Development of New Pothos Cultivars for the Foliage Plant Industry

Progress Report
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The objectives of this proposal are to (1) optimize somatic embryogenesis systems for pothos regeneration, (2) select unique tissues of pothos cultivars for inducing somatic embryogenesis, and (3) select, characterize, and evaluate mutants for releasing new pothos cultivars.

Progress:

1. An effective direct somatic embryogenesis system has been developed

Briefly, leaf explants are cultured on MS medium containing 4.54 μM TDZ with 1.07 μM NAA for inducing somatic embryos. Induced embryos can convert to plantlets or seedlings in the same medium.

2. The regeneration system has been used for inducing somatic embryos and for isolating variants

Unique variegated leaves have been used to produce explants, and leaf explants have been cultured on the developed regeneration system to produce variants. Figure 1 shows some variants from the culture (please see the attached supplementary information).

3. Isolated variants have been evaluated for potential release of new cultivars

We are in the process of selection and evaluation of variants. About 40 variants have been selected from the regenerated populations. Eight of them appear promising thus far for potential release of new cultivars (Figure 2).

The eight selections are briefly described as follows:

UF-Ea-0310. Leaves: oblique with white-grey and green coloration; stem: white; leaf size: 14 cm long and 7 cm wide with an average area of 60 cm^2; mean internode length: 4.0 cm.

UF-Ea-0311. Leaves: obtuse with white-grey and green coloration in irregular patches; stem: green and white lines; leaf size: 6 cm long and 6 cm wide with an average area of 30 cm^2; mean internode length: 3.0 cm; a small compact plant.

UF-Ea-0312. Leaves: cordate with white-grey and green coloration; stem: green; leaf size: 12 cm long and 8 cm wide with an average area of 64 cm^2; mean internode length: 6.0 cm; a tetraploid plant.

UF-Ea-0313. Leaves: cordate, complete green; stem: green; leaf size: 11 cm long and 7 cm wide with an average area of 54 cm^2; mean internode length: 7.0 cm; a tetraploid plant.

UF-Ea-0314. Leaves: acuminate, tapering to a long point, complete green; stem: green; Leaf size: 10 cm long and 5 cm wide with an average area of 25 cm^2; mean internode length: 7.0 cm.

UF-Ea-0315. Leaves: obtuse with pronounced yellow vein; stem: yellowish green; leaf size: 6 cm long and 6 cm wide with an average area of 32 cm^2; mean internode length: 3.5 cm.

UF-Ea-0316. Leaves: lanceolate with white-grey and green coloration; stem: green; leaf size: 10 cm long and 4 cm wide with an average area of 24 cm^2; mean internode length: 2.5 cm; a small compact plant.

UF-Ea-0317. Leaves: Aristate with white-yellow and green coloration; stem: yellow; leaf size: 6 cm long and 6 cm wide with an average area of 45 cm^2; mean internode length: 5.5 cm.

3.1. Local nursery evaluation

Among the eight selections, UF-Ea-0310, UF-Ea-0314, UF-Ea-0316, and UF-Ea-0317 were evaluated by Mercer Botanicals, and UF-Ea-0310, UF-Ea-0314, and UF-Ea-0317 were evaluated by Wekiva Gardens in 2019. Comments from Mercer Botanicals included: slow growth, leaf scorching, and limited marketability. However, comments from Wekiva Gardens were more positive: both UF-Ea-0310 and UF-Ea-0317 have unique variegation patterns and have marketability. However, leaf scorching of variegated selections could be a problem.

3.2. Investigation of leaf scorching

Leaf scorching is a problem for variegated selections. Our study found that this is caused by a combination of heat and high light. Photosystem II (PSII) in white sectors is much more sensitive to high light and high-temperature stress than green sectors. Under such growth conditions, the balance between the rate of PSII damage (induced by light stress) and the rate of PSII repair (impaired under heat stress) is broken, resulting in photoinhibition, thus leaf scorching of the white sectors. We found that 12-oxo phytodienoic acid (OPDA) in white sectors was 9-fold higher than green sectors. OPDA is related to jasmonic acid (JA), and application of JA showed alleviation of leaf scorching.

3.3. Evaluation of chilling responses

Some selections were evaluated for chilling tolerance by exposing them to 0^oC (32^oF) for four hours. Plant responses to the chilling stress were shown in Figure 3. Commercial cultivars of Jade, Neon, and Pearls and Jade were highly injured. New selections of UF-Ea-0314, UF-Ea-0310, and UF-Ea-0311 had little damage. Two plants of UF-Ea-0317 were in the same pot, one was killed, but the other had no injury.

Plan for next year:

1. To continue using the established somatic embryogenesis system to regenerate more new plantlets, and transplant the plantlets to shaded greenhouses for selection of potentially valuable variants.
2. To increase the number of selected variants for producing cuttings that will be used for evaluating the variants' performance in additional nurseries.
3. To continue investigating appropriate light and temperature levels for producing the variegated selections and also application of JA for improving their growth.

Supplementary Information for the Progress Report (Figures 1-3)

Figure 1. Plantlets or seedlings regenerated though direct somatic embryogenesis with leaves in different colors or variegation and also with varied growth patterns.

Figure 2. New pothos selections that are under evaluation or to be evaluated

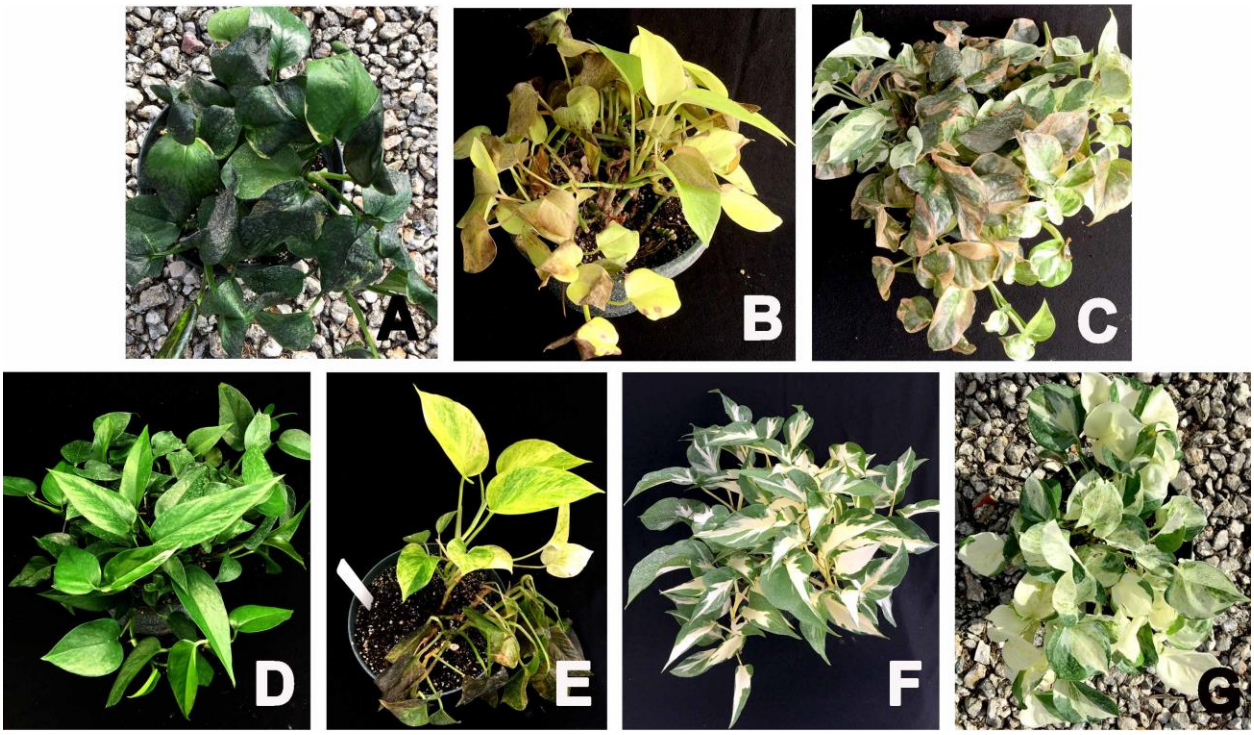

Figure 3. Pothos cultivar responses to a chilling temperature (0ºC or 32ºF) for 4 hr. A = Jade, B = Neon, C = Pearls and Jade, D = UF-Ea-0314, E = UF-Ea-0317, F = UF-Ea-0310, and G = E = UF-Ea-0311.