

**United States Department of Agriculture
Project Initiation**

Project Data for Accession Number 1011629

Project Title

Breeding plants for genetic diversity and ecological function for use in urban landscapes

Project Details

Sponsoring Institution National Institute of Food and Agriculture	Project Status COMPLETE
Funding Source NIFA Formula	Grant Year 2017
Grant No.	Cumulative Award Amt. N/A
Proposal No.	Multistate No. (N/A)
Project Start Date Nov 18, 2016	Project End Date Nov 14, 2021
Program Code	

Project Director

Robacker, C.

Recipient Organization

SAES - UNIVERSITY OF GEORGIA
310 E Campus Rd Tucker Hall Rm 409
Athens, GEORGIA 30602

Performing Department

Horticulture

Non Technical Summary

Landscape plants have an important functional and aesthetic impact on the environment, and are of great importance to urban areas. Green landscaping is designed for low water and maintenance requirements and reduced pesticide use. Selection of appropriate plants can reduce air-conditioning and heating costs and reduce water runoff. Plants that tolerate drought and heat should be used in urban areas that experience frequent droughts and water use restrictions. Choice of plants for urban areas can impact the biodiversity of insects and animals important to the ecological function of these already altered environments. It is important that plants used in landscaping and gardens have qualities that support pollinators such as bees and butterflies, food for birds and insects, and habitat for animals. Furthermore, incorporation of non-invasive plants is necessary, as the spread on invasive plants in the U.S. is threatening biological diversity and natural ecosystems. Native plants can support the natural ecosystem. Many conservation groups and federal and state agencies are recommending that native plants be incorporated into urban landscapes. However, many native species are not suited to an urban environment of potentially compacted soils, periodic drought and heat,

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or invasive pests. Also, they may be difficult to propagate commercially. Plant breeding can address these problems by developing cultivars of native plants that can be commercially propagated and are adapted to urban landscapes. Many non-native species are adapted to urban landscapes. Research to develop cultivars of non-native species that are not invasive, but have drought, heat and pest tolerance is also needed. This project will address the need to develop non-invasive cultivars adaptable to urban landscapes of both native and non-native species. Research will focus on the non-native species of glossy abelia, chaste tree, and pearl bush, and on the native species of deciduous azalea, little bluestem and Maryland Pink. Traditional plant breeding techniques will be used, including hybridization of plants within and among species, embryo rescue of hybrids using sterile in vitro techniques, collection of germplasm from within the U.S. to enhance genetic diversity in the breeding program, analysis of DNA using molecular markers to identify diversity, creation of polyploids with chemical mutagens, and induction of sterility from mutagenic agents. Plants developed will be evaluated over several years in containers and field conditions. Propagation methods will be developed to ensure availability of the cultivars commercially. The ultimate goal of the project is to release new cultivars of native species or non-invasive species that are adapted to urban landscapes with traits of drought and heat tolerance and pest resistance. These cultivars will be made available to commercial producers for marketing and sales to the nursery industry.

Animal Health Component

Animal Health Component: 0%

Research Effort Categories

Basic	10%
Applied	40%
Developmental	50%

Classification

Knowledge Area (KA)	Subject of Investigation (SOI)	Field of Science (FOS)	Percent
201	2110	1081	80%
211	2110	1081	10%
111	2110	1081	10%

Knowledge Area

[201] Plant Genome, Genetics, and Genetic Mechanisms

[211] Insects, Mites, and Other Arthropods Affecting Plants

[111] Conservation and Efficient Use of Water

Subject Of Investigation

[2110] Ornamental trees and shrubs

Field Of Science

[1081] Breeding

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Keywords

abelia, azalea lace bug, deciduous azalea, drought tolerance, exochorda, heat tolerance, interspecific hybridization, little bluestem, native plant species, pollinators, polyploids, urban landscapes, vitex, Schizachyrium scoparium, Stephanitis pyrioides, breeding landscape plants, non-invasive species, spigelia gentianoides, spigelia marilandica

Goals / Objectives

1. Develop new cultivars of woody and herbaceous landscape species that have adaptability to environmental conditions in Georgia, including heat, cold, drought and pests. 2. Develop sterile cultivars of potentially invasive exotic species. 3. Produce cultivars of native species that are readily propagated, have desirable ornamental qualities and are adaptable to urban landscapes.

Project Methods

Abelia cultivars and species will be intercrossed to obtain progeny with desired traits, including improved form, cold hardiness, foliage retention during drought, early flowering, continuous flowering, colorful or glossy foliage, attractive flowers and sepals, easy to propagate via cuttings, and attractive in a container. Salt tolerance will also be investigated via screening of species related to Abelia. Vitex cultivars and species will be intercrossed to obtain cultivars with compact form, reduced size, longer bloom time and repeat blooming, novel foliage and large and showy inflorescences with deep pink, blue or white color. Reduced fertility will be sought by producing interspecific hybrids and mutation breeding with chemicals and radiation. Exochorda cultivars with disease resistance, compact form and sterility will be produced. Crosses among subspecies will generate plants to be evaluated in the field for these traits. Ethyl methane sulfate will be applied to seeds to obtain sterile cultivars. Polyploidy will be induced using oryzalin to obtain tetraploids that will be crossed to diploids to obtain sterile triploid cultivars. Deciduous azalea selections were developed from interspecific crosses among native azaleas. These hybrid selections will be evaluated in field and laboratory trials for resistance to azalea lace bug. Field evaluations will also provide information on form and flowering. Selections will be propagated to determine ease of propagation. In a joint project with Dr. Dayton Wilde, DNA of the native species *R. canescens* will be evaluated for genes that play a major role in plant architecture, such as height and branching patterns. Plants with genes for improved branching and reduced height will be crossed to generate populations that will be evaluated for improved form. *Schizachyrium scoparium*, little bluestem, accessions from the germplasm collection in Griffin, GA, as well as new accessions from the northeastern U.S. and Georgia, will be evaluated for rust resistance, cold hardiness, lodging resistance, and colorful foliage. DNA analysis of the accessions from various locations throughout the U.S. will be evaluated with SSR markers to assess the genetic diversity. Plants with desirable traits and genetically diverse will be intercrossed to develop cultivars with improved adaptability to urban landscapes and desirable horticultural traits. To develop cultivars of *Spigelia* (Maryland Pink) suitable for gardens and urban landscapes, crosses will be performed among *S. marilandica* accessions and between *S. marilandica* and *S. gentianoides*. These hybrids will be evaluated for increased branching, heavy blooming, ability to grow in urban environments, and ease of propagation from vegetative cuttings. Hybrids will include F1, F2, and F3 individuals using traditional crossing methods.