The IR-4 Project

Pest Management Solutions for
Specialty Crops and Specialty Uses

Newsletter

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Selective Bioherbicides Under Development

— Michael Braverman, IR-4 Biopesticide & Organic Support Manager

Weed control continues to be one of the biggest challenges for biopesticides and especially for organic production. Most bioherbicides have tended to be non selective, in other words they can be toxic to crops and weeds. IR-4 helped to obtain an EPA registration of acetic acid, which is available to organic growers, but it can only be applied to young weeds. Plus, injury will occur if it comes in contact with the crop.

In the 1970s, nonselective conventional herbicides such as glyphosate were applied through ropewick applicators. In a ropewick system, glyphosate was wiped onto weeds that were taller than the cotton or soybean canopy. Before the advent of Roundup Ready crops, this was a common practice to control Johnsongrass. Capitalizing on this approach, Katie Jennings at NC State University evaluated an OMRI (Organics Material Review Institute) approved organic citrus oil based herbicide in a wiper system in sweetpotato. Some weeds such as pigweed (*Amaranthus* spp.) grow taller than sweetpotato, which allows a nonselective herbicide to be applied through a wiper bar onto the weed, minimizing contact with the crop . The IR-4 Biopesticide and Organic Support Program is funding efficacy research with Drs. Jennings and VanGessel at the University of Delaware to develop a weed management system in organic sweetpotato production systems.

There have been a few other selective herbicides that IR-4 has helped register: *Chondrostereum purpureum* for management of resprouting of cut stumps in forestry settings and Solvinix, a viral based herbicide that can selectively kill tropical soda apple in pastures.

The IR-4 Biopesticide Program has been working with Dr. Joe Neal at NC State for over a decade, primarily involving weed control in turf. In 2011, we started evaluating FeHEDTA, registered as a herbicide in turf which also showed some promise in ornamentals. Knowing the need for post -emergence selective weed control in containerized ornamentals, Joe expanded the project to look at overwintering weeds. Cheryl Wilen of UC Cooperative Extension, San Diego also started evaluating FeHEDTA providing a different spectrum of ornamentals and weeds focusing on low water use ornamentals more suited to arid climates. More recently, several USDA-ARS facilities and other researchers have helped look specifically at crop safety. While this project is still ongoing, some of the general trends are that the older woody plants tend to be more tolerant while herbaceous perennials will tend to have an initial burn and this is dependent on application rate. In some cases, the crop injury was reduced when spraying dormant plants in late winter.

Joe Neal observing weedy pots compared with weeds controlled on right

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Executive Director Notes

Dear Friends

Over the last couple of years, I have used this Executive Director's Notes column as a communication tool to keep IR-4's friends up to date on happenings with IR-4. Many times, I have focused on strategic issues involving IR-4 and our efforts to help the specialty crop community. In all honesty, I am starting to feel like the proverbial broken record, repeating the same statement with limited variation; "IR-4 is in desperate need of new resources". Much of my current job function is to repeat this mantra as often as possible to anyone who is willing to listen or at least not walk away.

I will continue to work hard to ensure that IR-4 remains a productive and progressive organization. However, in focusing on the funding shortfalls, I have sometimes placed all the good IR-4 does for production of specialty crops on the back burner. This hit me like a 2 X 4 across the head during some recent agriculture tours. Here the speakers highlighted the impact of IR-4 supported product registrations on their pest management systems and production of high quality specialty crops. Specifically, I am referring to the approval of new products to manage Spotted Winged Drosophila in New Jersey blueberries and Michigan cherries. Though this pest is far from being marginalized, some of the recent approvals of pesticides and biopesticides have given conventional and organic farmers more tools to help reduce damage. The Feature article (pgs 6&7) highlights some of the educational tours involving specialty crops that IR-4 team members attended this year.

We often receive letters of appreciations after an approval of a new product from commodity associations, knowledgeable farmers, or University scientist/extension workers. Recently, I was copied on a message from the IR-4 Nevada State Liaison Representative to a member of the IR-4 team stating, "You have made my day and that of several growers in Nevada. Thanks much my friend. The IR-4 program is the best" These types of messages validate IR-4's work for the greater good. Personally, these acknowledgments help keep this job exciting and rewarding.

I hope to see many of you at the upcoming Food and Ornamental Horticulture Workshops, September 20-21 in Denver, CO and October 17-19 in San Diego, CA, respectively. These are the most important meetings for IR-4 as we prioritize potential research solutions. Please see the IR-4 Website (ir4.rutgers.edu) for more details.

As I wrap up this issue's Executive Director's Notes, the IR-4 Project would like to congratulate and thank Rebecca (Becky) Sisco for her contributions to the success of the IR-4 Project through her tireless efforts as Western Region Field Coordinator. You will be missed! We wish you the best as you transition into the next phase of life.

That's all for now,

Jerry

New Product Corner

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

Pyriofenon (Fungicide – ISK Biosciences Corp.)

Introduction: Unconditional registration for the new active ingredient (AI) pyriofenone was granted by the EPA in April 2017. The first commercial label in the U.S. was released by ISK mid-2017.This registration provides growers with a new pest management tool for use against various powdery mildew diseases. Belonging to the aryl-phenyl-ketone class of chemistry, pyriofenone is a proposed actin disrupter. This new AI may be especially useful against target powdery mildews that have developed resistance to other fungicides. The first tolerances established by EPA for pyriofenone were import tolerances on grapes and raisins in 2012. Pyriofenone has been classified by the Fungicide Resistance Action Committee (FRAC) as a Group U8.

Other global registrations: Codex MRLs for berries will be established in 2019. First global registration was in 2012; and registrations exist in Japan, Australia, Canada, Mexico and are pending in additional countries. Tolerances exist in Canada, Mexico, Japan and the EU for various crops. Additional tolerances are pending.

US trade name/formulation: Prolivo® 300 SC fungicide (a 300

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Warwick Tour provides Learning Opportunity for EPA Staff — by The American Mushroom Institute

Warwick Mushroom Farm was one of the stops this year on the annual summer farm tour the IR-4 Project organizes for employees of the Environmental Protection Agency (EPA) . Jack Reitnauer and Bob Cantarera conducted the tour and explained Agaricus production, pesticide application practices and other pest management issues.

"EPA's Pesticide Program scientists found the recent IR-4 crop tour to the Delmarva Peninsula a great opportunity to learn more about the unique challenges that small farms and specialty growers face. The Warwick tour was extremely enlightening, giving us a better understanding of how mushrooms are grown, the potential pests and strategies to combat them, and how and when pesticides might be used (if at all). First-hand experiences like the IR-4 crop tour are a great help to OPP scientists when making regulatory decisions about various pest management tools," Wynne Miller, Director of EPA's Biological and Economic Analysis Division said.

"Most of the EPA tour participants had never before seen inside a mushroom production facility, and they were 'blown-away' with the high tech Agaricus production system they toured at the impressive Warwick site," said Van Starner, IR-4's Assistant Director for Research Planning and Outreach. "Jack, Bob and colleagues gave a very informative review of growing mushrooms 'from cradle to grave,' and participants learned so much in a short time. Kudos to Warwick staff for an outstanding final stop on our tour day! And the take-home mushrooms were a very generous, and much appreciated, bonus!"

The IR-4 Project is the major resource for supplying pest management tools for specialty crops, including mushrooms, by developing research data to support registration clearances.

Calendar of Events

2017 Food Use Workshop
September 20-21, 2017
Denver, CO

GMUS-3 — October 1-4, 2017
Montreal, Quebec, Canada

2017 Ornamental Horticulture Workshop — October 17 (tour)
October 18-19, 2017 priority setting, San Diego, CA

NRPM
November
1-2, 2017
Princeton, NJ

9th International IPM Symposium
March 19-22, 2018
Baltimore, MD
ipmsymposium.org/2018/

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Editor: Sherrilynn Novack
IR-4 Public Relations and Communication Manager, 732.932.9575 x 4632, novack@njaes.rutgers.edu

Newsletter Committee:
North Central Regional Director, **John Wise,** 517.432.2668.

Western Regional Assistant Field Coordinator, **Stephen Flanagan,** 541.688.3155.

Southern Regional Field Coordinator, **Michelle Samuel-Foo,** 352-294-3991
Southern Region Program Research Prog/Svs, Crd/QA **Robin Federline** 352-294-3983.

Commodity Liaison Committee member, **Mike Bledsoe,** 407-493-3933, Village Farms.

IR-4 HQ, 732.932.9575
Fungicide Coordinator, **Kathryn Homa** x 4604
Public Health Pesticides Manager, and Technical Copy Editor, **Karl Malamud-Roam** x 4628
Ornamental Horticulture Manager, and Technical Copy Editor **Cristi Palmer** x 4629
Technical Coordinator/Entomology, **Ken Samoil** x 4614
Assistant Director, **Van Starner** x 4621

New Product Corner

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g ai/L or 2.5 lb ai/gal suspension concentrate)

Prolivo 300 SC® labeled crops (see label for specific use patterns and other general directions for use): caneberry subgroup 13-07A, bushberry subgroup 13-07B, small fruit vine climbing subgroup 13-07D, low growing berry subgroup 13-07G (except cranberry) and cucurbit vegetables crop group 9

Labeled pest spectrum: grape powdery mildew (*Erysiphe necator*), strawberry powdery mildew (*Podosphaera aphanis*), and cucurbit powdery mildews (*Podosphaera xanthii, Erysiphe cichoracearum*)

Ongoing IR-4 residue projects (PR#): GH cucumber (11446)

Other IR-4 database requests (PR#): GH eggplant (12007); GH lettuce (11473); GH pepper (11447); GH tomato (11448) – use on GH fruiting vegetables in the US may be covered by submitting Canadian GH data from ongoing pepper and tomato studies

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Isofetamid (Fungicide – ISK Biosciences Corp.)

Introduction: Unconditional registration for the active ingredient (AI) isofetamid was granted by the EPA in July 2015. This registration provides growers with a new pest management tool for use against various diseases. Belonging to the phenyl-oxo-ethyl thiophene amide class of chemistry, isofetamid is an SDHI (succinate-dehydrogenase inhibitor) fungicide. This new generation SDHI has limited cross-resistance with pathogen isolates that have developed SDHI-resistance. Tolerances for this fungicide have been set by the EPA for the berry and small fruit group (13-07, except 13-07C), almonds, lettuce, canola, legumes (except soybeans), stone fruit, and pome fruit. Isofetamid is classified by the Fungicide Resistance Action Committee (FRAC) as a Group 7 fungicide.

Other global registrations: Isofetamid is registered in Canada and Korea (grapes), and will soon be registered in Mexico, Chile and Japan. MRLs are set in Canada, Korea, Japan and the EU for select crops, and first tier crops will have CODEX registration shortly.

US trade name/formulation: Kenja® 400SC fungicide (a 400 g ai/L [3.333 lb ai/gal] suspension concentrate), marketed by Summit Agro USA, LLC

Kenja® 400SC labeled crops (see label for specific use patterns and other general directions for use): almond, head and leaf lettuce, the berry and small fruit group (except 13-07C), rapeseed (canola) crop subgroup 20A, legumes (except soybean), stone fruit and pome fruit

Labeled pest spectrum: *Monilinia* species, *Botrytis cinerea, Sclerotinia* species, anthracnose, powdery mildews, *Venturia* spp.

Ongoing IR-4 residue projects (PR#): ginseng (12000)

Other IR-4 database requests (PR#): none at this time

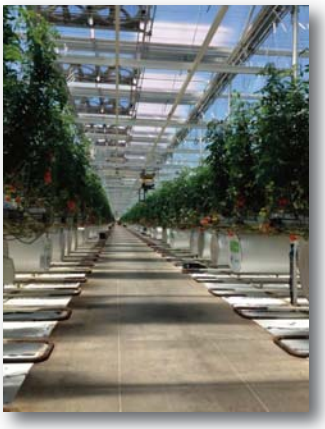
Ongoing IR-4 Ornamental Horticulture Program Research: Isofetamid has been included in 2016 and 2017 protocols studying efficacy on Botrytis. Most research results are still pending, and it is not yet available for use on ornamental horticulture crops.

IR-4 and PMC in Greenhouse Harmony

— by Kathryn Homal R-4 Fungicide Coordinator; Mike Bledsoe, VP Food Safety Village Farms; and Bill Barney, IR-4 Senior Coordinator Crop Groupings

One highlight of the summer season is growing your own fruit and vegetables and purchasing fresh produce from local growers. That juicy, sweet taste of a ripe tomato is like no other.

Unfortunately, in many locations, once the frost hits, it becomes impossible to maintain a garden. That's where the greenhouse industry comes to the rescue. Even in the middle of winter, when there is a foot of snow on the ground, you can visit the produce section of the supermarket and purchase fresh fruits and vegetables. What many do not know is that a lot of produce in the supermarket originated in a greenhouse. Another aspect that goes unnoticed is how the USDA IR-4 Project and the Pest Management Centre (PMC),



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Texas A&M AgriLife Research and Extension Center — by Michelle Samuel-Foo, IR-4 Southern Regional Field Coordinator

The people from L-R are: Cristina Marconi, James Hearn, Robert Saldena, Alfredo Rodriguez and Michelle Samuel-Foo

Despite the mud clinging to our boots, and the slippery conditions of the plots, Cristina Marconi and I were determined to walk the length of the IR-4 broccoli plots at Texas A&M AgriLife Research and Extension Center in Weslaco, TX on a cool January morning, earlier this year. The lush green foliage was a welcome sight, but Cristina had a look of slight worry on her face. I understood why, a few moments later, as from our vantage point no florets were visible yet . This had happened the previous year, and we all feared that history would be repeating itself, but luckily that was not the case. Upon closer examination, we were able to see the tiny buds peeking out from within the greenery. The huge smiles on both of our faces was a welcomed relief.

Growing crops in the Rio Grande Valley can prove challenging, but South Texas agriculture has managed to develop a very successful agricultural industry that has been in existence for almost a century. The IR-4 project is fortunate to partner with Texas A&M AgriLife Research and Extension Center in Weslaco, TX, where one of 6 dedicated IR-4 field research centers in the Southern US is located. Weslaco is about fifteen miles west of Harlingen in south central Hidalgo County, Texas. The location is a thriving agriculture hub where many specialty crops can be grown.

The IR-4 southern region welcomed a new team to its field research center at Texas A&M University, in Weslaco in July 2014 with the addition of Cristina Marconi and her assistant Alfredo Rodriguez. Ms. Marconi, who hails from the small town of Matao, in the state of Sao Paulo, Brazil, took over the position of IR-4 Field Research Director (responsible for overseeing the conduct of the GLP residue trials that are done at this south Texas location) from Lori Gregg, who previously held the position. Agriculture is not new to Cristina, who has been involved with ag for many years. She holds a masters degree in genetics, plant breeding and biotechnology which she earned at the Agronomic Institute in Campinas, Sao Paulo, Brazil.

When conducting field residue trials, Ms Marconi is assisted by Alfredo Rodriguez, a long term employee of the Tx AgriLife center. This team works under the faculty guidance of Dr. Juan Anciso, a professor and extension specialist in the Department of Horticultural Sciences, Texas A&M. They conduct an average of about 15 IR-4 GLP residue trials annually . Texas This field site is located in EPA region 6 , and they are the only location providing residue studies in region 6.. They are able to grow a variety of crops here, including peanuts, onions, broccoli, cabbage, sweet potato, and mustard greens.

Less than 3 miles away from the Texas A&M AgriLife Research and. Extension Center at Weslaco, TX is the Texas A&M –Kingsville Citrus Center. The two centers cooperate to conduct residue trials on citrus (oranges and grapefruit) when data is needed to support registrations for these commodities in EPA region 6.

Robert Saldena and James Hearn, who both work out of Dr. Mamadou Setamou's lab at the Citrus Center, play very important roles in ensuring that the field trials are conducted according to not only IR-4 protocol requirements but also in compliance with local commercial practices.

Following IR-4's Food Use Workshop and National Research Planning meeting every fall, the Weslaco TX team receives their tentative schedule from the Regional Coordinator and begins preparations for the following year's field season. Land requests, seeds and transplants are decided, and contact is made with the citrus center if any citrus trials are on the docket for the following year. Keys to success for the Weslaco team are organization and frequent communication, with both the regional coordinator and study director team at IR-4 headquarters..

The Southern Region is pleased to have this team on board and looks forward to many years of successful GLP residue trials under their watch.

Summer C

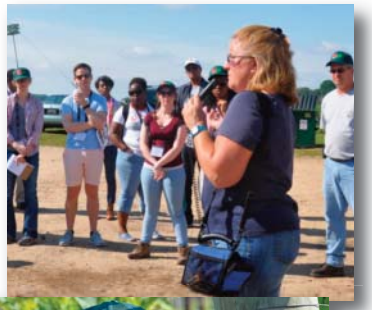
— with contributions from Van Starner, IR-4 Associate Director; Phil Korson,Cherry Mar

IR-4 personnel have been fortunate to take a number of very interesting crop tours this year. Beginning with a cannabis operation in Ft. Collins, CO as part of the Western Region SLR meeting tour, mushroom production seen on the annual IR-4/EPA/USDA summer tour in June, turf cutting and an urban vertical farm on the PMC tour and Michigan Decision Makers Tour in July, and finally the California Specialty Crop Council tour in early August visited farms in the Central Valley.

IR-4/EPA/UDSDA Crop Tour

On June 21, 2017, 49 people from the EPA and IR-4 participated in a daylong crop tour to visit 3 very different farms and learn more about farming practices.

The first stop on this tour was the Schmidt Farm in Sudlersville, Maryland. This farm grows 60 acres of tomatoes for processing and 22 acres of wine grapes. Participants also learned about this farm's production of 125 acres of fresh market green beans, specialty soybean varieties grown specifically for tofu and other varieties for high oleic acid content (for Perdue chickens). Jennie Han, the owner also discussed Schmidt Farm's practices in helping sustain the soils for generations to come.



The second stop on this tour brought the group to Godfrey's Farm, which includes a pick-your-own operation and farm market. Here, participants were treated to a wagon ride on the farm, which grows blueberries, peaches, strawberries, blackberries,

and peppers. Godfrey's farm practices sustainability by using Integrated Pest Management, crop scouting and targeted pesticide use to maintain their top-quality produce.

The third stop on this tour was a mushroom farm (see related article on pg. 3). Most of those on this tour had not seen such an operation and there were many questions and photos taken. Participants were grouped into smaller numbers for viewing this 624,832 sq. ft. growing facility. Here participants learned about the wood-less, odorless state of the art facility and moved from room to room to see the growing process from seed to harvest. Participants were also treated to box of mushrooms to take home.

The PMC Tour

When the IR-4 Project Management Committee (PMC) met in July and some on the committee were interested in a crop tour.Since the meeting was held in Philadelphia, a visit to the Phillip E. Marucci Center for Blueberry and Cranberry Research center was in order. Center director, Nick Vorsa, offered a brief history of the center, that was followed by a look at the research being conducted by Cesar Rodriquez-Saona. Cesar has been

conducting IR-4 Biopesticide research on finding pest management solutions for Spotted Wing Drosophila (SWD).

After a time of blueberry picking at the center, the group toured Tuckahoe Turf Farm. This 800 acre farm provides the athletic fields for many professional and college football and baseball teams. They recently provided turf for the Mall in Washington, DC. Owner, Allen Carter, gave the group a demonstration on how turf is cut

Farm manager, Dar
Jerry the ease of wh
parts for industrial
cleaning.

Metropolis Farms p
Griffin explains the
used for the lights
the plants.

rop Tours

keting Institute, Vice President; and Krista Coleman, IR-4 Biopesticide Research Assistant

n Sypolt, shows hich they exchange dishwasher

Metropolis Farms in downtown Philadelphia is even growing sunflowers in this urban vertical farming system.

resident, Jack control system needed to grow

and rolled onto a pallet. While most farms have dogs, this turf farm clearly states: NO DOGS ALLOWED!

The group headed back to Philly to see an urban farm on the second floor of a building in south Philadelphia. After a one-hour lunch where the charismatic president of Metropolis Farms, Jack Griffin, told us his story and shared his vision for urban farming the group saw this unique operation up close. Jack, once a venture capitalist, who studied economics, has developed a "Revolution Vertical Farming Technology™ designed to be ultra-efficient, environmentally responsible and commercially scalable. (metropolisfarmsusa.com)." All the pieces of the farming system can be purchased from "big box" stores, and is intended to be easily assembled and disassembled for cleaning in an industrial dishwasher. This 10-minute downtime to exchange parts is the reason this farm is so clean and pest and disease free.

With the population projected to grow to 9.7 billion by 2050 Jack's vision is to feed people and feels this is the way to feed the populations of the future.

To see a slide show from these tours visit www.ir4.rutgers.edu

Michigan Decision Makers Tour

The 2017 Michigan Decision Makers Tour was held on July 18-20, 2017, in Traverse City Michigan. The theme of his year's tour was invasive pests with a special focus on Brown Marmorated Stink Bug and Spotted Wing Drosophila (SWD). The Michigan IPM Alliance hosted the tour this year.

Cherry Farmer, Don Gregory addresses the more than 60 people gathered to discuss the impact of SWD on US Cherry Farmers.

The tour kicked off with talks on the 18th and an early morning start on the 19th and 20th. Over 60 people attended the welcome reception at the Townline Ciderworks Tuesday evening.

In attendance were 10 people from U.S. EPA, five from Region #5 (Chicago Office), one from USDA OPMP, Jerry Baron from IR4 as well as state regulators, researchers and most importantly growers.

SWD has been a game changer for the cherry industry. Growers do not have enough crop protection tools today with short Phi materials (3 day) to deal with this pest and simultaneous harvest the crop.

This is a nasty pest that regenerates quickly and can explode under certain conditions. Michigan growers are at a crossroad and must find new management tools to combat this pest as well as other invasive pests. Tour participants effectively received this message and witnessed the devastation this pest can cause.

Mike Goodis, US EPA Registration Director, shakes a Cherry Tree on the 2017 EPA Michigan Tour.

2017 California Specialty Crops Tour

California Specialty Crops Council, Executive Director, Gary Van Sickle organized another successful tour with visits to farms in the Central Valley. Attendees from the IR-4 Project included: IR-4 Registration Manager, Debbie Carpenter, Biopesticide and Organic Support Assistant, Krista Coleman, and IR-4 Western Region Director, Matt Hengel. The tour included stops in Visalia, Selma, Parlier, Coalinga, Salinas, Los Banos, Sacramento, and more.

Discussions were focused on notable problems such as the Asian Citrus Psyllid spreading huanglongbing (HLB) disease in citrus, decline of return on investment in raisins, due to post-harvest trade barriers, vertebrate pest control, and the need to establish viable water use practices. Many stops allowed attendees to view the world of production and processing, including several packing facilities.

Peaches are processed and packaged for the fresh market by B&C Packing, you might even find them in your local Costco!

The message this attendee extracted from the three-day tour was that farming is a valuable resource worth investing in. This includes human resources as well. With the average age of a farmer rising, it is important to educate upcoming generations on the benefits of entering such a field and the necessity of maintaining sustainable practices for feeding the billions of people across the globe.

The Exotic Orchid

— by Cristi Palmer, IR-4 Ornamental Hort. Manager

Orchids have been regarded as one of the most prized flowering plants, especially the large flowering tropical species. During the Victorian era, plant collectors explored tropical zones and brought back to Europe many different species. Many of the Latin species names of the collect plants are derived from those collectors or their wealthy sponsors. In the 18th and 19th centuries, only the wealthy could afford these expeditions to source new orchids or provide the special hothouse cultivation orchids required upon their arrival in Europe.

The orchid family originated back in the early Cretaceous period (about 120 million years ago) and represents one of the two largest plant families. Orchids naturally exist on every continent except Antarctica and species have adapted to temperate and tropical regions. Many temperate species have small subtle flowers, while tropical species tend to have large showy prominent flowers in every color of the rainbow. There are at least 28,000 currently accepted species with some of the commonly known genera being *Dendrobium, Phalaenopsis, Oncidium, Cattleya,* and *Vanilla*. Yes, vanilla flavoring is extracted from the seed pod of an orchid.

Fortunately, for us, propagators and growers have figured out the mysteries of growing the showy tropical genera and their hybrids. In addition to honing in on the optimal light, moisture, and fertilizer needs, propagating orchids occurs today mainly via vegetative methods: division, back bulbs, keiki (or little plantlets), aerial cuttings, and meristem or tissue culture. For breeding and hybridization to produce new cultivars, seed germination for many orchids require mycorrhizae fungi to survive and thrive. While there are several pests and diseases that impact orchids during production, management products are available for all but viruses which need to be managed through good sanitation and vector control. Here at IR-4 we have screened various tools to manage Erwinia bacterial diseases on a couple orchid species along with screening insecticide crop safety.

Today, orchids are still prized as elite flowers, but now they are affordably priced and can commonly be purchased in garden centers, florists' shops, and even grocery stores!

More Orchid Info

(aboutorchids.com)

Orchids Grow All Over the World. Over 30,000 species of orchids inhabit every corner of the planet except for the driest deserts and Antarctica. Humans have crossbred these species to create 150,000 hybrids, with more appearing all the time. Most are grown for their beautiful flowers, but the seedpods of the Vanilla orchid provide the popular flavoring. And unlike most plants, they do not grow in soil, but in the air. Their roots attach to trees or rocks where they capture moisture and nutrients that wash over them in the rainforest.

Orchids are Ancient Plants

Evidence of orchids appears from the age of the dinosaurs, 120 million years ago, making them some of the first flowering plants. Orchids are one of the largest and oldest families of plants in the world. For centuries, people all over the world have fallen in love with their flowers. Their bright colors, bizarre shapes, and enchanting smells have evolved to attract pollinators. Many have a relationship with a single type of insect or bird that can pollinate their flowers.

Habitat Destruction Endangers Many Orchids

Orchids in every part of the world face dangers from pollution, habitat destruction, and global warming. Do everything you can to stop these threats. We are already losing many of these wondrous plants forever. Reduce what you use and recycle. Take action to stop rainforests from being cut down or burned, or wetlands from being paved over. Only buy plants from legitimate vendors, and never take plants from the wild.

WHO, GLP, and IR-4

— by Karl Malamud-Roam, IR-4 Public Health Pesticides Manager

The World Health Organization (WHO), after more than 50 years of evaluating vector control pesticides with a small network of Collaborating Centers, is transitioning to an evaluation system based on formal Good Laboratory Practices (GLP). IR-4 is helping with this major change.

Public health pesticides (PHPs) are the primary tools for fighting malaria, dengue, and other diseases carried by arthropod vectors, and the WHO Pesticide Evaluation Scheme (WHOPES) publishes Standards and Recommendations for vector control products to support national efforts to use these chemicals safely and effectively. Over recent decades, WHOPES has relied on other bodies to evaluate pesticide safety and has focused on testing the efficacy or product performance of treated bed nets, indoor residual sprays, larvicides, space sprays, and other such products. The testing regime typically requires laboratory ("Phase I") tests of intrinsic toxicity, household-scale ("experimental hut") Phase II trials, and multi-year Phase III village trials of durability and acceptability. In addition, new classes of products must demonstrate epidemiological data of reduced disease burden to receive a WHOPES recommendation; new products from existing classes can avoid this requirement. WHOPES is not formally a regulatory agency, but many governments will not accept vector control products without their approval.

These rigorous requirements for evidence of efficacy have several motivations – national authorities want to ensure that their citizens are as well protected from disease as possible; funders want to use their money effectively; manufacturers want to differentiate their products from competitors on the basis of quality and effectiveness. On the other hand, they add many years and substantial costs to the product development process, and manufacturers have complained that the WHOPES process has been unpredictable, making it very difficult to plan for product introductions and marketing. In addition, WHOPES increasingly has issued recommendations for generic products after a brief evaluation of equivalency to proven products, which has been seen as a severe disincentive to invest in innovation.

In the face of increasing demand for new vector control products to address pyrethroid resistance and the reluctance of manufacturers to support innovations through the WHOPES evaluation process, WHO in 2015 began a major restructuring of vector control evaluation (who.int/whopes/en). WHOPES will continue to provide technical guidance, specifications for pesticides and application equipment, training, and other services, but the actual review of product data and approval of new products will shift by late 2018 to WHO's Prequalification (PQ) program, which now reviews medicines, vaccines, and medical devices internationally. The PQ model, like EPA or FDA registration, relies on registrants generating proprietary data under strict standards and rigorous review of the data dossier by WHO and outside experts. The hope is that this mechanism will speed the path to registration and marketing by providing consistent data guidelines and will encourage innovation by protecting intellectual property.

A major requirement for success for this new approach will be global acceptance of privately-held data, and the basis for data acceptability will be the use of GLP standards in all participating test sites. Multi-center GLP testing has been the basis of IR-4 regulatory science since the inception of GLP standards by US EPA in 1989. IR-4's PHP team has assisted e WHOPES in their transition by participating in WHOPES GLP training programs, instructing participants from Africa, Asia, Europe and the Americans on some of the basic principles of compliance. WHOPES has been able to adopt IR-4's Standard Operating Procedures, study design institutional management, data archives, and quality assurance to meet their needs. -We are proud to say that the collaboration between IR-4 PHP, QA, and other staff have provided critical assistance in the WHO vector control transformation.

MRL Harmonization Workshop

— by Dan Kunkel, IR-4 Associate Director; Gary Van Sickle, California Specialty Crops Council; and Ed Ruckert, McDermott Will & Emery

On May 31-June 1, 2017, the California Specialty Crops Council hosted its twelfth annual Maximum Residue Level (MRL) workshop in San Francisco, CA. About one third of the 128 attendees were new to the workshop this year with 16 international attendees representing 8 countries

Ed Ruckert, Partner at McDermott Will & Emery gave a presentation on "The Pesticide Regulatory Trends in the New Administration." His presentation addressed a wide variety of issues associated with the transition of EPA from the Obama Administration to the Trump Administration. These included reviewing EPA personnel changes, budget challenges, the status of the Pesticide Registration Improvement Extension Act of 2017, the status of the response to the environmental non-government organizations' request to revoke chlorpyrifos tolerances and cancel the product, the status of two EPA final rules, one concerning changes to the certification of pesticide applicators and the other changes to the worker protection standards. He also discussed the situation regarding regulating pesticides to address potential pollinator exposure to pesticides, the status of the Registration Review program and the endocrine disruptor program, and efforts directed towards establishing and maintaining MRLs/tolerances. He addressed improving the working relationship between EPA and USDA regarding pesticide issues. Finally, he encouraged all interested stakeholders to become involved as each of these and related issues are considered by the Agency.

Updates on MRL establishment in Taiwan, South Korea and Australia were presented by Emily Kao, Jin Sook Kim and James Deller respectively. Taiwan continues to expand crop groupings for setting MRLs on additional crops. Nevertheless, without a MRL assignment there will be no acceptable residues. Data generators were further encouraged to keep submitting data and they will work hard to address import issues, while being mindful of their own grower needs. In Korea, the default MRL will be 0.01 mg/kg. They will be extending the expiration date of current MRLs (set to expire 12/2018) until 12/2021. Regarding Australia, they require that a MRL already assigned in the country of origin maybe extended to a minor use permit. However, their list of low level inadvertent residues can not be used for off label use. All of these countries shared their support and efforts in the Asia-Pacific Economic Cooperation (APEC) efforts and harmonization.

Audrey Chen, FMC Ag Solutions, presented an industry perspective on the challenges of setting MRLs. She identified different application rates and timing (GAPs), different residue definitions, analytical residue method and differences in MRL calculation. She also pointed out the different crop groups used for extrapolation i.e. Leek (bulb vegetable in US/CODEX; stem vegetable in EU; leafy vegetable with small leaves in Taiwan.

Rick Keigwin, Acting Director of EPA Office of Pesticide Program gave a commented on the four goals of the EPA in the areas of 1) to Strengthen food safety, public health and environmental protection, domestically and globally 2) Enhance regulatory decisions through collaboration by leveraging scientific and regulatory resources with the international community 3) Conserve resources of U.S. consumers, growers, and industry stakeholders through more efficient and coordinated regulatory processes and 4) Minimize international trade issues related to pesticide regulatory requirements and facilitate trade and fair competition. Rick also identified opportunities for involvement within OECD working groups, NAFTA technical working groups, APEC food safety cooperation forum, CODEX committee on pesticide residues and thought collaboration could be accomplished through global joint reviews and bilateral partnerships.

Other presentations included Trade Issues, Global MRL Database Update, Recent Work in the WTO

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MRL

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SPS World Trade Organization Sanitary and/or Phytosanitary Standards) committee on Pesticide MRL and more. IR-4's Associate Director, Dan Kunkel gave a report on "The IR-4 Project's International Activities", which included capacity building, USDA-FAS Support, updates on the Global Minor Use Workshop, the details about the upcoming Global Minor Use Summit-3.

The second day of the Workshop started with an update regarding endocrine disruption and hazard criteria in the European Union. This will impact $65 billion of trade within the EU, and will have a major impact on ag products. There were then four case-study presentations, including a consumer packaged goods perspective of MRLs, wine and their MRL issues, trade issues for Canadian grains and the challenges of securing import tolerance for spice ingredients. The final presentations focused on the Spotted Wing Drosophila (SWD) and the management problems it poses for growers and information on quarantine treatments for SWD.

The organizing committee included: Dan Botts, Julie Chao, Robert Ehn, Gord Kurbis, Matt Lantz, Bob McClain, Gary Obenauf, Mark Rasmussen, Cindy Smith and Lois Rossi. Workshop sponsors included: Sponsors were: Agrian, AMVAC Chemical Corporation, BASF Agricultural Solutions, Bayer CropScience, CA Dried Prune Board, Dow AgroSciences, DuPont Crop Protection, E & J Gallo Winery,

Sponsors included: FMC Agricultural Solutions, Gowan Company, LLC, ISK Biosciences Corp., Loveland Products, Inc., Luxembourg-Pamol, Inc., Syngenta, The Morning Star Co., Tessenderlo Kerley, Inc., Valent USA Corporation, & Wonderful Orchards.

To view the agenda and all the presentations visit the California Specialty Crop Council website specialtycrops.org/mrlworkshop.html

Bioherbicides

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In cooperation with USDA-ARS we are in the process of pursuing the registration of *Pseudomonas fluorescens* ACK55 for the management of invasive weeds such as downy brome in rangeland. This product is unique since the organism does not kill the weed but reduces growth and seed production, allowing for native vegetation to outcompete and re-establish in rangelands. Four other bioherbicide products under development include new active ingredients for the selective management of dandelions in turf, algae, aquatic weeds, and for managing certain broadleaf weeds in grass and broadleaf type crops.

Tolerance Successes

May - July 2017

Federal Register:May 11, 2017
Flonicamid
Trade Name: Beleaf, Flonicamid
Crop: Tomato subgroup 8-10A (tolerance increase); Pepper/Eggplant subgroup 8-10B (separate tolerance)
PR#:10999

Federal Register: June 14, 2017
Spirotetramat
Trade Name: Movento, Ultor
Crop: Carrot, Stone fruit group 12-12, Tree nut group 14-12
PR#: 10788, 11455, 11456

Federal Register: July 5, 2017
Indaziflam
Trade Name: Alion, Indaziflam
Crop: Bushberry subgroup 13-07B, Caneberry subgroup 13-07A, Coffee, Hop, Small vine-climbing fruit except fuzzy kiwifruit subgroup 13-07F, Stone fruit group 12-12, Tree nut group 14-12, Tropical and subtropical small fruit with edible peel subgroup 23A
PR#: 10654, 10882, 10909, 11071, 11654, 11655, 11656, 11868

Federal Register: July 7, 2017
Flonicamid
Trade Name: Beleaf, Flonicamid
Crop: Peas and beans (edible podded, succulent shelled, and dried) subgroups 6A, 6B, and 6C
PR#:10472, 10473, 10474, 10475

Federal Register: July 28, 2017
Fenamidone
Trade Name: Reason
Crop: Basil, Cilantro, Brassica head and stem vegetable group 5-16, Leafy vegetable group 4-16, Leaf petiole vegetable subgroup 22B, Kohlrabi, Florence fennel, Celtuce, Cottonseed subgroup 20C
PR#: 10120, 10925, 11813, 11814, 11815, 11816, 11817, 11818, 11819, 11820

IR-4 & PMC Working Together

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Agriculture and Agri-Food Canada have aided the greenhouse industry in making largescale greenhouse production a possibility.

The US greenhouse largescale hydroponic vegetable industry began in 1989. At that time, there were no pesticides available to this industry, which made it very challenging to produce quality crops such as tomatoes, cucumbers, peppers, eggplant, strawberries, lettuce and herbs in an environment containing insects and pathogens. It soon became evident that this industry needed pesticide products in order to survive. Most of the US largescale growers have facilities located in both the US and Canada. Therefore, registration of the pesticide in both countries is necessary in order to promote trade. The IR-4 Project and Canada's PMC program have greatly aided the greenhouse industry by not only helping to obtain these critically needed pest management products, but also helping to develop registrations in both countries. The IR-4 Project developed a US EPA ChemSAC proposal that was recently approved by EPA to allow Canadian greenhouse data as support for US greenhouse registrations, provided that the use patterns are the same in both countries. The basis behind this decision is that greenhouse trials are conducted in a controlled environment and trial locations are not specified by region. Residue data generated in greenhouses in Canada can be expected to be comparable to what would be generated in greenhouse locations in the U.S. With this ChemSAC standing policy, greenhouse residue trials conducted in Canada do not have to be repeated in the US, which will provide significant savings in time and money. It will also provide greenhouse growers with greatly expanded opportunities for obtaining pest management tools, while promoting trade.

Current pest issues in the greenhouse industry include (but are not limited to) Botrytis, gummy stem blight, powdery mildew, downy mildew, Fusarium and Phytophthora. In 2017, IR-4 tolerance petitions were prepared on ametoctradin + dimethomorph for control of downy mildew and Phytophthora on greenhouse-grown cucumbers and lettuce and boscalid + pyraclostrobin for control of Botrytis, gummy stem blight, and powdery mildew on greenhouse-grown cucumber, lettuce, pepper, summer squash and eggplant.

Article photos provided by Mike Bledsoe

IR-4 Headquarters,
Rutgers, The State University
of New Jersey
500 College Road East
Suite 201 W
Princeton, NJ 08540

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