The IR-4 Project
Pest Management Solutions for Specialty Crops and Specialty Uses

Newsletter

Vol. 47 No. 4 Fall 2016

Lions, Bears and Tiger Nuts…Oh My!

— by Kathryn Homa, Fungicide Coordinator, IR-4 Project Headquarters

Never heard of this minor crop? I bet you have. Tiger nuts, more commonly known by other names such as chufa or yellow nutsedge (*Cyperus esculentus*) is a perennial sedge that is thought to have originated in tropical Africa, the Mediterranean and Asia. It's a grass-like plant with simple leaves, a triangular stem and a flower stalk. Rising from the ground surface, this plant can reach up to 3 feet in height. Tubers are small (0.5 to 0.75 inch long), cylindrical, hard and resemble a nut. Today, this plant is naturalized throughout the world and mostly exists as a noxious weed in the US. However, cultivated varieties are being developed that produce much larger tubers than wild plants. Currently, official cultivar lines have not been formally identified but can be obtained from Ghana and Nigeria.

In other parts of the world including Spain and Africa, chufa has been extensively cultivated since ancient times. In North Africa, including Egypt, there is evidence that tiger nuts have been cultivated for over 6,000 years. In fact, the tubers were found in the tombs of pharaohs. Some sources also indicate that Egyptians made the tubers the world's first cultivated food. The main growing region of tiger nuts continues to be in North Africa and Spain. However, cultivation has also been reported in Florida and California.

Tiger Nuts fields at Rutgers Hort Farm. Courtesy of http://bit.ly/2dpX6St

Tiger nuts thrive in warmer climates with full sun and moist soil with a high nitrogen content. Plants are also highly tolerant of a number of soil conditions and have few pest and disease issues. The planting to harvest period is approximately 3 to 6 months, with harvesting and drying in the fall. During harvesttime in Spain, aboveground shoots are burned and tubers are harvested by hand or a machine similar to a peanut harvester.

The popularity of this specialty crop

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Inside this issue…

Executive Director Notes

Dear Friends,

During the week of September 19, 2016, IR-4 held the Biopesticide and Food Use Workshops in Orlando, Florida. Over 200 delegates registered for the workshops where IR-4's specific research priorities for 2017 and beyond were established. This year's crowd was extremely cooperative and excellent research opportunities were selected. Please see page 10 for the selected priorities from both workshops.

I was given an opportunity to update the workshop participants on IR-4 activities including recent successes, ongoing challenges and opportunities, specific threats to the Project, update of Path Forward process and the Commodity Liaison Committee (CLC). Joining me at the podium for the CLC update was CLC member Lori Berger. Lori is the Co-Chair of the recently formed CLC Subcommittee,"Congressional Liaison". Some key points of her talk included:

- IR-4 continues to support a significant number of new registrations of conventional pesticides and biopesticides on food and ornamental specialty crops.
- Our partners, the Canadian Pest Management Centre, are hosting the Third Global Minor Use Summit in Montreal, Canada, on October 1-4, 2017.
- IR-4 continues to be challenged by the expanding need for product performance data along with the need to support global harmonization of Maximum Residue Levels. These challenges are stretching IR-4's limited resources.
- There are real threats to IR-4, including University Service Fees/flat funding (see Path Forward discussion, below), significant change in the regulatory climate at EPA, and numerous mergers within the crop protection industry.

Please email me directly (jbaron@njaes.rutgers.edu) if you would like a copy of the visuals from this presentation.

We recently sent out Path Forward Communique III. This communique highlighted the steps IR-4 is taking to address the issues of multiple years of flat/decreasing funding; a changing budgetary environment in the Land-grant institutions; challenging regulatory requirements; and evolving industry needs. Specifically, it updated IR-4 stakeholders on the conclusion/recommendations of the independent Organizational Assessment Panel and the acceptance of such recommendations by the IR-4 Project Management Committee. It was agreed that IR-4 should maintain its existing infrastructure; this is too valuable of a resource to sacrifice for short term savings. IR-4 will look at ways to increase efficiencies. Finally, IR-4 will step up its efforts to gain new funding sources.

IR-4 has initially set up two teams to explore opportunities for efficiencies. The first team involves the IR-4 analytical laboratories. The IR-4 Laboratory Research Directors are tasked with assessing processes in the labs, including project selection, analysis priorities, lab efficiency and achieving timelines. The second team will explore "field data flow" process improvement, looking at ways to develop greater efficiencies with the field data books going from the researcher to the regional office to QC/QA to the Study Director. Both teams will meet in early 2017 and report back mid-year with recommendations. At IR-4 Headquarters, we are investing in an enhanced telecommunications system with the potential to reduce travel cost. The new system will roll out with the virtual National Research Planning meeting, October 31- November 1, 2016.

Along the lines of gaining new sources of funds, I want to give a shout out to IR-4 Ornamental Horticulture Program Manager, Cristi Palmer, whose program was recently awarded $2.9 million from USDA-Specialty Crop Research Initiative for two grants over the next two years (see page 6). The first grant, a coordinated agriculture project, focuses on "Protecting Pollinators with Economically Feasible and Environmentally Sound Ornamental Horticulture". The second grant, to plan potential future research, involves "Identifying Knowledge Gaps and Novel Management Strategies for Downy Mildews Impacting Environmental Horticulture Crops." Congratulations Cristi, and her multiple team participants throughout the US.

All for now, all the best,
Jerry

IR-4 Receives TASC Grant from USDA-FAS

— by Dan Kunkel, IR-4 Associate Director

IR-4 recently received a Technical Assistance for Specialty Crops (TASC) grant from the USDA-Foreign Agriculture Service (USDA-FAS). The goal of the grant is to ensure that IR-4 data meets not only the US residue data requirements but also international standards. In many cases, this means that IR-4 will need to increase the number of data sites and in some cases provide different types of data (such as more decline studies or additional metabolite analysis). IR-4 started collecting these data in its domestic research program (to some extent) some years ago to meet data typically required by EU, Codex or Canada. The need has increased considerably and IR-4 does not believe that the USDA NIFA grant was intended to be used for this type of data. Therefore, IR-4 requested supplemental funding from USDA-FAS under their TASC Grant Program to help pay for the additional work.

While the primary work on each study will still be funded through USDA-NIFA, adding these additional sites etc. will avoid the need to go back later and generate additional data when export concerns arise. In many cases IR-4 will only need to add one to two additional trials to meet the minimum Codex requirements.

IR-4 believes this will be an extremely cost effective means to prevent trade barriers by developing adequate data up front. More importantly, the appropriate data is available to both domestic and international regulatory authorities at the same time, which will allow concurrent establishment of a pesticide tolerance and the international MRL for trade.

IR-4 is anticipating that the grant will support up to 50 additional field trials each year along with the analytical work associated with those trials. While the grant only covers 5 years, IR-4 is hopeful that the next Farm bill will provide more support for this type of work and IR-4 will receive future appropriations to fill this important need.

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Biopesticide Program Finds Promising Solutions for Organic Growers

— by Michael Braverman, IR-4 Biopesticide Manager, Krista Coleman, IR-4 Research Assistant and Julieane Lacsina, IR-4 Intern

In 2015, the IR-4 Biopesticide Program began organizing its efficacy program around specific high priority stakeholder needs. Based on the results of workshops, two priorities for organic growers has become clear. They included fire blight in apples and spotted wing drosophila in blueberries and caneberries. Both of these problems are challenging for both organic and conventional growers. The purpose of this article is to provide an update on what products appear to be effective to combat these issues.

In conventionally produced apples, the standard treatment for fire blight is centered on antibiotics. Until 2014, even organic growers were allowed to use antibiotics for the management of fire blight. Plant pathogen resistance to antibiotics is a concern; therefore new antibiotic and biopesticide tools are needed by conventional apple growers as well. Across many IR-4 trial locations in the Pacific Northwest in IR-4 trials and other independent evaluations, one organic product appears to have risen to the top. The organism *Aurebasidium* (in the commercial product Blossom Protect) is a strong colonizer of plant surfaces, effectively creating a barrier to infection by fire blight. In most cases it has performed as well as antibiotics in the western US. The activity has not been as consistent in the eastern US and further work is needed to determine possible reasons, such as interactions with copper and sensitivity (causing russeting) in some varieties.

IR-4 continues to fund this work along with a few other promising products. We thank scientists David Granatstein, Julianne Grose, Ken Johnson, Kari Peter, Tim Smith, George Sundin, and Keith Yoder for their work on fire blight management.

Spotted Wing Drosophila (SWD) is a severe problem on ripening soft fruit such as blueberry and raspberry. IR-4 Commodity Liaison member Alan Schreiber along with scientists throughout the country including Mark Bolda, Frank Drummond, Matt Grieshop, Rufus Isaacs, Oscar Liburd, and Dean Polk have been studying management of SWD.

IR-4's efforts have focused on blueberries and caneberries. Voted as one of the top pests two years running at the IR-4 Biopesticide Workshop, many berry growers complain that the larvae damage fruit, rendering it a sticky, inedible mess.

Spinosad (formulated as Entrust) was originally registered on these

Cesar shows his oriental beetle samples. IR-4 previously registered the oriental beetle pheromone.

Netted Spotted Wing Drosophila around a food source

crops based on data developed by IR-4 Study Director, Keith Dorschner and it continues to be the most reliable tool for management of SWD.To avoid resistance, which is also a concern in organic berries there are limitations in the number of Entrust applications that can be used. Research has indicated that *Chromobacterium subtsugae* (Grandevo) is an effective rotational product in combination with Entrust. Sabadilla (Veretran D) has also shown potential but has been more difficult to evaluate with small plot sprayers. There has been some efforts to incorporate attractants, but benefits have not been as clear in comparison with Entrust- Grandevo rotations alone.

Richard Cowles, an entomologist from Connecticut Agricultural Experiment Station, has been instrumental in designing experiments for testing attract and kill systems.

Recently, IR-4 personnel visited Entomologist Cesar Rodriguez-Saona who has worked with the IR-4 Biopesticide Project for several years. He is currently stationed at the Philip E. Marucci

continued on next page

Recent Regulatory Challenges to Area-wide Mosquito Control

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

The ongoing Zika virus outbreak has led to an increase in area-wide mosquito control activities and, in particular, to aerial application of pesticides aimed at adult mosquitoes. This expansion in area-wide pesticide use has also led to increasing scrutiny of the safety of these practices, both in terms of human and environmental risks. In this context, it is important to understand the scope of the adult mosquito control toolbox and some recent regulatory challenges facing it. A range of new mosquito control techniques are being developed, many with IR-4 support, but none have yet been recommended by public health agencies for widespread use. Thus,

Ground application of mosquito adulticide is common in suburbs.

Hand application of mosquito adulticide in an urban site.

for the near future at least, we will depend on conventional toxicants as the major mosquito control intervention, and their regulatory status is of critical importance.

Chemical control of mosquitoes can target either larvae or adults, but if there are adult mosquitoes carrying Zika and other human pathogens in an area, then only adulticides can reduce the vector risk. Unfortunately, while there are many larvicide types in the market, there are only two classes of pesticides now registered for wide-scale mosquito control, which has major implications for their regulation.

Both pyrethroids and organophosphates (OP's) have been available since the 1950's, but none of the newer pesticide classes have demonstrated the same combination of high effectiveness and low toxicity, especially to mammals.

Unfortunately, resistance to OP's became very high when they were the primary control tools, and resistance to pyrethroids is increasingly a problem as they have replaced OP's in routine use in

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Biopesticide Program

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The team examines a lure trap in the blueberry field

Center for Blueberry and Cranberry Research and Extension, a substation of the New Jersey Agricultural Experiment Station (NJAES) of Rutgers University located in Chatsworth, NJ. Cesar is funded in part by the IR-4 Project, USDA Crop Protection and Pest Management Grant, and Specialty Crop Research Initiative (SCRI). He is seeking to develop fruit, leaf, and yeast volatiles based on fermentation to attract the SWD. IR-4 stakeholders will be relying on Cesar's research in development of novel attractants, along with innovative tactics such as attract and kill for SWD control.

IR-4 Receives Funding to Coord and Boxwood

— by Cristi Palmer, IR-4 Orn

During the summer of 2016, the IR-4 Ornamental Horticulture Program was the beneficiary of several awards to facilitate research relating to pollinators, downy mildew, and boxwood blight. Each topic is an issue impacting ornamental horticulture growers in a unique way. Both pollinators and downy mildew affect wide swaths of the growing community while boxwood blight touches a small, but significant slice. Outcomes from each project will benefit growers, but consumers, scientists, the regulators, and the crop protection industry will all gain in knowledge and experience in how best to manage each respective issue.

Pollinator visiting Chaste Tree (*vitex agnus-castus*). Photo by Cristi Palmer

Pollinators

Pollinators are crucial to a well-functioning ecosystem by providing human beings fruits and vegetables through our food production systems and by supporting animals and insects via fostering reproduction through seed of many environmental plants in unmanaged landscapes. In residential and commercial landscapes, flowering plants may provide additional nutritional resources for pollinators from early spring to late fall. Studying the most common flowering plants in our US landscapes and whether they attract pollinators will help define how concerned we should be about using systemic insecticide on those plants during production.

Also contributing to our understanding will be determining the amount of residues in pollen and nectar of model plants. Hence, NIFA-SCRI awarded IR-4 a two year grant ($2.9 million), the first installment of a five-year project, to facilitate a multi-institutional research team to study these aspects of pollinator protection for ornamental horticulture crops and to work on three other areas.

Drawing on expertise within the research team, we will also study the efficacy, economics and environmental impact of alternative pest management strategies including other insecticides, biopesticides and other pest management techniques. We will survey plant-buying consumers on their preferences for pollinator attractive plants and terminology surrounding protecting pollinators, building on efforts already underway by Bridget Behe and her colleagues. Throughout the project, we will develop best management practices as research findings are gathered. This project will aid growers, landscape maintenance personnel, and regulatory officials by providing key information related to protecting pollinators within ornamental horticulture.

Downy Mildew

The activities here are two-fold. USDA-APHIS provided a cooperative agreement to continue research on Impatiens Downy Mildew (IDM) and several downy mildews impacting edible crops. And USDA-SCRI provided a planning grant to host a workshop to discuss and prioritize research and extension activities for downy mildews across environmental horticulture crops.

Impatiens downy mildew caused by *Peronospara obduscens.* Photo by Margery Daughtrey

linate Pollinator, Downy Mildew, Blight Projects

amental Horticulture Manager

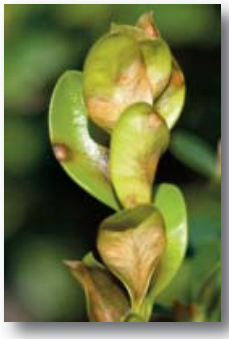
The 2016 **USDA-APHIS cooperative agreement** continues research and extension efforts on IDM, Cucurbit Downy Mildew (CDM) and other downy mildews of specialty crops. We will build on the research conducted over the last three years by continuing to examine environmental cues for the production of the two different types of IDM spores (conidia and oospores) and the role of reservoir plants which may harbor IDM or CDM over the winter. Preliminary results for genetic variability of IDM indicate that this pathogen is highly variable genetically and the populations in the US have shifted over time; we will continue to collect and analyze this variability in 2016 and 2017. Early detection of CDM and the resistance profile for that population can provide growers an edge in managing this disease and producing quality crops; we will develop detection tools using spore traps and genome technologies to distinguish CDM populations based on resistance gene markers. We will continue to refine best management practices for IDM based on additional screening of new tools and rotational programs incorporating fungicides with different modes of action, and we will continue to extend our research results to our stakeholder communities.

The **USDA-SCRI planning grant** is a natural extension of the work over the last several years through the APHIS cooperative agreements.

Downy mildews are becoming more prevalent in a wider number of environmental horticulture crops. The reasons for this increase are unknown. The objectives for the planning grant will be to discuss and prioritize research and extension needs. In addition to highlighting some of the newly emerged downy mildews, we will characterize the gaps in knowledge for the biology, epidemiology, economic impacts of downy mildews and the challenges in identification and diagnostics. We will also discuss options for managing downy mildews and what is missing for biopesticides, designer chemistry, induced resistance, host resistance, RNAi, and cultural options. In addition, we want to examine barriers to adoption of new methodologies and strategies for effectively communicating research results. This workshop will lead to a road map for addressing downy mildews with a strong multi-disciplinary team.

Boxwood Blight

Of the three topic areas, this USDA-APHIS sponsored cooperative agreement directly impacts the fewest growers, but this disease can be quite devastating in that not only does the pathogen defoliate boxwoods in production leading to plant death, but it can also destroy large boxwoods in historic plantings dating to the colonial era. Two pathogens cause this disease, *Calonectria pseudonaviculata* (Cps) and *Calonectria henricotiae* (Ch). Currently, only Cps is found in the US, and we want to keep it that way.



Boxwood blight caused by *Calonectria pseudonaviculata*. *Photo by Cristi Palmer*

Both pathogens instigate the same symptoms and have the same characteristics of very resilient resting spores (microsclerotia) and sticky asexual spores (conidia) which can be easily transferred on clothing, shoes, and animal fur and through water.

Over the past four years, we have investigated management options (sanitizers, fungicides, mulch, biofungicides, heat treatments, host tolerance and resistance), basic biology and survival, host range, and genetic characterization and detection techniques, and we have incorporated our research results into new best management practices. The 2016 **USDA-APHIS cooperative agreement** extends the research on mulch, new biofungicides, heat treatments, and begins to explore the potential for RNAi mitigation tools. We will continue to incorporate new findings into management recommendations.

In conclusion, we are very grateful for the opportunity to work with these excellent research teams on critical issues impacting growers of ornamental horticulture crops and look forward to providing answers to growers.

Research team members for each project are listed on page 11.

Mosquito Control

continued from page 5

many areas. Since resistance management requires at least two classes of chemicals with different modes of action, and since no alternatives are likely to come into the market for years, we must determine how to minimize any risks associated with mosquito control for both the pyrethroids and OP's.

A primary concern to EPA and the public is human safety, and EPA's Health Effects Division (HED) is reviewing both the pyrethroids and OP's as part of Registration Review. Since the last reviews, HED has focused on potential for endocrine disruption, developmental neurotoxicity, and drinking water, in addition to the more traditional measures of acute and chronic toxicity. While the pyrethroids do not appear to have any significant human health "red flags" in the reviews, there has been considerable discussion on whether there is an adequate safety margin for children exposed to OP's, and in particular to chlorpyrifos. Chlorpyrifos, malathion, and naled (dibrom) are the only OP's registered for area-wide mosquito control. Draft HED risk assessments have recommended that an additional 10x safety factor be added for these materials when calculating allowable concentrations in the environment, to cover "uncertainty" in the data sets. While final decisions have not been made, there has been substantial controversy about whether these reductions can be achieved without impacting control effectiveness.

Environmental risk assessments are the other key requirements of Registration Review, and there are two primary areas of concern for mosquitocides – endangered species and pollinators. EPA has long wrestled with how best to evaluate the risks of chemicals in the environment, including pesticides, and how to evaluate their potential impact on rare and highly protected species. Using chlorpyrifos, malathion and diazinon (which is not used in mosquito control) as a pilot project, and extremely low thresholds for risk (one in one million chance of harming any single organism of a species), federal regulators in April issued draft Biological Evaluations for pesticide uses. With such a low threshold of risk, it is not surprising that they concluded that 97% of protected species are "likely to be adversely affected" by current pesticide use patterns. This process, as with the health effects of OP's, has been contentious, and final determinations have not been issued, but mosquito control agencies and IR-4 have strongly argued that risks need to be rigorously evaluated and fairly compared to benefits. Pollinator declines have also received considerable attention as a possible impact of pesticides, and these concerns extend to area-wide mosquito control. (We will discuss pollinators in depth in an upcoming article.)

It seems highly unlikely that any of these reviews will lead to a cancellation of active ingredients by regulators, but expensive new requirements for data to evaluate safety or new label requirements designed to reduce exposures could lead to products leaving the already small toolbox. In addition, efforts to reduce dose could have unintended consequences including poor control of disease vectors, the need for repeated applications, development of residues, and/or increasing resistance. Thus, IR-4 is working closely with vector control personnel, regulators, and product registrants to help ensure that the best possible science is brought to bear on these questions.

Helicopters are often used to treat inaccessible habitats

This Air Force spray plane can treat very large areas quickly.

Tiger Nuts

continued from page 1

is growing due to its purported health benefits. Described as a "superfood", the tubers are highly nutritious. They are high in protein, lipids, oleic acid, fiber, iron, potassium, magnesium, phosphorous, calcium and vitamins C and E. The nuts are being marketed as an appetite suppressor and a gluten-free food. The oil, which is similar to olive oil, is high in monosaturated fatty acids. Other benefits include heart health and possible reductions in the risk of diabetes, cancer and digestive issues.

Tubers are hard for culinary purposes, so they are usually soaked in water before being consumed. Tubers are sweet and nutty in flavor, can be consumed raw or can be roasted as a root vegetable, dried, ground into flour, or pressed for oil. Tubers contain 20-30 percent of a non-drying mild-tasting oil that is obtained from pressing the tubers. This oil is used to prepare a drink (*Horchata de Chufas*) and is also used in cosmetic products. Some grocery stores in the US are currently selling tiger nut products including juice, dried tubers, flour and trail mix.

Courtesy of
https://tigernutsusa.com/what-are-tiger-nuts

Rutgers University, under the New Jersey Agricultural Experiment Station (NJAES) specialty crop research group has been funded for approximately $2 million by the USDA to conduct research to examine potential markets for ethnic specialty crops in the East Coast. With this data, researchers are planning to look into those crops that have the potential to be grown in greenhouse and hoop house production. In addition to tiger nuts, other speciality crops of interest include exotic peppers, roselle, amaranth, African eggplant and okra. Currently, these crops and others are being grown by students at Hort Farm 3 on the George H. Cook Campus and being sold at the New Brunswick Community Farmers Market. The group is being led by Ramu Govindasmy, a marketing specialist in the Department of Agricultural, Food and Resource Economics and Dr. Albert Ayeni, ethnic crop specialist in the Department of Plant Biology and Pathology.

Tiger nuts are currently included as "chufa"in the Root and Tuber Vegetables Crop Group 1 and subgroups 1C, Tuberous and corm vegetables subgroup (potato as the representative crop) and subgroup 1D, Tuberous and corm vegetables (except potato) subgroup (sweet potato as the representative crop). When IR-4 conducts studies on the representative crops and tolerances are obtained on subgroups 1C or 1D, then these pesticides can be used on tiger nuts (chufa).

Tolerance Successes — Third Quarter 2016

Federal Register: June 1, 2016 Fluensulfone *Trade Name:* Nimitz
Crop: Root vegetable except sugar beet subgroup 1B, Tuberous and corm vegetable subgroup 1C *PR#:* 10904, 10905, 10907, 11127, 11657

Federal Register: June 14, 2016 Clofentezine *Trade Name:* Apollo
Crop: Avocado, Papaya, Pome fruit group 11-10, Cherry subgroup 12-12A, Peach subgroup 12-12B, Small vine-climbing fruit except kiwifruit subgroup 13-07F *PR#:* 09321, 09322, 11531, 11532, 11533, 11534

Federal Register: June 14, 2016 Chlorantraniliprole *Trade Names:* Altacor, Coragen
Crop: Globe artichoke (revised tolerance), Hops (revised tolerance), Stone fruit group 12-12, Tree nut group 14-12 *PR#:* 10083, A10491, 11200, 11201

There were no IR-4 — related tolerances published in July or August.

Results of 2016 Food Use Workshop (Residue "A" Priorities)

PR#	Group	COMMODITY	CHEMICAL
12000	01AB	GINSENG	ISOFETAMID
11889	01CD	SWEET POTATO	DIQUAT
12026[3]	04-16	GREENS (MUSTARD) (GH TRANSPLANT)	UNICONAZOLE-P
11027	04-16A	LETTUCE (HEAD & LEAF)	MANDESTROBIN (S-2200)
12029	04-16A	SPINACH	PROMETRYN
11902	04-16A	PARSLEY	DIFENOCONAZOLE
11877	04-16B	GREENS (MUSTARD)	ETHABOXAM
11870	05-16	CABBAGE	ETHABOXAM
12034[2]	05-16	CABBAGE	PROMETRYN
11980	06C	BEAN (DRIED SHELLED)	TRIBENURON-METHYL
11981	06C	PEA (DRY)	TRIBENURON-METHYL
12021	08-10A	TOMATO	GLUFOSINATE
11919	08-10A	TOMATO (GH)	SPINETORAM + SULFOXAFLOR
12022	08-10BC	PEPPER (BELL & NONBELL)	GLUFOSINATE
11944	08-10BC	PEPPER (BELL & NONBELL) (GH)	SPINETORAM + SULFOXAFLOR
12018	09A	CANTALOUPE	GLUFOSINATE
12019	09B	CUCUMBER	GLUFOSINATE
12020	09B	SQUASH (SUMMER)	GLUFOSINATE
11926	09B	CUCUMBER (GH)	SPINETORAM + SULFOXAFLOR
11794	13-07A	CANEBERRY	PYDIFLUMETOFEN (FTH 545)
11983	13-07B	BLUEBERRY	BUPROFEZIN
11890	13-07G	STRAWBERRY (GH)	CYFLUMETOFEN
11962	13-07H	CRANBERRY	FLUMIOXAZIN
11876	14-12	WALNUT	OXYTETRACYCLINE
11970	15-16	CORN (SWEET)	FLONICAMID
12061[1]	17	GRASSES (PASTURE)	PRONAMIDE
11993	18	CLOVER (RED) (SEED CROP)	DIURON
11068	20B	SAFFLOWER	BIFENTHRIN
11945	21	MUSHROOM (WHITE BUTTON)	SPINOSAD
11935	23A	OLIVE	FLUTRIAFOL
10184	23A	OLIVE	RIMSULFURON
11547	23B	FIG	GLUFOSINATE
10405[4]	23B	GUAVA	FLUOPYRAM + TEBUCONAZOLE
10240	24B	AVOCADO	GLUFOSINATE
11699	24B	POMEGRANATE	FENPYROXIMATE
10765	24B	PAPAYA	TRIFLOXYSTROBIN + FLUOPYRAM
11292	24C	SUGAR APPLE	FLUMIOXAZIN
11952	99	ARTICHOKE (GLOBE)	CYCLANILIPROLE
11934	99	COFFEE	AZOXYSTROBIN + CYPROCONAZOLE
11525	99	HOPS	GLUFOSINATE
11971	99	MINT (FUTURE: HERBS)	FLUOPYRAM

[1]PR# 02297 - Pronamide/Grasses (Pasture) - Revised PR# 12061
[2]PR# 12034 –Commodity Revised to Rep Crop
[3]PR# 12026 –Commodity Revised
[4]PR# 10405 –Chemical Revised

Results of 2016 Food Use Workshop (Performance "H+" Priorities)

Revisions may still be coming in as of this document. Check the IR-4 website for the most up to date version

PR#	Group	COMMODITY	CHEMICAL
11667	01AB	HORSERADISH	BICYCLOPYRONE
11938	01CD	SWEET POTATO	INSECTICIDE
10558	01CD	SWEET POTATO	GLUFOSINATE
10557	05-16	BROCCOLI	SULFENTRAZONE
12023	06C	PEA (DRY)	PYROXASULFONE
11920	13-07G	STRAWBERRY (NON-BEARING)	FLUAZINAM
11915	23	TROPICAL & SUBTROPICAL FRUIT	METAFLUMIZONE
11726	99	MONARDA (FUTURE: HERBS)	PENDIMETHALIN

Results of the 2016 Biopesticide Workshop

Fruit	Organic	Other	Orn Hort	Residue	Vegetable
Stem gall wasp, blueberry	Downy mildew, spinach	Weeds, All crops	Chestnut blight, American Chestnut	Copper hydroxide/Hop powdery mildew, and hop downy mildew	Agrobacterium tumefaciens, GH cucumber + tomato
Spotted wing drosophila, All crops	Spotted wing drosophila, fruit	Varroa mite, honey bee	Botrytis leaf spot/blight, bulb cut flowers	Malathion/Aphid, cherry fruitworm, midge, root weevil, scale, SWD	Phorid fly, mushrooms
Black sigatoka, banana	Fire blight (Erwinia amylovora), pome fruit	Glyphosate resistant weeds, all crops	Botrytis, conifer nursery stock	Cyantraniliprole/Aphid, cherry fruitworm, midge, SWD	Pepper weevil, GH pepper
Whitefly (Q-biotype and others), all crops	Weeds, field	Thrips (chilli), all crops	Weed Control in Nursery Seed & Transplant Beds		Southern blight, tomato and pepper
Aflatoxin on nuts, dried fruit crops, figs, corn	Black rot, Brassicas	Post-harvest, export crops			Bagrada bug, Brassica

Team Members for Orn. Hort. Research Grants

see related article on pages 6 & 7

The multi-institutional Pollinator research and extension team is:

- Jim Bethke, University of California, Division of Agriculture and Natural Resources
- Christine Casey, University of California, Davis
- JC Chong, Clemson University
- Rich Cowles, Connecticut Agricultural Experiment Station
- Brian Eitzer, Connecticut Agricultural Experiment Station
- Dan Gilrein, Cornell Cooperative Extension of Suffolk County
- Christina Grozinger, Penn State University
- Zach Huang, Michigan State University
- Hayk Khachatryan, University of Florida
- Elina Nino, University of California, Davis
- Andrea Nurse, University of Maine
- Cristi Palmer, The IR-4 Project, Rutgers University
- Harland Patch, Penn State University
- Dean Potter, University of Kentucky
- Dave Smitley, Michigan State University
- Kim Stoner, Connecticut Agricultural Experiment Station
- Nishanth Thayirl, Clemson University
- The Plant Management Network

The members of the downy mildew research and extension team include the following scientists:

- JoAnne Crouch, USDA-ARS, Beltsville
- Margery Daughtrey, Cornell University
- Ann Gould, Rutgers University
- Mary Hausbeck, Michigan State University
- Aaron Palmateer, University of Florida
- Cristi Palmer, The IR-4 Project, Rutgers University
- Lina Quesada, North Carolina State University
- Nina Shishkoff, USDA-ARS, Fort Detrick
- Oney Smith, Hood College

Those involved in the USDA-APHIS boxwood blight research teams over the past five years include the primary investigators below. Several grad students and post doctorial associates also contributed to these efforts.

- Anton Baudoin, Virginia Tech *
- Mike Benson, North Carolina State University
- Len Coop, Oregon State University
- JoAnne Crouch, USDA-ARS, Beltsville *
- Norm Dart, Virginia Department of Agriculture and Consumer Services *
- Margery Daughtrey, Cornell University
- Sharon Douglas, Connecticut Agricultural Experiment Station
- Ann Gould, Rutgers University *
- Chuan Hong, Virginia Tech *
- Marc Cubeta, North Carolina State University *
- Kelly Ivors, Cal Poly (formerly, North Carolina State University)
- Jim LaMondia, Connecticut Agricultural Experiment Station
- Bob Marra, Connecticut Agricultural Experiment Station
- Cristi Palmer, The IR-4 Project, Rutgers University *
- Nina Shishkoff, USDA-ARS, Fort Detrick *
- Oney Smith, Hood College *

* those on the current 2016 boxwood blight agreements

Dont forget to follow us. www.facebook.com/IR4Project, www.facebook.com/IR4OrnHort and

@IR4_Project and @IR4Project.

Save the Date

October 1-4, 2017

Third Global Minor Use Summit (GMUS-3)

will be held October 1-4, 2017 at the Fairmont Queen Elizabeth Hotel, in Montreal, Quebec, Canada.

GMUS-3 will provide an update on the 5-year Work plan action items that resulted from the GMUS-2 with updates and accomplishments included in the areas of:

- Coordination and Collaboration
- Communication
- Incentives
- Capacity Development and
- Registration of Minor Uses and MRL Setting

GMUS-3 will put greater emphasis on policy considerations that can help specialty crop growers around the world obtain access to safe and modern tools to produce their crops, and to promote trade among nations.

The summit will also provide an opportunity for delegates to participate in the 2nd Global Minor Use Priority Setting Workshop which will be part of the GMUS-3 agenda.

For those interested in seeing Canadian horticultural production, an optional field tour will be offered on October 5th, 2017 for an additional fee. Therefore, please reserve your hotel accommodations accordingly.

Room Reservations:
The meeting will be held under one roof at the Fairmont Queen Elizabeth Hotel. A limited number of rooms have been secured and reservations can be made online at: https://aws.passkey.com/event/16298864/owner/17625/home.

Registration Information:
Information on GMUS-3 online registration will be provided in December 2016.

For additional information, please contact: Shirley Archambault at Shirley.archambault@agr.gc.ca or at 1-613-759-7714.

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