

HLB Concerns & Research

— by Michelle Samuel-Foo, IR-4
Southern Region Field Coordinator

The very mention of the letters “HLB” evokes grave concern among citrus growers everywhere. HLB also known as Huanglongbing, or Citrus greening is a disease that is posing a very serious problem for the Florida citrus industry. It is a grave threat to the state’s signature specialty crop.

There are three types of HLB—Asian, African and American with causal bacteria tentatively named *Candidatus Liberibacter asiaticus*, *Ca. L. africanus* and *Ca. L. americanus*. The type that is affecting Florida citrus HLB is caused by a highly fastidious phloem-inhabiting bacteria (*Candidatus Liberibacter asiaticus*) that is vectored by the Asian citrus psyllid (*Diaphorina citri Kuwayama*) a small winged insect pest, that was first discovered in backyard citrus in South Florida in 2005. Within just a few years, the disease had spread to every major citrus producing county in the state.



Photo courtesy of www.ars.usda.gov

Once a tree is infected, vein yellowing on leaves and an asymmetrical chlorosis referred to as “blotchy mottle” becomes evident. The discoloration usually occurs on a few branches initially, before spreading throughout the tree and roots. Trees will have reduced yields, and misshapen and discolored fruit will be evident. Infected fruit retains a green color at the navel end when mature, hence the name “citrus greening disease”. The fruit that are infected produce juice that is very bitter, a cause for severe concern that greatly affects the juice industry.

Infected trees are then highly susceptible to other “secondary” pathogens such as *Phytophthora* root rot. The disease eventually kills affected trees. IR-4 is currently completing residue studies that can aid in the control of these secondary pathogens including fluopicolide and mandipropamid.

HLB is currently the most devastating citrus disease worldwide. HLB was first detected in Florida in 2005 and has since affected all of Florida’s citrus-producing areas, leading to a 75 percent decline in Florida’s \$10 billion citrus industry.

Pest and disease threats to citrus

are not new. In fact the industry has contended with a variety of challenges over the years, but none appear to have posed the threat that citrus greening now presents. A recent NPR story reported Florida’s Agriculture Secretary, Adam Putnam, saying that the future of the state’s citrus industry hangs in the balance. He is quoted saying, “We are at a tipping point, and some would say we’ve blown past the tipping point.”

Researchers at the University of Florida’s Institute of Food and Agricultural Sciences (IFAS) have been working diligently towards being able to manage this critical

continued on page 10



Inside this issue...

3 SOAR Awardees

4 Dan Rossi Inducted into
NIFA Hall of Fame

5 Plant Back Studies

6 Concerns about Cacao

8 Spotlight on Ornamental
Horticulture: Roses

11 EPA Approves
Biopesticide: Bmj

Dear Friends,

Welcome to 2017...fasten your seat belts! As I am writing this, we are at the end of the Obama Administration and the transfer of power to the Trump Administration. There are many unknowns and uncertainties as to where our government is going.

To begin, in late 2016 Congress passed a Continuing Resolution that funds the federal government until April 28, 2017. Based on past practices, Congress will likely extend the Continuing Resolution until September 30, 2017 and focus their efforts on the fiscal year 2018 appropriations. However, Congress has agreed to use the appropriation process as a vehicle to revoke the Affordable Care Act (Obamacare). We are not certain what impact these changes to universal health care coverage will have on completion of the appropriation bills.

Another major question is how will the new Congress and Administration support agriculture/agricultural research? It is easy to assume that some funding priorities will change. Under ideal circumstances, a program that provides significant and documented benefits to farmers, food systems and consumers, as well as proves significant return on investment, would be supported. Now, more than ever, it is important that all IR-4 stakeholders share the message of the importance of the IR-4 Project and its work that contributes to profitable specialty crop industries, food security and agriculture infrastructure.

The other key question is what will happen to Environmental Protection Agency? Most expect significant changes at the Agency under the new leadership. IR-4 works in collaboration with and needs EPA's Office of Pesticide Programs (OPP) to review IR-4 data submissions and approve appropriate new uses. Deep budget cuts will affect OPP's ability to register new pest management technology needed for conventional and organic agriculture. Specialty crops will be affected the greatest. Registrants pay submission review fees for their major crop submissions that buffer the loss of government funds. Congressional appropriated funds cover 100% of OPP's review cost of IR-4's specialty crop submissions.

Despite these challenges, IR-4 has some good news! In 2016, IR-4 delivered many new and highly sought after registrations to stakeholders. IR-4 data supported 1000 new registrations on food crops and 1 new product registration supporting 532 ornamental horticulture crops! This success ranked 2016 as one of the most productive years in IR-4 history.

Every three years, IR-4 holds a National Education Conference to provide valuable training to those performing the day-to-day activities as part of IR-4 research. This year, we are meeting during late February in Orlando, Florida. At this conference, researchers in the field, lab and coordination offices will have an opportunity to share experiences and learn from each other on different techniques, procedures and applications. I am excited to meet the many new members of IR-4's research family as well as catch up with others.

Finally, the end of the year was also the end of an era as Dr. Paul Schwartz retired from the federal government after 56 years! Paul has been working for USDA-Agriculture Research Service for the past 40 years overseeing their research under the IR-4 umbrella. He has contributed so many different facets, as coordinator of USDA-ARS/IR-4 field site and analytical laboratories, as well as Chair of the IR-4 Project Management Committee. Personally, I thank Paul for being a mentor and a friend. Please join me in thanking Dr. Schwartz for his commitment to specialty crop agriculture and wish him the best in his well-earned retirement. Also, please join me in welcoming Dr. Alvin Simmons who will be filling in for Paul until USDA-ARS can hire a permanent replacement.

All for now, all the best,

Jerry



2016 SOAR Award

Recipients

IR-4 is proud to announce the 2016 SOAR Award winners. The SOAR award is given to those who excel in serving growers of Specialty and Minor Use Crops. The awardees will have demonstrated clear Service toward enhancing the mission of IR-4 through participation on committees, advisory panels, or similar activities; excellent Outreach to growers, educating them on IR-4; Altruism by donating time and effort towards IR-4's mission; and outstanding Research which contributes to expanded product labels and increased understanding of product use. In other words, awardees SOAR in supporting IR-4 and our mission to provide growers registrations of new and expanded pest management tools. This year's awardees are: Brian Flood, David Monks and Andrew Senesac.

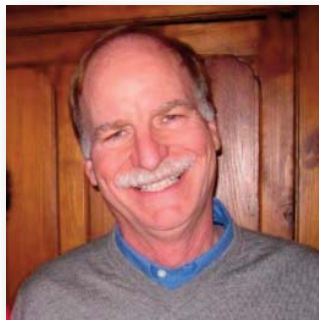


David Monks was described as having conducted extensive research and is among the most active State Liaison Representatives in the entire IR-4 system. He has conducted over 540 residue trials encompassing nearly 90 different commodities. He is one of the most outspoken researchers with regard to identifying and supporting needed pest control tools that will help growers and ultimately consumers.



A nominator of Andrew Senesac stated, "he has been instrumental in developing data for registrations and label expansions for nearly every herbicide for use in nurseries or landscapes." He was also described as THE expert on weed management in herbaceous ornamentals.

Congratulations to all the awardees!



One nominator described Brian Flood as a valuable member of numerous vegetable crop and IPM committees

and panels, over his decades of service. With particular reference to the mission of IR-4, this nominator concluded that "Brian has worked hard to help growers implement advanced agricultural practices to reduce the amount of water, fertilizer and pesticides needed to grow healthy and productive crops." Brian served on the IR-4 Commodity Liaison Committee for many years and was a significant supporter of the IR-4 Project and its mission.

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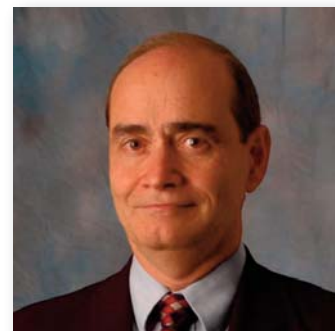
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Daniel Rossi, former NJAES Associate Director (Ag. Economics '71; '73), Inducted to NIFA Hall of Fame

Daniel Rossi, former executive director of the Northeastern Regional Association of State Agricultural Experiment Station Directors (NERA), and former IR-4 Project Administrative Advisor, has been inducted to the U.S. Department of Agriculture's National Institute of Food and Agriculture (NIFA) Hall of Fame, which was established in 2011 "to recognize individuals whose exceptional contributions to NIFA's mission at the local, regional, national, or international level have made a positive impact on the lives of citizens."

Rossi retired this year after serving more than nine years with NERA, the formal coalition of Directors of fifteen state agricultural experiment stations in the northeast US, and more than 37 years in the land-grant system. When Rossi assumed leadership at NERA in January 2007, he was the associate director of special projects at NJAES. He earned his bachelor's and master's from Rutgers in the field of agricultural economics in 1971 and 1973, respectively, and completed a doctoral program in agricultural economics at Pennsylvania State University.



Dan is currently serving as IR-4 NE Regional Director.

Congratulations Dan! 🌿

Read more in the USDA NIFA Announcement <http://bit.ly/DRossi>

Welcome Yu-Han Lan

IR-4 HQ is proud to announce the full time appointment of Yu-Han Lan. Yu-Han has been working with Karl Malamud-Roam as a part-time research assistant while completing her graduate degree at Rutgers University. With her studies completed, Yu-Han has been hired to the full-time position of Assistant Research Scientist working half-time for the Public Health Pesticides Program and half-time for the Ornamental Horticulture Program.

Her duties with the Public Health Pesticide program will include assisting with the collection, analysis, archiving, and presentation of data regarding pesticides used for vector control, with emphasis on efficacy, use pattern, and regulatory status of active

ingredients and formulated products. This will also include assisting with preparation and archiving documents for submittal to EPA and other regulatory agencies.

Her main focus in the Ornamental Horticulture program will be supporting pollinator research. She will be collaborating with pollinator team members to develop specifications and implement an online searchable website that identifies plants that attract pollinators. She will also be assisting with pollinator project management to keep research and outreach objectives on track, and writing annual reports.

Yu-Han's research experience includes working as a graduate student in the Rutgers Department



of Entomology and the Center for Vector Biology, studying nematodes as biological agents against mosquitoes.

Her areas of expertise include:

- Bioassay techniques,
- Maintaining pest cultures,
- Crop protection,
- Parasitic nematodes,
- Entomology,
- Microbial pesticides,
- Insect Vector Disease Control, and
- Biological control.

Welcome Yu-Han! 🌿

Plant-back Studies – Another Avenue for IR-4 to Address Specialty Crop Growers' Needs

— by Stephen Flanagan,
IR-4 Western Region Assistant
Research Field Coordinator



Top, Cilantro Rotation, Top, Bok Choy, Left, wide bed Cilantro, Right Spinach

Western growers approached IR-4 to remove the 12 month plant-back restrictions for the herbicide CAPAROL® (containing the active ingredient prometryn) which is registered for pre-emergent use on cilantro. Registrations to remove plant-back restrictions are critical for southern tier and western growers who plant multiple crops per season. A plant-back restriction on an herbicide label limits how quickly a rotational crop can be planted following the herbicide use on a labeled crop. The current Caparol registration is generally useful to vegetable growers to control weeds in cilantro, but as a 60-90 day crop, a grower wants to plant any number of other vegetable crops shortly after cilantro harvest. Cilantro is mature in about 50 days and is harvested once or multiple

times. Then the field is quickly plowed and prepared for the next crop.

The following crop after cilantro at Ratto Brothers in Modesto, California might be bok choy, spinach, rutabaga, parsley or any number of specialty vegetable crops. Caparol is safe and effective for weed control on cilantro, but the label restrictions state that rotational crops may not be planted back sooner than 5 months (cabbage and carrots), or 8 months (onions and red beets), or 12 months for crops like spinach, peppers and brussel sprouts. If you are a grower of a diverse set of vegetable crops, these restrictions limit the usefulness of Caparol on cilantro. The herbicide is registered and safe on the crop you want to grow, but the restrictions for the

following crop make the product unusable for your current crop.

This practical conundrum became the basis for four IR-4 residue projects and one IR-4 efficacy project in 2017. The efficacy project being conducted by Steve Fennimore with UC Davis will be looking at crop safety to spinach, Chinese cabbage, broccoli and peppers following a Caparol application to cilantro. These are four of the most important rotational crops following Cilantro that were selected in consultation with Hank Giclas at the Western Growers Association. Steve Fennimore will apply Caparol and then plant the rotational crops at 60, 90, & 120 days after the herbicide application. The rotational crops are then evaluated for any phytotoxicity (plant damage) that has occurred from the previously applied herbicide. This efficacy data will provide confidence that the rotational crops can be labeled for the shorter plant-back interval.

Along with demonstrating that the rotational crops can be safely grown following a Caparol application to cilantro, tolerance data (the level of prometryn found in or on these rotational crops) will be established through crop residue studies. For the 2017 field season, IR-4 will

continued on page 8

What's your favorite part of any holiday celebration? The chocolate, of course! That creamy, rich, sweet, melt-in-your-mouth taste is like no other. In fact, on Valentine's Day, the US spends approximately \$1.7 billion on chocolate. While you may think that cacao trees thrive only in "faraway lands," there are actually plantings in the US and US territories including Hawaii (more than 40 farms; ~100 acres), Puerto Rico (~5 bean-to-bar chocolate operations and trees throughout this land.) and American Samoa (~2,000 plants). In fact, trees were introduced onto these islands hundreds of years ago. Currently, the US cocoa industry is a niche domestic market, for specialty

products but production continues to expand each year.

Cacao (*Theobroma cacao* L.) is a tropical plant that thrives in areas close to the equator with average temperatures of greater than 65°F, 80 inches of rain per year, high humidity and shade. When

properly managed, trees can be productive for 100 years. While it may take you only a few seconds to devour a chocolate confection, the processing of cacao beans to cocoa commodities (cocoa butter, milk chocolate, sweet chocolate, cocoa powder) is a long process that involves cleaning, fermentation, roasting, winnowing, grinding, pressing, mixing and refining, among other steps.

Unfortunately, several pests are endangering this legendary treat. The top threats to cacao farms throughout the world include the Chinese rose beetle (*Adoretus sinicus*), which feeds on the tissue between leaf veins, creating a lace-like appearance on leaves; mirid pests (*Sahlbergella singularis* and *Distantiella theobroma*), which feed on cocoa pods and shoots, inducing tissue necrosis; cocoa pod borer (*Conopomorpha cramerella*), which as larvae feed inside cocoa pods, causing undersized seeds and poor-quality cocoa beans; various species of weeds; and diseases including vascular streak dieback (*Oncobasidium theobromae*), which kills trees in a short period of time, and black pod rot caused by various species of *Phytophthora* including *P. palmivora*, *P. megakarya*, and *P. capsici*. These pests and others can result in global losses of up to 40% of the cocoa supply.

Currently, the greatest pathogen of concern in the US is black pod rot. *P. palmivora* is causing the most loss, accounting for 10% of annual tree deaths. Symptoms start as small, hard, dark spots on the pod and eventually lead to rotting and necrosis. Internal tissues of infected pods and cacao beans eventually become colonized with the pathogen and shrivel to form a mummified pod. This infected pod can produce more than 4 million sporangia that can easily be spread by rain, insects, rodents, and contaminated pruning equipment. Unfortunately, pods can be attacked by this pathogen at any stage of development. The soil borne phase

Concerns a

— by Kathryn Homa, IR-

of the disease causes root infection. Inoculum remains in the soil for approximately one year. Because of this disease, growers continue to experience increasing difficulties with managing cocoa production. Approximately 20-30% of the world's cocoa crop is lost to black pod rot each year. In some areas, including American Samoa, a cocoa crop cannot be grown economically due to the destructive nature of this disease.

Some efforts have been made to control this pathogen including quarantine facilities in some regions, breeding for resistant varieties and injection of the trunk with inorganic salt and potassium phosphonate. Cultural practices include optimizing shade and aeration by increasing plant spacing, pruning to reduce surface wetness, maintaining soil health, promoting sanitation by disposing of infected plant material and frequent and complete harvesting. However, in many large cocoa-producing regions such as West Africa, cultural practices have become useless in controlling this pathogen.

In December 2015, the National



Severely infected cacao pod covered with sporangia of *Phytophthora palmivora*.



A cacao pod containing a bean mass.



Photo courtesy of www.ars.usda.gov

About Cacao

IR-4 Fungicide Coordinator

Confectioners Association, which is a trade organization representing the US chocolate, cocoa, candy and gum industry, met with IR-4 and the Environmental Protection Agency (EPA) in order to obtain assistance with securing tolerances and registered uses for two fungicide compounds - mefenoxam and oxathiapiprolin - to aid with control of black pod rot. IR-4 Project Clearance Requests were received from Puerto Rico and Hawaii for the use of oxathiapiprolin on cacao (PR 11883) and from Hawaii for the use of mefenoxam on cacao (PR 11884).

Mefenoxam, a systemic fungicide in FRAC Group 4, controls diseases caused by oomycete pathogens including Black Pod Rot.

Mefenoxam (also known as metalaxyl-M) is the active isomer in metalaxyl. It is the main active ingredient registered for use in cacao in major cocoa producing regions including Côte d'Ivoire and is used in combination with copper to prevent estimated losses of 40-90%. There is an existing Codex MRL of 0.2 mg/Kg (ppm) for metalaxyl on cacao beans. Using the residue data developed from field trials conducted in Côte d'Ivoire by Syngenta, IR-4 developed an EPA ChemSAC proposal in July 2016 to establish a mefenoxam tolerance of 0.20 ppm on cacao, bean, bean and establish the use pattern on the Ridomil Gold SL label in the US. This ChemSAC proposal was approved by EPA.



Cacao pod with black pod rot caused by *Phytophthora palmivora*.

In order to circumvent resistance of this pathogen to mefenoxam, the registration of an additional active ingredient with fungicidal activity on *Phytophthora* spp. that would promote rotation with applications of mefenoxam was needed. Therefore, IR-4 submitted a ChemSAC proposal in April 2016 to allow oxathiapiprolin residue data from US citrus trials to be used to establish a pesticide tolerance and labeled use pattern on the Orondis® and Orondis® OD labels for use on cacao in the United States to control black pod rot. Oxathiapiprolin, which is the only active ingredient in FRAC group U15, provides control of oomycete pathogens including *Phytophthora* spp. Its unique mode of action also aids in resistance management because it is not cross-resistant to any other fungicides, and provides an important Integrated Pest Management (IPM) fit for growers. This Reduced Risk product is effective at very low active ingredient use rates. It has systemic, translaminar, preventative fungicidal activity and residual

disease control. This ChemSAC proposal was approved and an EPA submission of these uses was made August 2016 with proposed tolerances of 0.1 ppm for cacao bean, bean and 0.15 ppm for the processed commodities cacao bean, roasted bean, cacao bean, cocoa powder and cacao bean, chocolate.

Before the uses on cacao are labeled in the US, IR-4 will conduct efficacy and crop safety research on both fungicides.

The US registration of mefenoxam as Ridomil Gold® SL and oxathiapiprolin as Orondis® and Orondis® OD will aid in addressing this serious threat to the emerging US cacao industry. The National Confectioners Association plans to continue to work with the IR-4 Project to develop additional registrations for controlling a number of pests that threaten US cocoa in order to support a sustainable US cocoa supply, while encouraging global harmonization. 🌱

Cacao pictures source: www.ctahr.hawaii.edu/oc/freepubs/pdf/PD-108.pdf



Branches killed by cankers. Dead leaves often remain attached after death of the branch.



Pod heavily infected

A Rose by any Other Name

– by Cristi Palmer, IR-4 Ornamental Horticulture Manager

A dozen long-stemmed roses is the modern tradition for giving a gift on Valentine's Day to one's sweetheart. This practice of giving flowers as presents may have arisen in the early 18th century when King Charles II of Sweden visited Persia and returned home with a new art: the language of flowers otherwise known as florigraphy. It became highly fashionable to send messages to one another by sending flowers. As this practice gained in popularity, Charlotte de la Tour from Paris codified the language in the first flower dictionary "Le Langage des Fleurs" published in 1818, which further increased the practice and spawned additional reference books on the topic. The nobility and developing middle

class equated knowing and using florigraphy with other valued traits of gentry such as good manners and being well groomed. Sending flowers wasn't just for romance. The language of flowers had depth and breadth and conveyed many emotions and meanings. For example, sending fennel meant the receiver was worthy of all praise. Some flowers had multiple meanings such as yellow roses which could signify both friendship and betrayal. Red roses meant passion and romantic love. With Valentine's Day celebrating romantic love with exchanging gifts and notes of affection with one's sweetheart, sending flowers became an elegant and nuanced way to convey ones feelings from



Photo by Cristi Palmer

friendship to disdain to passion. While much of the language of flowers has faded away, we still give flowers on major events – including sending red roses to one's valentine on Feb 14.

Whether as flowers in bouquets or bushes in landscapes, roses fill major niches in our urban plant world. According to the 2014 USDA NASS Census of Horticulture, the wholesale value of all roses grown in the US was \$262 million. More than 75% of these were shrub roses for landscaping around homes, businesses and public areas.

During production and in the landscape, roses are prone to numerous diseases, and pests. Some of the diseases include powdery mildew, downy mildew, black spot, and gray mold (*Botrytis*). Thrips, scale, mealybugs, mites, eriophyid mites and Japanese beetle larvae and adults feed on roses, causing damage and possibly defoliation. Some pests vector diseases. For example, eriophyid mites move rose rosette virus from infected plants to healthy ones nearby. This disease started in the Rocky Mountains in the beginning of the 20th century and has progressed across the US so that it is impacting naturalized multiflora rose (an invasive weed!) and landscape roses in eastern states today.

continued on next page

Plant Back Studies continued from page 5

specifically run residue trials on spinach, cabbage, broccoli and peppers. The IR-4 residue trials will be submitted to EPA in order to establish indirect or inadvertent residue tolerances for prometryn when planted following a labeled crop. The concept of an inadvertent tolerance covers this particular situation where the following crop may have residues from a compound that was not directly applied to that crop.

Carefully coordinated work between growers, extension weed specialists, and IR-4 will provide the technical support and data for a modification of the Caparol label. These modifications will address

shortening the plant-back interval for the rotational crops following cilantro. To that effect the residue trials are designed around 60-day and 90-day plant-back intervals to identify the shortest possible interval. Conducting IR-4 studies for a grower's plant-back needs may seem a little out of the ordinary, but these studies fill an important niche to improve a product's use in the field. The Caparol cilantro plant-back project is another twist on IR-4's multifaceted work to support the needs of US specialty crop growers and food production. 🌱

Mandestrobin (Fungicide –Valent USA Corporation/Sumitomo Chemical)

This is for informational purposes only as IR-4 does not endorse a particular product or registrant.

Rose research has been part of IR-4’s research since the inception of the Ornamental Horticulture Program in 1977. We have screened 56 products for crop safety, four for PGR affects, and 93 for efficacy against diseases, pests, and weeds. This has led to registration or label amendments for more than 50 products. A recent example of success is the development of data for gray mold caused by *Botrytis cinerea*. In California, Dr. Cai-Zhong Jiang studied the impact of several fungicides on the development of gray mold on ‘Karina’ miniature rose. Relying on natural infections, Orkestra (BAS 703) demonstrated superior disease development prevention (Table 1). This efficacy report became part of a larger data set to support registration of Orkestra to manage *Botrytis* on ornamental horticulture crops.

IR-4 will continue to aid rose producers to grow the best possible flowers, so you will be able to continue to enjoy giving or receiving beautiful long stem roses on Valentine’s Day, pots of miniature roses for Mother’s Day, and landscape rose bushes in your yard. 🌿

Introduction: Unconditional registration for the new active ingredient mandestrobin was granted by the EPA in October 2016 for various food crop uses. Registration of mandestrobin provides growers with a new strobilurin fungicide for use in controlling various diseases, such as gray mold (*Botrytis cinerea*), powdery mildew and those caused by *Sclerotinia* spp. It has been shown to be highly effective against *Botrytis* and *Sclerotinia*, and provides preventative and residual disease control. Mandestrobin is classified by the Fungicide Resistance Action Committee (FRAC) as a Group 11 fungicide (QoI inhibitor).

Other global registrations: Registrations have been granted to Valent/Sumitomo in Canada (for use in canola/other oilseeds, corn, grape, legume vegetables, strawberry/other low-growing berries and turfgrass); in Australia (for blossom blight and brown rot control in stone fruit); and in the EU (for *Sclerotinia* rot in winter oilseed [canola]).

US trade name/formulation/labeled crops: Intuity (a 4.0 lb ai/gal SC) - for uses on Berry, low-growing, subgroup I3-07G, except cranberry; and fruit, small vine-climbing, except fuzzy kiwifruit, subgroup I3-07F (see label for specific crops, use patterns and other general directions for use)

Intuity labeled pest spectrum: gray mold (*Botrytis cinerea*), powdery mildew, *Sclerotinia* spp.

Active IR-4 Food Use project: lettuce, head/leaf (I1027 – residue study in 2017)

IR-4 Ornamental Horticulture research – mandestrobin (S200 45C) is being screened for efficacy against leaf spots and *Botrytis* species and for crop safety on 16 ornamental horticulture plants

Turfgrass label (brand name is Pinpoint) - is very effective against dollar spot (*Sclerotinia homeocarpa*); also is labeled for control of brown patch (*Rhizoctonia solani*), Fairy ring (various Basidiomycete fungi), rusts (*Puccinia* spp.), and take-all patch (*Gaeumannomyces graminis*)

Table 1. Impact of weekly or biweekly fungicide sprays on the development of botrytis on rose flowers (Jiang, 2013).

Product, Rate per 100 gal	Active Ingredient	Application Pattern	Day 0	Day 7	Day 14	Day 21
Control	--	--	0.0 (± 0)	0.0 (± 0)	4.1 (± 0.5)	7.5 (± 1.0)
Disarm, 8 oz	Fluoxastrobin	Biweekly	0.0 (± 0)	0.0 (± 0)	4.6 (± 0.9)	8.1 (± 1.0)
F9110, 32 oz	F9110	Weekly	0.0 (± 0)	0.0 (± 0)	2.4 (± 1.5)	6.8 (± 1.4)
Medallion, 8 oz	Fludioxonil	Biweekly	0.0 (± 0)	0.0 (± 0)	5.3 (± 1.7)	8.7 (± 0.4)
Orkestra, 4 oz	Fluxapyroxad and pyraclostrobin	Weekly	0.0 (± 0)	0.0 (± 0)	*1.6 (± 1.0)	*4.6 (± 1.7)
Orkestra, 8 oz	Fluxapyroxad and pyraclostrobin	Weekly	0.0 (± 0)	0.0 (± 0)	*0.9 (± 0.4)	*3.7 (± 1.4)
Palladium, 6 oz	Cyprodinil	Weekly	0.0 (± 0)	0.0 (± 0)	4.2 (± 2.3)	*9.3 (± 0.9)
Proud 3, 4 qts	Thyme oil (5.6%)	Weekly	0.0 (± 0)	0.0 (± 0)	3.9 (± 1.0)	8.4 (± 0.6)
Regalia, 4 oz	Extract of <i>Reynoutria sachalinensis</i>	Weekly	0.0 (± 0)	0.0 (± 0)	5.9 (± 2.4)	7.9 (± 2.2)
SP2770, 2.66 lb	SP2770	Weekly	0.0 (± 0)	0.0 (± 0)	5.7 (± 2.0)	8.7 (± 1.6)
V10135SC, 16 oz	Fenpyrazamine	Weekly	0.0 (± 0)	0.0 (± 0)	4.5 (± 1.8)	9.0 (± 1.6)

Overall summary of total disease rating, where 0 = no sign of disease and 10 = 100% of flower blooms afflicted with either black petals or powdery fungal growth. Bold and asterisks values show results with statistical significance when compared to untreated controls. Dr. Jiang’s full efficacy report can be located at ir4.rutgers.edu/Ornamental/Ornamentals.cfm.

Citrus Greening

continued from first page

issue. Initially, scientists clamored for a cure, but it quickly became evident that a 'silver bullet' to control HLB was not on the horizon. The industry is focused on strategies to prolong the livelihood of infected trees for as long as possible until a long term solution is found.

In November 2016, researchers from UF IFAS announced that they had developed genetically modified citrus trees that show enhanced resistance to greening, and have the potential to resist canker and black spot.

Other management strategies have

included extra fertilizers, pesticide and antibiotic applications, even exposing infected trees to periodic "steam baths", in the hopes that the heat will control the disease.

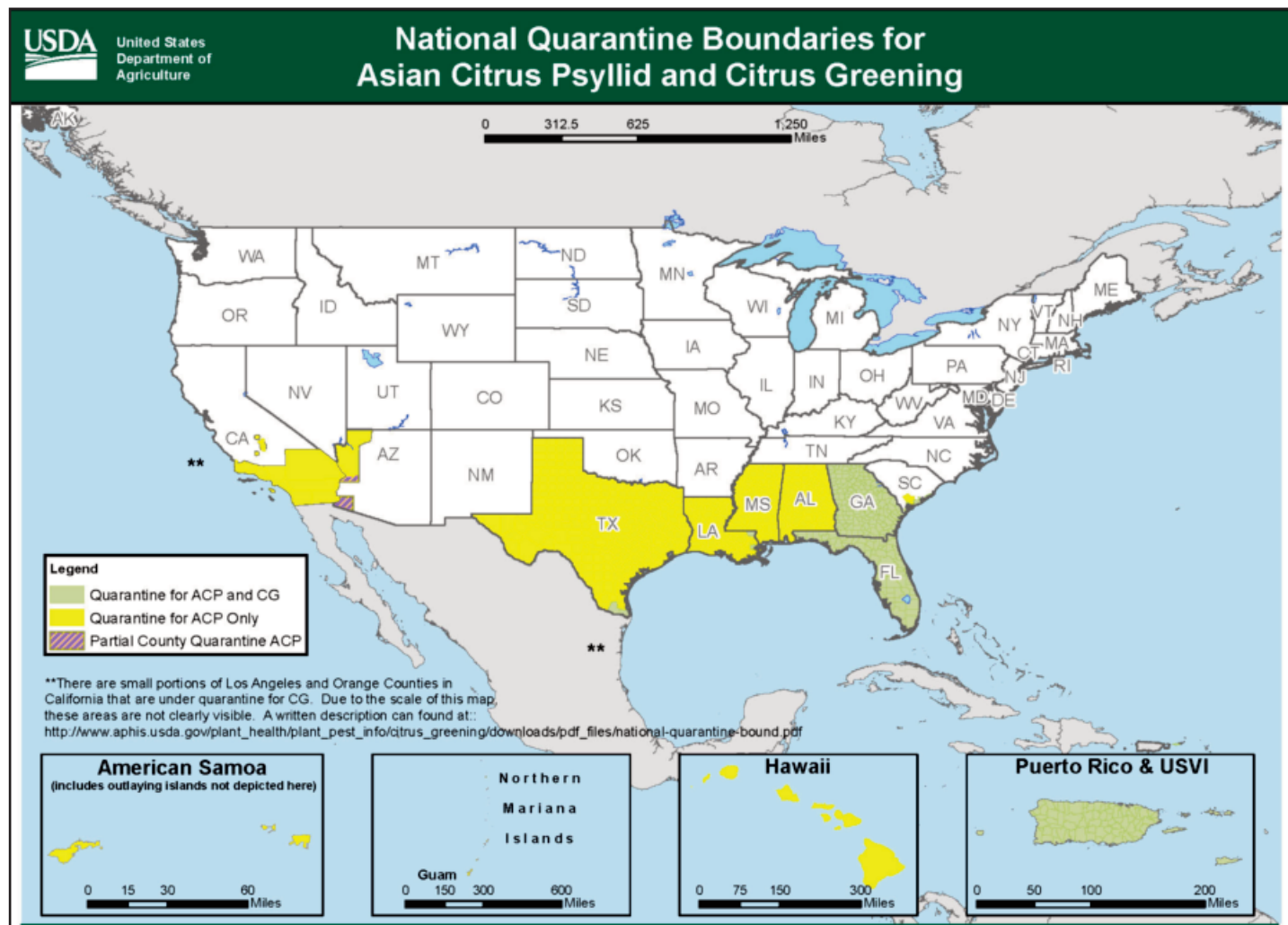
In 2009, IR-4 was involved in helping growers gain access to three insecticides: spinetoram, diflubenzuron and zeta cypermethrin, as ultra-low volume (ULV) applications for psyllid control. Recognizing the severity of the issue and the threat to Florida's citrus industry, the trials were fast-tracked and completed in record time (~ 8 months). IR-4's normal timeline is 24-36 months.

The industry has been leaving no

stone unturned in its efforts to combat this devastating disease. Growers have used 'metalized UV reflective polyethylene mulch' as a ground cover for newly planted trees. The metalized film reflects light and heat to make conditions less attractive for psyllids.

The race to combat HLB continues, and while the genetically modified (GM) citrus brings a sense of hope to the industry, the technology is likely to be unavailable for several years. Grower and consumer acceptance of GM citrus, and work with antibiotics to combat the disease, is going to prove another challenge to the industry. 🌿

Since 2009, USDA has invested more than \$400 million to address citrus greening, including more than \$57 million through the Citrus Disease Research and Extension Program. Awards for grant applications submitted in FY 2016 supported research at Clemson University, Regents of the University of California, (Riverside), Iowa State University and the USDA Agricultural Research Service (ARS) in Athens, Georgia. Many other Universities and USDA-ARS stations across the country have and continue to contribute to the fight against citrus greening. The Citrus Research and Development Foundation has also worked to advance disease and production research with HLB being their highest priority.



Tolerance Successes

Fourth Quarter 2016

Federal Register: September 7, 2016
Chlorantraniliprole Trade Name: Prevathon **Crop:** Teff, Quinoa
PR#: 11854, 11914

Federal Register: September 23, 2016
Flupyradifurone Trade Name: Sivanto **Crop:** Caneberry subgroup 13-07A, Cilantro (fresh leaves), Kava, Quinoa, Tropical and subtropical medium-to-large fruit with smooth inedible peel subgroup 24B **PR#:** 10770, 10860, 11710, 11713, 11714

Federal Register: October 14, 2016
Pyridaben Trade Name: Nexter, Sanmite **Crop:** Cucumber, Pome fruit group 11-10, Small vine-climbing fruit (except fuzzy kiwifruit) subgroup 13-07F, Low-growing berry subgroup 13-07G (except cranberry), Citrus

fruit group 10-10, Stone fruit group 12-12, Tree nut group 14-12
PR#: 08036, 11659, 11660, 11661, 11662, 11663, 11664

Federal Register: October 18, 2016
Metaldehyde Trade Name: Deadline **Crop:** Wheat*, Garden beet (roots and leaves)*, Rutabaga*, Turnip (roots and greens)*, Hop **PR#:** 10335, 10338, 11038
 *Tolerance for regional registration in the Pacific Northwest only

Federal Register: October 19, 2016
Penflufen Trade Name: Evergol Prime **Crop:** Bulb vegetable group 3-07 **PR#:** 10865

Federal Register: November 10, 2016
Clomazone Trade Name: Command **Crop:** Asparagus, Succulent soybean **PR#:** 10279, 11614

Federal Register: December 5, 2016
Oxathiapiprolin Trade Name: Orondis **Crop:** Basil, Leafy greens subgroup 4-16A, Brassica leafy

greens subgroup 4-16B, Head and stem Brassica vegetable group 5-16, Caneberry subgroup 13-07A, Stalk and stem vegetable subgroup 22A
PR#: 10623, 10772, 11125, 11720, 11855, 11856

Federal Register: December 19, 2016
Flumioxazin Trade Name: Chateau, Valor **Crop:** Low-growing berry subgroup 13-07G, Caneberry subgroup 13-07A, Citrus fruit group 10-10, Pome fruit group 11-10, Stone fruit group 12-12, Tree nut group 14-12, Bulb onion subgroup 3-07A, Small vine-climbing fruit (except fuzzy kiwifruit) subgroup 13-07F, Head and stem Brassica vegetable group 5-16, Fruiting vegetable group 8-10, Clover*
PR#: 09700, 10224, 10229, 10249, 10605, 10763, 10764, 10799, 11366, 11367, 11368, 11369, 11370, 11371, 11608
 *Tolerance for regional registration in the Pacific Northwest only

Biopesticide “BmJ” Approved by US EPA

— by Krista Coleman, Research Assistant

The US EPA has recently approved the product LifeGard by Certis USA. The active ingredient of this biopesticide, *Bacillus mycooides* isolate J (BmJ), has been the subject of efficacy work by the IR-4 Project for several years. *B. mycooides* is commonly used for prevention of fungal pathogens, such as *Pythium* and *Botrytis cinerea*.

Efficacy work with BmJ began in 1997, under the IR-4 Biopesticide grants program. The project focused on the development of a biological control product based on *B. mycooides* for control of *Cercospora* leaf spot of sugar

beets. The positive outcomes lead to further testing by Barry Jacobsen of Montana State University in 2003 and 2004.

In 2006, research under Michael Matheron at the University of Arizona expanded to include powdery mildew on cantaloupe. The efficacy demonstrated by Procure alternated with BmJ suggested that it could serve as an excellent rotation partner. During the same year, research by Tim Brenneman at the University of Georgia demonstrated that BmJ could provide a level of control similar to the commercial standard for pecan scab.

In 2010, Dr. Jacobsen continued his work with the microbial by examining the use of BmJ WP alone and in an integrated program with non-organophosphate insecticides and roguing (removal of volunteer plants) for reduction of Potato Virus Y infection. In 2011, BmJ with roguing was decidedly the best treatment.

The approval of BmJ helps reinforce the primary objective of the IR-4 Biopesticide and Organic Support Program, to further the development and registration of biopesticides for use in pest management systems for specialty crops or for minor uses on major crops. 🌱

Save the Dates

National Education Conference
February 28-March 1, 2017
Orlando, FL

**Canadian Priority Setting Meeting
& Resistance Management**
March 21-23
Quebec, Canada

Western Region SLR Meeting
April 25-27, 2017
Ft. Collins, CO

Food Use Workshop
Denver, CO
Sept. 20-21, 2017

Global Minor Use Summit-3
October 1-4, 2017
Montreal, Quebec, Canada

Ornamental Horticulture Workshop
October 17-19, 2017
San Diego, CA



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