

NFF Grant Request Application

Contact Jianjun Chen
Institution University of Florida, IFAS, Mid-Florida Research and Education Center
Address 2725 Binion Road
City Apopka State FL Zip 32703
Phone (407) 814-6161
Fax (407) 814-6186
Email Address jjchen@ufl.edu

Title of Proposal Development of New Pothos Cultivars for the Foliage Plant Industry

Does this proposal address an FNGA Research Priority? ☒ Yes ☐ No

If yes, in which priority area: ☐ Environmental/Resource Mgmt ☒ Genetics and Breeding ☐ Pest Management

☐ Enhance Quality of Life ☐ Production Systems

Significance to foliage industry (What impact will this research have on the industry?) _____

To develop several new pothos cultivars for the foliage plant industry

Objective and justification (What problem/opportunity will this research address?) Pothos is an important foliage plant, but there are only six cultivars in the market. This proposal is intended to develop several new cultivars for the industry.

Name of organization submitting request: _____
University of Florida

Name and title of individual(s) submitting request:

- a) Jianjun Chen, Professor
b) _____
c) _____

Name and title of individual(s) conducting proposed project (if different):

- a) _____
b) _____
c) _____

Cost analysis:

- a) Total cost of project \$50,000 for three years
b) Total request from foundation \$50,000 for three years
c) If project already initiated, funds expended to date _____
d) Funds anticipated from other sources (list sources and amounts) None

Timeline:

- a) If project has already commenced, provide date started _____
b) If project has not commenced, provide anticipated starting date January 2017
c) Anticipated date on completion December 2020

Publication of Research Results

Acceptance of a grant award from the National Foliage Foundation includes an agreement to provide the Foundation with a written report of the following: a) Title of paper, b) Author(s), c) Nature of work (introduction); brief but complete synopsis purpose, materials and method of research, d) Results and discussion (information should be thorough enough to be of value to reader), e) Significance to industry (brief statement of practical application), f) Literature cited.

The grant recipient(s) is also expected to participate in a conference currently in development that allows the recipients of NFF grants to focus on pertinent subjects essential to the survival of our industry. By holding the forum in locations where growers and allied tradesmen can attend, listen and exchange ideas, it is the Board's hope that more ideas of importance to the foliage industry will be generated for future research.



Signature of Proposal Applicant

12/05/2016

Date

Development of New Pothos Cultivars for the Foliage Plant Industry

Progress Report

Jianjun Chen

November 25, 2019

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 cm²; 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 cm²; 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°C (32°F) 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 through 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

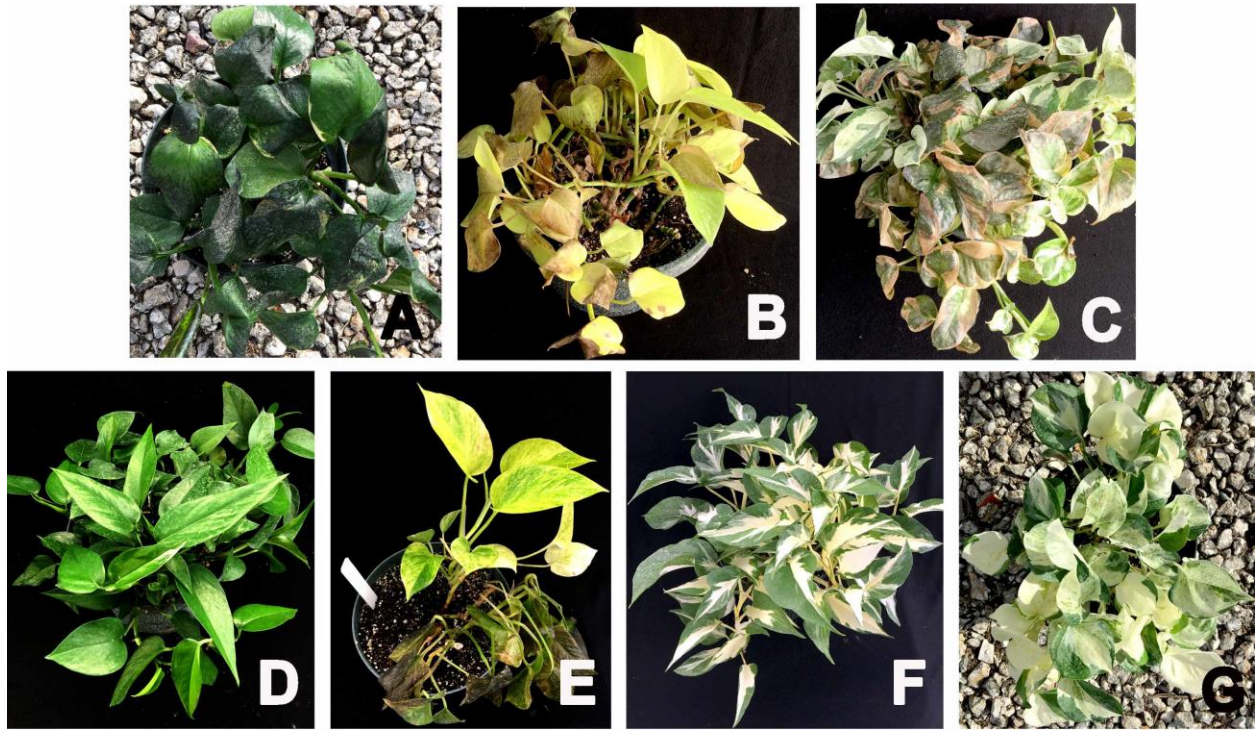


Figure 3. Pothos cultivar responses to a chilling temperature (0°C or 32°F) for 4 hr. A = Jade, B = Neon, C = Pearls and Jade, D = UF-Ea-0314, E = UF-Ea-0317, F = UF-Ea-0310, and G = E = UF-Ea-0311.