Facilitating regulatory approval of pest management technology for specialty crops/specialty uses to promote public wellbeing

2019 Annual Report

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ANNUAL REPORT OF THE IR-4 PROJECT[1]
January 1, 2019 - December 31, 2019

The IR-4 Project (IR-4) was established in 1963 by the United States Department of Agriculture (USDA) and remains relevant today because of the inherent need to have crop protection technology available to growers of specialty crops (fruits, vegetables, nuts, herbs, trees, shrubs, flowers, etc.) and minor or specialty uses on major crops (corn, cotton, soybeans, wheat, etc.). The registrants (owners) of crop protection products (chemical pesticides and biopesticides) often focus their product development efforts and resources on large acreage, major crops where potential sales are significant. Specialty crop markets are considered minor with the cost of data development often exceeding potential sales. This leads to an unacceptable return on investment. The IR-4 Project fills such voids by developing the data required by the U.S. Environmental Protection Agency (EPA) to register uses in these "minor" market areas.

The IR-4 Project has two main program areas: the Food Crops Program and Environmental (Ornamental) Horticulture Program with non-food crops. Within the Food Crops Program, IR-4 has six sub-objectives:

1. Magnitude of the Residue Studies: Following EPA guidelines, these studies provide data to set regulatory standards for the amount of chemical pesticide/metabolites remaining in/on a crop at harvest or in a processed commodity (e.g. juice).
2. Product Performance Testing: Development of crop safety and/or efficacy data that provides assurances that the use of a pesticide (chemical or bio-based) is safe and effective.
3. Crop Extrapolation Models: Development of new proposals to expand and enhance the formal codified EPA Crop Groups/Sub-Groups. IR-4 crop grouping efforts proposes models that allow collection of residue data on a small number of representative crops that data then supports pesticide tolerances for a much larger number of similar crops. Crop grouping extrapolation allows IR-4, the regulated community and EPA to use resources in a smart and efficient manner.
4. Integrated Solutions: This new IR-4 initiative develops data potentially utilizing all available crop protection tools in order to develop specific solutions for hard to manage pests, prevent or better manage pest resistance (to pesticides) and mitigate pesticide residues in the final food product. Integrated Solutions also includes management of pests in organic crop production systems.
5. Biopesticides: Provide regulatory assistance for biopesticides/biotechnology registration with products discovered/developed by public sector institutions and/or small businesses.
6. International: Through various means, IR-4 assists domestic specialty crop growers ability to export to international markets by harmonizing pesticide residue standards. Harmonization eliminates differences in pesticide residue standards that can be a non-tariff trade barrier.

IR-4's role in the Environmental Horticulture Program involves the development of efficacy and plant safety data that indicates if crop protection products are safe and effective. The Environmental Horticulture Program also coordinates some non-core research that aids the environmental horticulture industry. Currently, IR-4 is coordinating a multi-state research program that studies impact of systemic insecticides on pollinators and how the environmental horticulture industry can protect pollinators while at the same time produce high quality plants.

IR-4 cooperates with many government/non-government organizations to accomplish its mission and leverage its resources. Associated groups include[2]:

- Specialty crop growers and their commodity organizations,
- Land Grant Universities/State Agricultural Experiment Stations (SAES),
- Crop protection industry, including large and small companies that register chemical pesticides and biopesticides,
- Multiple units of the USDA including
    - Agriculture Research Service (ARS),
    - Foreign Agriculture Service (FAS),
    - National Institute of Food and Agriculture (NIFA),

[1] IR-4 Project, or Inter-Regional Research Project Number Four, is authorized by the Directors of the State Agricultural Experiment Station Directors as National Research Support Program Number Four (NRSP-4)

[2] These and other Cooperating Agencies, principal leaders of the project, technical managers and IR-4 State and Federal Liaison Representatives are shown in Attachment 1

- US Environmental Protection Agency (EPA),
- California's Department of Pesticide Regulation (CA-DPR),
- Agriculture and Agri-Food Canada's Pest Management Centre (CN-PMC).

The IR-4 Project activities have delivered nearly 21,350 registrations of chemical pesticides and biopesticides on specialty food crops since 1963. Over the last 25 years, IR-4 has emphasized research on products that are compatible with Integrated Pest Management Systems (IPM). This "IPM-Friendly" technology includes "Reduced-Risk" pesticides, biopesticides, and certain products that can be used in organic farming. The Environmental Horticulture Program's deliverables are equally as impressive with data supporting nearly 50,000 uses on trees, shrubs, flowers and other ornamental crops.

Additional details about IR-4 can be found on the IR-4 Project's website: http://www.ir4project.org.

Food Crops Program

Research Activities – Food Residue

Since 1963, IR-4 stakeholders have submitted 12,932 requests for assistance to the IR-4 Food Program. Of these, 328 are currently considered "researchable projects" that remain as outstanding documented needs of specialty crop growers. The other requests have been addressed through previous research and regulatory submissions or cannot be registered at this time. In 2019, a total of 168 new project requests were submitted to IR-4 from stakeholders. IR-4 staff added 104 requests to the IR-4 database to track the new crop group updates, international requests or other studies needed to address regulatory issues that will be bundled into future submissions to EPA. The total number of new requests added to the IR-4 tracking system during 2019 was 272.

IR-4's research priorities for 2019 were determined by stakeholders during the September 2018 IR-4 Food Crop Workshop, in St. Louis, MO. Based on the outcome of that workshop and other priority-setting mechanisms, such as using written proposals to "upgrade" projects and other projects to answer regional needs, IR-4 scheduled 65 new studies in 2019. An additional 7 studies were carried over from the previous year for a total of 72 residue research projects. There has been a steady decline in the number of studies that IR-4 has conducted over the past several years due to flat funding and some resources being transferred into required performance and crop safety work.

For most residue studies, IR-4 follows EPA's 860 Series Test Guidelines. Typically, the test chemical is applied in the field in a manner that simulates the proposed grower use of the pesticide on the target crop. When the crop is at the appropriate stage, samples of the crop are collected and shipped to the analytical laboratory where the amount of test chemical remaining in/on the crop is quantified. Field and laboratory data from this research are then compiled in a regulatory package and utilized to request a pesticide tolerance, also known internationally as a maximum residue limit (MRL).

In support of the 72 residue studies in the 2019 food residue research program, there were 414 total field trials. This total included 333 IR-4 "State" field trials conducted by land-grant university scientists, 52 field trials conducted by ARS researchers and 29 field trials managed by IR-4's partners in the Canadian Pest Management Centre (CN-PMC). Eighteen trials were dropped due to weather or other issues. Canada also served as Sponsor and Study Director for five of these studies. The specific studies for 2019, including test chemical and crop, are shown in Attachment 2.

Most residue samples developed in the field trials are assigned to the IR-4 Analytical Laboratories. When necessary, other cooperating facilities or contractors may be utilized to ensure projects are completed in a timely manner. IR-4 makes every effort to complete the field phase of a study in one year to help ensure that the 30-month timeline goal for each study is met. However, weather, proper trial separation requirements and other factors can sometimes preclude IR-4 from meeting this goal.

Product Performance (formerly Efficacy and Crop Safety [E/CS])

The need for IR-4 to develop product performance (efficacy and crop safety) data to support registrations of new uses for crop protection products remains an important priority in the IR-4 Project's annual research plan. In many cases, registrants must have the data prior to actively marketing new uses, especially in states like California where product performance data are required for registration. For 2019, the IR-4 Food Program Product Performance Team's plan utilized about $460,000 to support product performance research.

The 2019 funding supported research to address needs for 43 projects (49 PR #'s), including 89 state university trials (no Food Use performance trials were conducted within ARS in 2019). In addition, CN-PMC conducted several performance trials supporting a number of joint projects. See Attachment 3 – "2019 Product Performance Research Program" for full details.

A significant number of the projects were associated with IR-4 ongoing or completed residue studies to demonstrate that that a potential use is safe and effective. However, other studies may focus on potential future products, to ensure that they will provide the benefit to growers without harming the crop. A few legacy projects were designed to identify possible products to control pests where tools currently are not available (Pest Problem Without Solution, or "PPWS") were supported in this performance program in 2019. In the future these screening projects will be part of IR-4 Integrated Solutions initiative.

In addition to coordinating the 2019 performance research plan, the Food Crops Program Product Performance Team continued to work closely year-round with registrants and researchers to understand the quantity and scope of data requirements, and to ascertain the status of research results. They have also compiled as much detail as possible on each performance protocol prior to the annual National Research Planning meeting so that more informed trial placement and funding decisions can be made for the next year's program.

Integrated Solutions

In 2018, IR-4 established the Integrated Solutions initiative, a hybrid of the Pest Problems without Solutions (PPWS) research and elements of the traditional Biopesticide research program that also focuses on resolving pest problems and building pest control programs. Integrated Solutions objectives are (1) to identify solutions to an existing pest management void through product screening research, similar to the past "Pest Problems without Solutions" projects including biopesticides); (2) to integrate biopesticides into conventional (non-organic) agricultural systems to help prevent development of pest resistance; (3) to substitute biopesticides or short-residual reduced-risk products close to harvest to reduce the risk of MRL violations for specialty crops targeted for export markets (residue mitigation); and (4) to address the needs of organic production systems.

The 2019 IR-4 integrated solutions research focused on six main project areas:

IS00027	Wireworms / Sweet potato: David Riley, GA and Ric Bessin, KY
IS00094	Bacterial diseases / onion: Beth Gugino, PA and Lindsey du Toit, WA
IS00113	Verticillium wilt / eggplant: Mahfuz Rahman, WV
IS00327	Cucumber beetle / Watermelon: David Owens, DE and Shelby Fleischer, PA
IS00308	Damping-off / Hemp: Burton Johnson, ND; Alan Taylor, NY; and John Fike, VA
IS00330	Processing Tomato Orobanche parasitic weeds: Brad Hanson, CA

The first year was a success with much data resulting from the work. Some of the studies have also helped to leverage larger projects, funded by other grants. For protocols and reports please see: http://ir4app.rutgers.edu/ir4FoodPub/IS_trial.aspx.

Submissions and Successes

Submissions. This was another productive year for IR-4 submissions. IR-4 submitted data to EPA or to cooperating registrants for 22 chemicals, addressing 130 specific IR-4 requests (PR#s) for assistance. See Attachment 4 for a comprehensive listing of data submitted in 2019. There are currently another 115 reports signed at IR-4 HQ and ready for submission, but are awaiting final documents from cooperating registrants or are being bundled with other studies before the submission is made to EPA.

The IR-4 Food Crops Program continuously strives to work smarter and more efficiently to deliver new crop protection products for specialty crop growers. The 22 submissions will support hundreds of new uses based on established crop group extrapolations. Over half of the projects tracked in the 2019 submissions were for crop group tolerances (70 PR# of the 130 submitted). Often times IR-4 realizes as many as 10 or more new uses for each residue study submitted.

Successes. Based on IR-4 data and/or submissions, EPA established 208 tolerances which can support 1,545 new uses. The 1,545 new uses in 2019 bring the IR-4 56-year total of clearances to 21,359. There were also two emergency/ temporary tolerances set based on IR-4 preliminary data. A complete list of these new uses, along with the new crop groups, is in Attachment 5.

EPA reviewed 24 chemistries for IR-4 in 2019. This number of actions is back on par with previous years, likely due to EPA's Minor Use Team being fully staffed again and progress in Registration Review allowing EPA to make safety findings on certain products that had been on hold for several years. This productivity occurred in spite of the government being closed for several weeks in the beginning of 2019.

EPA continues to assess pesticide registrations with increased scrutiny to protect consumers, farm workers and the environment, with particular attention to protecting children, pollinators, endangered species and water. EPA's increased scrutiny of pesticide hazard/risk has required additional work by IR-4 to provide Public Interest support for these new uses and in many cases respond in the public comment process. IR-4 continues to add information from stakeholders to the IR-4 database to demonstrate the great need for these new pest control products. These products provide the much needed pest control products critical to IPM programs, resistance management and to combat new invasive pests arriving in the US.

A listing of IR-4 projects in the queue for future submission to EPA (that include data from 163 studies that will address 321 IR-4 project requests), is provided in Attachment 6, or can be searched on the IR-4 website at: http://ir4app.rutgers.edu/Ir4FoodPub/timelineSch.aspx. EPA posts their Multi-Year Work Plan, which includes IR-4 submissions pending at EPA, at: http://www.epa.gov/pesticide-registration/multi-year-workplan-conventional-pesticide-registration. IR-4 submissions are generally reviewed by EPA and a tolerance established within a PRIA 15-month review timeline. IR-4 continues to support EPA's goal of encouraging the use of pesticides that pose less risk to human health and the environment compared to existing alternatives, and IR-4 continues to make requests of EPA for many of our submissions to be classified as Reduced Risk.

Regulatory Compliance

Good Laboratory Practice Standards (GLP's as noted in Chapter 40, Code of Federal Regulations, Part 160) compliance is paramount to the quality and success of the IR-4 Project's Food Program residue data. Key components of compliance include the activities of the IR-4 Project's Quality Assurance Unit (QAU). The QAU continues to provide monitoring and support to cooperating scientists throughout the US. Audits of facilities and ongoing field and laboratory procedures provide assurance that IR-4's data are of the highest quality and ensure acceptance by EPA, the crop protection industry, and international regulatory authorities.

The Annual IR-4 QA Planning Meeting was held Feb. 26-27, 2019 in Dallas, TX. At this meeting, the audit plan for IR-4 QA officers for the 2019 field trial season was created. For calendar year 2019, regular inspections included 18 facilities, 175 in-life audits of field trials, 117 in-life audits of residue analytical laboratory activities, 53 analytical summary report/data audits and 310 field data book audits. During the 2019 calendar year, 64 final reports and amended reports were audited.

IR-4 facilities continue to work hard to meet the high standards demanded under GLP requirements. IR-4 has participated in a total of 182 EPA GLP IR-4 facility inspections since April 27, 1997, with only periodic minor findings to-date. In 2019, the EPA performed 6 inspections for GLP compliance/data integrity at IR-4 research sites.

IR-4 continues to use the eQA (electronic) reporting system to improve efficiencies and enhance communications across the program. Over 941 inspection and audit reports were processed using the web-based system in 2019. The electronic system was expanded in 2017 to include a document management system (eDOCs). This document management system is used to post protocols/changes, analytical methods and certificates of analysis for GLP test materials. To-date some 3139 sortable documents are now on the eDOCs system and are readily available to IR-4 study participants.

Crop Grouping Initiative

On August 27, 2019, EPA proposed two new large groups based on an IR-4 submission. The proposal called for "Crop Group 25 Herb Group" and "Crop Group 26 Spice Group". The proposal also included revision to one commodity

definition, the addition of three new commodity definitions, and amendment to the current herbs and spices crop group currently provided in Crop Group 19.

The crops in the current "Crop Group 19 Herbs and Spices Group" will be separated into two new crop groups. These revisions will allow for crop group tolerances for lower risk pesticides, and with fewer field trials necessary for regulatory decision-making. This proposed crop group revision is the fifth in an ongoing series of revisions to the crop grouping regulations.

International Activities

IR-4 remains committed to assisting US specialty crop growers with their desire to export fruits and vegetables to international markets through harmonizing pesticide residue standards in specialty crops, thus reducing the use of Maximum Residue Levels as a technical phytosanitary trade barrier.

In North America, IR-4's cooperation with CN-PMC continues to be mutually beneficial when priorities align. Joint research projects have been the standard. Canada contributed 29 field trials to the joint program in 2019. Of the 72 studies conducted by IR-4 in 2019, five were managed by CN-PMC, where they served as Study Director and Sponsor, and they utilized a number of IR-4 field research centers to complete the NAFTA data requirements. In total, the research benefit for the residue studies of working with CN-PMC saves IR-4 an estimated $500,000 each year. In addition, the CN-PMC program continues to provide significant contributions to IR-4 efficacy and crop safety research and shares ornamental efficacy and crop safety data with IR-4. There also continues to be a good exchange of personnel, with CN-PMC participating in various IR-4 meetings and vice versa.

The joint review process by EPA and Canada's Pest Management Regulatory Agency also benefits IR-4 stakeholders by saving resources on both sides of the border; only one agency is responsible for reviewing the residue data. More importantly, both agencies are establishing MRLs at the same level, at nearly the same time. This prevents trade irritants before they happen. EPA and PMRA completed joint reviews or workshares on 6 IR-4/CN-PMC joint submissions that could add 73 new uses to product labels.

There continues to be progress made in addressing priorities established at the first and/or second Global Minor Use Workshops. A number of studies are in progress for fruit fly control in tropical crops, such as spinetoram in Latin America. Many of the secondary priorities are also being considered; for example, the registration of flonicamid in NAFTA to address aphid control in legume crops. Anthracnose on tropical crops was raised as a priority where IR-4 is undertaking a number of residue studies along with Costa Rica and Peru, completing a study on papaya to address this need.

Many of the studies under the Global Capacity Development, Residue Data Generation Project came to completion in 2016 and 2017 and were reviewed by Codex/JMPR in 2018 and 2019. Coordinated by USDA-FAS, this project's objective was to enhance capacity of participating nations in Asia, Africa and Latin America to meet pesticide-related requirements based on international (Codex) standards. This goal is being achieved by collaborative residue data generation projects on low risk products, such as pyriproxyfen and spinetoram on tropical fruits, that incorporate all technical aspects of these studies and is expected to provide broader national residue monitoring as well. The focus of IR-4's contributions has been on developing the expertise to conduct field and laboratory pesticide residue studies under Good Laboratory Practices, and to eventually provide data to local authorities and Codex for product registration. All three of the regions participating in this project have received Standards Trade Development Facility (STDF) and USDA-FAS funding, which provides support for IR-4's contributions to the project as well. Going forward the newly formed Minor Use Foundation will coordinate and support much of this work, alleviating much of the burden that IR-4 carried to initiate and successfully bring this work to where it is today.

Projects submitted to JMPR in 2018 included: pyriproxyfen on Papaya, with samples from the Philippines, Malaysia and Brunei; pyriproxyfen on Mango that included samples from Malaysia and Singapore; pyriproxyfen on pineapple from Panama; and pyriproxyfen on Banana with samples from Costa Rica and Guatemala. Codex MRLs for these projects were adopted in 2019 for all except for banana and mango, which are being reconsidered and may result in 2020 MRLs. Africa finished their residue project with sulfoxaflor on mango in 2019 and the study was submitted to JMPR. Hopefully Codex MRLs will be established in 2021.

At the request of EPA, IR-4 personnel continue to be included as part of the US delegations to the: Codex Committee on Pesticide Residues (CCPR); the Organization for Economic Co-operation and Development (*OECD*), Expert Group on Minor Uses and the Working Group on Pesticides and the Expert Group on BioPesticides; and the NAFTA Technical Working Group on Pesticides. IR-4 plays a key role in these activities by supporting global standards and incentives that support minor uses. These include global recognition of crop grouping and extrapolation as well as promoting MRLs on specialty commodities. IR-4 also assists other countries, both developed and developing, as they begin to establish minor use programs, especially New Zealand, Brazil, Costa Rica and Colombia. The knowledge and expertise of IR-4 is often sought and is highly valuable to these countries as their minor use programs evolve.

IR-4 continued to support submissions to the JMPR for 2020 review, where IR-4 supported submissions of sulfoxaflor on asparagus, artichoke, blueberry, caneberry and sunflower, as well as the African mango study. It should also be noted that registrants continue to submit a number of IR-4 data packages to JMPR each year.

Plans for 2020

Residue Studies - The proposed 2020 Food Crops Program consists of 396 field trials involved in residue studies. This trial plan includes 356 trials scheduled at IR-4 Field Research Centers/other University sites, 51 field trials at ARS sites and 29 field trials conducted by Canadian partners (CN-PMC).

Product Performance - IR-4 is conducting 91 field trials to develop product performance data at University sites.

Integrated Solutions - The high priority projects for the Integrated Solutions research in 2020 include 5 repeats of field trials of the 2019 research and new studies with bacteria diseases/organic sweet potato (post-harvest); cabbage maggot on root crops, weeds in Brassica leafy vegetables, fire blight in apple and pear; vine mealybug on grape, corn earworm larvae on sweet corn, Lepidoptera on hemp, fusarium crown rot of tomato and bitter rot on apple.

Environmental Horticulture Program

The Environmental Horticulture Program continues to support an industry valued at nearly $19.2 billion in annual sales (Horticulture Census, 2014, NASS). This industry is quite complex because growers cover many diverse markets including flowers, bulbs, houseplants, perennials, trees, shrubs and more. These plants are grown and maintained in greenhouses, nurseries, commercial/residential landscapes, interiorscapes, Christmas tree farms and sod farms.

Research Activities

In 2019, IR-4 conducted 673 environmental horticulture research trials to support registrations in the greenhouse, nursery, landscape, Christmas tree and forestry industries. Of these, 273 were efficacy trials designed to compare different products to manage damaging insects, plant diseases and weeds; the remaining trials focused on plant safety. Please see Table 1 for a summary of research activities, Attachment 7 for a complete listing of 2019 field cooperators and Attachment 8 for research activities listed by project.

Table 1. Summary of IR-4's 2019 and Revised 2018 Environmental Horticulture Program Research Activities.

Category	**2019**			**Revised 2018**		
	Efficacy	Crop Safety	Total	Efficacy	Crop Safety	Total
Number of Studies (PR Numbers) with Planned Trials	127	266	393	201	289	490
Number of Trials	273	400	673	278	404	682

***Program Statistics as of 1/30/2020*

Submissions and Successes

During 2019, 22 data summaries were compiled based upon research reports submitted by researchers. See Attachment 9 for Abstracts from the individual reports. Afidopyropen Crop Safety Summary - 2019, Algal Leaf Spot Efficacy Summary - 2019, Azoxystrobin + Difenconazole Crop Safety - 2019, Azoxystrobin Crop Safety - 2019, Beetle, Borer, Weevil & White Grub Efficacy Summary - 2019, Bentazon Crop Safety - 2019, Botrytis Efficacy Summary - 2019, Cyflufenamid

Crop Safety - 2019, Cyflumetofen Crop Safety - 2019, Fluxapyroxad + Pyraclostrobin Crop Safety - 2019, Iron HEDTA Crop Safety - 2019, Mite Efficacy Summary - 2019, Oxyfluorfen + Prodiamine Crop Safety - 2019, Pendimethalin + Dimethenamid-p Crop Safety - 2019, Pendimethalin Crop Safety - 2019, Picarbutrazox Crop Safety - 2019, Prodiamine + Isoxaben Crop Safety - 2019, Pyridalyl Crop Safety - 2019, Pyrifluquinazon Crop Safety - 2019, Scale and MealyBug Efficacy - 2019, SP2700 Crop Safety - 2019, Tolfenpyrad Crop Safety Summary - 2019. Data from 4,199 trials contributed to the writing of these reports. Table 2 lists the number of trials by IR-4 Region that were used in the data summaries.

Table 2. 2018 Environmental Horticulture Program Research Summaries.

Region	**Number of Trials**
North Central	537
North East	695
Southern	1,231
Western	715
USDA-ARS	1,044
Total	4,199

During 2019, US EPA approved three new product registrations based partially on the efficacy data IR-4 generated: Pradia®, Regime® (commercial launch), and Sarisa®.

Table 3. Environmental Horticulture Program Registration Contributions, 2019.

Category	**2019**			
	Efficacy	Crop Safety	Both	Total
New US EPA Product Registrations [a]	3	0	0	3
US EPA Label Amendments [b]	0	0	0	0
State Registrations [c]	0	0	0	0
International	0	0	0	0
Not to be Registered	2[g]	0	0	2[g]
Number of Trials Contributing to Registrations [d]				
North Central	-	-	-	20
North East	-	-	-	7
Southern	-	-	-	36
Western	-	-	-	21
USDA-ARS	-	-	-	9
Number of Impacted Crops [e]	2,665	-	-	2,665

[a] New products for the environmental horticulture industry based on data collected through IR-4 and submitted to manufacturers in previous years.

[b] Label updates on existing products for the environmental horticulture industry based on data collected through IR-4 and submitted to manufacturers in previous years.

[c] State registrations and special local needs registrations on federally registered products for the environmental horticulture industry based on data collected through IR-4 and submitted to manufacturers in previous years.

[d] The total number of trials where data was utilized for registrations.

[e] The number of impacted crops is an estimate of the total plant species grown commercially for environmental uses impacted by the IR-4 data.

[f] For some registrations, IR-4 contributed both efficacy and crop safety data.

[g] For Pradia and Regime, some screened uses will not be registered.

2019 Workshop

The Environmental Horticulture priority setting for 2020 and 2021 was held as part of the "Week of Workshops" in Hunt Valley, MD, in September 2019. Similar to past workshops, registrant representatives presented new active ingredients and highlighted opportunities for existing products. The results of the Grower & Extension and the Diagnosticians' Survey were presented and then the participants discussed the pros and cons for conducting efficacy or crop safety

research on 30 (9 entomology, 7 pathology, 8 weed science, 6 biopesticide specific) current and potential new project areas across entomology, pathology and weed science. IR-4 staff created new, or updated 32 Project Sheets that summarized the need, research and registrations to date, and 21 Product Lists outlining the key features of tools currently available for certain diseases and pests. Also, new projects for each discipline were raised as potential research avenues during the workshop. After the relative merits of each project were captured, a Sticker Caucus was held by attendees to further refine the priorities for the IR-4 research projects for 2020 – 2021. An electronic voting system was tested for the selection of a specific biopesticide priority. The outcomes for each discipline were projected, and the research priorities were finalized after further conversations and refinement. Final priorities from the 2019 workshop include:

- Entomology Projects: Borers & Beetles (continued emphasis on Foliar Feeding Beetle Efficacy), Scale & Mealybug Efficacy, New Product Crop Safety
- Pathology Projects: Pythium Efficacy, Non-Oomycete Root Disease Efficacy, New Product Crop Safety
- Weed Science: Pre-Emergent Herbicide Crop Safety, Nostoc Efficacy
- Biopesticide Specific: Powdery Mildew Management with Biopesticides
- Regional Projects:
  - NCR – Ambrosia Beetle Efficacy, Root Knot Nematode Efficacy
  - NER – Improving Directions for Use with Fatty Acid Herbicides, Thrips Efficacy for Outdoor Uses
  - SOR – European Pepper Moth Efficacy, Bacterial Leaf Spots & Blight, SOR – Post Emergent Crop Safety & Efficacy for Glyphosate Resistant Weeds
  - WSR – Snail Efficacy, Liverwort Efficacy, Botrytis Efficacy on Peony

Invasive Species Research Activities

During 2019, the IR-4 Environmental Horticulture Program finalized the Impatiens Downy Mildew Biology and Management Project Summary funded under USDA-APHIS Farm Bill Section 10201/10007. A final summary of the Boxwood Blight project is underway. From 2010 through 2018, this program has received $5,155,465 total for cooperative agreements related to mitigating invasive species.

As an offshoot from the APHIS Impatiens Downy Mildew project, IR-4 submitted and received a competitive USDA-NIFA Specialty Crop Research Initiative (SCRI) planning grant to identify knowledge gaps for downy mildews of environmental horticulture crops and to better understand how scientist's findings are put into practice by growers. Subsequently, this team submitted an SCRI Coordinated Agriculture Project pre-proposal. This was ranked highly by the stakeholder review, but it needed to be withdrawn due to the addition of a matching fund requirement after the stakeholder review. A revised pre-proposal was submitted in the fall of 2019 but was not viewed as favorably by the 2020 stakeholder review panel.

Pollinator Protection Activities

Protecting pollinators remains a high level of concern and is affecting decision making at many levels, from individual consumers to the federal government regulators and representatives. This USDA-SCRI supported five year research project ($6,509,975), is expected to provide crucial, science-based information to growers and the environmental horticulture industry to enable informed decisions that contribute to improved pollinator health by growing plants under best production practices, that increase pollinator forage quality and quantity in rural and urban landscapes.

This research project team is comprised of entomologists and agricultural economist from Clemson University, Connecticut Agriculture Experiment Station, Cornell University, Michigan State University, Penn State University, University of California, University of Florida and University of Kentucky.

During the third year of this project, IR-4 in cooperation with several universities established test garden plots of common annuals and perennials and then collected/counted the number of visiting pollinators. IR-4 and the research team continued studies on the amount of remining systemic insecticides found in pollen and nectar of rhododendron, snapdragon, annual salvia, perennial salvia, dahlia, and knipofia from treated plants. We have presented preliminary findings to EPA for refined risk assessments for systemic insecticides, most notably the nitroguanidine neonicotinoids. The team has started compiling the available efficacy and toxicology information for alternative treatment options and have developed a grower survey to understand the economic and social impacts related to neonicotinoid use or lack thereof. The team has also developed the consumer online and eye tracking survey tools to assess consumer price index and preferences related to grower production practices. The team published 18 scientific articles, has another in press, 9 trade articles, and has given more than 120 presentations to multiple audiences from K-12 students to scientific peers.

Ultimately, these activities will improve pollinator health and improve the sustainability and profitability of the environmental horticulture and beekeeping industries.

Biopesticide and Organic Support Program

The IR-4 Biopesticide and Organic Support Program has the goal of facilitating the registration of crop protection products classified by EPA as Biopesticides. The program provides registration assistance to university and USDA researchers as well as to small biopesticide companies with regulatory advice and petition preparation assistance. The program also does considerable work on product performance.

Research Activities

Since its inception in 1982, the IR-4 biopesticide research program has provided competitive grant funding of projects, amounting to over $9 million to researchers (see http://ir4app.rutgers.edu/biopestPub/grantFundedProj.aspx for report summaries). In 2014, IR-4 transitioned its biopesticide program to a process where stakeholders choose the most critical needs for biopesticides and IR-4 focus research on those priorities.

Stakeholder input from the 2018 Biopesticide Workshop in Saint Louis, MO, included the following priorities and projects that were conducted in 2019:

B00026	Spotted wing drosophila/ All crops: K. Daane, CA:O. Liburd, FL; and C. Rodriguez-Saona, NJ
B00089	Bacterial speck, spot, canker / tomato: F. Louws and I Meadows, NC; M. McGrath, NY; and S. Miller, OH
B00102	Weeds/ All crops: Mark VanGessel, DE; R. Batts, NC; D. Doohan, OH; and E. Peachey, OR.
B00124	Downy mildew / Organic basil: Richard Raid, FL; Mary Hausbeck, MI; Andy Wyenandt, NJ; M. McGrath, NY; and Gary Chastanger, WA.
B00311	Virus and Viroid / Tomato, Greenhouse grown: Kai-Shu Ling, USDA-ARS, GA

Submissions and Successes *Biochemical Classification Submissions*:

In 2019 IR-4 submitted and successfully obtained EPA biochemical classification for cranberry extracts and noni
IR-4 also submitted a number of additional studies and an amended registration package to the EPA to support the pending request for *Pseudomonas fluorescens* ACK55. In addition pre-registration meetings were held to discuss sterile male mosquitoes and moths.

The EPA approved a label amendment and formulation change for HopGuard III.

Impact of IR-4 Activities

Specialty crop growers/farmers benefit in having access to legally registered crop protection products to manage pests on their commodities. This helps them produce an abundance of high-quality food and ornamental crops needed and desired by consumers, helps growers remain profitable and contribute to our well-being and helps to bolster rural economies.

Food processors and food retailers benefit in having a consistent supply of high-quality produce and/or raw materials to meet consumer demand or keep their processing facilities open and operational. The public benefits through having an abundant choice of healthy vegetables, fruits, nuts and other foods available at reasonable prices, as well as having ornamental horticulture plants to enhance the landscape and environment. IR-4's actions also prevent food waste throughout the supply chain at the farm to the consumer.

Individual growers and commodity associations continue to articulate testimonies on how IR-4 has helped to feed Americans and beautify the environment. To better ascertain the impact of IR-4's research and regulatory activities, Michigan State University's Center of Economic Analysis reported the economic impact of IR-4 Project's activities in the Food, Ornamental Horticulture and Biopesticide and Organic Support programs. According to the report, ***"the estimated total effects of the IR-4 Project includes supporting an estimated 95,261 jobs with total labor income of $5.6 billion and annual contributions to gross domestic product totaling about $9.4 billion. These impacts represent best estimates of ongoing contributions to the U.S. economy, largely through crop agricultural productivity and damage mitigation via pest management."*** See http://ir4.rutgers.edu/Other/IR4%202017%20Impact%20Final.pdf for a full report of the IR-4 economic impact study.

IR-4 focuses its research on modern lower/reduced risk chemical pesticides and biopesticides. The strategic decision to focus on these newer products has helped ensure that growers can produce their commodities with the best available technology to manage pests while ensuring the highest degree of safety for humans and the environment. Many of the registrations are essential components of Integrated Pest Management systems.

IR-4's research and regulatory activities are proactively solving many other pest management issues facing specialty crop growers, including pest resistance to pesticides, pesticides being a barrier to trade and food waste. Though IR-4 is not solely responsible for solving these and other critical agriculture/societal issues, IR-4 efforts reduce the negative impact.

Appropriations and other funding

Various units within USDA, SAES, and the private sector help fund IR-4. Total funding received in calendar year 2019 was approximately $16.5 million. The main source of funding ($11.916 million) is through Congressional Appropriation via Special Research Grants administered by USDA-NIFA. These funds are used for research and regulatory operations by all units in all research areas. In 2019, the IR-4 Project Management Committee allocated these funds as follows:

- $7.491 million distributed to the four IR-4 Regional offices and Headquarters for personnel, supplies, equipment; laboratory analysis and other core expenses;
- $2.475 million allocated for field trials that produce the necessary residue samples and product performance data;
- $534,750 supported Environmental Horticulture research;
- $317,000 provided for the first Integrated Solutions projects and a few legacy Biopesticide projects;
- $234,000 to cover lease costs for analytical instruments in the IR-4 laboratories;
- $372,500 for residue sample analysis at private laboratories to help reduce analytical analysis/report backlog;
- $848,500 was kept by NIFA to help fund their operations.

IR-4 Headquarters at Rutgers received $481,182 of Multistate Research funds from the SAES through a NRSP-4 award. These funds were used to fund salaries of its Program and Research Managers who provide overall leadership and coordination of the IR-4 Project's on-going research efforts.

USDA-ARS allocates $3,170,000 of its Congressional Appropriation funds to support the salary and other expenses for USDA-ARS personnel involved with high priority IR-4 research projects within IR-4's Food Crop and Environmental Horticulture programs. Participating ARS scientists are given specific research assignments that complement the on-going research of the scientists at the SAES. From these funds, USDA-ARS contributes about $120,000 to IR-4 Headquarters that funds Environmental Horticulture research at Rutgers Tree Fruit & Ornamental Research and Education Center as well as cost of travel for IR-4 Quality Assurance Unit personnel to perform required on-site critical phase audits at ARS Field Research Centers.

Crop Protection companies and commodity associations provided $940,288 of unrestricted funds that are used to supplement other IR-4 funds. This includes performing additional research, supplementing the cost of operations of IR-4 HQ, conducting the priority-setting workshops/other meetings and miscellaneous matters.

Though not directly part of IR-4's core mission, IR-4 has been managing a USDA-NIFA Specialty Crop Research Initiative grant that studies the impact of pesticides on pollinators in environmental horticulture production systems. This is a five-year grant totaling a little over $6.5 million.

In addition to the above, IR-4 also receives significant in-kind contributions from multiple sources including:

- SAES/land grant universities by hosting IR-4 field research centers, analytical laboratories and management offices throughout the United States (estimated at nearly $6.0 million annually)
- EPA Pesticide Registration Improvement Act fee waivers (average approx. $6.0 million/annually)
- Crop protection industry (their in-kind contributions are about $12 million or a 1:1 match of NIFA funds)
- The government of Canada also makes significant in-kind contributions (>$750,000).

IR-4 funding from government and non-government sources has remained relatively flat over the past ten-years while research expenses and employee compensation continues to increase. IR-4 has had to scale back its research efforts and research infrastructure to manage the fiscal shortfalls. It was not that long ago that IR-4 established nearly 100 new residue studies annually. In 2019, this number dropped to 72. There is a similar pattern in the Environmental Horticulture Program.

To offset the decade of flat funding, the IR-4 Project continues to explore opportunities to cut expenses and/or increase efficiencies. Unfortunately, we have "harvested most of the low hanging fruit". Currently, there is an active workgroup whose goal is to seek efficiencies within the collection and reporting of data from field research sites. IR-4's analytical laboratories have made progress in reducing the backlog of residue sample analysis. This has been accomplished through adoption of efficient best management practices along with the use of private research laboratories.

In 2019, IR-4 hosted the first Week of Workshops where research priorities for all program areas were established at a single venue during a single week. IR-4 was able to save significant dollars in travel costs by bringing all groups into one venue.

Future Directions

The cornerstone of IR-4 research and regulatory efforts is an open and transparent stakeholder-driven research prioritization process that provides direction to IR-4 to perform studies that address the most important pest management voids in specialty crop agriculture. The majority of priorities for 2020 research in the Food Crop Program including Magnitude of the Residue studies, Product Performance projects, Integrated Solutions projects and a few legacy Biopesticide research studies, along with priorities for the Environmental Horticulture Program were established at the Week of Workshops (WOW), September 23-26, 2019, in Hunt Valley MD (outside of Baltimore). Over 200 people attended the WOW.

IR-4 continues to operate according to the principals outlined in its current strategic plan, ***IR-4 Project - VISION 2020*** and IR-4 has taken the first steps in an effort to update the plan. At the WOW, a listening session was conducted by the stakeholders to allow them to weigh in on the most important directions for the Project. There was clear consensus of the future need for IR-4 in many specially crop protection areas. As preferred technology evolves, there is a role for IR-4 to ensure that growers, including growers following organic production practices, have access to effective tools to manage pests. There was a clear recognition that existing and future resource constraints will limit IR-4's ability to meet the ever increasing and evolving demand for crop protection products for specialty crops and minor uses. The group also discussed other ways IR-4 can help, including support for regulatory actions by public sector scientists and small business, further expansion of crop extrapolation models, further integration of pest management technologies into a systems approach and training of global trading partners to cooperate in data development activities.

Flat budgets and limited fiscal resources continue to be the most critical challenge for IR-4. The IR-4 Commodity Liaison Committee and the Minor Crop Farmers Alliance continue to advocate for IR-4 to the U.S. Congress and others in government about the importance of IR-4 and the need to provide adequate resources. Actions included a Congressional Lunch and Learn, visits with Congressional Members and/or their staff, a meeting with the Branch Chief of the Agriculture Division of the Office of Management and Budget, multiple visits with USDA/SAES leadership, etc. Senator

Menendez of New Jersey developed a “Dear Colleagues” letter to the Senate Appropriation Committee recommending an increase to $20 million annually. In spite of all of these efforts, IR-4 funding levels remained unchanged.

The other major funding challenges involve IR-4’s host institutions, the institutions that collaborate with IR-4 by providing field, laboratory and/or office space as well as other services. At this time, IR-4’s grants from USDA-NIFA prohibits host institution from collecting indirect costs on the grant funds. Despite this prohibition of collecting indirect costs, Rutgers University, IR-4 Headquarters host institution assessed IR-4 $1.4 million in service fees during 2019. IR-4 is legally prohibited form using grant dollars to pay the assessment. Rutgers University provided temporary relief from the assessment but was unwilling to provide a long-term waiver or reduction of the fees. IR-4 HQ was encouraged to find an alternate host institution. Fortunately, IR-4 HQ was able to enter negotiations with North Carolina State University and developed a 10-year agreement to serve as a new IR-4 HQ host institution.

IR-4 HQ will be relocating from its offices at Rutgers to the new location in North Carolina over a two-year transition period. During this transition, which started October 1, 2019, IR-4 is taking great efforts to ensure that research activities remain fully operational.

All existing IR-4 HQ scientists and staff employees have been offered opportunities to remain with IR-4 at its new offices in North Carolina. Some have accepted the offer and will be relocating, while others have decided to retire or seek other opportunities in the New Jersey area.

During this same time, IR-4 management has requested the USDA NIFA to convert its funding from a Special Research Grant that does not allow collection of administrative costs, to a Specific Cooperative Agreement that will allow IR-4 to contribute 10% of funds to offset host expenses. This conversion is expected to happen in the federal FY 2021 budget cycle. It is hoped that this change will provide existing host institutions with some resources to prevent future situations like Rutgers. However, unless Congress increases IR-4 funding by a corresponding amount, IR-4’s research capacity will be further reduced by at least 10% when this conversion is implemented.

IR-4 remains just as relevant today as it was in 1963. Specialty crop agriculture still needs safe and effective pest management products to manage newly emerging pests and pest resistant to pesticides. IR-4 is also essential in performing robust product performance testing, developing data needed to support refined risk assessments as well as efforts to assist growers’ access to lucrative international markets by reducing/eliminating pesticide residues as a trade barrier. The IR-4 Project remains as a critical component of our nation’s food security. An investment in IR-4 will help the agricultural sector meet the demands for high-quality food and environmental horticulture crops now and into the future.

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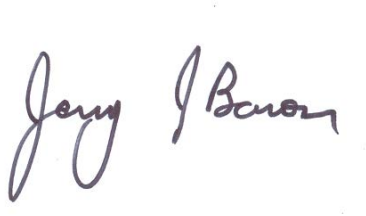
December 31, 2019

Approved by:



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John Wise, Chair,
IR-4 Project Management Committee
Michigan State University

Sherry Larkin, Chair,
IR-4 Administrative Advisers
University of Florida

ATTACHMENT 1

Participants in the Process

These are the primary customers for IR-4 Project services. A concerted effort is always made to seek input from growers/commodity group representatives for establishing research priority setting policies. The **IR-4 Commodity Liaison Committee (CLC)** provides input to the IR-4 Project Management Committee on overall operations and program direction. They are often effective communicators to Congress on the importance of the IR-4 Project and its deliverables to specialty crop agriculture in the United States. Members include:

Dr. Michael Aerts, Florida Fruit and Vegetable Association
Mr. Mark Arney, Nat'l Watermelon Promotion Board
Dr. Lori Berger, Ag Business Resources
Dr. Michael Bledsoe, Village Farms, L.P. and CLC Chair
Ms. Jennifer Clarke, CA Leafy Green Research Program
Dr. Jill Calabro, AmericanHort
Mr. James R. Cranney, California Citrus Quality Council
Ms. Allison Crittenden, American Farm Bureau Federation
Ms. Aline DeLucia, National Association of State Department of Agriculture
Mr. Alan DeYoung, Van Drunen Farms
Ms. Amy Gandhi, Kemin Industries
Ms. Ann E. George, Washington Hop Commission
Mr. Hank Giclas, Western Growers
Mr. Drew Gruenburg, Society of American Florists
Mr. Terry Humfeld, Cranberry Institute
Mr. Robert Jones, The Chef's Garden
Mr. Bob Kaldunski, Ginseng Board of Wisconsin
Mr. John Keeling, National Potato Council
Mr. Phil Korson, Cherry Marketing Institute
Mr. Armando Monterroso, Brooks Tropicals
Mr. Dennis Nuxoll, Western Growers Association
Ms. Laura Phelps, American Mushroom Institute
Mr. Keith Pitts, Marrone Bio Innovations
Mr. Cam Quarles*, National Potato Council
Ms. Rachel Roberts, American Mushroom Institute
Mr. Steven Salisbury, Mint Industry Research Council
Mr. Todd Scholz, USA Dry Pea & Lentil Council
Dr. Alan Schreiber, Agriculture Development Group, Inc.
Mr. Mark Seetin, U.S. Apple Association
Mr. Bob Simerly, National Onion Association
Mr. Berry Tanner, National Watermelon Association (alternative)
Mr. Dave Trinka, MBG Marketing
Ms. Amy Upton, Michigan Nursery & Landscape Association
Mr. Herman Waguespack, American Sugar Cane League

Cooperating Government Departments and Agencies

Agriculture and Agri Food Canada-Pest Management Centre (CN-PMC)
Health Canada-Pest Management Regulatory Authority (PMRA)
State Agricultural Experiment Stations/Land Grant Universities (SAES)
State of California Department of Pesticide Regulation (DPR)
U.S. Department of Agriculture, National Institute of Food and Agriculture (NIFA)
U.S. Department of Agriculture, Agricultural Research Service (ARS)
U.S. Department of Agriculture, Foreign Agriculture Service (FAS)
U.S. Department of Agriculture, Animal and Plant Health Inspection Service (APHIS)
U.S. Environmental Protection Agency (EPA)

ATTACHMENT 1 Continued

Crop Protection Industry

ADAMA Ag Solutions Ltd.
AgBio Development Inc.
Agrimar
AgroSource Inc.
Albaugh, Inc.
Amvac Chemical Corporation
Arkion Life Sciences
Arysta LifeScience North America Corp.
BASF Corporation
Bayer CropScience USA
Bayer Environmental Science
Belchim Crop Protection
BetaTec
BioBest
Bio HumaNetics
BioProdex
BioSafe Systems
Bioworks
CAI Limited
Certis USA
Corteva Agriscience, Agr. Div. of DowDuPont
Dow AgroSciences
DuPont Agricultural Products
Everris
Fine Americas
FMC Corporation
Gowan Company
Greenlight Biosciences
Hacco, Inc.
Helena Agri-Enterprises
Isagro, USA
ISK Biosciences
Janssen Pharmaceutica
K-I Chemical USA Inc.
Landis International
Lonza Inc.
Loveland Products
Luxembourg-Pamol, Inc.
Marrone BioInnovations, Inc.
MGK
Monsanto Company
Natural Industries
Neudorff
Nichino America, Inc.
Nisso America, Inc.
Novozymes, Inc.
Nufarm Americas, Inc.
Oat Agrio
OHP
Pace 49, Inc.
SePro Corporation
Sipcam Advan
Summerdale, Inc.
Syngenta Crop Protection, Inc.
Syngenta Flowers
TDA
TKI Novasource
UPL NA Inc.
Valent Biosciences
Valent USA, LLC
Westbridge Agricultural Products

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*Partial Year

ATTACHMENT 1 Continued

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Northcentral Region

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Dr.	D.	Yarborough	ME
VACANT			VT

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Mr.	C.	Luper	OK
Mr.	M.	Matocha	TX
Dr.	D.	Monks	NC
VACANT			LA
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ATTACHMENT 1 Continued

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Dr.	M.	Horak	CA
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Dr.	S.	Nissen	CO
Dr.	J.	Palumbo	AZ
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Dr.	B.	Stump	WY
Dr.	D.	Walsh	WA
VACANT			OR

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N. Cloud	IA
D. Doohan	OH
M. Hausbeck	MI
D. Heider	WI
K. Howatt	ND
B. Jenks	ND
B. Johnson	ND
T. Miles	MI
A. Van Woerkom	MI
B. Zandstra	MI

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M. Sylvia	MA
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ATTACHMENT 1 Continued

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M. Phillips	TX
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W. Robles Vazquez	PR
R. Tannenbaum	FL
D. Thomas	FL
G. Vallad	FL
D. Wright	LA

Western Region

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Z. Cheng	HI
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D. Ennes	CA
J. Felix	OR
S. Fennimore	CA
C. Hamilton	NM
B. Hanson	CA
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G. Koskela	OR
G. Kyser	CA
N. Leach	CA
D. Lightle	OR
M. Matheron	AZ
P. Mauk	CA
W. Meeks	ID
T. Michilaides	CA
T. Miller	WA
C. Ocamb	OR
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E. Peachey	OR
W. Peng	WA
T. Perring	CA
S. Rios	CA
K. Skiles	CA

ATTACHMENT 1 Continued

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C. Vanderwoude	HI
D. Walsh	WA
S. Watkins	CA

ARS

S. Benzen	CA
B. Fraelich	GA
R. Goenaga	PR
J. Harvey	WA
L. Horst	OH
P. Wade	SC

Canada

M. Clodius	BC
D. Cloutier	QC
D. Hanscomb	NS
D. Nield	BC
G. Riddle	ON
L. Stinn	AB
M. Weber-Henricks	ON
R. Wismer	ON

ATTACHMENT 2
2019 Food Use Research Projects - Residue Trials*

Chemical	Crop	PR #
Abamectin	Dragon Fruit (Pitaya)	12262
Abamectin	Sugar Apple	7830
Acetamiprid	Sunflower	12668
Asulam	Clover (Seed Crop)	11824
Azoxystrobin + Benzovindiflupyr	Stevia	12532
Azoxystrobin + Fludioxonil	Avocado (Post Harvest)	12552
Benzovindiflupyr	Strawberry	12373
Benzovindiflupyr + Difenoconazole	Stevia	12538
Bifenazate	Blueberry	11995
Bifenthrin	Coffee	11527
Bifenthrin	Date	12649
Bifenthrin	Kiwifruit	12627
Boscalid + Pyraclostrobin	Strawberry (GH)	11752
Clofentezine	Dill	11640
Clofentezine	Hops	11735
Cyantraniliprole (HGW86)	Papaya	11300
Cyclaniliprole	Lettuce (GH)	12515
Cyflumetofen	Cantaloupe	11787
Cyflumetofen	Cucumber	11786
Cyflumetofen	Pepper (Bell & Nonbell)	11790
Cyflumetofen	Squash (Summer)	11788
Difenoconazole + Cyprodinil	Olive	12545
Dimethomorph + Ametroctradin	Tomato (GH)	11691
Dimethomorph + Ametroctradin	Pepper (Bell & Nonbell)	11690
Diquat	Grape	12220
Diuron	Sesame	12680
Esfenvalerate	Watercress	12539
Ethaboxam	Celery (GH Transplant, Field)	12075
Fenpropathrin	Grape	12645
Flonicamid	Basil (GH)	12293
Flonicamid	Beet (Sugar)	9907
Flonicamid	Cantaloupe	8552
Flonicamid	Cucumber	12667
Flonicamid	Peach	8558
Flonicamid	Squash (Summer)	8553
Fluazinam	Strawberry (Non-Bearing)	11920
Flumioxazin	Avocado	10253
Flumioxazin	Banana	11289
Flumioxazin + Pyroxasulfone	Sesame	12640
Flupyradifurone	Olive	12563
Flutianil	Cucumber (GH)	12511
Flutianil	Hops	12655
Flutianil	Tomato (GH)	12287
Fluxapyroxad + Pyraclostrobin	Stevia	12535
Glufosinate	Coffee	9493
Glufosinate	Grasses (Seed Crop)	12109
Kasugamycin	Olive	12656

Chemical	Crop	PR #
Mandestrobin (S-2200)	Sweet Potato	12522
Methomyl	Blueberry (High Bush)	12681
NA11630	Cucumber (GH)	12297
NMG787	Onion	12322
Picarbutrazox	Basil	12633
Picarbutrazox	Basil (GH)	12481
Picarbutrazox	Lettuce (GH)	12291
Pronamide	Grasses (Pasture)	12061
Propiconazole	Passion Fruit	12560
Propiconazole + Fludioxonil	Avocado (Post Harvest)	12554
Pyridate	Mint	12477
Quinclorac	Apple	12570
Quinclorac	Cranberry	12639
Quinclorac	Pear	12571
Spinetoram	Asparagus	11830
Sulfoxaflor	Hops	10912
Sulfoxaflor	Quinoa	11653
Tebuconazole	Cranberry	10361
Tebuconazole	Sweet Potato (Post Harvest)	12119
Tolfenpyrad	Bean (Snap)	11299
Triclopyr	Sugarcane	12084
Trifloxystrobin + Fluopyram	Dragon Fruit (Pitaya)	12555
Trifloxystrobin + Fluopyram	Kiwifruit	12650
Trifloxystrobin	Strawberry	12500
Ziram	Olive	12544

ATTACHMENT 3
2019 Product Performance Research Program

Research in 2018 to complete performance needs for pre-2018 residue studies:

Chemical	Crop	PR#	Comments	ARS*State university trials
NMG787	onion	12322	2018 upgrade priority	CA, CA, NY
prometryn	leek	12131	2018 residue study	CA, MI
flutianil	lettuce (field/GH)	12388	2018 residue study	AZ
insecticides	cabbage maggot	11591	2018 upgrade priority (PPWS)	NY, NY, OR
glufosinate	tomato, pepper	12021 12022	2017 residue study	CA
glufosinate	cantaloupe, cucumber summer squash	12018 12019 12020	2017 residue study	CA
pydiflumetofen	caneberry	11794	2017 residue study	CA, WA
quizalofop	*Brassica carinata*	12335	2018 H+ performance priority	SD, SD
cyclaniliprole	sunflower	12264	2018 residue study	CA
glufosinate	avocado	10240	2017 residue study	CA, CA
fluazinam	papaya	08274	2016 residue study	FL, FL
fluxapyroxad + pyraclostrobin	pomegranate	11754	2016 residue study	CA
herbicides	hemp (industrial)	12340	PPWS research	NC, NC, WA, WA
cyflumetofen	hops	12334	2018 residue study	WA
s-metolachlor	quinoa	12247	2018 residue study	OR
			Total	27

Research in 2019 for new "A" & "H" priorities from 2018 FUW/Upgrades:

Chemical	Crop	PR#	Comments	ARS*/State university trials
fluopyram	carrot	12425	2019 H+ performance priority	CA, MI
ISM-555	carrot	12614	2019 residue study	NY, OR
picarbutrazox	ginseng	12606	2019 H+ performance priority	MI, MI
picarbutrazox	lettuce (GH)	12291	2019 residue study	FL
sulfentrazone	Brassica crops	11930 11931	2019 upgrade priority	CA
flutianil	tomao (GH)	12287	2019 residue study	AZ, FL
cyflumetofen	pepper	11790	2019 residue study	CA, CA, TX
cyflumetofen	cantaloupe	11787	2019 residue study	AZ, CA, CA, GA
cyflumetofen	cucumber	11786	2019 residue study	CA, CA, DE, GA
NA11630	cucumber (GH)	12297	2019 residue study	CA, GA
cyflumetofen	squash	11788	2019 upgrade priority	CA, CA, DE, GA, GA
bifenazate	blueberry	11995	2019 upgrade priority	GA, GA
clopyralid	grape	12604	2019 H+ performance priority	CA, CA, MI, WA, WA
diquat	grape	12220	2019 residue study	CA, NY, WA
trifloxysulfuron	strawberry	12500	2019 residue study	CA, FL
sulfentrazone	cranberry	12296	2019 H+ performance priority	NJ
sulfentrazone	basil	12416	2019 upgrade performance priority	CA, NJ
flonicamid	basil (GH)	12293	2019 residue study	GA

picarbutrazox	basil (GH and field)	12481 12633	2019 residue study	FL, NJ
fludioxonill + pydiflumetofen	asparagus	12619 12622	2019 H+ performance priority	MI, MI
flupyradifurone	olive	12563	2019 upgrade priority	CA
flumioxazin	banana	11289	2019 residue study	PR, PR
trifloxystrobin + fluopyram	dragon fruit	12555	2019 residue study	FL
propiconazole	passionfruit	12560	2019 residue study	FL, FL
glufosinate	coffee	09493	2019 residue study	PR, PR
quizalofop	field pennycress	12630	2019 upgrade priority	SD, SD
flumioxazin	stevia	12542	2019 H+ performance priority	NC, NC
fluxapyroxad + pyraclostrobin	stevia	12535	2019 upgrade priority	NC, NC
			Total	62

ATTACHMENT 4
2019 Submissions to EPA, Registrants, Codex, and State Departments of Agriculture

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	PR#
Cyantraniliprole	FMC	I	02/01/2019	Strawberry	10328
Flonicamid	ISK/FMC	I	02/15/2019	Leafy greens subgroup 4-16A, except spinach (revised tolerance to cover use on greenhouse-grown lettuce)	11705
2,4-D	DOWAGR, LILLY,	H	02/20/2019	Intermediate wheatgrass	12375
				Sesame	11807
Novaluron	ADAMA MAC-	I	03/14/2019	Tropical and subtropical, inedible peel, subgroup 24A	10956
				Vegetable, fruiting, group 8-10 (revised tolerance)	12323
				Sunflower subgroup 20B	11344
					11596
				Brassica, leafy greens, subgroup 4-16B	12661
				Vegetable, brassica, head and stem, group 5-16	12662
				Kohlrabi	12663
				Cottonseed subgroup 20C	12664
Clofentezine	ADAMA	I	04/01/2019	Hops	11735
Oxathiapiprolin	SYNGEN	F	04/03/2019	Berry, low growing, subgroup 13-07G, except cranberry	11719
				Tropical and subtropical, medium to large fruit, smooth, inedible peel, subgroup 24B	10915 11795
				Hops	11759
				Edible podded peas (proposed crop subgroup 6-18B)	12691
				Succulent shelled peas (proposed crop subgroup 6-18D)	12692
Kasugamycin	ARYSTA	F	05/03/2019	Peach	09888
					12646
				Apricot	10705
				Almond	11461
Saflufenacil	BASF	H	05/14/2019	Caneberry subgroup 13-07A	11079
				Fig	11557
					11841
				Chia	12241
Fenpyroximate	NAI	I	05/17/2019	Peanut	11748
				Tropical and subtropical, medium to large fruit, smooth, inedible peel subgroup24B, except banana	11699
Acequinocyl	ARYSTA	I	05/21/2019	Bushberry subgroup 13-07B	11867
Sethoxydim	BASF	H	06/03/2019	Caneberry subgroup 13-07A	00934
				Basil	A2063
Flupyradifurone	Bayer	I	06/10/2019	Stalk and stem vegetable subgroup 22A, except prickly pear pads, and Texas prickly pear pads	11318
				Sesame seed	11725
				Sunflower subgroup 20B	11673
					11674
				Coffee	11712
				Tropical and subtropical, palm fruit, edible peel, subgroup 20C	11831
				Sweet sorghum (data to support use on sorghum grown for syrup; no new tolerance is needed)	11709
				Pineapple	11711
				Grass, forage, fodder and hay, group 17	11755

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	PR#
				Vegetable, Brassica, head and stem, group 5-16	12724
				Kohlrabi	12725
				Brassica, leafy greens, subgroup 4-16B	12726
				Leaf petiole vegetable subgroup 22B	12727
				Celtuce	12728
				Florence fennel	12729
				Leafy greens subgroup 4-16A	12730
				Tropical and subtropical, inedible peel, cactus, subgroup 24D	12731
Spinosad	CORTEVA	I	07/11/2019	Dragon fruit	11512
				Vegetable, brassica, head and stem, group 5-16	12740
				Kohlrabi	12746
				Vegetable, leafy, group 4-16	12743
				Celtuce	12744
				Florence fennel	12745
				Leaf petiole vegetable subgroup 22B	12742
				Berry, low growing, except strawberry, subgroup 13-07H	12747
Spinetoram	CORTEVA	I	07/11/2019	Dragon fruit	11514
				Vegetable, brassica, head and stem, group 5-16	12732
				Kohlrabi	12739
				Leafy greens subgroup 4-16A	12735
				Celtuce	12737
				Florence fennel	12738
				Leaf petiole vegetable subgroup 22B	12734
				Brassica, leafy greens, subgroup 4-16B	12733
				Berry, low growing, except strawberry, subgroup 13-07H	12736
Zeta-Cypermethrin	FMC	I	09/11/2019	Basil	08397
				Onion, bulb, subgroup 3-07A	12872
				Onion, green, subgroup 3-07B	12873
				Leafy greens subgroup 4-16A	12874
				Leaf petiole vegetable subgroup 22B	12875
				Brassica, leafy greens, subgroup 4-16B	12876 11792
				Vegetable, brassica, head and stem, group 5-16	12877
				Vegetable, fruiting, group 8-10	12878
				Fruit, citrus, group 10-10	12879
				Fruit, pome, group 11-10	12880
				Fruit, stone, group 12-12	12881
				Caneberry subgroup 13-07A	12882
				Bushberry subgroup 13-07B	12883
				Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	12884
				Nut, tree, group 14-12	12885
				Rapeseed subgroup 20A	12886
				Sunflower subgroup 20B	12887
				Cottonseed subgroup 20C	12888
				Kohlrabi	12889
				Celtuce	12890
				Florence fennel	12891
				Quinoa	12644

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	PR#
				Teff	12786
				Commodities within Proposed Edible podded bean subgroup 6-18A	12892
				Commodities within Proposed Edible podded pea subgroup 6-18B	12893
				Commodities within Proposed Succulent shelled bean subgroup 6-18C	12894
				Commodities within Proposed Succulent shelled pea subgroup 6-18D	12895
				Commodities within Proposed Dried shelled bean, except soybean, subgroup 6-18E	12896
				Commodities within Proposed Dried shelled pea subgroup 6-18F	12897
Clopyralid	DOWAGR	H	09/26/2019	Caneberry subgroup 13-07A	A5147
				Strawberry (reduced PHI)	11256
				Onion, bulb, subgroup 3-07A	11600
				Intermediate wheatgrass	12748 12377
MCPA	LOVLND	H	09/27/2019	Intermediate wheatgrass	12377
				Tea	12478
S-Metolachlor	SYNGEN	H	10/03/2019	Dill	11325
				Rosemary	10819
Quizalofop	AMVAC	H	10/09/2019	Fruit, pome, group 11-10	10032 10033
				Fruit, stone, group 12-12	10034 10035 10036
				Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	10031
				Sunflower subgroup 20B	12685
				Cottonseed subgroup 20C	12686
				Pennycress	12630
				Carinata	12335
Benzovindiflupyr	SYNGEN	F	10/24/2019	Ginseng	11760
				Lowbush blueberry	12636
Tolfenpyrad	NAI	I	10/25/2019	Globe artichoke	11698
Thiabendazole	SYNGEN	F	11/20/2019	Sweet potato	11859
				Brassica, leafy greens, subgroup 4-16B	11585
				Animal feed, nongrass, group 18	11310
				Vegetable, tuberous and corm, subgroup 1C, except sweet potato	12911
				Vegetable, brassica, head and stem, group 5-16	12912
				Fruit, citrus, group 10-10	12913
				Fruit, pome, group 11-10	12914
				Vegetable, root, except sugar beet, subgroup 1B, except carrot	12915
				Carrot, roots	12916

ATTACHMENT 5
2019 Tolerance Successes - Permanent Tolerances
Published in the *Federal Register*

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	Note	PR#	# of Uses	# of Tolerances
Trifluralin	GOWAN	H	02/15/2019	Rosemary		10820	1	3
S-Metolachlor	SYNGEN	H	03/11/2019	Stevia		09872	1	1
				Vegetable, leaves of root and tuber, group 2, except sugar beet		11697 10480	15	1
				Brassica, leafy greens, subgroup 4-16B	1	11896	13	1
				Vegetable, Brassica, head and stem, group 5-16	1	11897	0	1
				Cottonseed subgroup 20C	1	11899	0	1
				Stalk and stem vegetable subgroup 22A, except kohlrabi	2	11901	10	1
				Leaf petiole vegetable subgroup 22B	1	11902	3	1
				Swiss chard	1	10673	0	1
				Kohlrabi	1	12134	0	1
Mandipropamid	SYNGEN	F	03/22/2019	Bean and cowpea, edible podded		12380	27	27
				Fruit, citrus, group 10-10		11138 11139 11140	28	3
				Vegetable, Brassica, head and stem, group 5-16	1	12381	0	1
				Vegetable, leafy, group 4-16	1	12382 12383	35	1
				Leaf petiole vegetable subgroup 22B	1	12384	3	1
				Celtuce	1	12385	0	1
				Florence fennel	1	12386	0	1
				Kohlrabi	1	12387	0	1
Flonicamid	ISK/FMC	I	04/08/2019	Sunflower subgroup 20B		11274 11383	14	1
Bentazon	ARYSTA BASF UPL	H	05/01/2019	Pea, dry		11510	2	1
Fluensulfone	BAYER	F	05/24/2019	Vegetable, root, except sugar beet, subgroup 1B	6	10904	1	1
				Vegetable, leaves of root and tuber, group 2	6	10907	1	1
Clofentezine	ADAMA	I	05/29/2019	Guava		09323	1	1
Penthiopyrad	DUPONT	F	06/06/2019	Caneberry subgroup 13-07A		10695	5	1
				Bushberry subgroup 13-07B		10694	19	1
				Vegetable, brassica, head and stem, group 5-16	1	12324	0	1
				Brassica, leafy greens, subgroup 4-16B	1	12325	13	1
				Oilseed group 20	2	12326	29	1
				Fruit, stone, group 12-12	1	12327	11	1
				Nut, tree, group 14-12	1	12328	26	1
				Leafy greens subgroup 4-16A	1	12329	18	1
				Leaf petiole vegetable subgroup 22B	1	12330	3	1
				Celtuce	1	12331	0	1
				Florence fennel	1	12332	0	1
				Kohlrabi	1	12333	0	1

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	Note	PR#	# of Uses	# of Tolerances
Sulfoxaflor	CORTEVA	I	07/24/2019	Artichoke, globe		10858	1	1
				Asparagus		11321	1	1
				Brassica, leafy greens, subgroup 4-16B, except watercress	1	12476	13	1
				Bushberry subgroup 13-07B		11296	19	1
				Caneberry subgroup 13-07A		11279	5	1
				Celtuce	1	12468	0	1
				Florence fennel	1	12469	0	1
				Fruit, stone, group 12-12	1	12471	11	1
				Kohlrabi	1	12470	0	1
				Leaf petiole vegetable subgroup 22B	1	12473	10	1
				Leafy greens subgroup 4-16A	1	12472	18	1
				Nut, tree, group 14-12	1	12474	27	1
				Sunflower subgroup 20B		11095 11269	14	1
				Vegetable, brassica, head and stem, group 5-16, except cauliflower	1	12475	0	1
Propiconazole	ADAMA	F	08/12/2019	Avocado		11053	1	1
	SYNGEN			Brassica, leafy greens, subgroup 4-16B, except watercress	1	12438	12	1
				Celtuce	1	12441	0	1
				Florence fennel	1	12442	0	1
				Leaf petiole vegetable subgroup 22B	1	12439	3	1
				Swiss chard	1	12443	0	1
				Vegetable, root, except sugar beet, subgroup 1B	2	11721	14	1
Pydiflumetofen	SYNGEN	F	08/12/2019	Berry, low growing, subgroup 13-07G		11159	9	1
				Bushberry subgroup 13-07B		11763	19	1
				Cherry subgroup 12-12A		11812	5	1
Emamectin benzoate	SYNGEN	I	08/27/2019	Herb subgroup 19A		07137	40	1
				Cherry subgroup 12-12A		10685	5	1
				Artichoke, globe		10863	1	1
				Fruit, pome, group 11-10	1	12428	5	1
				Nut, tree, group 14-12	1	12429	26	1
				Vegetable, brassica, head and stem, group 5-16	1	12430	0	1
				Brassica, leafy greens, subgroup 4-16B	1	12431	13	1
				Kohlrabi	1	12432	0	1
				Leafy greens subgroup 4-16A	1	12433	17	1
				Leaf petiole vegetable subgroup 22B	1	12434	3	1
				Florence fennel	1	12435	0	1
				Celtuce	1	12436	0	1
				Vegetable, fruiting, group 8-10	1	12437	12	1
Nitrapyrin	DOWAGR	NI	08/27/2019	Fruit, citrus, group 10-10		11314 11315 11316	28	3
				Leaf petiole vegetable subgroup 22B		02024	7	1
				Vegetable, brassica, head and stem, group 5-16		02021 02022 02023 02188	5	1
				Vegetable, bulb, group 3-07		11309	26	1

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	Note	PR#	# of Uses	# of Tolerances
				Vegetable, leafy, group 4-16		02658 02659 02660	62	1
Buprofezin	NAI	I	08/29/2019	Fig		11342	1	1
				Brassica, leafy greens, subgroup 4-16B	1	12246 11453	13	1
				Celtuce	1	12449	0	1
				Cottonseed subgroup 20C	2	12454	0	1
				Florence fennel	1	12450	0	1
				Fruit, citrus, group 10-10	1	12455	14	1
				Fruit, small, vine climbing, except fuzzy Kiwifruit, subgroup 13-07F	1	12457	5	1
				Fruit, stone, group 12-12, except nectarine and peach	1	12456	8	1
				Kohlrabi	1	12451	0	1
				Leaf petiole vegetable subgroup 22B	1	12448	3	1
				Leafy greens subgroup 4-16A	1	12445	16	1
				Nut, tree, group 14-12	1	12458	26	1
				Tropical and subtropical, small fruit, edible peel, subgroup 23A	2	12452	55	1
				Tropical and subtropical, small fruit, inedible peel, subgroup 24A	2	12453	17	1
				Vegetable, brassica, head and stem, group 5-16	1	12447	0	1
Abamectin	SYNGEN	I	09/09/2019	Carrot		10893	1	1
				Leaf petiole vegetable subgroup 22B	1	12409	3	1
				Leafy greens subgroup 4-16A	1	12408	18	1
				Arugula	1	12410	0	1
				Celtuce	1	12413	0	1
				Florence fennel	1	12414	0	1
				Garden cress	1	12411	0	1
				Upland cress	1	12412	0	1
				Tropical and subtropical, small fruit, inedible peel, subgroup 24A	2	12407	18	1
Pyraflufen-ethyl	NAI	H	09/12/2019	Hop		08708	1	1
				Cottonseed subgroup 20C	2	12083	0	1
				Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	2	12080	5	1
				Fruit, stone, group 12-12	1	12079	11	1
				Nut, tree, group 14-12	1	12078	26	1
				Tropical and subtropical, small fruit, edible peel, subgroup 23A	2	12082	55	1
				Vegetable, tuberous and corm, subgroup 1C	2	12081	16	1

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	Note	PR#	# of Uses	# of Tolerances
Cyromazine	ADAMA	I	10/07/2019	Chickpea, edible podded		11503	12	16
				Chickpea, succulent shelled				
				Dwarf pea, edible podded				
				Edible podded pea				
				English pea, succulent shelled				
				Garden pea, succulent shelled				
				Grass-pea, edible podded				
				Green pea, edible podded				
				Green pea, succulent shelled				
				Lentil, edible podded				
				Lentil succulent shelled				
				Pigeon pea, edible podded				
				Pigeon pea, succulent shelled				
				Snap pea, edible podded				
				Snow pea, edible podded				
				Sugar snap pea, edible podded				
				Brassica, leafy greens, subgroup 4-16B	1	12365	13	1
				Celtuce	1	12362	0	1
				Florence fennel	1	12363	0	1
				Kohlrabi	1	12366	0	1
				Leaf petiole vegetable subgroup 22B	1	12361	3	1
				Leafy greens subgroup 4-16A	1	12360	18	1
				Onion, bulb, subgroup 3-07A	2	12358	3	1
				Onion, green, subgroup 3-07B	2	12359	6	1
				Pepper/eggplant subgroup 8-10B	2	12368	8	1
				Tomato subgroup 8-10A	2	12367	9	1
				Vegetable, brassica, head and stem, group 5-16, except broccoli	1	12364	0	1
				Vegetable, tuberous and corm, subgroup 1C	2	12357	16	1
Indaziflam	BAYER	H	10/10/2019	Fruit, tropical and subtropical, edible peel, group 23	3	12378	53	1
				Fruit, tropical and subtropical, inedible peel, group 24 and Lowbush blueberry	2	12379 11412	104	1
Pendimethalin	BASF UPLNA	H	10/25/2019	Leaf petiole vegetable subgroup 22B		10746	7	1
				Monarda		11726	1	2
				Rosemary		12343	1	2
Tebuconazole	ADAMA ALBAGH BAYER	F	11/12/2019	Watercress		06481	1	1
				Brassica, leafy greens, subgroup 4-16B, except watercress	1	12417	12	1
				Cottonseed, subgroup 20C	2	12418	0	1
				Fruit, pome, group 11-10	1	12419	5	1
				Peach subgroup 12-12B	1	12420	0	1
				Plum subgroup 12-12C	1	12420	9	1
				Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	2	12421	5	1
				Tropical and subtropical, small fruit, inedible peel, subgroup 24A	2	12422	18	1
				Nut, tree, group 14-12	1	12423	26	1
				Sunflower subgroup 20B	2	12424	13	1

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	Note	PR#	# of Uses	# of Tolerances
Etoxazole	VALENT	I	12/05/2019	Sugar beet		11233	1	2
Propamocarb	ARYLSB BAYER	F	12/05/2019	Guava		07171	1	1
				Starfruit		11571	1	1
				Vegetable, tuberous and corm, subgroup 1C	3	12459	16	1
				Vegetable, fruiting, group 8-10	1	12460	12	2
				Leafy greens subgroup 4-16A	3	11499	40	1
Fenpyroximate	NAI	I	12/05/2019	Banana		10008	1	1
				Bushberry subgroup 13-07B		11501	19	1
				Caneberry subgroup 13-07A		08097	5	1
				Leaf petiole subgroup 22B		11100	7	3
				Squash/cucumber subgroup 9B	3	09033	10	1
				Blackeyed pea, succulent shelled		11029	12	1
				Broad bean, succulent shelled				
				Chickpea, succulent shelled				
				Cowpea, succulent shelled				
				Crowder pea, succulent shelled				
				Goa bean, pods, succulent shelled				
				Lablab bean, succulent shelled				
				Lima bean, succulent shelled				
				Southern pea, succulent shelled				
				Soybean, edible succulent shelled				
				Velvet bean, succulent shelled				
				Succulent bean, succulent shelled				
				Cottonseed subgroup 20C	2	12461	0	1
				Nut, tree, group 14-12	2	11246	26	1
Flutianil	LANDIS NAI OAT AGRIO	F	12/20/2019	Hops		09190	1	1
				Melon subgroup 9A Squash/cucumber subgroup 9B	2	12657	11	1
				Cherry subgroup 12-12A	2	12658	3	1
				Berry, low growing, subgroup 13-07G	2	12659	8	1
				Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	2	12660	5	1
						Totals	1545	208

[1] Update of established tolerance on old crop group or subgroup

[2] Conversion of established tolerance(s) on representative commodities to a crop group or subgroup tolerance

[3] Conversion of established tolerance(s) on representative commodities *and* submission of new data to complete the requirements for a crop group or subgroup

[4] Response to EPA request for Codex harmonization

[5] Tolerance for indirect or inadvertent residues

[6] Revised tolerance

[7] Tolerances to support regional registrations in the Pacific Northwest only

[8] Tolerances established but these uses will not be registered at the present time.

[**] notes a Joint Review or Workshare with EPA and PMRA

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	Note	PR#	# of Uses	# of Tolerances

Time-Limited Tolerances

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group and Expiration Date	Note	PR#	No. of Uses	No. of Tolerances
Cyromazine	ADAMA	I	10/07/2019	Potato onion (04/07/2020)		12358	1	1
Fenpropathrin	VALENT	I	12/23/2019	Kiwifruit (expires 12/31/2022)		12899	1	1
						Totals	2	2
*F=fungicide, H=herbicide, I=insecticide/acaricide N=nematicide, P=plant growth regulator								

ATTACHMENT 6
Pending Food Program Submissions to EPA

PR #	Chemical	Commodity (Full name)
7732	2,4-D	STRAWBERRY (ANNUAL) (13-07G = LOW GROWING BERRY SUBGROUP)
11842	2,4-D	CLOVER (SEED CROP) (18 = NONGRASS ANIMAL FEEDS GROUP)
275	2,4-DB	GUAR (06C = DRIED SHELLED PEA/BEAN (EXCEPT SOYBEAN) SUBGROUP)
8992	2,4-DB	LENTIL (06C = DRIED SHELLED PEA/BEAN (EXCEPT SOYBEAN) SUBGROUP)
12406	ABAMECTIN	SUBGROUP 20C (20C = COTTONSEED SUBGROUP)
10001	ACEQUINOCYL	BANANA (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
12492	ACETAMIPRID	SUBGROUP 22A (22A = STALK AND STEM VEGETABLE SUBGROUP)
10214	ACETOCHLOR	BEAN & PEA (SUCCULENT) (06AB = EDIBLE PODDED AND SUCCULENT SHELLED PEA/BEAN SUBGROUPS)
10958	ACIFLUORFEN	EDAMAME (VEGETABLE SOYBEAN) (06A = EDIBLE PODDED LEGUME VEGETABLES SUBGROUP)
11695	AFIDOPYROPEN	LETTUCE (GH) (04-16A = LEAFY GREENS SUBGROUP)
12277	AMETOCTRADIN	CELTUCE (22A = STALK AND STEM VEGETABLE GROUP)
12282	AMETOCTRADIN	CROP GROUP 05-16 (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
12278	AMETOCTRADIN	FENNEL, FLORENCE (22A = STALK AND STEM VEGETABLE SUBGROUP)
12280	AMETOCTRADIN	KOHLRABI (22A = STALK AND STEM VEGETABLE SUBGROUP)
12276	AMETOCTRADIN	SUBGROUP 04-16B (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
12279	AMETOCTRADIN	SUBGROUP 13-07F (13-07F = SMALL FRUIT VINE CLIMBING SUBGROUP, EXCEPT FUZZY KIWIFRUIT)
12281	AMETOCTRADIN	SUBGROUP 22B (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
3735	ATRAZIME	SORGHUM (SWEET) (15-16 = CEREAL GRAINS AND CEREAL GRAINS FORAGE/FODDER/STRAW GROUPS)
8052	AVG	CHERRY (12-12A = CHERRY SUBGROUP)
11055	AZOXYSTROBIN	BLUEBERRY (13-07B = BUSHBERRY SUBGROUP)
9026	BETA-CYFLUTHRIN	FLAX (20A = RAPESEED SUBGROUP)
11619	BICYCLOPYRONE	ONION (DRY BULB) (03-07A = ONION, BULB SUBGROUP)
10002	BIFENAZATE	BANANA (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
11465	BIFENAZATE	CROP GROUP 14-12 (14-12 = TREE NUT GROUP)
8857	BIFENAZATE	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)
11462	BIFENAZATE	SUBGROUP 12-12A (12-12A = CHERRY SUBGROUP)
11463	BIFENAZATE	SUBGROUP 12-12B (12-12B = PEACH SUBGROUP)
11464	BIFENAZATE	SUBGROUP 12-12C (12-12C = PLUM SUBGROUP)
11872	BIFENAZATE	SUBGROUP 20C (20C = COTTONSEED SUBGROUP)
11873	BIFENAZATE	SUBGROUP 24A (24A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, INEDIBLE PEEL SUBGROUP)
11297	BIFENTHRIN	CLOVER (SEED CROP) (18 = NONGRASS ANIMAL FEEDS GROUP)
11165	BIFENTHRIN	GRAPEFRUIT (10-10C = GRAPEFRUIT SUBGROUP)
11164	BIFENTHRIN	LEMON (10-10B = LEMON/LIME SUBGROUP)
11166	BIFENTHRIN	ORANGE (10-10A = ORANGE SUBGROUP)
11068	BIFENTHRIN	SAFFLOWER (20B = SUNFLOWER SUBGROUP)
9338	BROMOXYNIL	MILLET (15-16 = CEREAL GRAINS AND CEREAL GRAINS FORAGE/FODDER/STRAW GROUPS)

PR #	Chemical	Commodity (Full name)
11983	BUPROFEZIN	BLUEBERRY (13-07B = BUSHBERRY SUBGROUP)
9004	BUPROFEZIN	EGGPLANT (GH) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
10367	CHLOROTHALONIL	ALMOND (14-12 = TREE NUT GROUP)
391	CHLOROTHALONIL	BEET (GARDEN) (01AB = ROOT VEGETABLES SUBGROUPS)
10859	CHLOROTHALONIL	CHERRY, SOUR (12-12A = CHERRY SUBGROUP)
11846	CHLOROTHALONIL	CRANBERRY (13-07H = LOW GROWING BERRY SUBGROUP, EXCEPT STRAWBERRY)
10164	CHLOROTHALONIL	GRAPEFRUIT (10-10C = GRAPEFRUIT SUBGROUP)
5423	CHLOROTHALONIL	GREENS (MUSTARD) (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
10100	CHLOROTHALONIL	GUAVA (23B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, EDIBLE PEEL SUBGROUP)
10165	CHLOROTHALONIL	LEMON (10-10B = LEMON/LIME SUBGROUP)
147	CHLOROTHALONIL	LETTUCE (HEAD & LEAF) (04-16A = LEAFY GREENS SUBGROUP)
6420	CHLOROTHALONIL	LYCHEE (24A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, INEDIBLE PEEL SUBGROUP)
10163	CHLOROTHALONIL	ORANGE (10-10A = ORANGE SUBGROUP)
148	CHLOROTHALONIL	RADISH (01AB = ROOT VEGETABLES SUBGROUPS)
397	CHLOROTHALONIL	SPINACH (04-16A = LEAFY GREENS SUBGROUP)
3721	CHLOROTHALONIL	SUGAR APPLE (24C = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, ROUGH OR HAIRY, INEDIBLE PEEL SUBGROUP)
11672	CLETHODIM	CHIA (99 = MISC GROUP)
10582	CLETHODIM	GRAPE (13-07F = SMALL VINE CLIMBING SUBGROUP, ESCEPT FUZZY KIWIFRUIT)
12346	CYANTRANILIPROLE (HGW86)	HOPS (99 = MISC GROUP)
10327	CYANTRANILIPROLE (HGW86)	LETTUCE (GH) (04-16A = LEAFY GREENS SUBGROUP)
11952	CYCLANILIPROLE	ARTICHOKE (GLOBE) (99 = MISC GROUP)
11893	CYCLANILIPROLE	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)
11891	CYCLANILIPROLE	PEPPER (GH) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
11894	CYCLANILIPROLE	TOMATO (GH) (08-10A = TOMATO SUBGROUP)
12334	CYFLUMETOFEN	HOPS (99 = MISC GROUP)
7119	CYPRODINIL + FLUDIOXONIL	SUGAR APPLE (24C = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, ROUGH OR HAIRY, INEDIBLE PEEL SUBGROUP)
1548	DCPA	ASPARAGUS (22A = STALK AND STEM VEGETABLE SUBGROUP)
8332	DCPA	CARROT (01AB = ROOT VEGETABLES SUBGROUPS)
11433	DCPA	CROP GROUP 03-07 (03-07 = BULB VEGETABLE GROUP)
10245	DCPA	PRICKLY PEAR CACTUS (24D = TROPICAL AND SUBTROPICAL, CACTUS, INEDIBLE PEEL SUBGROUP)
11434	DCPA	SUBGROUP 09A (09A = MELON SUBGROUP)
11435	DCPA	SUBGROUP 13-07G (13-07G = LOW GROWING BERRY SUBGROUP)
8001	DIFENOCONAZOLE	GARLIC (03-07A = ONION, BULB SUBGROUP)
11271	DIFENOCONAZOLE + AZOXYSTROBIN	DRAGON FRUIT (PITAYA) (24D = TROPICAL AND SUBTROPICAL, CACTUS, INEDIBLE PEEL SUBGROUP)
11573	DIFENOCONAZOLE + AZOXYSTROBIN	PASSIONFRUIT (24E = TROPICAL AND SUBTROPICAL, VINE, INEDIBLE PEEL SUBGROUP)
12268	DIMETHOMORPH	CELTUCE (22A = STALK AND STEM VEGETABLE SUBGROUP)
12273	DIMETHOMORPH	CROP GROUP 05-16 (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
12274	DIMETHOMORPH	CROP GROUP 08-10 (08-10 = FRUITING VEGETABLE GROUP)
12269	DIMETHOMORPH	FENNEL, FLORENCE (22A = STALK AND STEM VEGETABLE SUBGROUP)
12271	DIMETHOMORPH	KOHLRABI (22A = STALK AND STEM VEGETABLE SUBGROUP)

PR #	Chemical	Commodity (Full name)
12275	DIMETHOMORPH	SUBGROUP 01C (01C = TUBEROUS AND CORM VEGETABLES SUBGROUP)
12270	DIMETHOMORPH	SUBGROUP 13-07F (13-07F = SMALL FRUIT VINE CLIMBING SUBGROUP, EXCEPT FUZZY KIWIFRUIT)
12267	DIMETHOMORPH	SUBGROUP 13-07G (13-07G = LOW GROWING BERRY SUBGROUP)
12272	DIMETHOMORPH	SUBGROUP 22B (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
11689	DIMETHOMORPH + AMETOCTRADIN	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)
11688	DIMETHOMORPH + AMETOCTRADIN	LETTUCE (GH) (04-16A = LEAFY GREENS SUBGROUP)
11302	DINOTEFURAN	APPLE (11-10 = POME FRUIT GROUP)
8595	DINOTEFURAN	BASIL (19A = HERB SUBGROUP)
11305	DINOTEFURAN	CHERRY (12-12A = CHERRY SUBGROUP)
10998	DINOTEFURAN	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)
11304	DINOTEFURAN	PEACH (12-12B = PEACH SUBGROUP)
11303	DINOTEFURAN	PEAR (11-10 = POME FRUIT GROUP)
12548	DINOTEFURAN	PEPPER (GH) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
11199	DINOTEFURAN	PLUM (12-12C = PLUM SUBGROUP)
10816	DIQUAT	AVOCADO (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
10818	DIQUAT	BANANA (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
10817	DIQUAT	GUAVA (23B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, EDIBLE PEEL SUBGROUP)
10815	DIQUAT	LYCHEE (24A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, INEDIBLE PEEL SUBGROUP)
10766	DIQUAT	ONION (DRY BULB) (03-07A = ONION, BULB SUBGROUP)
10669	DIQUAT	PEPPER (BELL & NONBELL) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
10814	DIQUAT	SUGAR APPLE (24C = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, ROUGH OR HAIRY, INEDIBLE PEEL SUBGROUP)
10668	DIQUAT	TOMATO (08-10A = TOMATO SUBGROUP)
9737	DIQUAT	WATERCRESS (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
2399	DIURON	CHERRY (12-12A = CHERRY SUBGROUP)
3071	DIURON	PLUM (12-12C = PLUM SUBGROUP)
12427	EMAMECTIN BENZOATE	SUBGROUP 20C (20C = COTTONSEED SUBGROUP)
10680	ETHABOXAM	BROCCOLI (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
11870	ETHABOXAM	CABBAGE (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
11877	ETHABOXAM	GREENS (MUSTARD) (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
9871	ETHALFLURALIN	STEVIA (99 = MISC GROUP)
10115	ETHEPHON	FIG (23B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, EDIBLE PEEL SUBGROUP)
10049	ETHOPROP	MINT (FUTURE: HERBS) (99 = MISCELLANEOUS COMMODITY)
4124	ETHYLENE	PINEAPPLE (24C = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, ROUGH OR HAIRY, INEDIBLE PEEL SUBGROUP)
8757	FAMOXADONE + CYMOXANIL	RADISH (01AB = ROOT VEGETABLES SUBGROUPS)
12415	FAMOXADONE + CYMOXANIL	RADISH (01AB = ROOT VEGETABLES SUBGROUPS)
12773	FENPROPATHRIN	CROP GROUP 05-16 (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
11332	FENPROPATHRIN	CROP GROUP 14-12 (14-12 = TREE NUT GROUP)
9266	FENPROPATHRIN	GREENS (MUSTARD) (04-16B = BRASSICA LEAFY GREENS SUBGROUP)

PR #	Chemical	Commodity (Full name)
12774	FENPROPATHRIN	KOHLRABI (22A = STALK AND STEM VEGETABLE SUBGROUP)
11333	FENPROPATHRIN	SUBGROUP 12-12A (12-12A = CHERRY SUBGROUP)
11334	FENPROPATHRIN	SUBGROUP 12-12B (12-12B = PEACH SUBGROUP)
11335	FENPROPATHRIN	SUBGROUP 12-12C (12-12C = PLUM SUBGROUP)
12775	FENPROPATHRIN	SUBGROUP 20C (20C = COTTONSEED SUBGROUP)
12776	FENPROPATHRIN	SUBGROUP 23A (23A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, EDIBLE PEEL SUBGROUP)
12777	FENPROPATHRIN	SUBGROUP 24A (24A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, INEDIBLE PEEL SUBGROUP)
12778	FENPROPATHRIN	SUBGROUP 24B (24B - TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP
7946	FENPROPATHRIN	SWEET POTATO (01CD = TUBEROUS AND CORM VEGETABLES SUBGROUPS)
9517	FENPROPATHRIN	TURNIP (ROOTS) (01AB = ROOT VEGETABLES SUBGROUPS)
12284	FENPYROXIMATE	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)
11966	FLONICAMID	PRICKLY PEAR CACTUS (24D = TROPICAL AND SUBTROPICAL, CACTUS, INEDIBLE PEEL SUBGROUP)
3399	FLUAZIFOP-P-BUTYL	ARUGULA (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
11861	FLUAZIFOP-P-BUTYL	BROCCOLI (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
11862	FLUAZIFOP-P-BUTYL	CABBAGE (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
2336	FLUAZIFOP-P-BUTYL	CELERY (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
2087	FLUAZIFOP-P-BUTYL	CHIVES (03-07B = ONION, GREEN SUBGROUP)
11363	FLUAZIFOP-P-BUTYL	CROP GROUP 10-10 (10-10 = CITRUS FRUIT GROUP)
11364	FLUAZIFOP-P-BUTYL	CROP GROUP 12-12 (12-12 = STONE FRUIT GROUP)
2076	FLUAZIFOP-P-BUTYL	GREENS (MUSTARD) (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
11265	FLUAZIFOP-P-BUTYL	PAPAYA (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
8274	FLUAZINAM	PAPAYA (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
12480	FLUAZINAM	PAPAYA (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
11231	FLUAZINAM	PEA (EDIBLE PODDED, SUCCULENT & DRIED SHELLED (06ABC = EDIBLE PODDED, SUCCULENT/DRIED SHELLED PEA/BEAN
10592	FLUAZINAM	TOMATO (08-10A = TOMATO SUBGROUP)
10374	FLUDIOXONIL	CELERY (GH) (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
12008	FLUDIOXONIL	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)
12400	FLUDIOXONIL	DRAGON FRUIT (PITAYA) (24D = TROPICAL AND SUBTROPICAL, CACTUS, INEDIBLE PEEL SUBGROUP)
12009	FLUDIOXONIL	PEPPER (BELL) (GH) (08-10B = PEPPER/EGGPLANT SUBGROUP)
12900	FLUDIOXONIL	PERSIMMON (23B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, EDIBLE PEEL SUBGROUP)
12010	FLUDIOXONIL	TOMATO (GH) (08-10A = TOMATO SUBGROUP)
12672	FLUDIOXONIL + PYDIFLUMETOFEN	PEPPER (GH) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
10908	FLUENSULFONE	BEET (SUGAR) (01AB = ROOT VEGETABLES SUBGROUPS)
11505	FLUMETSULAM	Clover (SEED CROP) (18 = NONGRASS ANIMAL FEEDS GROUP)
12928	FLUMIOXAZIN	BROCCOLI (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
12927	FLUMIOXAZIN	CABBAGE (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
12930	FLUMIOXAZIN	CUCUMBER (09B = SQUASH/CUCUMBER SUBGROUP)
11132	FLUMIOXAZIN	EDAMAME (VEGETABLE SOYBEAN) (06A = EDIBLE PODDED LEGUME VEGETABLES SUBGROUP)

PR #	Chemical	Commodity (Full name)
11545	FLUMIOXAZIN	FIG (23B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, EDIBLE PEEL SUBGROUP)
10254	FLUMIOXAZIN	GUAVA (23B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, EDIBLE PEEL SUBGROUP)
10686	FLUMIOXAZIN	GUAYULE (99 = MISCELLANEOUS COMMODITY)
11290	FLUMIOXAZIN	LYCHEE (24A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, INEDIBLE PEEL SUBGROUP)
11292	FLUMIOXAZIN	SUGAR APPLE (24C = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, ROUGH OR HAIRY, INEDIBLE PEEL SUBGROUP)
12929	FLUMIOXAZIN	TOMATO (08-10A = TOMATO SUBGROUP)
11971	FLUOPYRAM	MINT (99 = MISC GROUP)
10220	FLUTIANIL	PEACH (12-12B = PEACH SUBGROUP)
12289	FLUTIANIL	PEPPER (GH) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
9184	FLUTIANIL (V-10118)	GREENS (MUSTARD) (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
11935	FLUTRIAFOL	OLIVE (23A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, EDIBLE PEEL SUBGROUP)
11754	FLUXAPYROXAD + PYRACLOSTROBIN	POMEGRANATE (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
12467	FOMESAFEN	FOLIAGE OF LEGUME VEGETABLES EXCEPT SOYBEAN (07A = FOLIAGE OF LEGUME VEGETABLES (EXCEPT SOYBEAN) SUBGROUP)
10240	GLUFOSINATE	AVOCADO (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
12018	GLUFOSINATE	CANTALOUPE (09A = MELON SUBGROUP
12019	GLUFOSINATE	CUCUMBER (09B = SQUASH/CUCUMBER SUBGROUP)
11547	GLUFOSINATE	FIG (23B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, EDIBLE PEEL SUBGROUP)
11525	GLUFOSINATE	HOPS (99 = MISC GROUP)
12022	GLUFOSINATE	PEPPER (BELL & NONBELL) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
12020	GLUFOSINATE	SQUASH (SUMMER) (09B = SQUASH/CUCUMBER SUBGROUP)
12021	GLUFOSINATE	TOMATO (08-10A = TOMATO SUBGROUP)
11650	GLYPHOSATE	CROP GROUP 12-12 (12-12 = STONE FRUIT GROUP)
11651	GLYPHOSATE	CROP GROUP 14-12 (14-12 = TREE NUT GROUP)
8056	GLYPHOSATE	ONION (DRY BULB) (03-07A = ONION, BULB SUBGROUP)
10285	GLYPHOSATE	PEPPER (CHILI) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
9494	IMAZALIL	MUSHROOM (WHITE BUTTON) (21 = EDIBLE FUNGI GROUP)
7669	IMIDACLOPRID	BLUEBERRY (HIGH BUSH) (13-07B = BUSHBERRY SUBGROUP)
11270	IMIDACLOPRID	CORN (SEED CROP) (15-16 = CEREAL GRAINS AND CEREAL GRAINS FORAGE/FODDER/STRAW GROUPS)
11467	INDOXACARB	COFFEE (99 = MISC GROUP)
9521	INDOXACARB	GRASSES (SEED CROP) (17 = GRASS FORAGE, FODDER AND HAY GROUP)
9055	INDOXACARB	STRAWBERRY (13-07G = LOW GROWING BERRY SUBGROUP)
11707	INDOXACARB	SUNFLOWER (20B = SUNFLOWER SUBGROUP)
11111	IPCONAZOLE	ONION (SEED TRT) (03-07AB = ONION BULB AND GREEN SUBGROUPS)
11986	ISM-555	ONION (03-07AB = ONION BULB AND GREEN SUBGROUPS)
11985	ISM-555	PEANUT (99=MISC GROUP)
12000	ISOFETAMID	GINSENG (01AB = ROOT VEGETABLES SUBGROUPS)
11137	KASUGAMYCIN	OLIVE (23A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, EDIBLE PEEL SUBGROUP)
8742	LAMBDA-CYHALOTHRIN	ASPARAGUS (FERN) (22A = STALK AND STEM VEGETABLE SUBGROUP)

PR #	Chemical	Commodity (Full name)
10255	LAMBDA-CYHALOTHRIN	BROCCOLI RAAB (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
10343	LAMBDA-CYHALOTHRIN	BULB VEGETABLES SUBGROUP 03-07A (03-07A = ONION, BULB SUBGROUP)
9390	LAMBDA-CYHALOTHRIN	CARROT (01AB = ROOT VEGETABLES SUBGROUPS)
9926	LAMBDA-CYHALOTHRIN	GREENS (MUSTARD) (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
9430	LAMBDA-CYHALOTHRIN	MILLET, PEARL (15-16 = CEREAL GRAINS AND CEREAL GRAINS FORAGE/FODDER/STRAW GROUPS)
12347	LAMBDA-CYHALOTHRIN	MINT (99 = MISC GROUP)
9852	LAMBDA-CYHALOTHRIN	OKRA (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
9381	LAMBDA-CYHALOTHRIN	RADISH (01AB = ROOT VEGETABLES SUBGROUPS)
8850	LAMBDA-CYHALOTHRIN	RICE, WILD (15-16 = CEREAL GRAINS AND CEREAL GRAINS FORAGE/FODDER/STRAW GROUPS)
9380	LAMBDA-CYHALOTHRIN	RUTABAGA (01AB = ROOT VEGETABLES SUBGROUPS)
10344	LAMBDA-CYHALOTHRIN	TEA (99 = MISCELLANEOUS COMMODITY)
9379	LAMBDA-CYHALOTHRIN	TURNIP (ROOTS) (01AB = ROOT VEGETABLES SUBGROUPS)
10540	LAMBDA-CYHALOTHRIN + THIAMETHOXAM	AVOCADO (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
6684	LAMBDA-CYHALOTHRIN + THIAMETHOXAM	GUAVA (23B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, EDIBLE PEEL SUBGROUP)
10221	LINURON	BASIL (19A = HERB SUBGROUP)
11508	LINURON	BEAN (DRIED SHELLED) (06C = DRIED SHELLED PEA/BEAN (EXCEPT SOYBEAN) SUBGROUP)
11118	LINURON	SWEET POTATO (01CD = TUBEROUS AND CORM VEGETABLES SUBGROUPS)
11027	MANDESTROBIN	LETTUCE (HEAD & LEAF) (04-16A = LEAFY GREENS SUBGROUP)
1703	MEFENOXAM	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)
11548	MEFENOXAM	HERBS (GH) (19A = HERB SUBGROUP)
1700	MEFENOXAM	TOMATO (GH) (08-10A = TOMATO SUBGROUP)
11376	MESOTRIONE	CROP GROUP 13-07 (13-07 = BERRY AND SMALL FRUIT GROUP)
12919	METHOXYFENOZIDE	CELTUCE (22A = STALK AND STEM VEGETABLE GROUP)
12917	METHOXYFENOZIDE	CROP GROUP 04-16 (04-16 = LEAFY VEGETABLE GROUP)
12918	METHOXYFENOZIDE	CROP GROUP 05-16 (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
12920	METHOXYFENOZIDE	FENNEL, FLORENCE (22A = STALK AND STEM VEGETABLE SUBGROUP)
12921	METHOXYFENOZIDE	KOHLRABI (22A = STALK AND STEM VEGETABLE SUBGROUP)
11979	METHOXYFENOZIDE	RICE (15-16 = CEREAL GRAINS AND CEREAL GRAINS FORAGE/FODDER/STRAW GROUPS)
12922	METHOXYFENOZIDE	SUBGROUP 13-07H (13-07H = LOW GROWING BERRY SUBGROUP, EXCEPT STRAWBERRY)
12923	METHOXYFENOZIDE	SUBGROUP 22B (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
12924	METHOXYFENOZIDE	SUBGROUP 23C (23C = TROPICAL AND SUBTROPICAL, PALM FRUIT, EIDBLE PEEL SUBGROUP)
12925	METHOXYFENOZIDE	SUBGROUP 24A (24A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, INEDIBLE PEEL SUBGROUP)
12926	METHOXYFENOZIDE	SUBGROUP 24E (24E = TROPICAL AND SUBTROPICAL VINE, INEDIBLE PEEL SUBGROUP)
6388	METRIBUZIN	PEA (EDIBLE PODDED & SUCCULENT SHELLED) (06AB = EDIBLE PODDED AND SUCCULENT SHELLED PEA/BEAN SUBGROUPS)
10671	METRIBUZIN	POTATO (01C = TUBEROUS AND CORM VEGETABLES SUBGROUP)
3524	NAA	ALMOND (14-12 = TREE NUT GROUP)
3523	NAA	PLUM (12-12C = PLUM SUBGROUP)
3525	NAA	WALNUT (14-12 = TREE NUT GROUP)

PR #	Chemical	Commodity (Full name)
9777	NOVALURON	PEA (DRY) (06C = DRIED SHELLED PEA/BEAN (EXCEPT SOYBEAN) SUBGROUP)
9778	NOVALURON	PEA (EDIBLE PODDED & SUCCULENT SHELLED) (06AB = EDIBLE PODDED AND SUCCULENT SHELLED PEA/BEAN SUBGROUPS)
12370	OXATHIAPIPROLIN	AVOCADO (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
12371	OXATHIAPIPROLIN	POMEGRANATE (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
12372	OXATHIAPIPROLIN	STRAWBERRY (13-07G = LOW GROWING BERRY SUBGROUP)
3616	OXYFLUORFEN	CANEBERRY (RASPBERRY) (13-07A = CANEBERRY SUBGROUP)
9822	OXYFLUORFEN	COFFEE (99 = MISC GROUP)
6318	OXYFLUORFEN	KENAF (99 = MISC GROUP)
3574	OXYFLUORFEN	ONION (GREEN) (03-07B = ONION, GREEN SUBGROUP)
3573	OXYFLUORFEN	SHALLOT (03-07AB = ONION BULB AND GREEN SUBGROUPS)
9352	OXYFLUORFEN	STRAWBERRY (TRANSPLANTS) (13-07G = LOW GROWING BERRY SUBGROUP)
7377	OXYFLUORFEN	TI PALM (PEACH PALM) (23C = TROPICAL AND SUBTROPICAL, PALM FRUIT, EDIBLE PEEL SUBGROUP)
4132	OXYFLUORFEN	TOMATO (08-10A = TOMATO SUBGROUP)
11737	OXYTETRACYCLINE	OLIVE (23A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, EDIBLE PEEL SUBGROUP)
11876	OXYTETRACYCLINE	WALNUT (14-12 = TREE NUT GROUP)
11146	PARAQUAT	SESAME (20A = RAPESEED SUBGROUP)
11255	PENDIMETHALIN	SAFFLOWER (20B = SUNFLOWER SUBGROUP)
11307	PENTHIOPYRAD	BANANA (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
11444	PENTHIOPYRAD	LETTUCE (GH) (04-16A = LEAFY GREENS SUBGROUP)
12305	PERMETHRIN	ARUGULA (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
12306	PERMETHRIN	CRESS, GARDEN (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
12307	PERMETHRIN	CRESS, UPLAND (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
12303	PERMETHRIN	SUBGROUP 04-16A (04-16A = LEAFY GREENS SUBGROUP)
12311	PERMETHRIN	SUBGROUP 08-10C (08-10C = NON-BELL PEPPER/EGGPLANT SUBGROUP)
12035	PROMETRYN	BROCCOLI (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
12034	PROMETRYN	CABBAGE (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
12036	PROMETRYN	PEPPER (BELL & NONBELL) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
12029	PROMETRYN	SPINACH (04-16A = LEAFY GREENS SUBGROUP)
11717	PROPAMOCARB-HCL	BROCCOLI (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
11847	PROPAMOCARB-HCL	CABBAGE (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
11586	PROPICONAZOLE	BROCCOLI (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
11587	PROPICONAZOLE	CABBAGE (05-16 = BRASSICA HEAD AND STEM VEGETABLE GROUP)
11078	PROPICONAZOLE + CHLOROTHALONIL	TOMATO (GH) (08-10A = TOMATO SUBGROUP)
11880	PYDIFLUMETOFEN (FTH 545)	LETTUCE (GH) (04-16A = LEAFY GREENS SUBGROUP)
11879	PYDIFLUMETOFEN (FTH 545)	PEPPER (GH) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
11878	PYDIFLUMETOFEN (FTH 545)	TOMATO (GH) (08-10A = TOMATO SUBGROUP)
7968	PYMETROZINE	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)
11445	PYMETROZINE	LETTUCE (GH) (04-16A = LEAFY GREENS SUBGROUP)
7969	PYMETROZINE	TOMATO (GH) (08-10A = TOMATO SUBGROUP)
11446	PYRIOFENONE	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)

PR #	Chemical	Commodity (Full name)
11447	PYRIOFENONE	PEPPER (GH) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
11448	PYRIOFENONE	TOMATO (GH) (08-10A = TOMATO SUBGROUP)
12497	PYROXSULAM	RYE (15-16 = CEREAL GRAINS AND CEREAL GRAINS FORAGE/FODDER/STRAW GROUPS)
12639	QUINCLORAC	CRANBERRY (13-07H = LOW GROWING BERRY SUBGROUP, EXCEPT STRAWBERRY)
12687	QUIZALOFOP	IR-4 PROPOSED CROP GROUP 02 (99=MISC GROUP)
12688	QUIZALOFOP	IR-4 PROPOSED SUBGROUP O6-18D (99=MISC GROUP)
12689	QUIZALOFOP	IR-4 PROPOSED SUBGROUP 06-18E (99=MISC GROUP)
12690	QUIZALOFOP	IR-4 PROPOSED SUBGROUP 06-18F (99=MISC GROUP)
10184	RIMSULFURON	OLIVE (23A = TROPICAL AND SUBTROPICAL, SMALL FRUIT, EDIBLE PEEL SUBGROUP)
10606	RIMSULFURON	POMEGRANATE (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
11875	RIMSULFURON	SUBGROUP 08-10A (08-10A = TOMATO SUBGROUP)
10716	SEDAXANE	ONION (DRY BULB) (03-07A = ONION, BULB SUBGROUP)
8345	SETHOXYDIM	VERNONIA (IRON WEED) (20B = SUNFLOWER SUBGROUP)
9577	S-METOLACHLOR/METOLACHLOR	SPINACH (04-16A = LEAFY GREENS SUBGROUP)
11895	S-METOLACHLOR/METOLACHLOR	SUBGROUP 04-16A (04-16A = LEAFY GREENS SUBGROUP)
11926	SPINETORAM+SULFOXAFLOR	CUCUMBER (GH) (09B = SQUASH/CUCUMBER SUBGROUP)
11944	SPINETORAM+SULFOXAFLOR	PEPPER (BELL & NONBELL) (GH) (08-10BC = PEPPER/NONBELL PEPPER/ EGGPLANT SUBGROUPS)
11919	SPINETORAM+SULFOXAFLOR	TOMATO (GH) (08-10A = TOMATO SUBGROUP)
9971	SPIROMESIFEN	CANTALOUPE (09A = MELON SUBGROUP)
9970	SPIROMESIFEN	CUCUMBER (09B = SQUASH/CUCUMBER SUBGROUP)
10800	SPIROMESIFEN	FRUITING VEGETABLES (08-10 = FRUITING VEGETABLE GROUP)
9842	SPIROMESIFEN	GRASSES (17 = GRASS FORAGE, FODDER AND HAY GROUP)
9290	SPIROMESIFEN	OKRA (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
9972	SPIROMESIFEN	SQUASH (SUMMER) (09B = SQUASH/CUCUMBER SUBGROUP)
10551	SPIROMESIFEN	WATERCRESS (04-16B = BRASSICA LEAFY GREENS SUBGROUP)
10290	STREPTOMYCIN	PEPPER (BELL & NONBELL) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
12261	SULFOXAFLOR	PEA (DRY) (06C = DRIED SHELLED PEA/BEAN (EXCEPT SOYBEAN) SUBGROUP)
12526	SULFOXAFLOR	QUINOA (99 = MISC GROUP)
11727	TERBACIL	MONARDA (99 = MISC GROUP)
11235	TERBACIL	OREGANO (19A = HERB SUBGROUP)
9017	TERBACIL	PEACH (12-12B = PEACH SUBGROUP)
8959	TERBACIL	STRAWBERRY (ANNUAL) (13-07G = LOW GROWING BERRY SUBGROUP)
12499	THIFENSULFURON + TRIBENURON	RYE (15-16 = CEREAL GRAINS AND CEREAL GRAINS FORAGE/FODDER/STRAW GROUPS)
9709	THIOPHANATE METHYL	BEAN (SNAP) (06A = EDIBLE PODDEDLEGUME VEGETABLES
8614	THIOPHANATE METHYL	PEPPER (FIELD & GH) (08-10BC = PEPPER/NON-BELL PEPPER/EGGPLANT SUBGROUPS)
11980	TRIBENURON-METHYL	BEAN (DRIED SHELLED) (06C = DRIED SHELLED PEA/BEAN (EXCEPT SOYBEAN) SUBGROUP)
12245	TRIBENURON-METHYL	PEA (DRY) (06C = DRIED SHELLED PEA/BEAN (EXCEPT SOYBEAN) SUBGROUP)
9916	TRIFLOXYSTROBIN	BEAN (SNAP) (06A = EDIBLE PODDEDLEGUME VEGETABLES
7049	TRIFLOXYSTROBIN	ONION (03-07AB = ONION BULB AND GREEN SUBGROUPS)

PR #	Chemical	Commodity (Full name)
10765	TRIFLOXYSTROBIN + FLUOPYRAM	PAPAYA (24B = TROPICAL AND SUBTROPICAL, MEDIUM TO LARGE FRUIT, SMOOTH, INEDIBLE PEEL SUBGROUP)
11644	TRIFLURALIN	CARDOON (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
11645	TRIFLURALIN	CELERY, CHINESE (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
11628	TRIFLURALIN	CROP GROUP 03-07 (03-07 = BULB VEGETABLE GROUP)
11629	TRIFLURALIN	CROP GROUP 08-10 (08-10 = FRUITING VEGETABLE GROUP)
11630	TRIFLURALIN	CROP GROUP 10-10 (10-10 = CITRUS FRUIT GROUP)
11631	TRIFLURALIN	CROP GROUP 12-12 (12-12 = STONE FRUIT GROUP)
11633	TRIFLURALIN	CROP GROUP 14-12 (14-12 = TREE NUT GROUP)
11646	TRIFLURALIN	FUKI (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
11647	TRIFLURALIN	RHUBARB (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
11632	TRIFLURALIN	SUBGROUP 13-07F (13-07F = SMALL FRUIT VINE CLIMBING SUBGROUP, EXCEPT FUZZY KIWIFRUIT)
11648	TRIFLURALIN	UDO (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
11649	TRIFLURALIN	ZUIKI (22B = LEAF PETIOLE VEGETABLE SUBGROUP)
11526	TRINEXAPAC-ETHYL	CLOVER (SEED CROP) (18 = NONGRASS ANIMAL FEEDS GROUP)

ATTACHMENT 7 – 2019 ENVIRONMENTAL HORTICULTURE PROGRAM

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Mr. Ben Fraelich	GA
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Mr. John Harvey	WA
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Dr. Mr. Paul Wade	SC

ATTACHMENT 8 – 2019 ENVIRONMENTAL HORTICULTURE PROGRAM PROGRAM RESEARCH ACTIVITIES

Discipline	Project	Researchers	Crops	Products	Trials
Entomology	Afidopyropen (BAS 440I) Crop Safety *	4	12	1	14
Entomology	Borer & Beetle Efficacy *	6	4	15	48
Entomology	Cyclaniliprole + Flonicamid Crop Safety *	3	10	1	17
Entomology	Cyflumetofen Crop Safety *	1	1	1	1
Entomology	Mealybug Efficacy *	3	3	9	26
Entomology	Mollusc Efficacy	1	1	3	3
Entomology	Mosquito Larvicide Bromeliad Crop Safety	1	1	1	5
Entomology	Scale Efficacy *	3	2	9	27
Entomology	SP3014 Crop Safety *	2	6	1	6
Entomology	Thrips Efficacy *	2	1	8	16
Entomology	V-10433 Crop Safety *	1	3	1	3
Pathology	Botrytis Efficacy *	6	3	10	51
Pathology	Cyflufenamid Crop Safety *	1	1	1	1
Pathology	Cylindrocladium Efficacy *	1	1	10	10
Pathology	F6123 Crop Safety *	3	11	1	26
Pathology	Fluopyram (ESP 715) Crop Safety *	4	9	1	19
Pathology	Flutianil Crop Safety *	3	5	1	5
Pathology	Fluxapyroxad + Pyraclostrobin Crop Safety *	5	6	1	10
Pathology	Fusarium Efficacy *	1	2	9	9
Pathology	IKF-309 Crop Safety *	2	9	1	9
Pathology	Mandestrobin Crop Safety *	2	6	1	6
Pathology	Mefentrifluconazole (BAS 750) Crop Safety *	4	11	1	24
Pathology	Mono and di potassium salts of phosphorus acid + hydrogen peroxide Crop Safety	1	1	1	2
Pathology	Oxathiapiprolin Crop Safety *	3	7	1	9
Pathology	Picarbutrazox Crop Safety *	6	9	2	14
Pathology	Pseudomonas chlororaphis Crop Safety *	3	4	1	4
Pathology	Pydiflumetofen + Difenoconozole Crop Safety *	1	7	1	14
Pathology	Pydiflumetofen Crop Safety *	5	10	1	21
Pathology	Rhizoctonia Efficacy *	2	1	6	12
Pathology	SP2480 Crop Safety *	3	3	1	4
Pathology	SP2700 Crop Safety *	4	4	1	6
Pathology	TDA01 Crop Safety *	2	2	1	2
Pathology	Thielaviopsis Efficacy *	2	1	9	18
Weed Science	Bentazon Crop Safety *	8	19	1	30
Weed Science	Dimethenamid-p Crop Safety *	4	5	1	6
Weed Science	Dithiopyr Crop Safety *	2	6	1	6
Weed Science	Flumioxazin + Pyroxasulfone Crop Safety *	3	4	1	5
Weed Science	General Weed Efficacy *	2	1	4	24
Weed Science	Indaziflam Crop Safety *	6	8	1	13
Weed Science	Iron HEDTA Crop Safety *	10	33	1	46
Weed Science	Isoxaben + Dithiopyr Crop Safety *	8	13	1	27
Weed Science	Isoxaben Crop Safety *	1	1	1	1
Weed Science	Liverwort Efficacy	1	1	8	8
Weed Science	Oxadiazon Crop Safety *	2	3	1	4
Weed Science	Oxalis Efficacy *	1	1	4	4
Weed Science	Oxyfluorfen + Prodiamine Crop Safety *	4	7	1	7
Weed Science	Pendimethalin + Dimethenamid-p Crop Safety *	2	2	1	3
Weed Science	Pendimethalin Crop Safety *	4	9	1	13
Weed Science	Prodiamine + Isoxaben Crop Safety *	2	4	1	4
Weed Science	SP1770/SP1772 Crop Safety *	2	8	1	9
Weed Science	Spurge Efficacy *	1	1	4	4
Weed Science	Sulfentrazone Crop Safety *	2	3	1	3

* National Priority Projects

For a detailed list of research activities visit https://www.ir4project.org/ehc/ .

ATTACHMENT 9 – ENVIRONMENTAL HORTICULTURE RESEARCH SUMMARIES FOR 2019

Afidopyropen Crop Safety
Ventigra (BAS 440i) (afidopyropen) is a new insecticide recently registered by BASF for the control of piercing and sucking insect pests such as aphids, whiteflies, psyllids, scales and leafhoppers. The IR-4 Project completed 106 crop safety trials on 42 environmental horticulture plant species or genera from 2015 through 2019. In these trials, 24 genera or species exhibited minimal or no injury after foliar applications in a minimum of 3 trials for each crop; these can be added to a list of tolerant plants in the new label for this active ingredient. All trials for 18 other species or genera exhibited minimal or no injury in the limited number of trials (one or two) for each crop with the exception of dahlia which had moderate injury in one trial.

Algal Leaf Spot Efficacy
At the IR-4 Environmental Horticulture Program Workshop in 2015, Algal Leaf Spot Efficacy was selected as a regional special project for the Southern Region to determine the efficacy of several fungicides for this disease. Eleven products representing 10 active ingredients were tested as foliar applications against *Cephaleuros virescens* causing algal leaf spot on southern magnolia. Two of the products tested were copper fungicides recommended for management of algal leaf spot. Although there were insufficient IR-4 data for definitive conclusions, two relatively new products that are included in this research project, KleenGrow and Mural, provided efficacy comparable to COC DF, the top performing copper fungicide in the trials.

Azoxystrobin + Difenoconazaole Crop Safety
Alibi Flora (azoxystrobin + difenoconazole) was registered on January 12, 2015 for use on ornamental horticulture crops and landscape ornamental horticulture plants in the United States to manage foliar, stem and crown diseases. From 2014 to 2016, the IR-4 Project conducted 41 trials on 15 ornamental plant species / genera examining phytotoxicity related to Alibi Flora applications. The data contained in this report were generated to register uses of azoxystrobin + difenoconazole for use on environmental horticulture plants. The rates tested were 8 (1X), 14 (2X) and 28 (4X) fl oz per 100 gal.

Alibi Flora was applied to fifteen (15) plant species or genera. Eight exhibited no or minimal transient injury in at least 3 trials, and two of these (*Buddleia davidii* and *Dianthus* spp.) are already in the Alibi Flora label. Seven species or genera exhibited no injury in one or two trials; six of them are already in the label. Six additional species can be considered for labelling: *Aquilegia* spp., *Calibrachoa* spp., *Lamium* spp., *Lavandula* spp., *Monarda didyma* and *Osteospermum* sp. be added to the Alibi Flora label.

Azoxystrobin + Difenoconazaole Crop Safety
Azoxystrobin was registered as Heritage in the United States in 1997 as a turf fungicide. In April 2003, this label was updated to include applications for certain diseases on ornamental crops. The label contains an extensive list of environmental horticulture plants where Heritage can be used without causing phytotoxicity. From 1999 to 2014, the IR-4 Project conducted 107 trials on 77 ornamental plant species examining phytotoxicity related to Heritage applications. In these trials, only 2 crops (*Pseudotsuga menziesii* and *Tsuga heterophylla*) exhibited noticeable, significant injury and that was a slight height reduction and stem swelling at the 2X and 4X rates applied as drench to emerged seedlings. Based on this information, it is recommended that 54 plants in the IR-4 trials be added to the list of tolerant plants with the precautionary statements in the Plant Safety and Tolerant Ornamentals Plant sections of the current Heritage 50WG label.

Borers, Beetles, and White Grub Efficacy
Collectively, managing coleopteran insects can be challenging because the adult and larval stages may both cause damage and sometimes occur on different hosts or on different plant parts. While organophosphates, pyrethroids, and neonicotinoids can provide good to excellent control of coleopteran insects, not all products work equally well in all situations. Treatments for borers are very different than treatments targeting white grubs. Developing newer classes of chemistry are important to reduce the environmental consequences and to minimize the development of resistance. Starting with the 2004 Annual Workshop, screening a number of products to manage coleopteran insects became one of the high priority projects for entomology. From 2005 through 2018, 74 products representing 49 different active ingredients were tested for management of adult and larval stages of coleopteran insects. In addition, 10 products

representing 10 active ingredients were evaluated for lepidopteran clearwing borers in 2008 and 2009. These products represented both biological and chemical tools. Some products were already registered but more data were needed or they were considered standards to measure the level of efficacy achieved with other materials. Other products were in development but have not yet been registered with the EPA. While a number of coleopteran and lepidopteran species were tested, only enough experiments were able to be completed on the coleopteran species black vine weevil, Japanese beetle, oriental beetle, Sri Lankan weevil, and viburnum leaf beetles to recommend actions to register or amend labels for these pests.

Bentazaon Crop Safety

Basagran T/O has been registered for a number of years as a directed application and as an over-the-top application on limited plant species. However, growers have expressed the need to have additional plants added for over-the-top applications. Data collected throughout the history of the IR-4 Environmental Horticulture Program are presented here to support specific Basagran T/O applications over the top of certain ornamental horticulture plants. The rates chosen for this research were 1.0, 2.0 and 4.0 pounds active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. In addition, early studies compared single versus two consecutive applications of 1.0 lb ai per A or 2.0 lb ai per A followed with 1 lb ai per A. Throughout the years, 83 different crop species were examined for over the top applications. Of these, 21 exhibited no or minimal transient injury after application at all three rates. Twenty-eight crops require further research because of unclear results. Twelve crops exhibited no phytotoxicity at 1.0 lb ai per acre, but did have some injury at the higher rates or with repeat applications. Twenty-three species exhibited phytotoxicity at even the 1.0 lb ai per acre rate.

Botrytis Efficacy

At the IR-4 Environmental Horticulture Program Workshop in 2011, Botrytis Efficacy was selected as a high priority project to expand the knowledge and list of fungicides available to growers for these diseases. In addition to research collected through the IR-4 Program, this summary includes a review of experiments conducted from 1998 to 2018 on environmental horticulture crops. During this time period, numerous products representing 52 active ingredients were tested as foliar applications against several *Botrytis* species causing blight and gray mold on ornamentals. Most products are registered and commercially used. Almost all trials were conducted on *Botrytis cinerea*; other species tested were *B. elliptica*, *B. paeoniae* and *B. tulipae*. Although there were insufficient IR-4 data for definitive conclusions, seven relatively new products that are included in this research project, Orkestra Intrinsic, Mural and Emblem (NUP 09092), Rhapsody/Serenade, Astun/IKF 5411, Picatina, and Picatina Flora looked effective, while Botector, BW165N, Proud 3, SP2480, SP2770 and SP2773 looked ineffective. Data on other relatively new products (EcoSwing, F9110, MBI-110, PreStop, Prophytex, Regalia, S2200, Torque, Tourney, Trinity) were limited to provide some conclusions. Of the established registered products, Compass, Daconil, Decree, Heritage, Insignia, Pageant and Palladium generally provided excellent efficacy; Chipco 26019 and Veranda O provided good efficacy and Disarm provided mediocre efficacy. ZeroTol, and the copper products (Badge X2, Camelot, Phyton 27, STBX-304) generally performed poorly under the conditions of these experiments.

Cyflufenamid Crop Safety

Cyflufenamid is an active ingredient for managing foliar diseases including powdery mildew and botrytis. It is not yet registered by EPA for the ornamental horticulture industry. From 2012 to 2014, the IR-4 Project completed 55 trials on 16 ornamental plant genera or species.

Cyflumetofen Crop Safety

Sultan (cyflumetofen) was registered for use on greenhouse environmental horticulture crops as foliar spray in the United States on May 9, 2014 to manage mites. The label does not contain a list of crops tested for tolerance. During 2014 to 2018, the IR-4 Project conducted 92 trials on 25 environmental horticulture plant species or genera examining phytotoxicity related to Sultan applications. Sixteen species or genera exhibited no injury in a minimum of 3 trials, and eight species or genera exhibited no or minimal injury in the limited number of trials (one or two) for each crop. BASF can consider adding these to the label. Only one crop (*Impatiens walleriana*) exhibited significant injury or growth reduction during these experiments.

Fluxapyroxad + Pyraclostrobin Crop Safety The IR-4 Project screens new active ingredients for potential deleterious impacts to aid growers in selection of appropriate disease management tools for their crops. From 2014 to 2018, IR-4 completed 78 trials on 34 environmental horticulture plant species examining phytotoxicity related to foliar applications of Orkestra (fluxapyroxad + pyraclostrobin). During 2016 and 2018, an additional 15 trials were conducted using drench application on 9 crops. In these trials, 17 species or genera exhibited minimal or no injury after foliar applications in a minimum of 3 trials for each crop. Thirteen of these are already on the current label for this active ingredient; the other four (*Aquilegia* sp, *Hemerocallis* sp., *Picea* sp. and *Pinus* sp.) can be added to a list of tolerant plants in the current label. Only two plant species (*Cornus florida* and *Impatiens hawkeri*) exhibited significant injury in one study. All trials for 13 other species or genera exhibited no or minimal injury in the limited number of trials (one or two) for each crop. Four of these are already in the current label; BASF can consider adding the other nine to the label. Drench application caused no significant phytotoxicity on all crops tested.

Iron HEDTA Crop Safety
Fiesta (Iron HEDTA) is a new herbicide currently labeled for post emergence broadleaf weed control on lawns (use on rights of way or non-crop areas), turf, golf courses, parks, playgrounds, cemeteries and athletic fields. Neudorff is interested in adding environmental horticulture crops to the Fiesta label. The IR-4 Project completed 100 crop safety trials on 74 ornamental horticulture plant species / genera during 2016 to 2018. In these trials, 2 plant species / genera (*Festuca glauca* and *Juniperus* spp.) exhibited no or minimal transient injury after application to either dormant or actively growing plants at all 3 rates in at least 3 trials. Three species / genera (*Hibiscus* sp., *Lagerstroemia indica* and *Teucrium chamaedrys*), where Fiesta was applied to actively growing plants, exhibited no phytotoxicity at 1X but did have some injury at 2X and 4X rates. Fifteen species / genera exhibited significant phytotoxicity at even the lowest rate; in ten of these crops, Fiesta was applied to dormant plants.

Mite Efficacy
From 1999 to 2016, 34 active ingredients were tested mainly as foliar applications against several genera and species of mite pests on ornamentals and vegetables (Tables 1 and 2). Mite species tested included: broad mite, *Polyphagotarsonemus latus*, Eriophyid mites including *Aceria* sp., *Aculops lycopersici, Aculus ligustri, Aculus schlechtendali, Epitrimerus pyri,* spider mites including *Tetranychus urticae, Oligonychus ilicis* and *Panonychus citri,* and the red palm mite *Raoeilla indica.* Although there were insufficient data for definitive conclusions, Akari/Fujimite (fenpyroximate), Magus (fenazaquin) and Pylon (chlorfenaphyr), generally performed well on various species. Kontos/Movento/BYI 08330 (spirotetramat) looked promising on the Eriophyds *Aceria* sp. and *Aculus ligustri* and on the spider mites *P. citri* and *T. urticae*. Proclaim (emamectin benzoate) was promising on the Eriophyds *Aceria* sp. and *Aculus ligustri* and on *P. latus*. Mesa/Ultiflora (milbemectin) looked promising on the Eriophyds *A. ligustri, Aculus schlechtendali, Epitrimerus pyri* and *Aculops lycopersici*, and on the spider mites *T. urticae.* Shuttle (acequinocyl) looked promising on Southern red mite. On red palm mite, limited data indicated that Forbid/Judo (spiromesifen), Pylon, Sanmite (pyridaben), Shuttle (acequinocyl) and Sulfur/Thiolux (sulfur) performed well while Avid (abamectin), Hexygon (hexythiazox) and Tetrasan (etoxazole) were less effective. Tank-mix combination with oils generally improved mite control.

Oxyfluorfen + Prodiamine Crop Safety
From 2009 through 2018, IR-4 completed 246 trials evaluating Biathlon (oxyfluorfen + prodiamine) crop safety to crops grown in field containers. The data contained in this report were generated to register uses of oxyfluorfen + prodiamine as over-the-top applications on and around environmental horticulture plants. The rates tested were 2.75 (1X), 5.5 (2X) and 11.0 (4X) pounds active ingredient per acre (lbai per acre). Biathlon was applied to130 plant species / genera. Thirty-two species /genera exhibited no or minimal transient injury in at least 3 trials. Results are summarized at the species level, as there is some evidence that crop safety can differ at the varietal level. On the Biathlon label, *Potentilla fruticosa* appears twice: it may be used on the variety 'Abbotswood' but is not recommended on 'Goldfinger'. More data are needed to establish the actual varietal sensitivities within *Potentilla fruticosa* and identify other species with the same difficulty. Based on the data provided here, we recommend that *Acer palmatum, Arctostaphylos* sp., *Betula nigra, Camelia japonica, Chasmantium latifolium, Cornus florida, Cornus kousa, Cornus serícea, Dasiphora fruticosa, Dryopteris erythrosora, Distylium* sp., *Gladiolus* spp., *Lantana camara, Mahonia aquifolium, Pachysandra terminalis, Quercus rubra, Rosmarinus officinalis, Rudbeckia* spp., *Salvia nemorosa* and *Sedum* spp. be added to the Biathlon label along with 13 additional varieties of species already listed in the label.

ATTACHMENT 9 – Continued

Pendimethalin + Dimethenamid-p Crop Safety

From 2007 to 2018, IR-4 completed 657 trials on Freehand 1.75G (BAS 659 G; dimethenamid-p + pendimethalin).The data contained in this report was generated to register uses of dimethenamid-p + pendimethalin on and around environmental horticulture plants with broadcast applications, including over the top of established plants. The Freehand rates in this testing program were 2.65, 5.3 and 10.6 pounds active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. Freehand 1.75G had been applied to 194 plant genera or species. Of these genera and species, 74 exhibited no or minimal transient injury after application at all three rates. Thirty five (35) crops exhibited little or no phytotoxicity at 2.65 lb ai per acre, but did have some injury at 5.3 and/or10.6 lb ai per acre, or showed injury after the second application. Twenty two (22) genera or species exhibited damage at the lowest rate sufficient to recommend growers not utilize Freehand 1.75G as an over-the-top treatment for pre-emergent weed control. Of the sixty two (62) crops that still need additional information, there are twelve (12) genera or species in which three or more trials do not show significant injury, but one or more additional trials shows some sort of notable injury, necessitating additional research. Additional trials are also indicated to establish species or cultivar sensitivities.

Pendimethalin Crop Safety

Pendimethalin has been registered in the United States since 1994 for uses in and around environmental horticulture plants in production nurseries and in landscapes. Between 1981 and 2008, the IR-4 Project has conducted over 469 trials using two granular formulations (Corral 2.68G and Pendulum 2G), two liquid formulations (Pendulum AquaCap and Prowl 4E) and a wettable dry granular formulation (Pendulum WDG). Between 2014 and 2018, 70 trials were conducted on ornamental grasses to determine crop safety of the Pendulum 2G formulation. This summary is an update of the second summary, issued in 2017, across all the available data generated through IR-4 since screenings began in 1981.

Eighty-seven plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of Corral 2.68G and Pendulum 2G formulations. Of these, 22 species or genera are not on the current Pendulum 2G label. Two species (*Phlox paniculata* and *Rhodiola pachyclados)* exhibited significant injury to Pendulum 2G. Thirty-seven plant species or genera exhibited no or minimal transitory phytotoxicity to applications of Pendulum AquaCap and Pendulum WDG formulations. All these ornamentals are currently listed on the Pendulum AquaCap label. One species (*Stachys byzantina*) exhibited phytotoxicity at 2 lb ai per acre and higher rates.Twenty plant species or genera exhibited no or minimal transitory phytotoxicity to applications of Prowl 4E. Of these, one (*Paeonia* sp.) is not currently listed on the label.

Picarbutrazox Crop Safety

Picarbutrazox is a novel fungicide with a new mode of action being developed by Nisso America for the control of oomycete diseases such as *Bremia, Peronospora, Pseudoperonospora, Phytophthora* and *Pythium.* The IR-4 Project completed 27 crop safety trials on 12 environmental horticulture plant species or genera during 2018. In these trials, all 12 species or genera exhibited no or minimal injury. Three species or genera (*Impatiens hawkeri, Impatiens walleriana* and *Rosa* sp.) exhibited no injury in 3 trials, and 9 species or genera exhibited no or minimal injury in the limited number of trials (one or two) for each crop. Nisso America may consider including these to a future label.

Prodiamine + Isoxaben Crop Safety

Prodiamine + Isoxaben (Gemini G) is a new herbicide combination being developed by Everris dba ICL Specialty Fertilizers for pre-emergent control of grasses and broadleaf weeds on environmental horticulture crops. The IR-4 Project completed 32 crop safety trials on 22 ornamental horticulture plant species or genera during 2017 and 2018. In these trials, one species (*Quercus virginiana*) exhibited no injury after over-the-top applications in a minimum of 3 trials; this species can be added to a list of tolerant plants in the new label for this product. One species (*Phlox paniculata*) exhibited damage at the 1X rate sufficient to recommend growers not utilize Gemini G as an over-the-top treatment for pre-emergent weed control.

Pyridalyl Crop Safety

Pyridalyl was registered as Overture for use on environmental horticulture plants in greenhouses with foliar applications in the United States in 2008. The label recommends use on horticulture plants with testing by the grower. From 2010 to 2015, the IR-4 Project conducted 51 trials on 12 ornamental plant species or genera examining phytotoxicity related to Overture applications. In these trials, no injury was noted.

Pyrifluquinazon Crop Safety

Pyrifluquinazon was registered for use on greenhouse environmental horticulture crops as foliar sprays in the United States in 2013 to manage whiteflies, aphids, leafhoppers, chilli thrips, and mealybugs. The label contains a list of crops tested for tolerance. From 2010 to 2016, the IR-4 Project conducted 131 trials on 29 ornamental plant species / genera examining phytotoxicity related to pyrifluquinazon applications. In these trials, 23 species or genera exhibited minimal or no injury after foliar applications in a minimum of 3 trials for each crop. Nineteen of these are already in the current Rycar label; the other four can be added to the label. All trials for six other species or genera exhibited minimal or no injury in the limited number of trials (one or two) for each crop and two of these are already registered.

Scale & Mealybug Efficacy

Managing scale and mealybug insects presents unique challenges. Products with contact modes of action must be applied at specific timings in order to reach the most susceptible crawler stages. Products with systemic modes of action may work well for certain species and not others based on application timing and whether the insect feeds within phloem or xylem. In 2003, IR-4 initiated a high priority project to determine efficacy of several insecticides on several scale and mealybug species so data can be obtained to add appropriate species to existing registrations. This research was conducted between 2004 and 2018.This report is a brief summary of available data from 86 experiments received through the IR-4 Environmental Horticulture Program.

Several neonicotinoids (Aloft SC/Celero 16WSG, Flagship 0.22G/25WP, Safari 2G/20SG/Transtect 70WSP, and TriStar 30SG/70WSP), insect growth regulators (Distance and Talus 40SC/70DF), and other products were tested against scales and mealybugs. All products tested generally provided excellent control of elongate hemlock scale, cryptomeria scale, gloomy scale, citrus mealybug and Mexican mealybug, generally mediocre to excellent control of false oleander scale, Fletcher scale, Florida wax scale, magnolia scale, and poor control of armored scale. For other species, efficacy levels varied with the active ingredient and method/timing of application.

All products tested on citrus mealybug and Mexican mealybug, including Aria, Flagship, Safari, Talus, and TriStar, generally provided good to excellent control of these species. An experiment on Madeira mealybug showed excellent control when TriStar was mixed with Capsil surfactant, and poor control without Capsil. Rycar, Safari and Talus provided good to excellent control of this species, while A16901B provided mediocre control when applied as drench but good when applied as foliar treatment. Phormium mealybug control was good to excellent with all neonicotinoids tested – Flagship, Safari and TriStar. Good to excellent control of Rhizoecus root mealybug was obtained with A16901B, Aria, Kontos, MBI-203, MBI-205 and Safari in single experiments.

Three recently registered products (Mainspring, Rycar and XXpire), and three new experimentals (BAS 440/Ventigra, BYI-2960/Altus, IKI-3106/Sarisa and IKI-3326/Pradia) looked promising on several species based on their efficacy relative to standards. Further research is needed to obtain additional efficacy data to recommend actions to register or amend labels for these pests.

SP2700 Crop Safety

SP2700 is a new fungicide being developed by SePro for the control of diseases on ornamentals such as *Alternaria, Cylindrocladium, Fusarium, Rhizoctonia,* and *Thielaviopsis.* The IR-4 Project completed 18 crop safety trials on 10 ornamental horticulture plant species or genera from 2018 through 2019. In these trials, two genera or species exhibited minimal or no injury after foliar applications in a minimum of 3 trials for each crop; these can be added to a list of tolerant plants in the new label for this active ingredient. All trials for 8 other species or genera exhibited minimal or no injury in the limited number of trials (one or two) for each crop.

Tolfenpyrad Crop Safety

Tolfenpyrad was first registered in the United States as Hachi-Hachi 15 EC on July 28, 2010 for the control of aphids, leafhoppers, scales, thrips, whiteflies, and early instar lepidopteran larvae on environmental horticulture crops grown in greenhouses. A new formulation Hachi-Hachi 15 SC was registered on March 30, 2015, then on June 11, 2018. An expansion of this label for outdoor uses is planned. The IR-4 Project completed 194 trials on 29 ornamental plant species from 2010 through 2016 examining phytotoxicity related to foliar applications of Hachi-Hachi 15EC or Hachi-Hachi SC. In this report, 11 species or genera exhibited no or minimal injury after foliar treatments of Hachi-

Hachi 15EC (tolfenpyrad) at 21, 48 and 84 fl oz per 100 gal. Three of these crops are already in the current label as crops tested for tolerance: *Chrysanthemum/Dendranthemum sp.*, *Petunia sp.,* and *Tagetes sp.* The rest can be added to the label: (*Alyssum sp.*, *Angelonia sp*., *Antirrhinum sp*., *Begonia sp., Dahlia sp., Verbena sp., Viola sp.* and *Zinnia sp.*). For Hachi-Hachi SC, 20 species or genera exhibited no or minimal injury; 5 of these crops are already in the current label as crops tested for tolerance. Fifteen crops can be listed on the label (*Angelonia sp*., *Bacopa sp.*, *Begonia sp., Calibrachoa sp., Dracaena sp., Dahlia sp., Fuschia sp., Hydrangea sp., Lobularia maritima, Pelargonium x hortorum, Petunia sp., Rosa sp., Tagetes sp., Verbena sp.* and *Viola sp.*).

SP1770 Liquid Crop Safety
SP1770 Liquid is a new herbicide being developed by SePro. The IR-4 Project completed 27 crop safety trials on 19 environmental horticulture plant species or genera during 2016 to 2018. In these trials, 16 of the 19 species or genera tested exhibited significant injury in the limited number of trials (one or two) for each crop.

Thielaviopsis Efficacy: A Literature Review
From 2003 to 2017, numerous products representing 23 active ingredients were evaluated in greenhouse trials as soil drench against *Thielaviopsis basicola* causing black root rot on ornamentals. Although there were insufficient data for definitive conclusions, two new experimentals (BAS 750 - mefentrifluconazole) and A20808C showed promising efficacy comparable to the standards. Several products that are not yet labeled for *Thielaviopsis basicola* also showed promising efficacy in single trials. These include Empress Intrinsic (pyraclostrobin), Endorse/Veranda O (polyoxin D), *Mural (a*zoxystrobin + benzovindiflupyr), Tourney (metconazole) and Vital (potassium phosphite). The experimentals A19649B and *Pyraziflumid SC (pyraziflumid)* provided poor efficacy in single trials. The established standards 3336 and Terraguard generally provided excellent efficacy.

ATTACHMENT 10- Biopesticide and Organic Support Program

2019 Grant Awards

- Efficacy evaluations of biopesticides for management of spotted wing drosophila.
- Efficacy evaluations of biopesticides for management of varroa mite in honeybees.
- Efficacy evaluations of biopesticides for management of weeds
- Management of PMV in tomato
- Combining Downy Mildew resistant basil with biopesticides in organic basil.
- Management of bacterial diseases in vegetables.

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Biopesticide Regulatory Support Packages Approved in 2019

Product	Crop	PR Number	TYPE	Registration Type	Uses
Cranberry	Citrus	01060B	Fungicide	Biochemical Classification	Citrus
Noni	All	01054B	Fungicide	Biochemical Classification	All
Hops Beta Acid	Honeybee	00432B	Miticide	Formulation change	Honey & Beeswax

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