AgInfomatics

The Value of Neonicotinoids in Turf and Ornamentals:

A Case Study of Neonicotinoid Use for Controlling Chinch Bug in Florida St. Augustinegrass

2014

This report series, researched and produced by AgInfomatics, LLC, is a comprehensive analysis of the economic and societal benefits of nitroguanidine neonicotinoid insecticides in North America. The research was sponsored by Bayer CropScience, Syngenta and Valent in support of regulatory review processes in the United States and Canada, with Mitsui providing additional support for the turf and ornamental studies.

AgInfomatics, an agricultural consulting firm established in 1995 by professors from the University of Wisconsin-Madison and Washington State University, conducted independent analyses exploring the answer to the question: *What would happen if neonicotinoids were no longer available?* Comparing that answer to current product use revealed the value of neonicotinoids.

Robust quantitative and qualitative study methods included econometrics modeling of insecticide use, crop yield data and market impacts; surveys of growers, professional applicators and consumers; regional listening panel sessions; and in-depth case studies.

Active ingredients in the study included clothianidin, dinotefuran, imidacloprid and thiamethoxam.

The Value of Neonicotinoids in North American Agriculture

Reports include:

Estimated Impact of Neonicotinoid Insecticides on Pest Management Practices and Costs for U.S. Corn, Soybean, Wheat, Cotton and Sorghum Farmers

Methods and Assumptions for Estimating the Impact of Neonicotinoid Insecticides on Pest Management Practices and Costs for U.S. Corn, Soybean, Wheat, Cotton and Sorghum Farmers

Value of Insect Pest Management to U.S. and Canadian Corn, Soybean and Canola Farmers

A Meta-Analysis Approach to Estimating the Yield Effects of Neonicotinoids

An Economic Assessment of the Benefits of Nitroguanidine Neonicotinoid Insecticides in U.S. Crops

A Summary of Grower and Agri-Professional Perspectives From Regional Listening Sessions in the United States and Canada

A Case Study of Neonicotinoid Use in Florida Citrus

A Case Study of Neonicotinoid Use in Mid-South Cotton

Executive Summary

The Value of Neonicotinoids in Turf and Ornamentals

Reports include:

Estimating the Economic Value of Neonicotinoid Insecticides on Flowers, Shrubs, Home Lawns and Trees in the Homescape

The Value of Neonicotinoids to Turf and Ornamental Professionals

A Case Study of Neonicotinoid Use for Controlling Chinch Bug in Florida St. Augustinegrass

A Case Study of Neonicotinoid Use for Controlling Emerald Ash Borer—The Naperville, Illinois, Experience

A Case Study of Neonicotinoid Use for Controlling Silverleaf Whitefly in Ornamentals

Executive Summary

For more information, please contact
AgInfomatics@gmail.com

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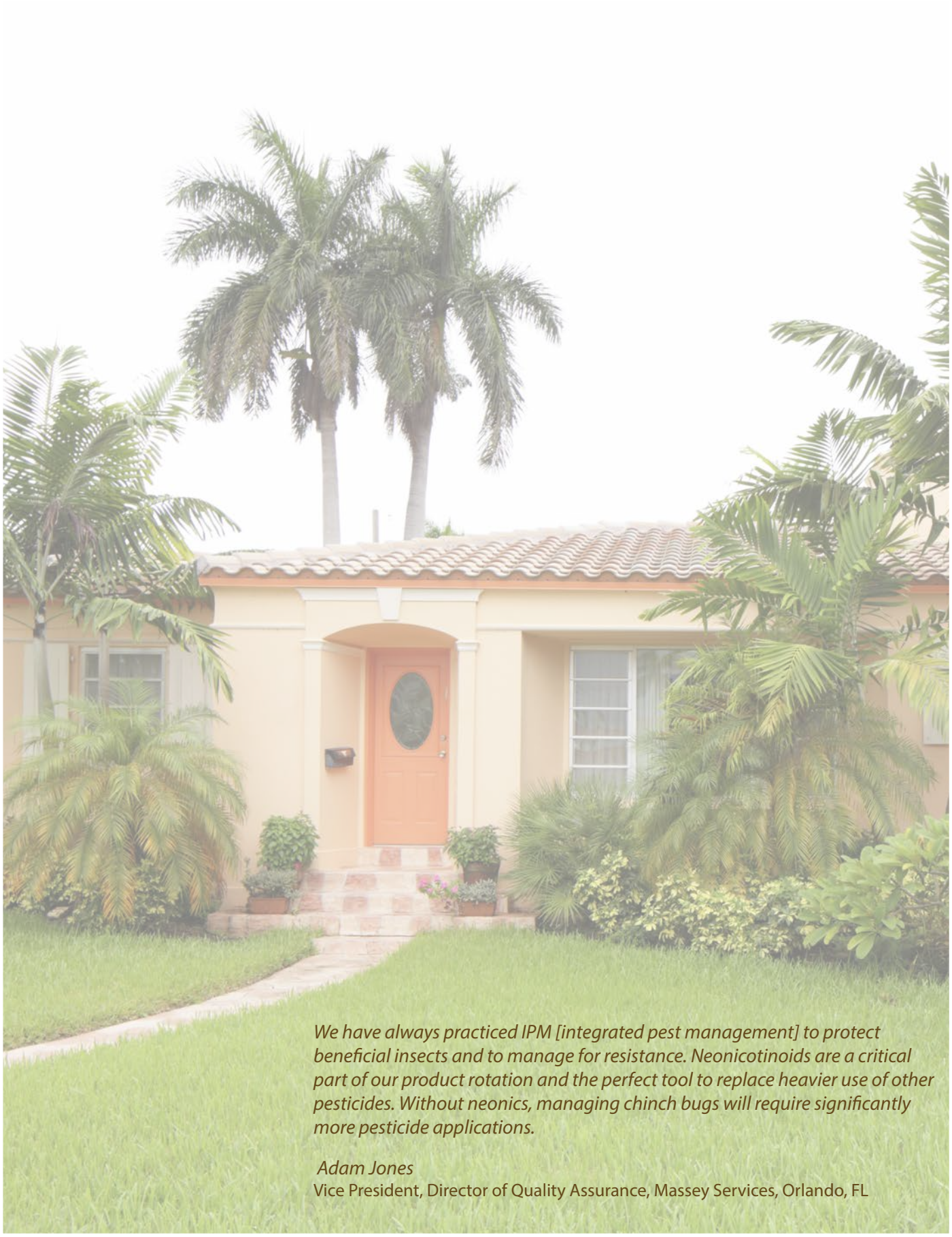


We have always practiced IPM [integrated pest management] to protect beneficial insects and to manage for resistance. Neonicotinoids are a critical part of our product rotation and the perfect tool to replace heavier use of other pesticides. Without neonics, managing chinch bugs will require significantly more pesticide applications.

Adam Jones
Vice President, Director of Quality Assurance, Massey Services, Orlando, FL

David Shetlar, The Ohio State University, Bugwood.org

Neonicotinoids are an important component in the control of southern chinch bugs, *Blissus insularis* Barber, in St. Augustinegrass—a prevalent lawn grass throughout the southern United States. Proper mowing, fertilization and watering, in conjunction with appropriate neonicotinoid products, are considered an essential part of an integrated chinch bug management program. This case study examines the use of neonicotinoids in protecting Florida St. Augustinegrass from chinch bug damage. It describes the context, the chinch bug problem and the use of neonicotinoids for control, as well as the implications if neonicotinoids were no longer available.

1.0 Context and Background

For many home and business owners, a healthy lawn is an important element of their property. Beyond the visual appeal, healthy turf provides a functional space for recreation and entertainment.[1,2,3] Economically, healthy lawns can add significant market value to a home and a sense of aesthetic quality to both business and residential settings. In addition, a healthy lawn has several important environmental benefits, including stormwater retention, soil stabilization, carbon sequestration from the air and reduced cooling costs.

Although many home and business owners care for their own lawns, many others employ the services of lawn care and landscape management companies. According to a 2006 University of Florida study, the U.S. turfgrass industry (including lawn care providers, sod growers, equipment manufacturers and others) involves nearly 823,000 jobs and a total economic impact of $57.9 billion.[3] In Florida alone, the turfgrass industry has an economic impact of $3.3 billion and involves nearly 84,000 jobs, more than 25,000 just in the lawn services sector.

St. Augustinegrass (*Stenotaphrum secundatum*) is among the most common residential and managed turf choices in Florida and throughout the southern U.S.[4] St. Augustinegrass is considered an attractive, high quality turfgrass that is well suited to a southern climate and has good salt tolerance for coastal areas. Very different from cool season turfgrass species, St. Augustinegrass grows and spreads primarily through above-the-ground stolons and must be established through propagation (not through seeding), by installing sod, plugs or sprigs. There are many varieties/cultivars, some of which have been developed specifically to resist chinch bugs. One St. Augustinegrass variety called Floratam was introduced as a chinch bug resistant cultivar in 1973, but while initially very effective, by 1985, the chinch bug population adapted and caused damage to the Floratam variety.[4]

Southern chinch bugs are the worst pest and biggest management problem for St. Augustinegrass, which it destroys when present in sufficient populations.[5] Maintaining a healthy lawn can help the plant survive the presence of chinch bugs. When maintenance and treatment fail, St. Augustine grass must be removed and replaced at a cost of up to $1 per square foot of turf.[6]

Above: St. Augustinegrass treated with neonicotinoid product

Below: Untreated St. Augustinegrass damaged by chinch bug

2.0 The Problem—Chinch Bugs

The southern chinch bug, *Blissus insularis* Barber, was detected in the U.S. as early as the mid-1700s and is pervasive across southern states.[5] Chinch bugs are very small (1/8th to 1/10th of an inch in length) and live in the leaf sheaths and thatch of turfgrasses where nymphs and adults feed on plant fluids. Their feeding drains the grass of critical plant fluids, causing the grass to wither, turn brown and die. The damage makes turf areas more susceptible to infestation and degrades the economic and environmental benefits provided by healthy lawns. Although preferring St. Augustinegrass, the chinch bug will also feed on other prevalent southern grasses, including bermudagrass, bahiagrass, centipedegrass and zoysiagrass.[5,7]

Chinch bugs are most active in north and central Florida from March through November. Females can lay several eggs each day, up to 200-300 in a lifetime, and nymphs mature in four to five weeks, eating as they grow. Chinch bugs may have three to four reproductive generations in a single calendar year. In warmer areas, such as southern Florida, there might be seven to ten generations within a single year with no dormancy period. Although adults have wings, they move from one turf area to another by walking. They move and feed in groups and can go dormant during cooler winter periods, then resume feeding in the same place when temperatures warm. Their frequent generations add to their ability to become resistant to frequently applied pesticides with the same mode of action.

Cultural practices that promote healthy lawns are an important part of chinch bug management.[2,7] Southern chinch bugs are found in most St. Augustinegrass lawns, but turf can tolerate light infestations if maintained with proper water, fertility and mowing. Excessive application of nitrogen in spring or fall can increase vulnerability to chinch bug damage, as can improper watering, over-mowing and allowing a build-up of thatch. Chinch bug infestations flare-up during hotter months with less precipitation.

At high population levels, insecticides are typically required to prevent serious injury to lawns. When chinch populations do reach the point of damaging a lawn, there are limited options for treatment.[5,7] Biocontrols using natural predators (such as big-eyed bugs, earwigs, some spiders and small wasps) can help, but those predators are generally not present in sufficient quantities to suppress the rapid reproduction and expansion of chinch bugs. Chemical treatment options include neonicotinoids, pyrethroids, organophosphates and carbamates.

The southern chinch bug is notorious for its development of resistance to insecticides, most recently bifenthrin and other pyrethroid products. As a result, university researchers and professional lawn services recommend a rotation of chemistries to protect against resistance.[7,8] In some areas, pyrethroids are no longer an effective part of that rotation because of chinch bug resistance. Most treatment approaches call for spot treatment in the affected area plus a five-foot buffer around the area where chinch bugs are likely traveling. There is broad interest in managing lawns sustainably to help support stormwater management, other benefits of turfgrass and "Florida-friendly landscaping"[1] that are explicitly recognized by Florida statute, which emphasizes the importance of managing pests (including chinch bugs) with chemical controls where appropriate.

3.0 Use of Neonicotinoids to Control the Problem

Neonicotinoids are seen as a vital part of the chemistry rotation for controlling chinch bugs, especially in the areas where pyrethroids are no longer effective. Neonicotinoid products used to control chinch bugs include imidacloprid, clothianidin and thiamethoxam. These systemic products are absorbed and distributed throughout the plants. They are applied as a spray or dry granule. Chinch bug adults and nymphs feed on the stem, ingest the chemical and die within seven to ten days.[5,7] St. Augustinegrass does not produce flowers that attract bees, and it is unlikely that other bee attracting flowers would be present in managed lawns treated with neonicotinoids.

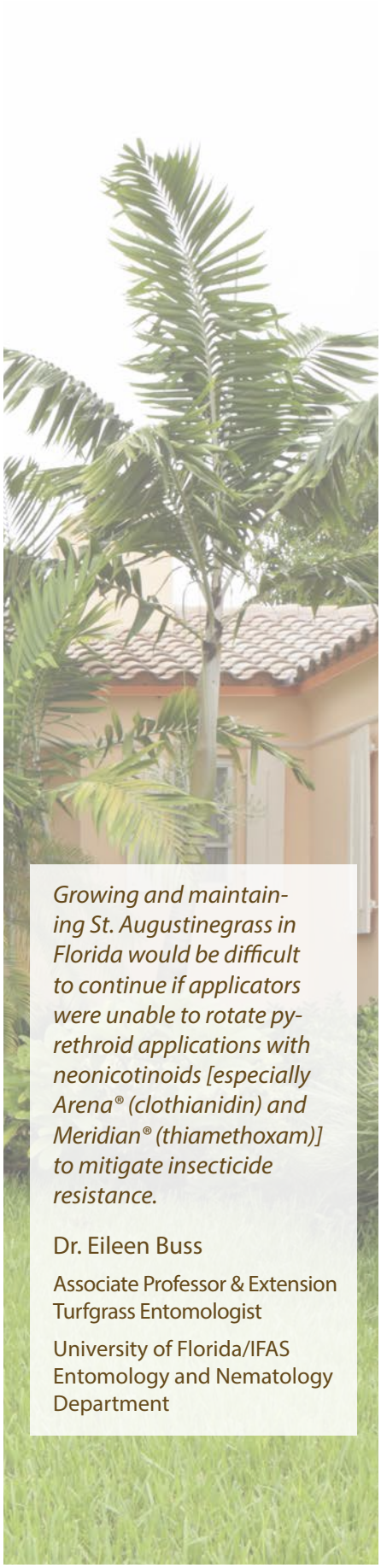
Lawn service professionals state a preference for neonicotinoids because they are safer and easier for workers to use, and they do not target beneficial insects important for suppressing pests. Historically, chlorpyrifos (no longer available) was used to control chinch bugs, and it had a long residual effect in the thatch layer. It also killed "virtually all insects" in the grass, and because of its higher mammalian toxicity, workers required regular blood testing to monitor for potential adverse health effects from repeated exposure to chlorpyrifos. With neonicotinoids, workers, while still cautious, are not as concerned about health risks.

4.0 Implications of Neonicotinoid Loss

Losing neonicotinoids for controlling chinch bugs would leave homeowners and lawn service professionals with fewer options and no effective chemistry rotation. If not already resistant to the other chemistries, chinch bugs could become resistant more rapidly without the neonicotinoid chemistry as part of a treatment rotation. Without effective treatment, homeowners would need to remove and replace infested St. Augustinegrass, either with the same or another St. Augustinegrass cultivar (some of which are being bred for chinch bug resistance), or with one of the other turfgrass varieties, such as zoysiagrass. It is theorized that if St. Augustinegrass is less available, chinch bugs will feed more on zoysiagrass.[6]

As part of their higher level services, many lawn service companies offer a lawn care guarantee that includes replacing any turfgrass that is damaged while subscribing to the service.[6] Although the market would likely adapt and no longer offer that guarantee to new customers, the guarantees already in place would apply for existing customers, and those claims could be substantial without neonicotinoids. That was the case for several years before neonicotinoids were available. With replacement costs for each lawn costing as much as $1,000 for every one-thousand square feet of turf and an average Orlando area lawn of 6,500 square feet, those costs can climb rapidly for the company and for an individual homeowner.

Losing neonicotinoids would raise costs and increase challenges for resistance management. Lawn care providers could lose customers if unable to protect against the pervasive chinch bug lawn pest. They would bear heavy costs for lawn replacement guarantees, and they would lean heavily on other chemical solutions with mixed results. The combined losses could have an impact on industry profitability, which could lead to layoffs or job losses. The net effects would create significant challenges for maintaining



Growing and maintaining St. Augustinegrass in Florida would be difficult to continue if applicators were unable to rotate pyrethroid applications with neonicotinoids [especially Arena® (clothianidin) and Meridian® (thiamethoxam)] to mitigate insecticide resistance.

Dr. Eileen Buss

Associate Professor & Extension Turfgrass Entomologist

University of Florida/IFAS Entomology and Nematology Department

Above: St. Augustinegrass treated with neonicotinoid product

Below: Untreated St. Augustinegrass damaged by chinch bug

St. Augustinegrass and related cultivars. Shifting to other turfgrass varieties would involve different pest and disease challenges that would also require chemical treatments. Researchers and service professionals are concerned about the ability to control chinch bugs without neonicotinoids.

5.0 Main Insights From This Case Study

- Chinch bugs destroy St. Augustinegrass, a predominant turfgrass used in residential and commercial lawns throughout Florida and the southern U.S.
- Neonicotinoids are an essential component for effective control of chinch bug in many parts of Florida where chinch bugs have developed resistance to other chemistries.
- Without neonicotinoids, lawn care professionals would be forced to rely on older chemistries, some of which are no longer effective. This could lead to a net increase in insecticide use on lawns. They could also expect to replace infested turf more frequently.
- Costs would accrue to Florida homeowners, business owners and lawn care companies.
- St. Augustinegrass does not produce flowers that attract bees, and it is unlikely that bee attractive flowers would be present in managed lawns treated by neonicotinoids.
- The southern chinch bug is prevalent throughout the southern U.S., and chinch bug control problems associated with the loss of neonicotinoids would not be limited to Florida.
- Protection from chinch bugs conserves the important environmental services provided by healthy St. Augustinegrass lawns, including storm-water retention, soil stabilization, carbon sequestration from the air and reduced cooling costs.

If we lost neonicotinoids for chinch bug management in Florida, we would lose the only really effective chemical class with which to rotate and mitigate insecticide resistance. Pyrethroids are not enough to protect lawns. Greater use of organophosphates and carbamates is a major step backwards, in terms of the FQPA of 1996. Even with bifenthrin, more applications would need to be made because of the shorter residuals, which would increase commercial applicator costs from 'call-backs.'

Dr. Eileen Buss
Associate Professor & Extension Turfgrass Entomologist
University of Florida/IFAS Entomology and Nematology Department

6.0 Footnotes

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3. Haydu, J., A. Hodges, and C. Hall. 2006. *Economic Impacts of the Turfgrass and Lawncare Industry in the United States.* University of Florida Cooperative Extension Service, Institute for Food and Agricultural Sciences (IFAS) publication FE-632. Available through UF/IFAS/EDIS website at http://edis.ifas.ufl.edu.

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Massey has always offered a lawn replacement guarantee to our customers, and customers have come to expect that. We will always honor those guarantees, but without neonics as a management tool, I don't think the market could continue to offer those guarantees to new customers. Without neonics, lawn replacement costs would skyrocket.

Adam Jones
Vice President, Director of Quality Assurance, Massey Services, Orlando, FL