

**2011 CANR Research Report:
Non-invasive Cultivars for the Green Industry**

Gary W. Knox
University of Florida/IFAS
North Florida Research and Education Center
155 Research Rd.
Quincy, FL 32351
850/875-7100
Fax 850/875-7188
gwknox@ufl.edu

Introduction

Promotion, production and use of plants considered invasive have placed the Green Industry under scrutiny. The annual cost of invasive plants to the U.S. has been estimated at more than \$34 billion (Pimentel et al., 2005). An estimated 85% of woody plants now considered invasive were originally introduced for landscape purposes (Bell et al., 2003). The establishment of the National Invasive Species Council (1999) and its release of the National Invasive Species Management Plan (NISC, 2001) have major implications on the ability of the Green Industry to produce some current plants and introduce new plants. However, cultivars of species may have characteristics making them less invasive (Wood, 2007).

One strategy for the nursery industry is to identify and promote non-invasive cultivars of plants otherwise considered invasive. Availability of non-invasive cultivars will provide the Green Industry with a ready substitute to the invasive cultivars for continued use of these popular plants. Promotion and use of noninvasive cultivars will improve the industry's image and standing with environmental groups as well as federal, state or local governments.

Background

Previous research showed wide variation in growth and fruiting among cultivars of invasive ornamentals and regions of Florida (Knox and Wilson, 2006; Wilson and Knox, 2006, 2009, 2010). These studies validate the importance of research to assess cultivars of ornamentals for invasiveness.

Nandina (*Nandina domestica*) is an extremely popular landscape plant in USDA Hardiness Zones 6-10. Introduced to the U.S. before 1804, the species has since escaped cultivation in nine states (USDA NRCS, 2008). Over 40 cultivars of *nandina* exist but research on invasiveness is only available for 11 selections (Knox and Wilson 2006).

As with *nandina*, Chinese privet (*Ligustrum sinense*) and glossy privet (*Ligustrum lucidum*) have widely naturalized throughout the southeastern United States, dominating the understory of mesic forests and displacing native plant communities. A third privet, Japanese privet (*Ligustrum japonicum*) has escaped cultivation but is not listed as invasive. All three species have ornamental value, with numerous cultivars commercially available. Current designation of the invasive status of these species was based on the wild-type selection of each, since landscape use of cultivars in the southeastern United States was not common until the 1900s. However, subsequent production shifted to selected cultivars, including variegated and compact forms that have been widely used in the landscape. No information exists on invasiveness of *Ligustrum* cultivars.

Current CANR Funded Research

The overall objective of this research is to characterize the potential invasive impact (growth rate, flowering period, seed production, germination requirements) of *Ligustrum* and *Nandina* cultivars as compared to the unimproved form ("wild type") of each. Twelve selections of *Ligustrum* spp. and eight

selections of *Nandina domestica* (Table 1) were evaluated over a 3-year period for potential invasive impact (growth rate, flowering period, seed production, germination requirements). Six of the nandina selections have not been studied previously.

Field plantings of nine uniform plants of each were installed in 2008 under full sun conditions in south Florida (Fort Pierce, USDA Cold Hardiness 10a) and north Florida (Quincy, USDA Cold Hardiness, 8b). Plants were spaced 1.2 m (4 ft) on center in beds covered with polyethylene landscape fabric. Plants were irrigated as needed and fertilized annually with 18 g (0.6 oz) of 12-month 15N-9P-12K Osmocote Plus. Plants were evaluated monthly for flowering and fruiting, and tri-monthly for visual quality based on a scale from 1 to 5 where 1=poor, and 5=excellent. Observations of flower initiation and fruit set were recorded monthly. At annual fruit maturity, fruit was harvested and quantified.

Ligustrum Results

Each year's visual quality and flowering varied by cultivar and site. Regardless of cultivar, north Florida plants received higher visual quality ratings than south Florida plants. 'Howard' Japanese privet, 'Jack Frost' Japanese privet, and 'Variegatum' Chinese privet had very good to excellent landscape performance at both sites. North Florida plants grew 1.2 to 2.8 times larger and produced 31 times more fruit than south Florida plants. Data on plant size and fruit yield is being analyzed.

Seed viability and germination experiments were conducted using fruit collected from larger, independent populations of Chinese privet, glossy privet and Japanese privet. Pre-germination viability was 81% (Chinese privet), 92% (glossy privet), and 57% (Japanese privet). Seed viability and germination of seeds from cultivars is being assessed on all selections in which sufficient fruit was collected.

Nandina Results

Fruit data are still being analyzed. However, throughout the study, four *Nandina domestica* cultivars in north Florida did not produce fruit: 'AKA' Blush™, 'Firehouse', 'Firepower' and 'Firestorm'™. Estimates of north Florida fruit production in 2010 by 'Harbour Dwarf' and 'Monfar' (Sienna Sunrise™) showed reductions of 97% and 92%, respectively, compared to the wild type, likely qualifying them as non-invasive. 'Gulf Stream'™ in north Florida produced about 85% fewer fruit than the wild type, but this still resulted in significant numbers of fruit and this cultivar's non-invasive status may need to be re-assessed. Finally, 'Moyer's Red' and var. *leucocarpa* ('Alba') fruit numbers were about 62% and 67% fewer than the wild type, but these cultivars still would likely be considered invasive. Statistical analysis of data from all years will clarify any significant differences in fruit production. Seed viability data may also affect conclusions about invasivity.

Data on plant height, width and performance has not yet been analyzed. Plant quality ratings in north Florida were estimated to be highest for 'Gulf Stream'™, 'Monfar' (Sienna Sunrise™), and 'Harbour Dwarf'. Next best quality was associated with 'Moyer's Red', wild type and 'AKA' Blush™. 'Firehouse', 'Firepower', 'Firestorm'™ and var. *leucocarpa* ('Alba') received the lowest quality ratings. It should be noted that all plants were planted in full sun in north Florida, and partial shade may have improved appearance of selections such as 'AKA' Blush™, 'Firehouse', 'Firepower', 'Firestorm'™ and var. *leucocarpa* ('Alba').

Until all data is analyzed statistically, 'Monfar' (Sienna Sunrise™) and 'Harbour Dwarf' are recommended for production and use based on their apparent reduced fruit production and high plant quality.

Literature Cited and Other References

Bell, C.E., C.A. Wilen, and A.E. Stanton. 2003. Invasive plants of horticultural origin. HortScience 38:14-16.

Knox, G.W. and S.B. Wilson. 2006. Evaluating north and south Florida landscape performance and fruiting of ten cultivars and a wild type selection of *Nandina domestica*, a potentially invasive shrub. J. Environ. Hort. 24(3):137–142. September 2006.

National Invasive Species Council. 2001. National invasive species management plan. <http://www.invasivespecies.gov/main_nav/mn_NISC_ManagementPlan.html>, retrieved 14 February 2012.

Pimentel, D., Zuniga, R., and Morrison, D. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. Ecological Economics. 52: 273-288.

USDA, NRCS. 2008. The PLANTS Database. National Plant Data Center, Baton Rouge, LA 70874-4490 USA. <<http://plants.usda.gov>>, retrieved 14 February 2012.

Wilson, S.B. and G.W. Knox. 2006. Landscape performance, flowering, and seed viability of fifteen *Miscanthus sinensis* taxa grown in northern and southern Florida. HortTechnology 24:137-142

Wilson, S. B. and G.W. Knox. 2009. Evaluating landscape performance and flowering of ten *Pennisetum* taxa in north and south Florida Landscape Performance of Green Fountain Grass Alternatives Grown in Northern and Southern Florida. HortTechnology 19(2): 471-476.

Wilson, Sandra B. and Gary Knox. 2010. Assessing the Invasive Potential of 12 *Ligustrum Sinense*, *Ligustrum Lucidum* and *Ligustrum Japonicum* Cultivars Grown in Northern and Southern Florida. HortScience 45(8):S161. (Abstr.)

Wood, T. 2007. Ban all plants. The Plant Hunter, May 16, 2007. <<http://plant-quest.blogspot.com/2007/05/gardeners-are-not-bad-guys.html>>, retrieved 14 February 2012.

Table 1. List and descriptions of *Ligustrum* and *Nandina* species and cultivars obtained for this study.

Scientific Name	Description
<i>Ligustrum japonicum</i>	Dense evergreen shrub or small tree with upright habit. Heavily branched habit responds well to pruning into hedges, topiary or small trees. Fast grower to 6 to 12 feet tall, 6 to 8 feet wide. White flowers in spring, black berries maturing in fall. Plants for this study were grown from seed collected from naturalized plants.
<i>Ligustrum japonicum</i> 'Howard'	Also known as 'Frazieri'. New leaves are yellow turning to glossy, dark green with age, although older leaves may retain a splash of yellow. Moderate growth rate.
<i>Ligustrum japonicum</i> 'Jack Frost'	Shiny, leathery green leaves have creamy white margins. Grows 6 to 12 feet tall and 6 to 8 feet wide. Small white flowers in spring.
<i>Ligustrum japonicum</i> 'Lake Tresca'	Slow-growing, compact shrub up to 8 feet tall with small, rounded leaves on a plant with a mounding habit. Creamy-white flowers. An FNGA (now FNGLA) Plant of the Year in 1999.
<i>Ligustrum japonicum</i> 'Rotundifolium' (received as, and also known as, 'Coriaceum')	Also known as 'Coriaceum'. Attractive crinkled, thick, dark green leaves appear crowded on stems. Plant habit is stiff and upright, growing 4 to 6 feet tall. Considered less hardy than the species. White flowers in summer. Introduced from Japan by Fortune in 1860.

Scientific Name	Description
<i>Ligustrum japonicum</i> 'Texanum'	Sometimes listed as <i>L. texanum</i> . Large glossy dark green leaves on a compact, upright plant. Grows up to 10 feet tall. Spring flowers.
<i>Ligustrum lucidum</i>	Fast-growing evergreen tree, 25 to 40 feet tall (occasionally up to 50 feet) and 25 to 35 feet wide. Glossy green leaves are large, 4 to 6 inches long, with narrow, translucent margins. Terminal, 6 to 10-inch panicles of small, white flowers are produced in late spring and are followed by blue-black fruit. Plants for this study were grown from seed collected from naturalized plants.
<i>Ligustrum lucidum</i> (or <i>L. japonicum</i>) 'Davidson Hardy'	This selection is more cold hardy than <i>Ligustrum lucidum</i> . It has been hardy at Davidson College, Davidson, NC, where foliage wasn't damaged by -15F. Leaves are a flat dark green and the plant is larger and coarser than <i>Ligustrum japonicum</i> cultivars like 'Nobilis' and 'Recurvifolium'. This cultivar was received as <i>L. lucidum</i> but it has been variably assigned to <i>L. lucidum</i> and <i>L. japonicum</i> .
<i>Ligustrum sinense</i>	Evergreen to semi-evergreen shrub growing 10 to 15 feet tall and wide (rarely 20 feet tall). Adapted from full sun to dense shade and from dry to wet soils. Panicles of creamy-white flowers are 2 to 3 inches long and occur in late spring. Flowers are followed by waxy black fruit that may persist through winter. Plants for this study were grown from seed collected from naturalized plants.
<i>Ligustrum sinense</i> 'Swift Creek'	An improved selection of <i>L. sinense</i> 'Variegatum' with leaves that show more variegation and less green area. The plant grows slower and is said to be much less likely to revert to solid green foliage. It is a new form from Lanny Thomas at Swift Creek Nursery in North Carolina. Mature plant size is 8 to 10 feet tall and wide.
<i>Ligustrum sinense</i> 'Variegatum'	Leaves have cream- to white margins. This selection is not as fast-growing as the species and attains heights of 6 to 8 feet (occasionally 15 feet). Branches are known to revert to all-green leaves. Flowers in late spring or early summer.
<i>Ligustrum</i> × 'Suwannee River'	Said to be a hybrid of <i>Ligustrum japonicum</i> and <i>L. lucidum</i> . Dark green evergreen leaves on a plant with a compact, mounding form. Slow-growing to 4 feet tall, 3 to 4 feet wide. White flowers in spring.
<i>Nandina domestica</i> (species form)	Broadleaf evergreen shrub growing 6 – 8 ft. tall; bluish-green leaves turning blush to reddish purple in winter, depending on the selection.
<i>Nandina domestica</i> var. <i>leucocarpa</i> or 'Leucocarpa' or 'Alba'	Whitish fruit and lighter green foliage, otherwise similar to the species; grows 5 – 6 ft. tall.
<i>Nandina domestica</i> 'AKA' Blush™	A sport of 'Firepower' with each growth flush sporting red coloration. Blush red colored foliage is long-lasting in contrast to the typical lime-green colored new growth of 'Firepower'. Selected at the Magnolia Gardens Nursery tissue culture facility and introduced in 2008.
<i>Nandina domestica</i> 'Firehouse'	Chosen for its excellent red fall color; this dwarf variety holds that red fire engine color all winter long. This compact mounding form has bright green spring foliage. Selected by Greenleaf Nursery.

Scientific Name	Description
<i>Nandina domestica</i> 'Firepower'	Dwarf similar to 'Atropurpurea Nana' but without contorted leaves; Foliage turns brilliant red in fall and winter.
<i>Nandina domestica</i> 'Firestorm' TM	This cultivar's color and soft texture distinguish it from traditional dwarf nandinas. In winter, leaves turn deep red and in summer, new growth is red and contrasts with mature, green foliage. 'Firestorm' TM reaches 3 1/2 feet tall and 3 feet wide. Allegedly derived from 'Gulf Stream' TM . Introduced by Plant Development Services Inc.
<i>Nandina domestica</i> 'Gulf Stream' TM	Extremely dense growth. Does not "sucker" like 'Harbour Dwarf'. Dwarf growing 3 – 3 ½ ft. high; variable red-green winter coloration.
<i>Nandina domestica</i> 'Monfar' Sienna Sunrise TM	Intense fiery red new foliage cools to lush medium green in summer; red highlights reappear in fall and winter; Slow growth 3 feet tall, 2 to 3 feet wide.