NEW ADVANCED GENERATION SEEDLING SEED ORCHARDS USE METHODOLOGY DEVELOPED FOR *EUCALYPTUS GRANDIS* IN FLORIDA

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Two advanced generation seedling seed orchards (SSO) recently established in Florida followed a novel cost-efficient, effective methodology developed through four generations of E. grandis genetic improvement. Combining short generation time and rapid growth with provenance and progeny testing in one place at one time, early selection, large infusions of new, primarily single-tree accessions, and use of pedigrees to minimize inbreeding resulted in steady and often great genetic gains. Advancing from a 1st-generation genetic base population of 4,352 trees from only 13 accessions to a 4th-generation genetic base population (GPop77) of over 31,000 trees from 529 worldwide E. grandis accessions resulted in productivity gains of as much as 195%. While the 1,500 trees in the 4th-generation SSO GO77 also captured individual tree responses to severe freezes, thus further illustrating the benefit of continued selection and orchard establishment, additional progeny tests contributed to the calculation of breeding values for stand basal area, bluegum chalcid resistance, and/or freeze resilience. Applying similar methodology to the tropical species *Corymbia torelliana*, a 1st-generation genetic base population (TPop08) included 960 seedlings from 29 local trees of unknown sources. The 72 selected trees in SSO TO08 combine surprising freeze tolerance (as low as −5°C) with good growth and tree form.

A 5th-generation *E. grandis* genetic base population (GPop15) established at the UF/IFAS Indian River Research and Education Center near Ft Pierce, FL, from July to October 2015 consisted of 4,157 propagules from 42 up to 4th-generation, open-pollinated progenies with superior growth, freeze resilience, and/or chalcid breeding values and four UF commercial cultivars. Sixty trees of 10 progenies were replanted in April 2016, resulting in 20 60x90' replications (10x3' spacing) with 36 progenies/cultivars systematically assigned to six rows of six 5-tree row plots and four incomplete replications. Based on periodic growth, freeze, form, chalcid, and windfirmness measurements, GPop15 was rogued to the best tree in each plot in April 2017 to create SSO GO15. Using performance through 2018, each replication will be further rogued to approximately the best six trees, resulting in GO15 having ~150 trees when abundant flowering begins in Fall 2019. GO15 should produce large quantities of seed by Spring 2020 and provide fast growing, freeze resilient, windfirm, and chalcid resistant *E. grandis* seedlings for central and southern Florida and similar areas.

TPop12, the 2,027 tree 2nd-generation *C. torelliana* genetic base population planted October 2012 on former citrus beds near Ft Pierce, included 66 progenies: 10 TO08 progenies, 25 Australian single-tree seedlots, and 31 Florida "wild" progenies. Tree size, form, fecundity, windfirmness, and survival were measured periodically. Seedlings coming from the diverse 115 trees selected for retention in SSO TO12 representing 54 progenies (25 from 10 TO08 trees, 52 from 22 Australian trees, and 38 from 22 "wild" trees) may be deployed in central and southern Florida.

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