

Annual report to
FLORICULTURE NURSERY RESEARCH INITIATIVE
and
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
for the period of
OCTOBER 2010 TO SEPTEMBER 2011

PROJECT

Alternative substrate development in three key regions of the U.S.

PRINCIPLE INVESTIGATORS:

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SYNOPSIS

Situation: Pine bark is the primary component in container substrates used by Ohio and other Upper Midwest growers. Pine bark is typically imported from southern states such as Louisiana, Georgia, and North Carolina. Availability of pine bark has decreased over the past 5 to 10 years and continues to decrease as its bioenergy value increases. Coupled with this decrease in availability is an increase in price and transportation costs. The goal of our project was to develop locally sourced substrates in three key regions of the U.S. to replace all or part of pine bark in container substrates.

Results and Impacts: In Ohio, collaborators at North Branch Nursery are evaluating switchgrass, wheat straw, and pine wood substrates. Their year-long assessment of the straw based substrates are very high, however, sourcing these materials economically has been challenging. Pine wood substrates, sourced from Ohio forests, are being evaluated at Willoway Nursery, Acorn Farms, and North Branch Nursery. These crops are growing as well as plants in traditional pine bark based substrates, however, our collaborators at Buckeye Resources (a substrate and potting mix company) were not able to secure and generate the pine wood substrate at a price point lower than pine bark. Similar to the straw materials, these alternative wood substrates have been demonstrated horticulturally viable, but economically non-viable.

In Kansas, high percentages of Redcedar did not perform well. Despite careful watering to a 30% leaching fraction, treatments containing more than 25% Redcedar were stunted and chlorotic. Interestingly, water was available in the bottom of the 4-inch containers, but liners were not able to grow enough to reach the water before production was compromised. It is possible that cyclic irrigation may be able to overcome this barrier and we plan to conduct a study in 2011-2012 to evaluate this idea.

In Oregon, research on conventional soilless substrate components continue to result in growers assessing their need and use during the economic downturn, thus resulting in elimination of components (such as peat or pumice) that provide no proven benefit for a given crop or production system. Screening alternative soilless substrates has resulted in narrowing suitable Pacific Northwest alternatives to Douglas fir slash, culled Christmas trees and chipped poplar. All alternatives can be utilized to supplement up to one-third of the Douglas fir bark currently utilized while growing a comparable crop. Furthermore, information is disseminated via the World Wide Web and stakeholder presentations.

PUBLICATIONS

Altland, J.E. and C.R. Krause. 2009. Use of Switchgrass as a Nursery Container Substrate. *HortScience* 44:1861-1865.

Altland, J.E. 2010. Use of Processed Biofuel Crops for Nursery Substrates. *J. Environ. Hort.* 28:129-134.

Altland, J.E., J. Owen, W. Fonteno. 2010. Developing moisture characteristic curves and their descriptive functions at low tensions for soilless substrates. *J. Amer. Soc. Hort. Sci.* 135:563-567.

Altland, J.E. and C. Krause. 2010. Modification of switchgrass substrate ph using compost, peatmoss, and elemental sulfur. *HortTechnology* 20:950-956.

Altland, J.E. and C.K. Krause. 2009. Use of Switchgrass as a Nursery Container Substrate. *HortScience* 44:1861-1865.

Altland, J.E., J.S. Owen, and M.Z. Gabriel. 2011. Influence of pumice and plant roots on substrate physical properties over time. *HortTechnology* 21:554-557.

Altland, J.E., and J.C. Locke. 2011. Use of ground miscanthus straw in container nursery substrates. *J. Environ. Hort.* 29:114-118.

Locke, J.C. and J.E. Altland. 2011. Use of ground wheat straw in container nursery substrates to overwinter daylily divisions. *J. Environ. Hort.* (Submitted 9/29/2011).

Starr, Z.W., C.R. Boyer, and J.J. Griffin. 2011. Cedar substrate particle size affects growth of container-grown *Rudbeckia*. *Proc. Southern Nurs. Assoc. Res. Conf.* (In Press)

Starr, Z.W., C.R. Boyer, and J.J. Griffin. 2010. Growth of *Pistacia chinensis* in a cedar amended substrate. *Proc. Intl. Plant Prop. Soc.* (In Press)

Boyer, C.R., J.S. Owen, Jr. and J.E. Altland. 2010. Development of sustainable and alternative substrates for nursery container crops. *Proc. Southern Nurs. Assoc. Res. Conf.* 55:410-412.

Stoven, H.M. and J.S. Owen, Jr. 2010. Into the blue: A comparison of substrate amendments for the adjustment of hydrangea flower color. *Digger* 54: 25-30.

ABSTRACTS

Boyer, C.R., J.E. Altland, J.S. Owen, Jr. 2011. SustainableSubstrates.com: An extension outreach tool. *HortScience* (In Press).

Starr, Z.W., C.R. Boyer, and J.J. Griffin. 2011. Propagation of chrysanthemum and ivy geranium in redcedar substrate. *HortScience* (In Press).

Starr, Z.W., C.R. Boyer and J.J. Griffin. 2011. Alternative nursery substrates for the Great Plains: *Maclura pomifera*. *HortScience* (In Press).

Owen, J.S. Jr., H.M. Stoven, J.E. Altland, W.J. Pruett, J. Klick. 2010. Crop response to hybrid poplar alternative soilless substrate component for pacific northwest ornamental container production. *HortScience* 45:S110-S111 (Abstr.)

Albano, J.P., J.S. Owen, Jr., J.E. Altland, T. Evans, S. Reed, and T. Yeager. 2010. Composted algae as an alternative substrate for horticultural crop production: Chemical and physical properties. *HortScience* 45:S164-S165 (Abstr.)

Owen, J.S. Jr., M. Zazirska-Gabriel, D.M. Sullivan, J.E. Altland, and J.P. Albano. 2010. Water use and growth of two woody taxa produced in varying indigenous Douglas fir based soilless substrates. *HortScience* 45:S111 (Abstr.)

PRESENTATIONS

“Cedar substrate particle size affects growth of container-grown *Rudbeckia*.” (Z. Starr) Southern Nurseryman’s Association Research Conference, January 2011. Mobile, AL.

“Developing Local, Sustainable Substrate Resources for the Great Plains.” (C. Boyer) Horticulture Research Institute Alternative Substrates Conference, January 2011. Mobile, AL.

Developing Local, Sustainable Substrate Resources for the Pacific Northwest. Horticulture Research Institute Alternative Substrates Conference, January 2011. Mobile, AL.

A roundtable discussion on innovations in effective container fertility. Clean Water Services, March, 2010, Tigard, OR.

Water Management Tools for Container Nurseries. August 2010, NWREC, OSU, Aurora, OR.

OSU Nursery Research and Extension Field Day, September, NWREC, OSU, Aurora,

Indiana Green Expo trade show on development of new substrates. (1/19/2011).

Symposium on Alternative Substrates at the Southern Nursery Research Conference (1/21/2011).

STUDENT INVOLVMENT

Graduate

Z. Starr, MS; Horticulture, Forestry and Recreation Resources (HFRR2009 to present

J. Pool, MS; HFRR, 2009 to present

B.M. Morales Rivera, MS; HFRR, 2010 to present

T. Carmichael, MS; HFRR, 2011 to present

M. Wilson, Ph.D.; HFRR, 2011 to present

D. Bailey, MS, Biological & Ecological Engineering, 2010 to present

R. Costello, MS, Crop and Soil Science, OSU, 2009 to present

A. Newby, Ph.D., Horticulture, Ohio State University, 2008 to present

Undergraduate

D. Huber, undergraduate student assistant, Fall 2010 to present, Kansas State University

S. Sydow, student intern, summer 2010, University of Minnesota, MN

M. Kapsimalis, student intern, summer 2010, University of Rhode Island, RI

DOLLARS LEVERAGED IN 2011 - \$38,000

Altland, J.E. and J.C. Locke. 2011. Use of biochar in container media to reduce nitrate and phosphate leaching. J. Frank Schmidt Family Charitable Foundation. - \$5100.

Owen, Jr., J.S., J.E. Altland, and H.M Stoven. 2011. Integrating selected alternative substrates for woody ornamental container production: From substrate properties to cultural management. Oregon Department of Agriculture - \$26,932.

Miller, F.L., R.J. Whitworth, E. DeWolf, W. Upham, C.R. Boyer, B. McCornack, L.L. Buschman, W.T. Schapaugh Jr., C.M. Smith, and T.W. Phillips. 2010. Extension IPM coordination in Kansas. USDA NIFA: Extension IPM Coordination and Support Program. 3 years. \$273,119. Year 1: \$91,040. Boyer portion: \$6,000.

PRIMARY INDUSTRY COOPERATORS

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