

Growing Together

> 1Q | 2014

# thrive<sup>®</sup>



## Resistance **MATTERS**

Stay a Step Ahead of Weeds,  
Pests and Disease

- > MANAGE PSYLLIDS TO SLOW THE SPREAD OF CITRUS GREENING
- > WHAT THE POST-PATENT WORLD MIGHT MEAN FOR AGRICULTURE

syngenta<sup>®</sup>

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## thrive

Even if you love your print edition of *Thrive*, you'll still want to check out the magazine's digital edition. You'll find more content and links to important resources to help you succeed in today's marketplace. The online version also makes it easy to share specific articles with others.



Scan this QR code to take the fast track to the digital version of *Thrive*, or go to [www.syngentathrive.com](http://www.syngentathrive.com).

ON THE COVER Palmer amaranth is a prolific weed that is especially challenging to control. Photo: Agstock Images

THIS PAGE An orange harvest in LaBelle, Fla. Photo: George Contorakes

In the last issue of *Thrive*, the editors incorrectly attributed the quote in the display copy on page 21 to Greg Thies. The correct attribution is Jim Adaskaveg. We apologize for this error.

### We welcome your story suggestions and comments about *Thrive*.

Please send them to [thrive@syngenta.com](mailto:thrive@syngenta.com). For more information, visit the FarmAssist website at [www.farmassist.com](http://www.farmassist.com), or call the Syngenta Customer Center at 1-866-SYNGENT(A) (796-4368).

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*Thrive* is produced quarterly for a nationwide agricultural audience. Its purposes are to update readers on Syngenta products, services and solutions, and to provide them with the information they need to succeed in today's complex marketplace.



# The Year Ahead

With hope and promise, the agricultural industry welcomes 2014. To balance the excitement of the new and unknown, growers look to familiar faces for guidance.

As their most trusted adviser, you are a primary source of their strength. Your insight into their farms' unique challenges enables you to prescribe precise solutions that will help elevate their productivity and profits.

At Syngenta, we proudly partner with you in finding the solutions that best fit each farm. Every year, we spend more than \$1.25 billion globally in research and development, investing in state-of-the-art technologies, active ingredients and traits. A portion of these funds also goes toward developing industry-leading premixes that combine new and established chemistries, conveniently formulated to help growers overcome some of their most difficult threats.

A prime example is our ever-evolving herbicide portfolio and the lead role it is playing in the battle against weed resistance. The phrase "What's old is new again" is particularly relevant in this area because so many of our tried-and-true brands—Flexstar®, Reflex® and Gramoxone® herbicides, for example—which were crop staples before the advent of Roundup Ready® technology, are now essential ingredients in today's weed resistance management programs.

The momentum of the Syngenta herbicide lineup continues to grow with the anticipated 2015 launch of additional premixes in corn containing bicyclopyrone, a novel active ingredient that, upon registration, will help fill the gap of controlling large-seeded broadleaf weeds. In this issue of *Thrive*, weed experts will discuss its anticipated value and the remarkable difference they expect other Syngenta brands, including Lumax® EZ, Lexar® EZ, Prefix® and Callisto® GT herbicides, will make in 2014 early-season and residual weed management programs. You'll also see how Syngenta, through its development of trait stacks, value-added premixes and enhanced formulations, is injecting new life into seed technologies and active ingredients going off patent. Because our broad range of solutions addresses more than just weeds, you'll read about disease and insect challenges as well, including a tiny species of psyllid that is wreaking havoc on the U.S. citrus industry.

Behind every Syngenta brand, a deep bench of experts—from our local sales and agronomy service teams in the field to our formulation professionals and researchers in the lab—stands ready to discover and share with you the next innovation that will positively impact agriculture. After all, our partnership is steeped in a tradition of trust with an eye toward new frontiers.

"Every year, we spend more than \$1.25 billion globally in research and development, investing in state-of-the-art technologies, active ingredients and traits."

—KEN FISTER

**KEN FISTER**  
Head, Herbicide Product Management  
Syngenta

PHOTO: ALEX MANESS





# What's in Store

Premixed herbicide formulation offers robust weed control; news updates keep you informed on the latest developments.

## NEW TECHNOLOGIES

### > Callisto GT Potent Weapon Against Weeds

Callisto® GT herbicide features the proven power of Callisto and Touchdown® herbicides conveniently combined into one easy-to-use premixed formulation. Studies have shown Callisto GT provides the same weed control and crop tolerance users have come to expect from the tank mixture of Callisto plus Touchdown. Callisto GT provides the following benefits:

- > Superior post-emergence burndown and residual weed control in glyphosate-tolerant corn
- > Control of emerged grasses and broadleaf weeds, including waterhemp, pigweed, lambsquarters, Palmer amaranth, common and giant ragweed, and common cocklebur
- > Effective resistant weed management because of its two active ingredients and two modes of action
- > Faster burndown compared to glyphosate alone

To ensure a sound resistance management strategy with Callisto GT, always add an atrazine (e.g., AAtrex® 4L or AAtrex Nine-O® herbicides) tank mix. If atrazine cannot be used, tank mix a dicamba product (e.g., NorthStar® herbicide). For more information on Callisto GT, go to [www.callistoplanttechnology.com](http://www.callistoplanttechnology.com).



Troy Griess, Syngenta agronomy service representative (left), and Dave Keffeler, grower and seed dealer, discuss the proper way to prepare and maintain application equipment for Force® CS insecticide in Remsen, Iowa.

### >> Force Videos Focus on Best Practices

New videos from Syngenta demonstrate the simple, safe processes for preparing and maintaining application equipment for Force® CS insecticide. Featuring the John Deere Central Insecticide System and the Raven application system, the videos guide users through preplanting clean-out, in-season maintenance and post-season winterization, showing important steps to keep equipment running smoothly. To view the videos or for more information on Force CS, visit [www.ForceOnTrait.com](http://www.ForceOnTrait.com) or contact your local Syngenta representative.

## NEWS AND EVENTS

### > Innovation Center Expansion Begins

Syngenta has broken ground on the second phase of its Innovation Center in Research Triangle Park, N.C. The \$94 million expansion will include 200,000 square feet of specially designed laboratories, office areas and meeting spaces connected to the Advanced Crop Lab—the center's first building phase, which opened in 2013. The addition will allow Syngenta to further study traits that help crops better tolerate climate variability, combat plant stressors and improve yield in corn, soybeans and sugar cane. It also will support new research in cereals, rice and vegetables. The project is scheduled for completion in 2016.

### >> Ethanol Plants Choose Enogen Corn

Enogen® trait technology continues to establish its footprint in the ethanol industry with two additional ethanol plants

committed to using Enogen corn in commercial production. Arkalon Ethanol, LLC, in Liberal, Kan., and Three Rivers Energy, LLC, in Coshocton, Ohio, signed agreements with Syngenta to begin using corn that features Enogen trait technology. These recent agreements contribute to a new total of five ethanol plants licensed to use Enogen grain commercially. Each ethanol plant is contracting with local farmers to produce Enogen corn during the 2014 season and will begin using the revolutionary grain in production following harvest. For more information on Enogen, visit [www.enogen.net](http://www.enogen.net).



### >>> Bug Squad Fights Corn Pests

To help growers and resellers better understand strategies and solutions for corn insect control, Syngenta has formed the Bug Squad. This team of nine Syngenta experts is sharing its collective knowledge on emerging management strategies

and best practices at trade shows and other events throughout the country.

"Corn insect control is a moving target, and sometimes the answers aren't as simple as they seem," says Bruce Battles, Syngenta solutions development manager and Bug Squad member. "As the leader in U.S. corn insect control, Syngenta wants to help farmers develop multiyear, whole-farm strategies for integrated pest management. The company assembled the Bug Squad to offer unparalleled insight and solutions to farmers and agricultural resellers."

Working with the Syngenta portfolio of corn insect control technologies—from traits and seed treatments to insecticides—the Bug Squad is committed to helping growers produce more corn. Members include:

- > **Craig Abell**, business development manager
- > **Miloud Araba, Ph.D.**, product lead, technical seed traits
- > **Bruce Battles**, solutions development manager
- > **Dirk Benson, Ph.D.**, head of trait projects
- > **Tony Burd, Ph.D.**, product biology technical manager
- > **Dale Ireland, Ph.D.**, technical product lead, Seedcare technology
- > **Isaac Oyediran, Ph.D.**, insect traits resistance management lead
- > **Palle Pedersen, Ph.D.**, Seedcare technology manager
- > **Caydee Savinelli, Ph.D.**, pollinator and IPM stewardship lead

To learn more about the Bug Squad, visit [www.SyngentaUS.com/BugSquad](http://www.SyngentaUS.com/BugSquad) or tweet them a question with the hashtag #BugSquad.



## Trade Shows and Conferences

To find out what's new and exciting at Syngenta, please visit our booth at any of the shows and events listed below:

### JANUARY 2014

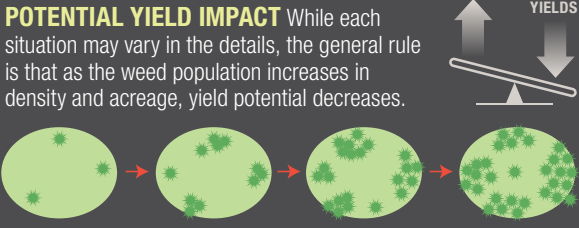
- |       |  |
|-------|--|
| 8–10  | <b>Potato Expo</b> , San Antonio, Texas                                  |
| 9–12  | <b>Southeast Regional Fruit and Vegetable Conference</b> , Savannah, Ga. |
| 15–18 | <b>National No-Tillage Conference</b> , Springfield, Ill.                |

### FEBRUARY 2014

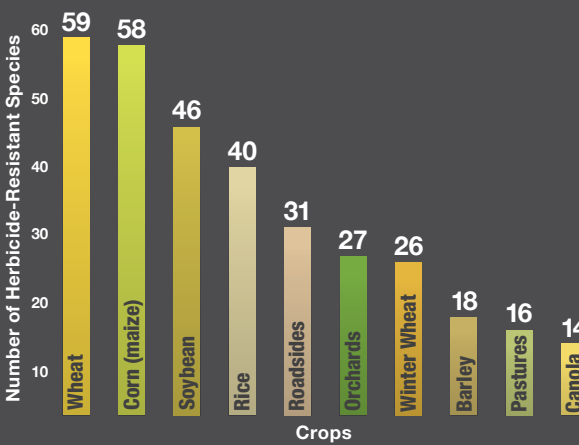
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| 12–15      | <b>National Farm Machinery Show</b> , Louisville, Ky.             |
| 19–23      | <b>National Watermelon Association Convention</b> , Savannah, Ga. |
| 27–March 1 | <b>Commodity Classic</b> , San Antonio, Texas                     |
| 28–March 1 | <b>Mid-South Farm &amp; Gin Show</b> , Memphis, Tenn.             |

# Prevent Resistance

A herbicide resistance problem doesn't develop overnight. Usually, it's the result of high selection pressure exerted on a weed population over the course of several years. By repeatedly applying the same herbicide or several herbicides that use the same mode of action, growers can inadvertently create that pressure. The results of herbicide resistance can be extremely costly. In the long run, taking a proactive approach to weed management is the most effective and economical way to tackle this problem. The first step toward effective weed resistance management is to know the facts.



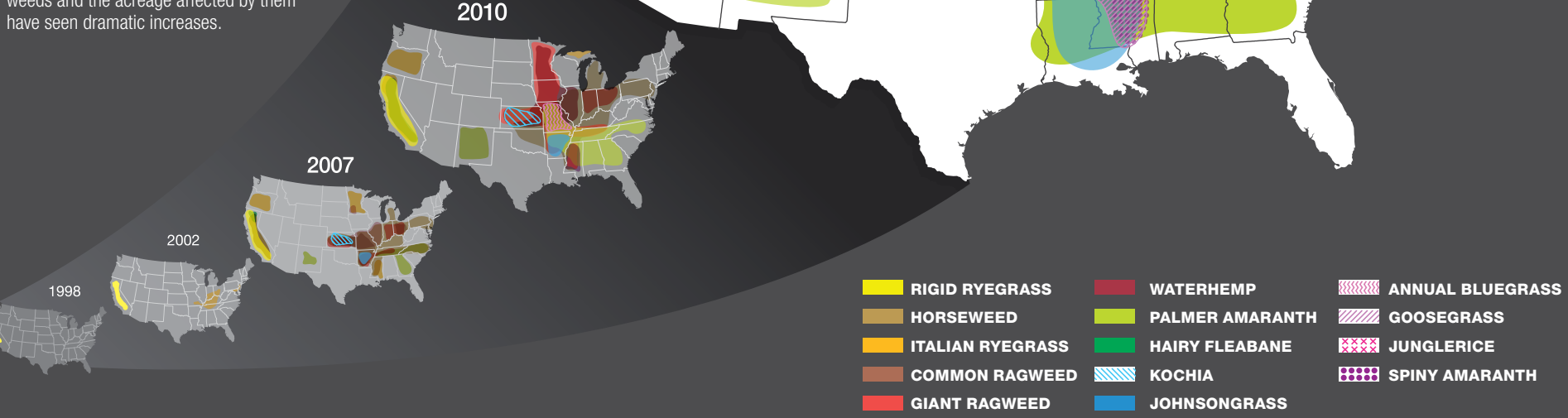
**TOP 10 CROPS** Many of the global food supply's most important staples are affected by resistant weeds. The U.S. has an especially challenging situation with 145 identified weeds resistant to herbicides.



**404** unique cases (species x mode of action) of herbicide-resistant weeds globally

## The Spread of Weed Resistance in the U.S.

In recent years, the number of resistant weeds and the acreage affected by them have seen dramatic increases.



## WEED RESISTANCE AND GLYPHOSATE

Glyphosate-resistant weeds have been of special concern. Here are just a few of the most widespread—and most devastating:

<b>Giant Ragweed</b> One of the most competitive weeds in the U.S.	<b>Horseweed (Marestail)</b> Can produce up to 200,000 seeds	<b>Johnsongrass</b> Crops affected: corn, cotton, potatoes, soybeans and wheat	<b>Palmer Amaranth</b> Known as the most problematic glyphosate-resistant weed in the South	<b>Ryegrass</b> Can reduce wheat yield up to 75 percent at 100 weeds/sq. meter	<b>Waterhemp</b> Can produce up to 1 million seeds per female plant	<b>Common Ragweed</b> Has developed herbicide resistance to four modes of action, including glyphosate

## POWER MEASURES



Apply residual herbicides with multiple modes of action.



Increase herbicide diversity with premixes and tank mixes.



Rotate crops, which also allows rotation of herbicide modes of action.



Scout fields, borders, fencerows and ditches for weed pressure.



Start with clean fields, including borders.



Use full herbicide rates, carrier and recommended adjuvant(s).



Consider mechanical weed control (cultivation), if appropriate.



Use cover crops to help knock down existing weed populations.

Sources: Heap, I. The International Survey of Herbicide Resistant Weeds. Online. Internet. Friday, November 15, 2013. (graph, number of resistant weeds)  
 "What is Weed Resistance," Lesson 5. Weed Science Society of America. Online. Internet. Friday, November 15, 2013. (illustration of progressive weed density)

# Resistance Roundtable

Proactive, diverse strategies are essential when it comes to effectively managing resistance.

**Q. Why is resistance a real concern and resistance management a real need?**

**A. Les Glasgow, Ph.D., technical product lead, herbicides, Syngenta:** Over the last 10 years, we've seen a significant increase in the incidence of herbicide-resistant weeds. This trend was confirmed in a 2012 grower survey\*, which estimated that glyphosate-resistant weeds infested 61.2 million acres. Of the growers interviewed, 49 percent reported glyphosate-resistant weeds on their farms, representing a staggering 51 percent increase over the previous year.

If we do not respond proactively to this serious threat, there will be significant changes in agriculture. Growers will lose the tools they have as more herbicide modes of action become compromised across a wider range of weed species. As a result, the use of tillage—with its associated negative environmental impact—will likely increase. The development may reverse the conservation tillage and no-tillage gains made in the last 20 years, resulting in increased erosion and contamination of surface water with soil and nutrients. Weed management will become less diverse, less efficient and less effective. We will see an increase in management costs coupled with a reduction in productivity and profitability. If this scenario comes to pass, a decrease in land values will be inevitable, and reduced economic stability in the production of key agricultural commodities—such as corn, soybeans, cotton and cereals—could lead to increased bankruptcy in farming communities. At the same time, significant increases in food and fuel prices will hit consumers.

**A. Caydee Savinelli, Ph.D., pollinator and IPM stewardship lead, Syngenta:**

Insecticide resistance can greatly diminish the value of products in the marketplace. It can lead to an increase in the number and frequency of applications to control insects at the same level as in the past. With the onset of insecticide resistance, product nonperformance complaints go up and grower confidence goes down. Resistance management strategies and tactics that delay or minimize resistance development are important aspects of product stewardship and critical for the long-term maintenance of crop protection technologies. For effective resistance management, the practices used must help delay resistance development, while also being practically oriented and cost-effective so that growers will adopt them.

\*www.stratusresearch.com

**A. Allison Tally, Ph.D., technical product lead, fungicides, Syngenta:**

We've all heard about staph-resistant bacteria in hospitals and warnings not to use antibiotics when they aren't needed to help prevent resistance. Microorganisms can reproduce quickly and mutate, developing resistance to the medicines that can help us. Plant diseases can also become resistant to "plant medicines," rendering them either totally or partially ineffective. At Syngenta, when we develop a new fungicide, we also study the potential resistance risk. When a pesticide has multiple modes of actions—that is, it attacks several different sites in the pest—it is less likely to become resistant than those that target a single site.

**Q. Why should resistance management be top of mind, even for growers who are not currently experiencing a problem?**

**A. Glasgow:** While awareness of herbicide resistance is high among growers, many do not see it as a problem on their own farms. It is someone else who has the issue, so the response is, "Why should I change my low cost, convenient weed-management tactics and spend more on inputs?" They do not realize how soon their neighbor's problem will become their own through pollen or seed movement. In many cases, the resistant weeds are already present on the farm but not detected until it is too late. Weeds, such as Palmer amaranth or waterhemp, can produce up to 1 million seeds from a single plant. It doesn't take long to cover a field with resistant weeds that can compete severely with the crop.

**A. Savinelli:** All growers need to make best use of the available tools to control insects. This requires them to consider their options and not use the same insecticide over and over again. Even if they aren't currently experiencing resistance in their fields, the threat is there; they, therefore, should use insecticides judiciously.

**A. Tally:** A spray program may work great, as long as only a limited amount of the pest population is resistant. But over time, these can multiply and, all of sudden, there is no control. Rotating different modes of actions is an excellent way to keep the ones that may be resistant from increasing rapidly. It is a numbers game. Growers need to keep the pest population as low as possible. *(continued on page 8)*



**CAYDEE SAVINELLI**  
Ph.D., Pollinator and IPM  
Stewardship Lead, Syngenta



**ALLISON TALLY**  
Ph.D., Technical Product  
Lead, Fungicides, Syngenta



**LES GLASGOW**  
Ph.D., Technical Product  
Lead, Herbicides, Syngenta



**Q. What can growers and retailers do to fight resistance?**

- A. Glasgow:** It's important for growers and retailers to take a concerted, collaborative approach to manage herbicide resistance and preserve the tools that we currently possess. There are a number of important principles that Syngenta has supported for many years:
- > Do not rely solely on post-emergence-applied herbicides.
  - > Start clean, utilizing tillage where appropriate or an effective burndown plus a pre-emergence-applied residual herbicide.
  - > Always use a two-pass pre- and post-emergence system with herbicides at full rate and recommended adjuvants and proper application timing.
  - > At each application, use multiple-mode-of-action herbicides with overlapping efficacy (activity on the same weed species with two or more different herbicide active ingredients).
  - > Include diversified management programs, such as cover crops, mechanical weed control and rotation.
  - > Do not allow weeds to go to seed and add to the seed bank; remove any escapes early by hand weeding, spraying a herbicide or cutting out patches.

The overall message is that retailers should recommend and growers must employ as much diversity in their weed management programs as possible.

- A. Savinelli:** Insecticide resistance management should be part of the integrated pest management of the insect. An understanding of the insect's biology and population dynamics, as well as its economic threshold level on the crop, is essential. This will lead to better decisions on when to apply the insecticide and at what rate. The resistance management component is to not use the same insecticide for the control of multiple generations of the same pest in one crop. It is best to rotate insecticides with different modes of action.

- A. Tally:** Various cultural practices should be incorporated to help keep the pest populations to lower levels. If growers know that a disease is a routine problem, they know to use varieties that are resistant or more tolerant to that disease. Planting dates can help slow down the disease pressure. For example, if some diseases like warmer soils, then planting a little earlier when the fungus isn't active can get the plant

**"In many cases, the resistant weeds are already present on the farm but not detected until it is too late."**

—LES GLASGOW

up and out of the ground where it may be less susceptible to the fungal attack. Another cultural practice is managing irrigation to avoid creating a good infection period. When season-long spray programs are needed, the grower and retailer should discuss a multipronged approach that uses

different chemistries. Most chemicals now have a code that indicates their chemical class, so figuring out the rotation is easier than it used to be.

**Q. What support does Syngenta offer?**

- A. Glasgow:** Since 2001, Syngenta has helped lead the fight against weed resistance, partnering with university and extension researchers to update growers on the latest management tactics. We also have a wide range of herbicides with different modes of action and use patterns that can fit almost any situation. In particular, we have led the way in developing premix products, such as Lexar® EZ and Lumax® EZ herbicides in corn, which ensure delivery of three effective herbicides with different modes of action. In soybeans, growers can apply Boundary® or Prefix® herbicides pre-emergence in a program with early post-emergence application of herbicides, such as Flexstar® or Liberty®, respectively. Since herbicide resistance management is a local and, in many situations, a field-specific issue, growers can contact their local Syngenta agronomist or sales representative to receive advice and a customized management program. In addition, Syngenta is a member of the Global and North American Herbicide Resistance Action Committee (HRAC) that has established the herbicide resistance management principles promoted widely in agriculture today.

- A. Savinelli:** Syngenta is a member of the Insecticide Resistance Action Committee (IRAC), both in the U.S. and internationally. We utilize the IRAC mode-of-action symbols on our product labels along with resistance management guidelines. As part of our technical training for the field sales force, we provide insecticide-resistance-management best practices and information. Our research facilities in Vero Beach, Fla., and Stein, Switzerland, also enable us to address field insecticide resistance. Additionally, we have a good working relationship with the university research and extension community in implementing resistance management guidelines and addressing emerging issues.

- A. Tally:** Syngenta offers several fungicides with different modes of actions that growers can rotate. We also have premixes, which provide a convenient way to apply two chemistries together. To slow resistance development, we recommend alternating different modes of action. In certain cases, we recommend that growers not use a product or use it only once per season because we know the level of control will not meet their expectations. The Fungicide Resistance Action Committee makes it easier to identify modes of action by providing guidelines for the various chemical classes. It would be nice if a red light turned on as soon as a problem started emerging in the field, but nature does not warn us when it comes to resistance. 🍀

INTERVIEWS BY SUSAN FISHER



# Sweet Success

The efforts of Syngenta during a crisis show its commitment to sugarbeet growers.

Imagine you have planted the same variety of a crop you have grown for the last few years. With just a month or so until harvest begins, the crop is looking good. And then, a federal judge rules that the U.S. Department of Agriculture failed to consider certain environmental and interrelated economic impacts when it first deregulated the herbicide-tolerant trait used in the variety growing in your field.

Although the judge's decision allows you to harvest that crop and your grower-owned cooperative to process it, you begin worrying about next year's crop immediately. That's because the now re-regulated trait is planted on 95 percent of the acres grown across the U.S. Fears there is not enough conventional seed to plant 1.2 million acres the following year are real.

That's the situation the U.S. sugarbeet industry found itself in on a Friday afternoon in mid-August 2010, following a federal judge's ruling that the USDA failed to consider certain environmental and interrelated economic impacts when the agency first deregulated Roundup Ready® Sugarbeets in March 2005. This decision plunged the seed back into a regulated status and

threatened to devastate the industry, which supplies half of the domestic sugar. Not only was conventional seed in short supply, but the lack of labeled herbicides and hand labor needed to control weeds in a conventional sugarbeet crop were what had motivated growers to adopt the technology so quickly in the first place.

In the midst of that turmoil, Syngenta worked with the industry—from grower organizations to sugar cooperatives to other seed companies—to ensure farmers would have the freedom to operate.

**Industry Advocates**

The fight began in January 2008 when organic seed growers and non-governmental organizations (NGOs) in Oregon sued the USDA to stop commercial seed production of Roundup Ready sugarbeet seed varieties. As a primary supplier of Roundup Ready sugarbeet seed, Syngenta was part of a team of industry players who took the lead in defending the genetically modified seed.

"Both the industry and Syngenta saw the value of the trait and the importance to defend the technology," says Tyler Ring, head of cereals and diverse field crops product management at Syngenta.

## The real beauty is its ability to turn water into grain more effectively.

Corn plants with Agrisure Artesian® trait technology have the unique ability to thrive under a wide variety of growing conditions. In fact, Agrisure Artesian is really an all-weather trait that can help any corn hybrid turn available water into more grain—all season long. With Agrisure Artesian, you'll maximize your yield when it rains. And improve yield up to 15% when it doesn't. So talk to your Syngenta Seed Advisor or retailer to learn how you can grow more corn.

**GROW more corn**

AgrisureArtesian.com



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The legal team at Syngenta worked collaboratively with lawyers from the Department of Justice, Monsanto and other seed companies, and sugar cooperatives, spending countless hours to develop a strategy.

### Regulatory Aspect

While attorneys argued in court, others at Syngenta developed contingency plans. When the USDA announced in February 2011 the beet industry could grow Roundup Ready sugarbeets under a partially regulated permit system while it completed its environmental impact study, Syngenta was ready.

To meet the new USDA permitting requirements, seed needed three layers of sealed containment while being shipped from the seed processing center to warehouses, re-packaged for customers and then triple-contained again for the trip to the farm. Syngenta changed some deliveries from open flat-bed trailers to contained trailers.

"We had to change several aspects of how our seed associates handled sugarbeet seed, from storage to on-farm delivery," Ring says.

As regulatory compliance manager for Syngenta, Paul Miles is used to dealing with the regulatory aspects of pre-commercial seed production. But the partial deregulation was just as new to him as it was to everyone else in the industry. The Syngenta Regulatory Compliance team developed robust protocols that were used throughout the seed production and seed distribution chains.

"There were times when we were frustrated, but we worked through those difficult times and found solutions that met USDA requirements."

—PAUL MILES

Opponents of the technology underestimated the industry's ability to adapt and work with USDA to keep seed production moving forward in the interim, Miles says. "There were times when we were frustrated, but we worked through those difficult times and found solutions that met USDA requirements."

### Raising Seed

When a new biotech trait is nearing commercialization, companies typically produce seed on only a limited number of acres, with production acres expanding after the necessary regulatory approvals have been obtained. But suddenly Syngenta found itself dealing with 186 sites and nearly 700 acres of regulated seed production until July 2012. That's when USDA's Animal and Plant Health Inspection Service announced Roundup Ready sugarbeets were once again completely deregulated after over two years of litigation and further study.

Ring is proud of the leadership and resources Syngenta provided during that turbulent time. "We are a science-based organization. We will continue to bring new traits and new technology to the marketplace. That's who we are," he says. "We strongly believe in our technologies and will continue to do what it takes to defend our products." 🌱

STORY BY CINDY SNYDER

# DEFEND YOUR YIELD

**Early-season weed management is an essential step toward maximizing yields at harvest.**

By Darcy Maulsby

## Is weed pressure in your area lighter than it was five years ago?

Across the country, the answer is no, including in Larry Steckel's region.

"The coffee-shop talk around here focuses on two topics every day—pigweeds and politics," says Steckel, Ph.D., an extension weed specialist with the University of Tennessee. "When glyphosate isn't effective at controlling weeds of any height, you know life is never going to be the same again."

Steckel notes that weed control in Tennessee had seemed straightforward until 2005. "In year one, there were a few weeds, such as waterhemp or Palmer amaranth, that were surviving in farmers' fields," Steckel says. "By year

two, bigger patches of weeds persisted. By year three, the weeds were so thick that some growers couldn't run a combine through their fields."

Since then, growers have been spending up to \$100 an acre on herbicides for soybeans

and \$60 or more for corn. They also hire chopping crews, which adds another \$20 to \$25 per acre. "Even then, we're still not getting the weed control we'd like," Steckel says.

These challenges aren't confined to the South, he adds. "Right now, growers in Missouri, Illinois, Iowa, Indiana and beyond are in the similar situation we were in right before the big blow up in 2008, when it became nearly impossible to control weeds, such as waterhemp."

### Start Clean, Stay Clean

A recent University of Illinois study suggests that it's a question of when, not if, Palmer amaranth will become established in the state. "We're on the threshold of a major Palmer amaranth outbreak," says Aaron Hager, Ph.D., an associate professor of weed science at the University of Illinois.

Soybean yield losses approaching 80 percent and corn yield losses exceeding 90 percent from Palmer amaranth have been reported in peer-reviewed scientific literature, Hager notes. "We typically don't lose entire fields to weeds, such as waterhemp, but Palmer amaranth will be a game changer."

A grower's best defense against Palmer amaranth (which can grow 3 inches or more per day) and many other yield-robbing weeds is an early-season weed management system, says Gordon Vail, Ph.D., a technical product lead at Syngenta. "When you take a preventive approach, you've got a fighting chance of controlling weeds before they become a problem."

The best weed is the one that never germinates, adds Hager, who is a strong proponent of pre-emergence herbicides. "Try to stop problems before they start, because the most competitive weeds are the ones that come up with the crop. The window of how long the crop can compete with weeds without yield loss is pretty small."

In areas where glyphosate resistance has taken hold, the lack of a pre-emergence system can transform small weeds into big headaches, Steckel says. "Once the weeds got 3 or 4 inches tall, growers around here had to disk up their fields and replant."

Early-season weed management can prevent this scenario while offering many other benefits, including:

**> Fewer deposits in the weed seed bank.** Pre-emergence products offer growers a fighting chance to control weeds throughout the growing season. The seedling stage is the most vulnerable time in a plant's life, making small weeds easier to kill than large weeds. "If you're diligent about controlling weeds right from the start, you can control the weed population," Vail says. "You not only reduce weed competition, but you also reduce the number of weeds your post-emergence product has to control."

**> Greater peace of mind.** In farming, few things go exactly as planned. "If it rains a lot, for example, a pre-emergence product gives you more flexibility with your post-emergence application," Vail says.

**> Delayed development of herbicide resistance.** "Controlling weeds early in the season generally means targeting smaller weeds," says Bryan Ulmer, Ph.D., Syngenta global technical manager for herbicides. "Most herbicide options are more effective on germinating and small weeds. Good examples are populations of waterhemp and Palmer amaranth (often already resistant to one or more modes of action), which become very difficult to control if you let them grow more than 3 or 4 inches. Early-season weed management helps maximize efficacy and minimize the escapes that can lead to increased tolerance and ultimately resistance in populations."

**> Higher yield potential.** Years of research in corn have shown that growers harvest higher yields when they incorporate an early-season weed management program, rather than using a total post-emergence program. "By starting with clean fields, growers can maximize yield potential and reap the full benefits from the significant investments that they are making in their crop," Ulmer says.

Pre-emergence products aren't just for corn. Early-season weed management with pre-emergence herbicides in



Corn treated with SYN-A197 herbicide featuring a new active ingredient, bicyclopyrone (right), vs. an untreated check (left)

soybeans plays an important role in reducing weed competition, decreasing the number of weeds that need to be controlled post-emergence and providing mode-of-action diversity in managing herbicide resistance, says Don Porter, a technical product lead for Syngenta. "With glyphosate resistance becoming more widespread, growers are realizing that early-season weed management with pre-emergence herbicides offers a good return on investment in soybeans."

### Get a Jump on Weeds

The foundation of any effective early-season weed management program needs to start with a robust pre-emergence product. Lexar® EZ or Lumax® EZ herbicides from Syngenta offer multiple effective modes of action to manage herbicide resistance issues in corn, Vail says. Lumax EZ, for example, contains Dual II Magnum®, Callisto® and AAtrex® 4L herbicides to provide broad-spectrum, effective weed control.

In soybeans, Prefix® pre-emergence herbicide offers a mix of Dual Magnum and Reflex® herbicides and provides up to five weeks of control on Palmer amaranth, waterhemp and other driver weeds. Its long residual control allows for a wider application window, reducing the risks associated with applying glyphosate too early or too late. Boundary® 6.5 EC soil-applied herbicide is another option in soybeans. It delivers early-season grass and broadleaf weed control, excellent resistance management and rotation flexibility. By using Boundary, growers can extend the post-application window up to five weeks after planting, thereby protecting yield and keeping fields cleaner longer.

As a leader in early-season weed management solutions, Syngenta is also developing a new active ingredient (bicyclopyrone) for corn. Upon registration, it will be part of a four-active-ingredient herbicide premix that will provide three different modes of action for sustainable control of waterhemp and Palmer amaranth, as well as improved control of large-seeded broadleaf weeds, such as common ragweed, giant ragweed and cocklebur. "Bicyclopyrone will raise the bar on weed control in corn, particularly for large-seeded broadleaf and tough-to-control weeds," Ulmer says.

Syngenta is also developing other products that will become important tools for weed control and resistance management. Callisto GT, a post-emergence premix of Callisto and Touchdown® herbicides for corn, can be tank mixed with atrazine and will be available for the 2014 growing season, Vail says.

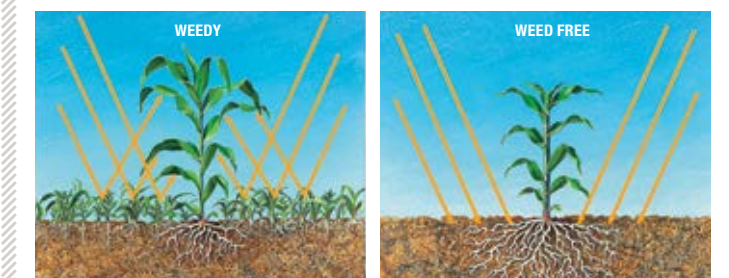
All these options allow growers to incorporate various modes of action for sustainable, early-season weed management. Although weed control is becoming more complex, the results are worth the effort, Hager says. "In the end, it's about maximizing yields. We can be successful if we adopt a new mindset of controlling weeds upfront and realize that this is a long-term investment." ■

### Shedding Light on Yield Loss

It's well documented that weeds taller than 2 inches compete with corn plants for water and nutrients. That's not the whole story to yield loss, however. Just ask Mark Lawson, an agronomic service representative for Syngenta. "The impact of light is much greater than we give it credit for," says Lawson, who has based his own field trials on the research of Clarence Swanton, Ph.D., at the University of Guelph in Ontario.

Swanton's studies have shown that early-emerging corn seedlings contain light-sensing compounds called phytochromes that can detect subtle shifts in the reflected light around them. When weeds emerge with the crop, phytochromes tell the corn seedlings to grow taller stalks and wider leaves to better compete for light. This above-ground growth leaves fewer resources for root growth, which compromises yield potential.

Lawson observed similar results by using inexpensive, green, indoor-outdoor carpet to mimic weeds' effect on corn seedlings. "I've demonstrated a 9-bushel-per-acre yield loss, on average," he says. "It's one more reminder that early-season weed control is vital."







# POSTSCRIPT FOR PATENTS

As active ingredients and traits mature, patent expiration is an eventual stage in the lifecycles of most agricultural brands.

By Tricia Sheehan / Illustrations by Michael Austin

**T**he ongoing development of newer, more sophisticated products is essential for any industry to thrive. Agriculture is no exception. Over the past two decades, the call to produce higher-yielding crops has spurred a wave of unprecedented innovation that has resulted in such revolutionary technologies as mesotrione, the active ingredient in Callisto® brand corn herbicides, and traits such as Roundup Ready® soybean.

Both of these products, as well as several other broadly used tools, will either be coming off patent or losing exclusive data protection in the next couple of years, which compels the people who distribute, sell and use them to ask, "What does patent expiration mean to my farm or business?"

## Lifecycle Protection

Given the stringent regulatory approval process, the average time it takes to bring a new crop protection product to market can exceed 10 years and cost more than \$100 million. Patent protection and the exclusivity it affords are critical to helping companies recover the costs of research and development, incentivizing them to make future investments that will lead to continued industrywide growth and advancement.

Over the next few years, Syngenta has several active ingredients coming off patent. They will join other key active ingredients in its portfolio, including atrazine, metolachlor and lambda-cyhalothrin, with patents that have already expired. For each of these products, the company's post-patent approach follows the same overarching plan.

"Our primary focus on all our products, especially those coming off patent, is performance," says Rex Wichert,

post-patent strategy manager for Syngenta. "We want to make sure farmers and retailers have a consistent supply of industry-proven

technologies that will help them overcome challenges, such as resistance, and maximize opportunities."

## Product-Preserving Strategies

When patents expire and generic competitors enter the market, Syngenta continues to make sure key brands still deliver the results growers have come to expect.

For example, as the patent on the herbicide metolachlor approached expiration, Syngenta introduced Dual II Magnum® herbicide, a formulation containing the more active isomer s-metolachlor. This formulation reduced use rates by approximately 33 percent because of the isomer's enhanced activity.

"From the time we introduce a new active ingredient, we look for ways to enhance its value to growers and retailers," Wichert says. "Improving its formulation and incorporating it into new products are ways we can better meet their changing needs."

Syngenta is using both approaches with mesotrione, whose data exclusivity under FIFRA expires in June. Originally launched as a single corn brand, the mesotrione or Callisto herbicide family now includes multiple brands, 90 percent of which are premixes. Callisto GT, a combination of Callisto and Touchdown® herbicides, is the latest mesotrione premix on the market. And coming soon to corn are mixtures with a new active ingredient, bicyclopyrone, which, upon registration, will offer improved residual control of large-seeded broadleaf weeds.

Enhanced formulations are also bringing new life to the Callisto family. Lumax® EZ and Lexar® EZ herbicides, with their patented capsule-suspension formulation technology, provide easier handling and more flexible application.

"We are constantly challenging ourselves to look at how the market is changing and see how we can evolve our product line to better fit farmers' needs," says Wichert. "We want our customers to see Syngenta as more than just the supplier of one new chemistry or active ingredient."

**The average time it takes to bring a new crop protection product to market can exceed 10 years and cost more than \$100 million.**



“From the time we introduce a new active ingredient, we look for ways to enhance its value to growers and retailers. Improving its formulation and incorporating it into new products are ways we can better meet their changing needs.”

—REX WICHERT

### Biotech Trait Milestone

While patent expiration is nothing new to crop protection products, no major biotech trait has had to face this milestone—until now. The first generation of the Roundup Ready soybean technology (RR1) will be off patent in 2015, making this season its last as a patent-protected trait. Introduced in 1996, this technology hit the market by storm with its potential to make weed management easier, more convenient and effective. The technology also made conservation tillage practices more practical to implement.

Fast forward nearly 20 years, and growers now use herbicide-tolerant technologies on more than 95 percent of soybeans planted across the U.S. It's no wonder that the imminent patent expiration of the RR1 trait is a hot topic throughout the industry. Fortunately, companies like Syngenta have plans in place to help minimize market disruption.

“Seeing an opportunity to improve performance and manage growers' needs, we transitioned much of the NK<sup>®</sup> soybean portfolio to the more advanced Genuity<sup>®</sup> Roundup Ready 2 Yield<sup>®</sup> technology,” says Ross Weikel, head of soybeans for Syngenta. “We plan on launching additional herbicide-tolerant traits in the near future to further improve weed management performance and offer options for sustainability.”

### Saved Seed

For those growers who will continue planting RR1-traited soybeans, their right to save and replant the seed is often not fully understood. Other intellectual property protections may apply to some RR1 soybean seed varieties, so even if the trait patent has expired, certain seed may be protected by a patent on the seed's germplasm. Growers who are interested in replanting saved RR1 soybeans will need to check with their seed supplier to find out if the variety they are interested in can be saved and replanted without legal repercussions.

Weikel explains that current NK soybean varieties are protected by a variety of intellectual property rights; therefore, saving seed for replanting the following year could be an infringement of these rights.

“Syngenta invests millions of dollars every day into R&D for new products like NK soybeans, which are covered by patents or plant variety protection, no matter which herbicide-tolerant traits are included,” he says. “These help Syngenta continue to deliver better products to growers.”

### Impact on Overseas Markets

In this new age of patent expiration for traits, an issue that impacts the entire industry is off-patent trait maintenance in overseas markets.

To address the transition, the Biotech Industry Organization, the American Seed Trade Association and a wide range

of other stakeholders, including grower groups, grain handlers and government officials, are taking action. Their goal is to identify and create solutions that provide clarity and enable ongoing grower choice of these traits following patent expiration.

Not surprisingly, one grower group involved in the dialogue is the American Soybean Association (ASA). Its leadership is actively pursuing ways to develop pathways that will facilitate the continued availability of traits to soybean farmers as single generic traits or as part of stacked traits after patent expiration. The association breathed a collective sigh of relief when Monsanto confirmed that it supported the short- and mid-term marketability of the RR1 trait for the next three to five years and pledged to maintain full global regulatory responsibility for RR1 through 2021. ASA President Ray Gaesser believes longer-term assurances are needed.

“It's a two-way street,” says Gaesser, who is also a soybean producer from Corning, Iowa. “We need to remember that while safeguards may be in place to cover farmers' worries today, we need to make sure that the corn and soybeans we grow will continue to be accepted overseas now and into the future. There will be an incredible cost if grain is refused.”

### What Comes Next?

For the long-term success of all products, Syngenta understands that making timely, accurate deliveries is essential to its supply chain partners that bring these products to the farm. Regular, ongoing communication between manufacturers and retailers is essential to maintaining proper supply throughout the season. But as more generic products hit the market, the retailers that choose to sell them will work with more manufacturers to predict product supply needs for the coming year. With so many conversations taking place, the dialogue to make sure growers get what they want when they need it is bound to become more confused and less focused.

Despite these challenges, Wichert believes the post-patent world has a silver lining. “Innovating, upgrading and delivering are the keys to evolving in the post-patent marketplace,” he says.

A case in point is the decision by Syngenta to transition its corn seeds product line to the newest, highest-performing genetics and traits. For 2014, Golden Harvest<sup>®</sup> and NK brand corn touts one of the most diverse corn genetics line available. The Syngenta corn hybrids include such breakthrough traits as Agrisure Artesian<sup>®</sup>, Agrisure Duracade<sup>™</sup>, Agrisure Viptera<sup>®</sup> and Enogen<sup>®</sup> trait technology—all launched over a 5-year period, a rate unparalleled in the industry.

“We know the market is continuing to evolve,” says Wichert, “and as a company, we are investing in our portfolio to help drive market growth and create new opportunities for farmers, retailers and dealers alike.”

# Citrus Under Siege

**U.S. growers from coast to coast look for ways to battle citrus greening and the vector that spreads it.**

*By Chris Harrell*

*Photography by Stephen Williams*

Joby Sherrod, crop protection research superintendent for A. Duda & Sons, Inc. (left), and John Taylor, coastal agronomic service representative for Syngenta, inspect a grove near LaBelle, Fla., for signs of HLB.



Many a boogeyman has spooked citrus growers over the years,” says John Taylor, coastal agronomic service representative for Syngenta. “But citrus greening and its impact on the industry isn’t folklore. It has the potential to put people out of business.”

Citrus greening, or Huanglongbing (HLB), is a systemic bacterial disease that has ravaged the citrus industries in India, China and Southeast Asia for decades. Currently, there is no cure, and citrus trees that contract the disease die in as little as five years. With symptoms that initially look very similar to nutrient deficiencies, HLB often goes undetected. By the time it is properly diagnosed, the disease has often spread to many of the surrounding trees.

### Hard-to-Detect Symptoms

For U.S. growers, HLB is threatening the heart of citrus production, including Florida, Texas and, most recently, California. Because the disease has inflicted significant damage in the Florida market with 2012 yield losses hovering around 15 percent, growers in Texas and California are on high alert.

When it comes to fighting HLB, growers face some unique challenges. For starters, HLB-infected citrus trees do not show symptoms during the first year of infection, so there is a long period of time when a grower cannot visually detect an infected tree—but the tree is still a source of bacteria that can spread to other trees via the Asian citrus psyllid (*Diaphorina citri*).

Once symptoms begin to manifest, they can resemble common nutrient deficiencies. Leaf yellowing, misshapen fruit that do not ripen, premature fruit drop and root dieback are all symptoms of HLB, which is caused by the bacterium *Candidatus Liberibacter L. asiaticus*. The bacterial infection impedes the tree’s vascular system and inhibits the movement of nutrients.



Left to right: Symptoms of citrus greening include leaf yellowing and premature fruit drop.

### A Dangerous Pair

Interestingly, these menacing bacteria need help to spread. “The bacterium can live and persist in a plant. But until it comes in contact with a vector, nothing really happens,” says Jim Graham, Ph.D., professor of soil microbiology at the University of Florida Citrus Research and Education Center in Lake Alfred. “Unfortunately, that can create a period when many people do not realize the disease is on their doorstep.” However, when a vector, such as the Asian citrus psyllid, interacts with the HLB-causing bacteria, their union can quickly cause a major epidemic in the citrus industry.

The reproductive and feeding habits of the psyllid make it the perfect carrier of the bacterium. An infected or “hot” psyllid creates a localized infection when it feeds and transmits the bacterium into a citrus tree. It does not take long for the bacterium to spread throughout the plant, but the inoculum is first concentrated in the leaves and stems where the infected psyllid feeds. Female psyllids lay eggs in the same region where they feed. If these females are infected, their nymphs, which begin feeding in the infected area of the tree when they hatch, eventually acquire the bacterium, molt to the winged adult stage and disperse taking it along with them.

Once infected, psyllids are disease carriers for the rest of their lives. They can travel miles under their own power, by air currents or as hitchhikers on harvested fruit. Controlling psyllids has become one of the primary strategies to prevent the spread of HLB.

### Managing an Incurable Problem

For now, there is no cure for HLB, and no resistant citrus varieties are available. Management is difficult, but certain strategies can slow the spread of the disease. These include planting disease-free nursery stock, removing infected trees, managing psyllids and promoting root health.

### LESSONS FROM BRAZIL

Citrus greening, or Huanglongbing (HLB), has impacted Brazilian citrus since 2004 when researchers first detected the disease in the southeastern part of the country. Marcos Pozzan, stewardship manager and citrus specialist in Brazil for Syngenta, has partnered with local experts and growers to help develop the country’s HLB management strategy. “We work with three pillars, none more important than the other: Produce healthy trees, manage the vector, and eliminate the inoculum source or the infected trees as soon as possible,” he says.

To make sure growers begin with HLB-free citrus trees, Florida has established a production model where all citrus seedlings must be produced in enclosed greenhouses. The overall U.S. citrus nursery industry is moving in that direction as well.

Identifying and removing infected trees are big challenges. In Florida, the disease was so widespread by the time it was detected, eradication was impractical. In California and Texas, researchers are pursuing more efficient ways to detect the disease in trees not yet exhibiting symptoms and are hoping early awareness of HLB will prevent the rapid advancement of the disease that Florida has faced.

### The Way Forward

Neonicotinoid insecticides are one option for psyllid management. Growers and applicators can make neonicotinoid applications to the soil and as a foliar spray to suppress psyllids. But, as Elizabeth Grafton-Cardwell, Ph.D., entomologist and director of the Lindcove Research and Extension Center for the University of California, Riverside, points out, “The real beauty of neonicotinoids is that they are anti-feedants, so psyllids don’t want to feed on trees treated with them.” This is an important factor in preventing HLB spread, because the psyllid needs to feed to pick up the bacteria.

Taylor recommends that Florida citrus growers soil-apply neonicotinoids every six weeks and in between make foliar applications of insecticides with different modes of action. Thiamethoxam, the active ingredient in Platinum® 75 SG insecticide, is a neonicotinoid with good solubility that allows for faster uptake by trees, which makes it a good choice during those times of year that are a little dry or when trees are less active.

Optimizing root health may also play a role. After initial transmission in the shoots, the HLB pathogen infects roots, where it extensively colonizes. This infection causes rapid

The U.S. citrus industry now uses much of this strategy. For example, Florida adopted Brazil’s greenhouse production infrastructure to ensure seedlings planted into citrus groves are HLB-free. Soil drenches and foliar applications of neonicotinoid insecticides play a key role in managing psyllids in both Brazil and the U.S.

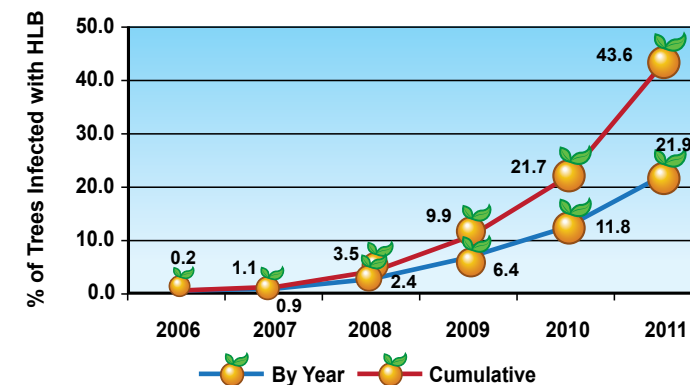
The large size of Brazilian citrus farms led to the implementation of area-wide management strategies, with some encouraging

results. Jim Graham, Ph.D., professor of soil microbiology at the University of Florida Citrus Research and Education Center, describes a success story of a 14,000-acre Brazilian citrus farm that identified and removed infected trees. The farm treated its citrus, as well as the citrus of neighboring farms within two kilometers of its borders, for psyllids. Within one year, the farm cut its HLB incidence from 10 percent per year to less than 2 percent. This example and others like it are encouraging to such areas as

California, where HLB has made only an isolated appearance—and Florida, where the disease has made a greater impact.

Still, Graham recommends caution. “Brazil has had Asian citrus psyllids since the 1940s, but it wasn’t until a few years ago the bacterium was introduced and caused an epidemic,” he says. “That shows how quickly it can happen—something worth remembering in citrus-producing areas of the U.S. not yet facing this epidemic.”

Estimated % of Trees Infected in Florida



fibrous root loss of 27 percent to 40 percent before symptoms in the canopy appear. Studies show that roots infected with *Phytophthora ssp.* may interact with the root bacterial infection to further damage roots.

To delay crop decline from this dual root disease threat, growers can implement a root health treatment program with Ridomil Gold® SL fungicide. Ridomil Gold has direct fungicidal activity against the *Phytophthora* root rot disease. Roots rapidly absorb the fungicide, which is then translocated throughout the root system, promoting root health and crop development.

One of the best weapons the citrus industry has against HLB is open communication. Growers and researchers who have experienced the disease are willing to share advice about what works and what does not.

“We’re fortunate in this industry to have so many educational opportunities and ways of getting information on HLB,” says Joby Sherrod, research & development/technical services manager for A. Duda & Sons, Inc. “My advice? Be proactive. Do everything you can to detect HLB as early as possible and remove the infected trees, if feasible, all while managing the psyllid down to the lowest population levels possible.”



## Farm Roots

Syngenta field representatives share stories of their family farms—and how those ties help them understand growers’ and retailers’ needs.

**T**o this day, John Richman remembers walking out to the barn at 5 a.m. to help his dad milk the cows one last time before they left the farm. John was 6 years old.

Ashley Bandoni’s grandfather was a fresh market tomato grower in California’s Merced County, where she and her husband now grow 350 acres of almonds.

Growing up, Larry Huffmeyer helped his father create buffer strips to protect the waterways around their farm in Ripley County, Ind.

Along with their farm roots, these three share other bonds. Their careers include holding key positions in the Syngenta field sales organization, while also making decisions on their own family farms—the types of decisions that ag retailers and growers make every day.

### Multiple Perspectives

After graduating from Virginia Tech, Richman, a district manager in the Northeast, returned to his family’s farm in Salem County, N.J. His grandfather moved to the farm in 1946, and his dad continued raising grain and dairy heifers until Richman took over in 1996.

Today, he produces 265 acres of corn and soybeans. His wife is his partner and herd manager, caring for 800 milking cows and replacement heifers. They also invest in registered Holsteins for their daughter and son. “Our objective is for them to breed from these foundation animals and market the offspring to help pay for their education,” Richman says.

Like his fellow growers, Richman carefully weighs the value proposition of crop inputs. He says this helps him relate to Syngenta customers. “I know what impact lodged corn or green stem can have on equipment and on my frustration level. I know what it’s like to be burned by Mother Nature, to be spared by her and to be blessed by her.”

Richman’s neighbors provide him added perspective. “Interacting with neighbors who see me as their neighbor, and not for the sales position I hold, allows me to further understand value propositions and buying motivations.”

Having begun his career working in the administration and sales departments of a national retail organization, Richman also understands the ag retailer’s perspective. “I’ve done the same things and have had the same conversations as many of our retailers.” The administrative experience taught him how retailers manage purchases, programs and incentives.

### Broad Knowledge

Meanwhile, across the country, 24-year-old sales representative Ashley Bandoni serves growers in California’s Stanislaus, Merced and San Joaquin counties. Almonds are the area’s top crop, followed by other tree nuts, stone fruits, grapes, corn, and fruiting and leafy vegetables.

Bandoni’s grandfather was a fresh market tomato producer. Her husband’s grandfather emigrated to the U.S. from Italy and began producing walnuts and vegetables in Merced. The farm is now in its fourth generation, with Ashley’s husband producing almonds alongside his father.

“Being married to an almond grower, I feel comfortable in my role at Syngenta where our goal is to ‘think like a grower,’” Bandoni says. “I am able to relate to growers because we share that lifestyle. I strive to be a reliable resource both as a Syngenta representative and as a grower.”

While still in college at California Polytechnic State University, Bandoni earned a Pest Control Adviser (PCA) license. She gained experience working with growers as a PCA for Agri-Valley Consulting in Merced before joining Syngenta last year.

Bandoni also has become a Certified Crop Adviser (CCA). While she is not selling fertilizer or soil amendments, her CCA background provides opportunities to discuss crop inputs and regulatory issues in greater depth with grower customers.

Bandoni confers with her husband on new plantings and pest control products and applications best suited for their almond farm. This also helps her better relate to the interests of the growers and retailers with whom she works.

### A Tradition of Stewardship

Like Richman and Bandoni, recently retired sales representative Larry Huffmeyer is a grower. He and his son are third- and fourth-generation growers, managing a 1,300-acre farm in Ripley County, Ind. And like his fellow growers, he stays on top of a wide variety of subjects, including government farm programs, regulatory issues and conservation programs, to name just a few.

Conservation has made a particularly strong impression on Huffmeyer. He is a no-till farmer and has long used cover crops for erosion control. He now also is experimenting with cover crop mixtures to sequester nutrients and break up soil compaction. He receives many calls from other growers about how to plant cover crops, the types of mixes to use and so on.

“Farmers exchange a lot of information among themselves,” Huffmeyer says. “I share their values, and being able to communicate with them also helped me more easily interact with my customers.”

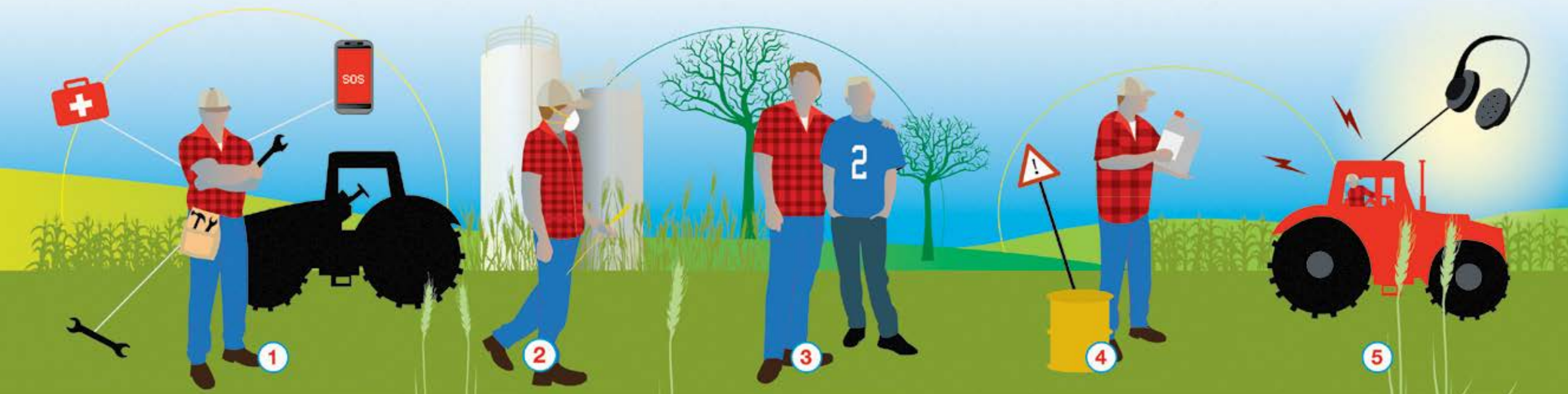
In 2012, the Indiana Association of Soil and Water Conservation Districts named Huffmeyer Conservation Farmer of the Year. In 2013, he was named Indiana Certified Crop Adviser of the Year for the service he provides fellow growers in nutrient management, soil and water management, pest management, and crop production.

Throughout his long, successful career at Syngenta, Huffmeyer says he always listened to good advice, incorporated what made sense into his own farm and shared ideas with his grower and retailer customers. Following the same game plan are Richman and Bandoni—like-minded professionals with strong farm roots. **STORY BY LYNN GROOMS**

“I know what it’s like to be burned by Mother Nature, to be spared by her and to be blessed by her.”

—JOHN RICHMAN

**PHOTOS** To see family farm photos from Richman, Bandoni and Huffmeyer, go to [www.syngentathrive.com](http://www.syngentathrive.com).



# Healthful Hints

Growers should have a take-charge approach to managing their physical and emotional well-being.

More than almost any other job, agricultural work presents inherent dangers. Growers suffer an average of 70,000 disabling injuries a year, not including respiratory illness and hearing loss.

Given the many challenges of their work environment, growers deserve credit for all they do to stay well and safe, says Judy Garrett, Syngenta health services manager. “Farmers do a really good job of taking care of their health,” she notes. However, there’s always more that can be done; and taking the extra time to be safe is always a worthwhile investment, especially in relation to these five common health-related challenges in agriculture:

**1. Traumatic injury.** Injuries from tractors and other equipment are quite common. One in every 10 growers has an amputation, says Deborah Reed, distinguished service professor at the University of Kentucky College of Nursing. Fatigue and stress are contributing factors to those numbers. “Our brains are wired to do one thing at a time,” Reed says. Fatigue and stress distract us from the task at hand. And more than half of growers also have an off-farm job, making fatigue and stress even more likely.

Growers need to be sure all equipment is operating and serviced properly. “Form good safety habits around issues, such as working alone,” Garrett says. “You should always have a first-aid kit and a cellphone handy. Make sure you can call for help.”

It’s also important for growers to understand how their machinery works. “Learn where the dangers lie with each machine,” says

Susanna Von Essen, M.D., professor of internal medicine at the University of Nebraska Medical Center. “Learn the safe way to use it, and do it that way every time.”

**2. Respiratory illness.** Rates of farmer’s lung, a disease caused by breathing in moldy hay or crop dust, have fallen as farming has become more mechanized. But organic dust toxic syndrome remains an issue, Von Essen says. It causes flu-like symptoms several hours after working in a grain bin. “People who have had this are more likely to report future problems when exposed to dust of any kind,” Von Essen says. “It changes the lungs somehow.”

When working around grain, growers need to always remember to wear an N95 respirator with two straps as a precaution.

**3. Mental health issues.** Being constantly subjected to many factors outside their control may create an exceptionally stressful work environment for growers. And there’s still a stigma attached to getting mental health help, Von Essen says. “Farmers are used to solving their own problems. They may just think they’ll work through it.”

The result: high rates of suicide and mental health issues, Reed says. “The older you get, the worse it becomes. Growers tend to age in place, and they equate health with the ability to work. When you’re surrounded by work you can no longer do, it becomes overwhelmingly depressive.”

Aging farmers should put a succession plan in place and start bringing in a younger farmer, Reed says. “By the time you can’t work, you can sit back and watch them work and take care of the farm.”

Self-care is crucial too, at any age. Take time to relax and find an outlet for stress, Von Essen says. “Aerobic exercise is important. Go for a walk, and get enough sleep.”

**4. Chemical exposure.** Anhydrous ammonia probably causes the most problems for farmers, Von Essen says. “It can blind you and can cause an asthma-like response when inhaled.”

When using farm chemicals, growers need to remember to wear appropriate equipment and know what to do if exposure occurs. Keep chemicals in their original containers, and post poison control numbers, Reed says. “Have people you can call. In rural areas, rescue squads can take a long time,” she says. “Also, post directions to the farm.”

Reading the product label is also critical. “The most important thing for growers to do is read and understand chemical labels,” says Syngenta Health, Safety, Environmental & Safety Security Manager Scott Moore. “The label is law and provides a wealth of ways to protect against exposures.”

**5. Hearing loss.** Half of growers over age 50 have hearing loss. “Hearing loss is still an issue,” Garrett says. “People may think, ‘I’m only running the combine for a short time.’ But it’s all cumulative.” Once hearing is gone, it is usually gone for good. You always want to protect what you still have.

As a rule of thumb, if growers need to raise their voices over whatever they’re doing, they need hearing protection while doing it.

And one more practice that’s always essential to good health, Garrett adds: Getting regular physical exams. “This would go for any profession. You may look and feel great, but many serious health threats—including many cancers, high blood pressure and heart disease—have no warning signs.” ■ STORY BY SUZANNE BOPP

**FOR MORE INFORMATION** on health and agriculture, visit these websites:

- > AgrAbility, [www.agrabilityproject.org](http://www.agrabilityproject.org)
- > Agricultural Health Study, [www.aghealth.org](http://www.aghealth.org)
- > AgriSafe Network, [www.agrisafe.org](http://www.agrisafe.org)
- > AgriWellness, [www.agriwellness.org](http://www.agriwellness.org)
- > County Cooperative Extension offices, [www.csrees.usda.gov](http://www.csrees.usda.gov)
- > Southeast Center for Agricultural Health and Injury Prevention, [www.mc.uky.edu/scahip/index.html](http://www.mc.uky.edu/scahip/index.html)

ILLUSTRATION: LEON MUSSCHE

## CULTIVATING TOMORROW'S LEADERS



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# Ripple Effect

Awards and scholarships highlight the important roles of ag professionals; FFA Ag Ambassadors educate the public about food production.

## AWARDS AND SCHOLARSHIPS

### > Chilton Honored With World Food Prize

Syngenta Biotechnology founder and Distinguished Science Fellow Mary-Dell Chilton, Ph.D., was one of three scientists to receive the 2013 World Food Prize in Des Moines, Iowa, during the World Food Prize Laureate Award Ceremony. The ceremony drew more than 800 international guests, celebrating the foremost international award recognizing an individual who has enhanced human development by improving the quality, quantity or availability of food in the world.

Chilton's work has led to the development of a number of genetically enhanced crops, which farmers around the globe grow on more than 420 million acres.

"For centuries, those in agriculture have worked to do by choice what nature could only do by chance," she says. "With biotechnology, we are working with nature on a higher level to more precisely determine the outcome of crops. Through ongoing research, we can continually improve their quality and productivity and do this in a way that will allow future generations to provide for their needs as well."



Healthy corn fields make for a picturesque view in Iowa.

# 420M

Number of acres growers cultivate globally using biotechnology

### >>> Farm Manager Recognized

Ken Schmitt of Farmers National Company in Jefferson, Iowa, is the recipient of the 2013 Professional Farm Manager of the Year Award. He received this recognition at the American Society of Farm Managers and Rural Appraisers 84th Annual Convention and Trade Show, held Nov. 11–15 in Reno, Nev. To honor Schmitt, Syngenta made a \$1,000 donation in his name to the Greene County, Iowa, 4-H Foundation.



KEN SCHMITT

### >>> Scholarship Awarded

Syngenta is pleased to announce that Katie McKenna, a freshman at Ohio's Cedarville University, is the 2013 recipient of the \$5,000 Syngenta Potato Scholarship. McKenna, a native of Mapleton, Maine, is a biology major and member of 4-H. "I hope to use my degree to help others through missionary and humanitarian projects involving medicine and agriculture," she says. "The impact of the scholarship reaches far beyond me, and I am thankful for the support of Syngenta." For more information on the new national Syngenta Agricultural Scholarship, go to [www.syngenta-us.com/scholarships](http://www.syngenta-us.com/scholarships).



KATIE MCKENNA

# thrive

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### Cautionary Statement Regarding Forward-Looking Statements

This document contains forward-looking statements, which can be identified by terminology such as 'expect,' 'would,' 'will,' 'potential,' 'plans,' 'prospects,' 'estimated,' 'aiming,' 'on track' and similar expressions. Such statements may be subject to risks and uncertainties that could cause the actual results to differ materially from these statements. We refer you to the publicly available filings of Syngenta with the U.S. Securities and Exchange Commission for information about these and other risks and uncertainties. Syngenta assumes no obligation to update forward-looking statements to reflect actual results, changed assumptions or other factors. This document does not constitute, or form part of, any offer or invitation to sell or issue, or any solicitation of any offer, to purchase or subscribe for any ordinary shares in Syngenta AG, or Syngenta ADSs, nor shall it form the basis of, or be relied on in connection with, any contract therefore.

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Platinum and Platinum 75SG are highly toxic to bees exposed to direct treatment on blooming crops and weeds. Do not apply these products or allow them to drift onto blooming plants while bees are foraging adjacent to the treatment area.

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# » Raising Voices

FFA program fine-tunes young leaders' ability to advocate for agriculture.

As the pressure on natural resources increases from feeding, fueling and clothing a growing global population, agriculture needs a stronger chorus of voices to tell its story effectively. To help meet this challenge, the National FFA Organization (FFA) has developed the National Collegiate Agriculture Ambassadors program, which trains, empowers and supports the industry's most promising young leaders.

"The FFA Ag Ambassador program helps educate a broad audience on food production," says J.R. Peterson, district manager at Syngenta, an annual program sponsor. "It is critical that our best and brightest young people can effectively communicate the importance of agriculture in public settings."

Each year, 20 college students from across the country are selected to participate in the program. These Ag Ambassadors serve for one year, speaking at local schools, colleges, FFA chapters, civic organizations and Farm Bureau groups about the importance of sustainable

**"The FFA Ag Ambassador program helps educate a broad audience on food production. It is critical that our best and brightest young people can effectively communicate the importance of agriculture in public settings."**

—J.R. PETERSON

agriculture in their communities. In return, they receive a \$1,000 scholarship, a digital camera, the use of an LCD projector and compensation for travel.

For Samantha Paschal, a junior agricultural education major at Purdue University, her experiences as a 2012/2013 Ag Ambassador gave her much more than that. One of her presentations at Mintonye Elementary School in Lafayette, Ind., inspired a new program called "From Farm to You."

"For a third-grade class presentation, I used maps of the United States and color-coded the states that were top

producers of pizza ingredients: wheat for flour, tomatoes for sauce, dairy farms for cheese, hogs for pepperonis and so forth," she says. "We then made pizzas, and the kids loved it!"

Later in the year, the teacher, Barbara Tilley, developed a new program on how food gets from the farm to the table and invited Paschal back to the school to reprise her pizza presentation to the entire second and third grades.

The school has since expanded "From Farm to You" to include a farmers market day where students taste healthy, farm-grown foods and learn about how and where they are grown. VIP guest speakers, including Indiana Governor Mike Pence, recently participated in the event.

"I find it amazing how one presentation to one third-grade class led to a schoolwide curriculum that teaches students about agriculture's importance in their daily lives," Paschal says.

The 2013/2014 Ag Ambassador team is already hard at work helping to promote the industry. Sam Tauchen, a senior at the University of Wisconsin–River Falls, says, "When I share my story of agriculture, I realize what I am doing is bigger than myself. The program has been a blessing, and I am honored to join a group of people who are committed to improving the future of agriculture."

College sophomores, juniors, seniors or graduate students pursuing agricultural degrees can apply for the program. All ambassadors must be former FFA members, current collegiate FFA members or members of the National FFA Alumni Association. Applications are available each spring, with winners notified in June. Applicants must submit a video of themselves presenting information on agriculture's economic importance, environmental stewardship, sound science and sustainability. They also must answer essay questions and provide references.

"Our goal is to grow these students personally and professionally through their experience as ambassadors," says Jenna Genson, an FFA education specialist. "Throughout their year of service, students are learning more about agriculture, building a strong network of peer and professional contacts in the industry, and telling the inspirational story of agriculture." ■ STORY BY ALEX MOSS



Back row, left to right: Joshua Lanham, Samantha Paschal, Barbara Tilley. Front row, left to right: Lexani Ozuna, Leah Criswell

**FOR MORE INFORMATION** go to [www.ffa.org/Programs/Outreach/AgAmbassadors](http://www.ffa.org/Programs/Outreach/AgAmbassadors).





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