

## Alternatives to Neonicotinoids for Insect Control in Greenhouses and Retail Centers

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### Pests of Concern in Garden Centers

- Sucking insects such as aphids, whiteflies, mealybugs, scale insects, thrips etc. are the most likely pests



- Mites such as spider mites, broad mites and cyclamen mites are also potential pests



### Greenhouse vs Retail Center Pest Control

- Most pest control takes place in the greenhouse prior to shipping



- Retail centers should only accept pest free plants from suppliers

### Greenhouse vs Retail Center Pest Control

- Neonicotinoid use in greenhouses provides long lasting control that benefits retail centers and their customers
- Greenhouse plants not treated with a neonicotinoid may require more frequent pest scouting



### Greenhouse vs Retail Center Pest Control

- Retail Center pest control is more difficult due to the presence of customers during the day and possibly early evening



### Greenhouse vs Retail Center Pest Control

- Reentry intervals (REI) after an insecticide application need to be strictly followed



Snail damage

- Most insecticides have a REI of 12 hours while that of many others is 4 hours and a few are either 24 hours or 48 hours

### An Ornamental Plant Pest Management Guide and Pesticide Rotation Planning Aid

- Control options for nursery, greenhouse, interiorscape, and commercial landscape use sites
- An online publication from UT Extension, UT AgResearch and Clemson University
- <https://extension.tennessee.edu/publications/Documents/W329.pdf>



### Using the Guide

- The "x" in the pest column means that the insecticide is labeled for that pest
- Neonicotinoid insecticides are listed at the top of the second page of the chart (IRAC [mode of action] code 4A)
- There are many chemical alternatives for neonicotinoids

### Using the Guide

- For example, non-neonicotinoid insecticides for aphids in the greenhouse are plentiful
- Some select listed aphid insecticides are: XXpire (IRAC Code 4C + 5) - can only use existing stocks
- Aria (9C)
- Endeavor (9B)
- Kontos (23)
- Hachi-Hachi (21A)
- Sirocco (6 + unknown mode of action)
- Enstar AQ (7A), Preclude (7B), Distance IGR and Fulcrum (7C)
- Rycar (unknown mode of action)

IRAC Code <sup>a</sup>	Mode of Action	Chemical subgroup	Active ingredient	Selected Trade Name <sup>a,b</sup>	Rate (lb/a) <sup>c</sup>	REI (hours) <sup>d</sup>	Job title	Pyrethroids	Pyridinyls	Amides and oxadiazoles	Soft scales	Mealybugs
4A <sup>18</sup>	Nicotinic acetylcholine receptor agonists	Neonicotinoids	acetamiprid	TritStar 8.5 SL <sup>TM</sup> 4A <sup>18</sup>	L, N, G	12	x	x	x	x	x	x
			chlorantraniliprole	Arena 0.25 G <sup>18</sup>	L, I	12	x	x	x	x	x	x
				Arena 50 WP <sup>18</sup>	L, I	12	x	x	x	x	x	x
			imidacloprid	Safari 20 <sup>TM</sup>	L, N, G, I	12	x	x	x	x	x	x
				Safari 20 SG <sup>18</sup>	L, N, G, I	12	x	x	x	x	x	x
				Zylen Liquid <sup>18</sup>	L	N/A	x	x	x	x	x	x
				TriStar 20 WP <sup>18</sup>	L	N/A	x	x	x	x	x	x
			imidacloprid <sup>18</sup>	TriStar 20 WP <sup>18</sup>	L, N, G, I	12	x	x	x	x	x	x
				Marathon 8 <sup>TM</sup>	N, G, I	12	x	x	x	x	x	x
				Marathon 60WP <sup>18</sup>	N, G, I	12	x	x	x	x	x	x
				Marathon	N, G, I	12	x	x	x	x	x	x
				CoreTect <sup>18</sup>	L, I	N/A	x	x	x	x	x	x
				CoreTect <sup>18</sup>	L, I	N/A	x	x	x	x	x	x
				Discus Tablets <sup>18</sup>	N, G, I	12	x	x	x	x	x	x
			thiamethoxam	FlagShip 25WG <sup>18</sup>	N, G, I	12	x	x	x	x	x	x
				Marathon 0.33G <sup>18</sup>	L, I	N/A	x	x	x	x	x	x
				Marathon 25WG <sup>18</sup>	L, I	N/A	x	x	x	x	x	x



## XXpire

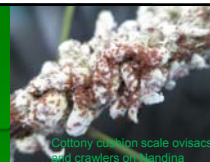
Canna  
leafroller



- Active ingredients are sulfoxaflor + spinetoram (IRAC 4C + 5)
- Since the **EPA cancellation order** on Nov. 12, 2015 for sulfoxaflor containing products, **growers can only use their existing stocks** of these products
- For use in landscape, nursery and greenhouse

## Aria

- Active ingredient is flonicamid
- For use in landscape, nursery and greenhouse
- Listed pests include: aphids, armored scales, soft scales, mealybugs, whiteflies, thrips, leafhoppers, and plant bugs



## Endeavor

- Active ingredient is pymetrozine
- For use in landscape, nursery, greenhouse and interiorscape
- Listed pests include: aphids and whiteflies



## Kontos

- Active ingredient is spirotetramat
- For use in nursery, greenhouse, and interiorscape
- Listed pests include: adelgids, aphids, psyllids, armored scales, soft scales, mealybugs, whiteflies, thrips, leafhoppers, broad mites, eriophyid mites, and spider mites



## Hachi-Hachi

- Active ingredient is tolfenpyrad
- For use in greenhouse
- Listed pests include: aphids, armored scales, soft scales, mealybugs, whiteflies, thrips, leafhoppers, and caterpillars

Boisduval scale on orchid



## Sirocco

- Active ingredients are abamectin + bifenthrin
- For use on landscape, nursery, greenhouse and interiorscape
- Listed pests include: aphids, whiteflies, thrips, leafminer (fly), broad mite, eriophyid mites, spider mites



Image courtesy of A. Windham, UT

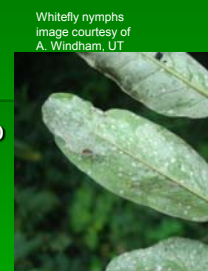
## Enstar AQ

- Active ingredient is s-kinoprene
- For use in green and interiorscape
- Listed pests include: aphids, armored scales, soft scales, mealybugs, whiteflies, thrips, leafhoppers, leafminer (fly or midge, moth, wasp), and fungus gnat



## Preclude TR

- Active ingredient is fenoxycarb
- For use in greenhouse
- Listed pests include: aphids, armored scales, soft scales, mealybugs, whiteflies, thrips, weevils, caterpillars, leafminer (midge), broad mites, eriophyid mites, and spider mites



## Distance IGR and Fulcrum

- Active ingredient is pyriproxifen
- For use in landscape, nursery, greenhouse, and interiorscape
- Listed pests include: aphids, armored scales, soft scales, mealybugs, whiteflies, thrips, leafminers (moth), fungus gnats, and shore flies



## Rycar

- Active ingredient is pyrifluquinazon
- For use in greenhouse
- Listed pests include aphids, mealybugs, whiteflies, thrips, and leafhoppers



## Scale Control Without Neonicotinoids

- The key to scale control is to apply an insecticide with thorough coverage when the crawlers have emerged from the eggs
- Thus, monitoring for crawlers is essential to determine the proper timing of the insecticide sprays

## Armored Scale



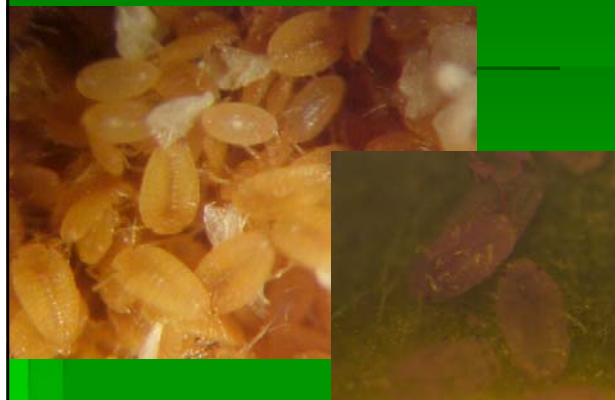


## Scale Monitoring

- Sticky traps can be made to catch the emerging scale crawlers
- Use double sided Scotch tape, black electrical tape, or even white tape coated with a thin layer of petroleum jelly (Tape color depends on crawler color)
- Flag the stem and check at least once per week starting 10-14 days before expected emergence



## Scale Crawlers



## Scale Insecticides

- A dormant application of horticultural oil
- Target crawlers with horticultural oil, malathion, Sevin, Carbaryl, Orthene, Insecticidal soap, Distance, Fulcrum, and Talus 70 DF

### Insect Growth Regulator Insecticides

- Insect growth regulators (IGRs) such as pyriproxyfen (Distance, Fulcrum) and buprofezin (Talus 70 DF) target crawlers
- IGRs have been very effective on many species of immature scale

## Crape Myrtle Bark Scale *Eriococcus lagerstroemia*



Images courtesy of M. Merchant, Texas A&M AgriLife Extension



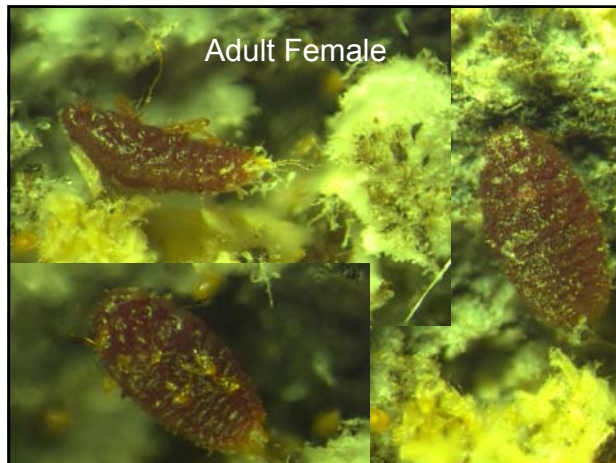
## Crape Myrtle Bark Scale

New fact sheets at: [http://www.uaex.edu/Other\\_Areas/publications/pdf/fsa-7086.pdf](http://www.uaex.edu/Other_Areas/publications/pdf/fsa-7086.pdf)  
And <http://www.agrilifebookstore.org/product-p/ehl-049.htm>

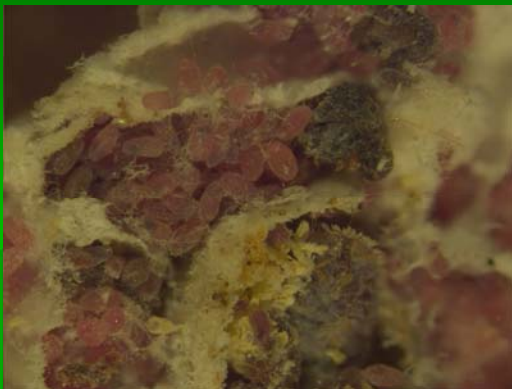


Image courtesy of M. Merchant, Texas A&M AgriLife Extension

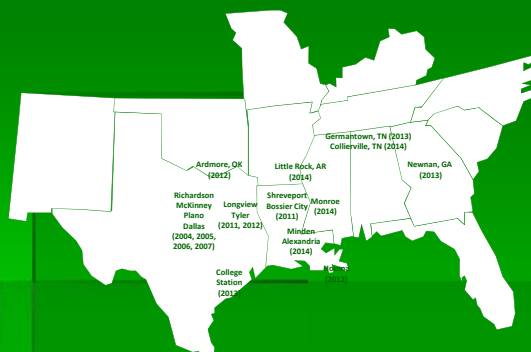
## Adult Female



## Crape Myrtle Bark Scale Eggs



## Crape Myrtle Bark Scale Populations - USA



In 2014, CMBS was also detected in Mobile, AL; Fayette County, TN; and Bernalillo County, New Mexico. In March 2015, CMBS was found in south Mississippi.

## Crape Myrtle Bark Scale Control without Neonicotinoids

- As needed, use a JD9-C spray gun at 125 – 150 psi with dishwashing soap or insecticidal soap solution as a pressure wash to physically remove scale
- Apply a dormant application of horticultural oil



## Crape Myrtle Bark Scale Control Without Neonicotinoids

- Target crawlers with insecticide sprays when they emerge around early June and again for second generation crawlers in early August





## What Does it Mean to Grow Bee-Friendly Plants in the Nursery?

Dave Smitley, January 22, 2016  
Michigan State University



## The Home Depot Announces Neonic Plant Labels (Oct. 2014)



What does it mean to grow bee-friendly plants in the nursery?  
Dr. Dave Smitley, Michigan State U., January 6, 2016

## Which Nursery Insecticide Products are Neonicotinoids?

Technically, according the IRAC mode of action classification system, it is all insecticides in the 4A category. This includes :

acetamiprid (Tristar), but TriStar is relatively nontoxic to bees  
dinotefuran (Safari, Dinotefuran, Sagacity),  
thiomethoxam (Flagship)  
clothianidin (Arena)  
imidacloprid (Marathon, Benefit, Discus, Imigold, Bounty, and others).



What does it mean to grow bee-friendly plants in the nursery?  
Dr. Dave Smitley, Michigan State U., January 6, 2016

April 2015



## Bee declines driven by combined stress from parasites, pesticides, and lack of flowers

Dave Goulson,\* Elizabeth Nicholls, Cristina Botías, Ellen L. Rotheray

Over 170 scientific papers are cited.

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## June - November 2015 Recent Developments on Neonics and Bees

- One County in Maryland banned use of neonics (several cities around the country have done so already, like Boulder, Colorado)
- Lowe's to phase-out neonics by 2019
- Home Depot to phase-out neonics by 2018
- Home Depot survey: 64% of greenhouse and nursery growers not planning to use neonics in 2016



What does it mean to grow bee-friendly plants in the nursery?  
Dr. Dave Smitley, Michigan State U., January 6, 2016

## What Does it Mean to Grow Bee-Friendly Plants in the Nursery?

Two definitions of 'bee-friendly':

1. Growing plants that will not be harmful to pollinators after they are sold and planted in the yard and garden
2. Selling plants that are good food sources for bees



What does it mean to grow bee-friendly plants in the nursery?  
Dr. Dave Smitley, Michigan State U., January 6, 2016

### In general, annual flowers are not good food plants for bees



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### Lots of Perennials are Highly Attractive to Bees\*

Genus species	Common name
<i>Achillea millefolium</i>	yarrow
<i>Agastache</i>	anise hyssop
<i>Asclepias tuberosa</i>	butterfly weed
<i>Allium</i> spp.	Onion, garlic, chives, leek, scallion
<i>Asclepias</i>	butterfly weed
<i>Aster</i> ( <i>Ionactis</i> , <i>Eurybia</i> and <i>Doellingeria</i> )	aster
<i>Astilbe</i> spp.	astilbe
<i>Berkheya purpurea</i>	aster
<i>Berlandiera lyrata</i>	aster
<i>Buddleia</i>	butterfly bush
<i>Calamintha nepeta</i>	lesser calamint
<i>Campanula</i> spp.	bellflower
<i>Centaurea</i> spp.	corn flowers
<i>Chrysanthemum serotinum</i>	leucanthemelle tardive
<i>Clematis</i> spp.	Clematis

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### Perennials Highly Attractive to Bees

<i>Cleome</i> spp.	spider plant
<i>Dahlia</i>	dahlia
<i>Echinacea</i>	cone flower
<i>Echinops</i>	globe thistle
<i>Eremus stenophyllus</i>	foxtail lilly
<i>Eryngium</i> spp.	eryngo, sea holly
<i>Foeniculum</i>	fennel
<i>Gaillardia</i>	blanket flower
<i>Geranium ibericum</i> x	hardy geranium, blue
cranesbill, ( <i>Geranium himalayense</i> )	Johnson's blue
<i>Helenium</i>	sneezeweed
<i>Helianthus</i>	sunflower
<i>Heliotropium arborescens</i>	garden heliotrope
<i>Hylotelephium</i>	sedum
<i>Inula royleana</i>	Inula, Himalayan elecampane

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### Perennials Highly Attractive to Bees

<i>Lantana</i>	lantana
<i>Lavandula</i> spp.	lavender
<i>Liatris</i>	blazing star
<i>Lobularia</i>	sweet alyssum
<i>Lobelia siphilitica</i>	great blue lobelia
<i>Malva alcea</i>	cut-leaf mallow
<i>Mentha</i> spp.	mints
<i>Melissa officinalis</i>	lemon balm
<i>Monarda</i>	bee balm
<i>Nepeta</i>	catmint
<i>Ocimum basilicum</i>	basil
<i>Origanum vulgare</i>	oregano

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### Perennials Highly Attractive to bees

<i>Papaver rhoeas</i>	poppies
<i>Penstemon</i>	foxglove or beardtongues
<i>Perovskia atriplicifolia</i>	Russian sage
<i>Rosmarinus officinalis</i>	rosemary
<i>Rudbeckia</i> spp	rudbeckia
<i>Salvia</i>	salvia
<i>Scabiosa</i>	pincushion flower
<i>Sedum</i>	sedum
<i>Symphyotrichum</i>	aster
<i>Thymus</i>	thyme
<i>Veronica longifolia</i>	garden speedwell

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### Shrubs Highly Attractive to Bees

<i>Aronia melanocarpa</i>	black chokeberry
<i>Cephalanthus occidentalis</i>	buttonbush
<i>Clethra alnifolia</i>	summersweet
<i>Cornus</i> spp.	silky, gray, and red-osier dogwoods
<i>Cotoneaster</i>	cotoneaster
<i>Fothergilla gardenia</i>	dwarf fothergilla
<i>Hamamelis virginiana</i>	common witch-hazel
<i>Ilex aquifolium</i> , <i>Ilex crenata</i> , <i>Ilex verticillata</i>	holly (European, Japanese, winterberry)
<i>Ligustrum vulgare</i>	privet
<i>Philadelphus coronarius</i>	mock orange
<i>Physocarpus opulifolius</i>	eastern ninebark

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### Shrubs Highly Attractive to Bees

<i>Potentilla fruticosa</i>	potentilla, bush cinquefoil
<i>Rhus spp.</i>	sumacs
<i>Rosa rugosa</i>	rugosa rose
<i>Rubus spp.</i>	raspberry
<i>Sambucus spp.</i>	elderberry
<i>Spiraea</i>	spiraea
<i>Viburnum opulus</i>	European cranberry bush



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### Trees Highly Attractive to Bees

<i>Acer rubrum</i>	red maple
<i>Amelanchier spp.</i>	serviceberry
<i>Catalpa speciosa</i>	Catalpa, Catawba
<i>Cercis canadensis</i>	eastern redbud
<i>Cornus alternifolia</i>	alternate-leaved, pagoda dogwood
<i>Cercis Canadensis</i>	eastern redbud
<i>Crataegus spp. (many)</i>	hawthorn
<i>Liriodendron tulipifera</i>	tulip-tree
<i>Malus sp. (many)</i>	crabapple
<i>Nyssa sylvatica</i>	black tupelo
<i>Philadelphus coronarius</i>	mock orange
<i>Prunus spp. (many)</i>	cherry, peach, plum, almond
<i>Pyrus calleryana</i>	callery pear, Bradford pear
<i>Robinia pseudoacacia</i>	black locust
<i>Salix sp.</i>	willow
<i>Tetradium daniellii</i>	bee-bee tree (escape potential)
<i>Tilia americana</i>	linden, basswood
<i>Tilia cordata</i>	little leaf linden

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### Safety and Use of Neonicotinoid Insecticides in the Landscape

If flowering weeds such as dandelions and white clover are present:

- Mow the turf immediately before spraying any insecticide. This will remove 90% or more of the flowers and reduce pollinator foraging.
- Mow frequently to remove blooms when neonicotinoids are used
- Remove weeds with herbicide

by Dr. Doug Richmond, Purdue University

### Safety and Use of Neonicotinoid Insecticides in Landscapes

- Maintain buffers (a buffer strip of turfgrass 2-3 feet between the treated turf and the margin of the landscape bed)
- This will minimize the potential for unintended uptake by the roots of flowering ornamentals



by Dr. Doug Richmond, Purdue University

### Questions?



<https://extension.tennessee.edu/publications/Documents/PB1595.pdf>  
<https://extension.tennessee.edu/publications/Documents/PB1594.pdf>

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