm square propagation tube filled with moistened perlite. Ensure roots are covered, but leaves stay above the surface.

TC plant 3 weeks after deflasking

Acclimatised plant

Step-by-Step Acclimation Process

1. **High Humidity Environment:**
   Place the newly planted TC plants in a mist house or under a humidity dome (>70%) with low light for 2–3 weeks. Avoid direct sunlight to prevent leaf damage.
2. **Gradual Adjustment:**
   Once new growth appears, begin reducing humidity by slightly opening the dome or mist house for a few hours daily. Increase ventilation over 1–2 weeks. Alternatively, move plants to a 70% shade house with frequent overhead irrigation to avoid sudden shock.
3. **Repotting:**
   When healthy new leaves and roots emerge from the bottom of the tube, transplant the plant into a 90 mm square deep pot with a well-drained potting mix with a 1:1 mix of cocopeat and small wood chips.
4. **Increased Light Exposure:**
   After 3-4 weeks, plants can be transferred to a 50% shade house. Avoid direct sun which can scorch young leaves.
5. **Transition to Normal Conditions:**
   After 6–8 weeks, plants should be robust enough for full sun exposure.

Feeding Guidelines

1. Begin fertilising one week after deflasking using a ¼-strength soluble fertiliser like Yates Thrive®, applied daily.
2. Increase fertiliser solution concentration to ½-strength after 4 weeks, and then to full-strength after repotting, applied daily.
3. At repotting, apply 0.5 g of slow-release fertiliser (e.g., 270-Day Nutricote®) per plant.
4. Reapply slow-release fertiliser before transferring plants to full sun.
5. Avoid over-fertilising. Excess nutrients can harm the plant, causing root damage, leaf burn, yellowing, and wilting.

Trellis TC passionfruit plants with fruit

All photos credit Northern Territory Government.