THE IR-4 PROJECT

HELPING PEOPLE

PEST MANAGEMENT SOLUTIONS FOR SPECIALTY CROPS
AND SPECIALTY USES

The IR-4 Project

Annual Report 2016

ANNUAL REPORT OF THE IR-4 PROJECT[1]
January 1, 2016 - December 31, 2016

In 1963, the Directors of the State Agricultural Experiment Stations (SAES) and the United States Department of Agriculture (USDA) established the IR-4 Project (IR-4). The necessity for IR-4 remains; registrants of pesticides focus their product development efforts on large acreage crops (major crops such as corn, soybeans, wheat, etc.) where the potential sales are significant. Fruits, vegetables, nuts, herbs, and other small acreage food crops (collectively called specialty crops) are minor markets and the development of pest management technology for pest control in the production of specialty crops is not usually the objective of the private sector. This often leads to many pest management voids in/on specialty crops, commonly referred as the "Minor Use Problem".

IR-4's role in solving the Minor Use Problem involves developing the data needed by the US Environmental Protection Agency (EPA), the crop protection industry and/or other regulatory authorities to allow registrations on the specialty crops. Data developed through IR-4 research includes magnitude of the residue and/or product performance. IR-4's main objective is to provide specialty crop farmers legal access to essential pest management products that protect their crops from destructive pests while reducing food waste. Without the regulatory approval of safe and effective pest management products specialty crops would suffer significant yield and quality losses. IR-4 provides national coordination, technical guidance and research funding to develop the appropriate data and/or facilitate registrations.

The Minor Use Problem is broad, affecting every state, every US territory and essentially every country. The Minor Use Problem also applies to minor uses on major acreage crops. It extends beyond food crops to non-food ornamental horticulture crops[2]. IR-4 develops solutions with conventional chemical pesticides as well as biopesticides[3]. IR-4 further expanded its efforts in solving the Minor Use Problem when it extended its regulatory support efforts in 2009 by assisting with registration of pesticides that manage arthropod pests that transmit diseases to humans.

IR-4 Project efforts have supported over 48,000 registrations of conventional pesticides and biopesticides on specialty food crops and ornamental horticulture crops in its 53-year history. IR-4 focuses its efforts on technology that is the cornerstone of, or compatible with Integrated Pest Management Systems (IPM). Technology often includes "Reduced-Risk" pesticides and biopesticides.

Many benefit from the efforts of the IR-4 Project. It is safe to assume that all states/territories benefit from the efforts of the IR-4 Project. Farmers/growers benefit in that they have legal access to pest management technology to protect their crops. Food processors benefit in having a consistent and adequate supply of high quality raw materials to keep their operations efficient. The public benefits through having healthy vegetables, fruits, nuts and other foods broadly available at reasonable prices, as well as ornamental horticulture plants that enhance the landscape and environment. IR-4 is a critical component of the U.S. Food Security infrastructure and a resource in the battle to combat invasive species and bioterrorism. IR-4 contributes to the economic well-being; a 2012 Study by the Michigan State University's Center of Economic Analysis documented that IR-4 contributes $7.8 billion dollars annually to the U.S. Gross Domestic Product and supports over 100,000 jobs.

IR-4 has achieved this success and value because it works in close cooperation with many groups and associations to accomplish its mission. Resources are leveraged to their fullest potential. Some of the major partners/cooperators include:

- Specialty crop growers and their commodity organizations
- Land Grant Universities and their State Agricultural Experiment Stations
- Pest Management Industry including large and small companies that register pesticides and biopesticides

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[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] IR-4 expanded its research activities to include registration of pesticides for the protection of nursery/floral crops and Christmas trees in 1977

[3] IR-4's research was further expanded in 1982 to include support for microbial and biochemical pesticide products (biopesticides)

- Multiple government Departments/Services/units[4] including:
  - USDA-Agriculture Research Service (ARS)
  - USDA-Foreign Agriculture Service (FAS)
  - USDA-National Institute of Food and Agriculture (NIFA)
  - USDA-Animal and Plant Health Inspection Service (APHIS)
  - US Environmental Protection Agency (EPA)
  - Department of Defense-Deployed Warfighter Protection Program (DWFP)
  - California's Department of Pesticide Regulation (CA-DPR)
  - Canada's Pest Management Regulatory Agency (PMRA) and the Pest Management Centre in Agriculture and Agri-Food Canada (CN-PMC).

Further details about the IR-4 Project are found on the IR-4 Project's website: http://ir4.rutgers.edu.

Food Program

The IR-4 Project remains committed to its original objective to provide regulatory approval of safe and effective plant protection products to assist in the production of food crops and give specialty crop growers the tools they need to grow a healthy crop and be successful and competitive in local, regional, national and international markets.

Research Activities – Food Residue

Since 1963, IR-4 stakeholders have submitted 12,096 requests for assistance to the IR-4 Food Program. Of these, 418 are currently considered researchable projects that remain as documented needs of specialty crop growers (up from 390 reported last year). The others have been addressed through previous research and regulatory submissions or cannot be registered at this time. In 2016, a total of 182 new project requests were submitted to IR-4 from stakeholders. IR-4 staff added 57 requests to the IR-4 database to track the new crop group updates or other studies needed to address regulatory needs that will be bundled into future submissions to EPA. The total number of new project requests added to the IR-4 tracking system during 2016 was 239.

IR-4's research priorities for 2016 were determined by IR-4 stakeholders during the September 2015 IR-4 Food Use Workshop, in Chicago, IL. Based on the outcome of that workshop and other priority setting mechanisms such as upgrading projects to answer regional needs, IR-4 scheduled 65 new studies in 2016. An additional 11 studies were carried over from the previous year for a total of 76 research projects. The 2016 residue program was most challenging; numerous changes were made after the initial priorities were set. Many factors were responsible for these changes, such as regulatory issues and potential crop liability. In the end, 15 studies had to be exchanged before the final program was in place.

For most residue studies, IR-4 follows the EPA 860 Series test guidelines for pesticides. Routinely, 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 or on the crop is determined. Field and laboratory data from this research are then compiled into a regulatory package and utilized to request a pesticide tolerance, also known as a maximum residue limit (MRL).

In support of the 76 residues studies in the 2016 food residue research program, there were 354 IR-4 State (land grant) field trials, 52 USDA-ARS field trials and 33 field trials provided from CN-PMC partners for a grand total of 439 field trials. This is down from 484 field trials conducted in 2015. Canada served as Sponsor and Study Director for four of these studies and IR-4 for the remaining 72 studies. The specific studies for 2016, including test chemical and crop, are shown in Attachment 2.

The majority of residue samples developed in these studies are analyzed by one of IR-4's five analytical laboratories. When necessary, other cooperating facilities or contractors are utilized to ensure projects are completed in a timely manner. IR-4 makes every effort each year to complete studies to meet the 30-month time line goal for each study. However, weather, proper trial separation requirements and other factors can often preclude IR-4 from meeting this goal.

[4] 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

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

The need for IR-4 to develop product performance data (efficacy and crop safety data) to support labeling of new uses for specialty crop pest management has become an increasingly important priority in the IR-4 Project annual research plan. In many cases the data is required by registrants prior to actively marketing new uses. For 2016, the IR-4 Product Performance team planned trials requiring ~$450,000 in funding to support product performance research in four research areas:

- projects where data are needed to support past residue research, but more performance data are needed before registration
- projects supporting on-going residue research
- projects to address highest priority regional performance needs
- projects to identify possible products to control pests where tools currently are not available (Pest Problem Without Solution, or "PPWS").

The 2016 funding supported research to address needs for 43 projects, including 82 state university trials. In addition, CN-PMC planned to conduct seven performance trials, affecting six joint projects. Data from all these performance trials can be used to support new uses in the US, which will benefit specialty crop stakeholders (see Attachment 3 – "2016 Product Performance Research Program" for full details).

In addition to coordinating the 2016-performance research plan, the Product Performance team also made significant process improvements to better establish, implement and monitor/track this expanding segment of the Food Use Program. The team modified and improved the performance trial protocol format away from the former "GLP-lite" version, with changes in both look and language (i.e., use of different font than residue protocols, simplifying instructions, etc.). The team now works even more closely year-round with registrants and researchers to understand the quantity and scope of data required to satisfy data requirements. They also compile as much detail as possible on each performance protocol prior to the annual National Research Planning meeting (end of October), so that more informed trial, placement and funding decisions can be made for the next year's program. An 'IR-4 Product Performance Team Procedures and Timelines' document was established to provide guidance on many tasks, including, but not limited to:

- preparation for known potential/expected projects
- timelines for developing performance research protocols
- capturing data in performance field trial reports
- preparation of final performance project summaries

Significant progress was made in 2016 by the Product Performance team to more fully establish Food Use Product Performance research as a crucial, and formal, IR-4 program.

Submissions and Successes

Submissions. In 2016, IR-4 submitted data to EPA or to the cooperating registrant for 30 chemicals, addressing 107 specific IR-4 requests (PR#s) for assistance submitted by IR-4 stakeholders. Additionally, IR-4 submitted one petition to EPA that proposed to add new crops to the existing crop group for Animal feed, nongrass, group 18. Included in these pesticide submissions were seven packages that were submitted to cooperating registrants, where they submit IR-4 data with their submissions for new uses, for label amendments, to address conditional registrations (data call-in), or to address registration review (re-registration) requirements to maintain the use of a product. This was another productive year for IR-4 submissions. See Attachment 4 for a comprehensive listing of data submitted in 2016. There are currently another 100 reports signed at IR-4 and ready for submission but are awaiting final documents or the reports are being bundled with other studies before being submitted to EPA.

The IR-4 Food Use Program continuously strives to work smarter and more efficiently to deliver new plant protection products for specialty crop growers. In 2016, IR-4 continued making all submissions electronically through the EPA portal. This change has enabled EPA to process and review IR-4 submissions more efficiently as well as enabling them to work smarter with their review partners, such as the PMRA in Canada. IR-4 also takes advantage of crop groups to work more efficiently. Nearly every submission made by IR-4 includes an update to at least one of the newly updated crop groups, which adds more new uses to product labels and supports new crop markets for growers. For example, the long awaited tropical crop groups were codified in 2016. Shortly after codification, EPA established the IR-4 supported tolerances for flupyradifurone on the Tropical and subtropical, medium to large fruit, smooth, inedible peel, subgroup

24B, which represents 42 crops. In this case, data for avocado and pomegranate supported all of these additional crops being added to the label.

Successes. IR-4 posted 1000 possible new uses for growers from 157 tolerances that EPA established based on IR-4 data. The 1000 deliverables were the third highest number of possible new uses in a single calendar year. This success followed the record high 1175 new uses in 2015. EPA continues to review IR-4 data as it is submitted, and generally within their Pesticide Registration Improvement Act required timelines. The 1000 new uses in 2016 bring the IR-4 53-year total of clearances to 18,362. A complete list of these new uses along with the new crop groups are found in Attachment 5. In total, EPA reviewed 19 chemistries in 20 actions for IR-4 in 2016, which further demonstrates EPA's support for IR-4 and their commitment to address grower needs.

It is important to note that the successes IR-4 achieved in 2015 and 2016 were realized in a climate where EPA has placed crop protection products under increased scrutiny. EPA's increased scrutiny of pesticide hazard/risk has required additional work by IR-4 to provide documentation of 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 that demonstrates the great need of new pest control products. These products provide the much needed pest control and are also critical to IPM programs and resistance management. The great deal of success reflected in the 1,000 new uses further demonstrates that IR-4 continued collaboration and discussion of products with EPA and registrants, before research starts, ensures the best use of resources.

A listing of IR-4 projects in the queue for future submission to EPA that include data from 142 studies that will address over 255 IR-4 project requests, are provided in Attachment 6 or can be viewed 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. EPA generally reviews IR-4 submissions within their Pesticide Registration Improvement Act required timelines. 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 its submissions to be classified as Reduced Risk.

IR-4 continues to evaluate labels to determine if new uses approved by EPA are indeed available to growers through labels registered in each state. IR-4 updates the database accordingly to let stakeholders know when uses have been added to product labels. IR-4 continues to contact each of the registrants on a regular basis to encourage them to continue adding all possible uses to their marketing labels.

Regulatory Compliance

Good Laboratory Practice Standards (GLP's as noted in Chapter 40, *Code of Federal Regulations*, Part 160) compliance is paramount to the success of the IR-4 Project's Food Program. 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 will be accepted by the crop protection industry and EPA.

The Annual QA Planning Meeting was held in on March 29-30, 2016 in Houston, TX. At this meeting, the audit plan for the 2016 field trial season was created. For calendar year 2016, regular inspections included 22 facilities, 148 in-life audits of field trials, 48 in-life audits of residue analytical laboratory activities, 48 analytical summary report/data audits and 430 field data book audits. During the 2016 calendar year, 52 final reports and amended reports were audited.

In 2016, the US EPA notified IR-4 of 11 inspections for GLP compliance and data integrity. A total of 162 EPA GLP facility inspections have occurred at IR-4 related sites since April 27, 1997, with no findings to date. IR-4 facilities continue meeting the high standards demanded under GLP requirements.

IR-4 continues to use the novel eQA reporting system to improve efficiencies and enhance communications. Over 875 inspection and audit reports were processed using the web-based system in 2016. The system was upgraded, adding new features. The electronic document management system (eDOCs) was developed during 2016 and became active in January of 2017. This document management system will be used to post protocols/changes, analytical methods and certificates of analysis for GLP test materials.

Crop Grouping Initiative

IR-4 continues to expand and enhance crop groups and sub-groups. The proposed revised Nongrass Animal Feeds (Forage, Fodder, Straw and Hay) Crop Group 18 was submitted in 2016. The final rule for Leafy Vegetables (except Brassica) and Brassica Vegetables and the new crop groups for Stalk, Stem, and Leaf Petiole; Tropical and Sub-tropical fruit, edible peel and Tropical and Sub-tropical fruit inedible peel was published on May 3, 2016. The effort to update crop groups continues with the Codex Committee of Pesticide Residues as well and the Vegetable types are expected to be completed during the 2017 Codex Committee of Pesticide Residues meeting.

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 MRLs as a technical phytosanitary trade barrier.

In North America, IR-4's cooperation with CN-PMC continues to be fruitful; these partners contributed 33 field trials to our joint program in 2016. Of the 76 studies conducted by IR-4 in 2016, four 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 of working with CN-PMC on residue studies saves IR-4 an estimated $500,000 per 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 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 the same time. This prevents trade irritants before they happen. EPA and PMRA completed joint reviews or workshares on 12 IR-4/CN-PMC submissions in 2016, highlighted in Attachment 5.

There have been a series of teleconferences to share and discuss the priorities resulting from the first Global Minor Use Workshop, in Chicago in 2015. For example, the recent 2016 approval of oxathiapiprolin in the NAFTA countries is one solution for the temperate crops-downy mildew on leafy vegetables priority. Information about this project is being shared with other interested parties such as the EU and Australia so they can consider this as a possible solution for evaluation. The EU started a sulfoxaflor residue study on leaf lettuce in 2016 that addresses the greenhouse/protected crops-aphids on lettuce, which is being considered by NAFTA for research in 2017. Finally, a number of studies are under consideration for fruit fly control in tropical crops, such as spinosad or spinetram. Many of the secondary priorities are also being considered, for example, the pending registration of flonicamid in NAFTA to address aphid control in legume crops. Anthracnose on tropical crops was raised as a priority as well and IR-4 is undertaking a number of residue studies in 2016 and 2017 to address this need. It is expected in the next year that other countries will join in these research efforts to address the needs identified.

The CN-PMC has agreed to co-host the next Global Minor Use Summit (GMUS-3) in Montreal, October 1-4, 2017, with IR-4 and the US Department of Agriculture Foreign Agriculture Services co-sponsoring the event. This is expected to be another international forum to further international exchange of information on current activities that address minor use issues, further identify future opportunities and challenges in technical and cooperative areas, and to promote policy considerations that support minor uses.

Many of the studies under the IR-4's Global Capacity Development, Residue Data Generation Project came to completion in 2016. This project's objective is 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. The projects 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). This same group provides support for IR-4's contributions to the project.

In 2016, projects completed and reports submitted (by the MFG) to JMPR for 2017 review included: azoxystrobin plus difenoconazole on dragon fruit, with samples from Indonesia and Vietnam; spinetoram on lychee and mango, with samples from Thailand; and spinetoram on avocado from Columbia. Other projects completed in 2016, but will be submitted (by the manufacture) to JMPR for 2018 review include: 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. Africa started their residue project with sulfoxafor on mango in 2016 and it is expected to be completed by the end of 2017.

At the request of the US government (EPA, USDA), 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 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 with New Zealand, Brazil, Costa Rica and Colombia. The knowledge and expertise of IR-4 is often sought after and is highly valuable to these countries as their minor use programs evolve.

IR-4 continued to support submissions to the JMPR for 2017 review, where IR-4 supported a number of submissions by registrants (captan (ginseng), clethodim, cyprodinil, difenoconazole, fenpyroximate, potassium phosphite, and spinetoram), and IR-4 submitted data for potassium phosphite (tree nuts), captan on ginseng, and flonicamid on legume vegetables.

Ornamental Horticulture Program

The Ornamental 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 2016, IR-4 conducted 676 ornamental horticulture research trials to support registrations in the greenhouse, nursery, landscape, Christmas tree and forestry industries. Of these 147 were efficacy trials designed to compare different products to manage damaging insects, plant diseases and weeds and to measure the impact of growth regulators; the remaining trials were conducted to determine the level of phytotoxicity to crops with herbicides used to manage common weeds in and around nurseries. Please see Table 1 for a summary of research activities and Attachment 7 for a complete listing of 2016 field cooperators and Attachment 8 for research activities listed by project.

Table 1. Summary of IR-4's 2016 and Revised 2015 Ornamental Horticulture Program Research Activities.

Category	2016			Revised 2015		
	Efficacy	Crop Safety	Total	Efficacy	Crop Safety	Total
Number of Studies (PR Numbers) with Planned Trials	157	328	485	199	369	568
Number of Trials	203	473	676	258	498	756

Submissions and Successes

During 2016, 20 data summaries were compiled based upon research reports submitted by researchers. See Attachment 9 for Abstracts from the individual reports. The summary reports include Azoxystrobin + Difenconazole Crop Safety, Botrytis Efficacy Summary, Cyflumetofen Crop Safety, Dimethenamid-p Crop Safety, Dithiopyr Crop Safety, Downy Mildew Efficacy Summary, Flumioxazin + Pyroxasulfone, Flumioxazin Crop Safety, Fluxapyroxad + Pyraclostrobin Crop Safety, Fusarium Efficacy Summary, Imazamox Crop Safety, Leaf Spot & Anthracnose Efficacy Summary,

Oxyfluorfen + Prodiamine Crop Safety, Pendimethalin Crop Safety, Phytophthora Efficacy, Pyrifluquinazon Crop Safety, Scale and MealyBug Efficacy, Sulfentrazone + Prodiamine Crop Safety, Tolfenpyrad Crop Safety Summary, and Triticonazole Crop Safety. Data from 4,895 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. 2016 Ornamental Horticulture Program Research Summaries.

Region	**Number of Trials**
North Central	620
North East	856
Southern	1,175
Western	1,056
USDA-ARS	1,176
Total	4,895

During 2016, US EPA approved one new label based partially on the efficacy or crop safety data IR-4 generated: Orkestra Intrinsic (fluxapyroxad + pyraclostrobin).

Table 3. Ornamental Horticulture Program Contributions to 2016.

Category	**2016**		
	Efficacy	Crop Safety	Total
New US EPA Product Registrations [5]	1	0 [6]	1
US EPA Label Amendments [7]	0	0	0
State Registrations [8]	0	0	0
International	0	0	0
Not to be Registered	0	0	0
Number of Trials Contributing to Registrations [9]	27	0	27
North Central	2	0	2
North East	7	0	7
Southern	0	0	0
Western	6	0	6
USDA-ARS	12	0	12
Number of Impacted Crops [10]	532	0	532

2015 Workshop

The Ornamental Horticulture Workshop was held outside Chicago in Schaumburg, IL in October 2015 to establish priorities for the 2016 to 2017 biennial research cycle. As in past workshops, during the first morning of the workshop, registrant representatives presented new active ingredients and highlighted opportunities for existing products. Then the results of the Grower & Extension Survey were presented, and we discussed the pros and cons for conducting efficacy or crop safety research on 34 current and potential new projects across entomology, pathology and weed science. To have these discussions flow smoothly, IR-4 staff updated Project Sheets which summarized the need, research and registrations to date, and 15 Product Lists outlining the key features of tools currently available for certain diseases and pests. The 33 project sheets were created to cover recently studied projects and potential new projects based on the annual Grower &

5 New products for the ornamental horticulture industry based on data collected through IR-4 and submitted to manufacturers in previous years.
6 For some registrations, IR-4 contributed both efficacy and crop safety data.
7 Label updates on existing products for the ornamental horticulture industry based on data collected through IR-4 and submitted to manufacturers in previous years.
8 State registrations and special local needs registrations on federally registered products for the ornamental horticulture industry based on data collected through IR-4 and submitted to manufacturers in previous years.
9 The total number of trials where data was utilized for registrations.
10 The number of impacted crops is an estimate of the total plant species grown commercially for ornamental uses impacted by the IR-4 data.

Extension Survey and newly received project requests. Also, new projects for each discipline were raised as potential research avenues during the workshop. After the relative merits of each project were captured on poster-size paper and fastened to the walls, a Sticker Caucus was held so that workshop attendees could vote for the research projects IR-4 should undertake during 2016 – 2017. During the second morning of the workshop, the outcomes for each discipline were projected, and the research priorities were finalized after further conversations.

Priorities from the 2015 Workshop include:

- Entomology Projects: Thrips Efficacy, Foliar Feeding Beetle Efficacy, New Product Crop Safety.
- Pathology Projects: Botrytis Efficacy, Bacterial Disease Efficacy, New Product Crop Safety.
- Weed Science: Pre-Emergent Herbicide Crop Safety will be focused on Tower EC and Dimension 2EW, while the Ornamental Grass Herbicide Crop Safety will screen Dimension 2EW, Gallery, and Pendulum 2G.

Invasive Species Research Activities

During 2016, the IR-4 Ornamental Horticulture Program continued to facilitate research activities for several invasive species impacting the Ornamental Horticulture Industry: Chrysanthemum White Rust Biology and Management, Boxwood Blight Biology and Management, and Impatiens Downy Mildew Biology and Management. Each project was funded under USDA-APHIS Farm Bill Section 10201/10007 and encompassed key objectives to manage exotic invasive species by studying aspects of pathogen or pest biology and management tools (conventional or biopesticide as appropriate to the target organism) on plants to enable growers to better implement mitigation strategies. The Arthropod Management Project finished during 2015, but the team continues to refine the final summary report of research results for posting to the IR-4 website. Key elements of each project are listed in Table 4 below.

Table 4. Invasive Species Projects during 2016

Project Topic	Collaborating Researchers	Research Objectives	Duration
Chrysanthemum White Rust	Doug Luster, USDA-ARS Fort Detrick Mo Bonde, USDA-ARS Fort Detrick Oney Smith, Hood College, Kurt Heungens, ILVO, Belgium Bas Brandwagt, Royal van Zanten, The Netherlands JoAnne Crouch, USDA-ARS, Beltsville	Overwintering of *Puccinia horiana* Fungicide impact on sporulation Fungicide screening on whole plants Development of serological and genetic diagnostic tools Biology and development of *P. horiana* in chrysanthemum including systemic movement	2010 - 2016
Boxwood Blight	Sharon Douglas, Connecticut Agriculture Experiment Station Robert Marra, CAES Jim LaMondia, CAES Margery Daughtrey, Cornell University Nina Shishkoff, USDA-ARS- Fort Detrick JoAnne Crouch, USDA-ARS, Beltsville Mike Benson, NC State University Marc Cubeta, NC State University Kelly Ivors, NC State University Chuan Hong, Virginia Tech Anton Baudoin, Virginia Tech Norm Dart, Virginia Department of Ag. & Consumer Services Len Coop, Oregon State University Anne Gould, Rutgers University Brad Hillman, Rutgers University	Fungicide screening and mitigation strategies Cultural control potentials including use of heat treatments Effect of sanitizers on conidia and mycelia Impact of fungicides on microsclerotium development Screening of potential biopesticides for microslerotium inactivation Development of isothermic LAMP detection assay Boxwood species and cultivar screen for resistance *Calonectria pseudonaviculata* host range (*Pachysandra* and *Sarcoccoca*) Development of infections under field conditions *Calonectria pseudonaviculata* population genetics Development of epidemiology model based on U.S. temperature and moisture conditions	2011 – 2017
Impatiens Downy Mildew	Margery Daughtrey, Cornell University Mary Hasubeck, Michigan State University Aaron Palmateer, University of Florida JoAnne Crouch, USDA-ARS, Beltsville Nina Shishkoff, USDA-ARS, Fort Detrick Lena Quesada, NC State University Ann Gould, Rutgers University	Overwintering of *Plasmopora obducens* oospores Fungicide screening and rotational strategies Sporangia and oospore development and epidemiology *Plasmopora obducens* population genetics Development of genetic tools for downy mildews including Impatiens Downy Mildew, Cucurbit Downy Mildew, Hops Downy Mildew, Basil Downy Mildew	2012 - 2017

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. IR-4 also has a registration assistance program to provide university and USDA researchers as well as small biopesticide companies with regulatory advice and petition preparation assistance.

Research Activities

Since its inception in 1982, the IR-4 biopesticide research program has provided competitive grant funding of projects, amounting to over $8 million in grants to researchers. In 2014, IR-4 decided to transition its biopesticide program from a "Request for Application" program that supports Early, Advanced and Demonstration stage research, to a priority setting workshop with actively engaged stakeholders who choose the most critical needs for biopesticides, and IR-4 responds by directing research to these priorities.

IR-4 held its first Biopesticide Workshop in September 2014 in association with the Food Use Workshop in Atlanta, GA. The priority setting workshop was established to actively engage stakeholders and encourage submission of known pest management voids that can potentially be answered by biopesticide technology. In September of 2015, over 180 participants attended the workshop in Chicago, Illinois. The voting process was refined over the years, leading to additional time for discussion. Continued stakeholder input occurred at the 2016 Biopesticide Workshop on September 21st in Orlando, Florida. Based on the priorities established at the 2015 workshop, IR-4 funded 13 studies with 31 different researchers. These studies were conducted by different universities on fruits, vegetables, honeybees, and ornamentals. Among the high profile invasive pests, the biopesticide program has supported projects involving Spotted Wing Drosophila, American Chestnut Blight, and Fire Blight management in organic pome fruit. See Attachment 10 for the specific research projects and research cooperators.

Due to feedback gathered from the preceding Biopesticide Workshops, the meeting will now be held every other year. This allows researchers more time to compile important information and understand efficacy results. The next workshop will take place in September of 2018.

Submissions and Successes

In 2016, IR-4 submitted an amended registration package for *Aspergillus flavus* AF36, Prevail, for use on commercial almond and fig orchards. This year, EPA granted a time-limited exemption from the tolerance for residues of the pesticide Aspergillus flavus AF36 in or on dried figs. This expires December 31, 2017.

Additionally, an Experimental Use Permit was obtained for the state of Texas using *Aspergillus flavus* TC16F, TC35C, TC38B, TC46G on corn. IR-4 submitted a petition to EPA requesting temporary tolerance exemptions for the product FourSure, which will expire on June 30, 2020.

Researching the displacement of aflatoxin producing fungi by *Aspergillus flavus* has been long supported by the IR-4 Project. Beginning in 1997, a grant funded project was led by Peter Cotty of USDA-ARS. This resulted in registration on cotton in 2004. Themis Michailides and the Arizona Cotton Research & Protection Council contributed to the registration of Aspergillus flavus AF36 on pistachio. An Experimental Use Permit was achieved in 2013 for use on commercial almond orchards and a Section 3 has been submitted.

The US EPA also approved the product LifeGard by Certis USA in 2016. The project focused on the development of a biologic control product based on opesticide, *Bacillus mycoides* isolate J (BmJ), has been the subject of efficacy work by the IR-4 Project for several years. BmJ strain PTA-4838 is currently exempt from the requirement of a tolerance.

Efficacy work with BmJ began in 1997, under the IR-4 grant program. The project focused on the development of a biological control product based on *Bacillus mycoides* for control of Cercospora leaf spot of sugar beets. The positive outcomes led to further testing by Barry Jacobsen of Montana State University in 2003 and 2004.

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

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

Potassium salts of hop beta acids is a new active ingredient for the management of varroa mite in honeybee hives. In 2016, the registration package IR-4 submitted resulted in 3 products registered including the technical grade active ingredient, the manufacturing use product and the end use product which has the trade name HopGuard II. The HopGuard II also represents a change in the manufacturing process compared with HopGuard. A revised label was submitted for HopGuard II in 2016. HopGuard II was effective in managing varroa mites during 2015 and 2016 trials funded by the IR-4 Project.

Also in 2016, a residue study on Anthraquinone in rice occurred thanks to the combined efforts of the Food Use and Biopesticide and Organic Support Programs. Data was submitted to the registrant, and Anthraquinone was registered on rice as a bird repellent. Previous efficacy work has been funded by the Biopesticide and Organic Support Program in 2007 and 2010, in rice and blueberries respectively.

The Public Health Pesticides Program

The IR-4 Public Health Pesticide (PHP) Program focuses on expansion and maintenance of the toolbox of pesticide products that protect the public from vector-borne diseases (e.g. Dengue or Zika virus, Lyme disease, malaria, etc.) and from the nuisance and economic costs caused by mosquitoes, ticks, and other arthropod public health pests. Vector control uses of pesticides are statutorily recognized as “minor uses”, and it is widely recognized that public support for their development and registration is in the public interest. The PHP Program provides regulatory support for new vector control materials, products, and use patterns. In addition, the Program maintains a unique database of existing vector control tools and potential PHP’s; collaborates with industry, the user community, and regulators on developing strategies to retain products in the vector control toolbox in the face of new regulatory requirements; and participates in efforts to encourage innovation and streamline the path to registration and market.

Primary funding for the IR-4 PHP Program is provided by the Deployed Warfighter Protection Program (DWFP) of the U.S. Department of Defense (DoD), and by USDA-ARS. IR-4 serves as a regulatory consultant and representative for many of the new materials and methods developed by DWFP-funded researchers, as well as other military and USDA medical and veterinary entomology programs. In addition, the DoD and ARS have engaged IR-4 to help maintain and expand the vector control toolbox by identifying new or underutilized vector control tools, supporting the continued registration of existing useful vector control products, and providing regulatory support generally for military pest management.

Since its start in 2008, IR-4 PHP has linked researchers, the vector control user community, commercial partners, and regulators in the development of a wide range of new chemical tools for vector control, including toxicants, repellents, attract-and-kill products, pesticide-treated fabrics, and novel biocontrol agents regulated as pesticides. This collaborative approach has also been fruitful in the search for underutilized chemicals from other realms which might be repurposed for vector control or introduced into the U.S. market from abroad. It has been applied, but with less clear success, in efforts to retain existing tools facing new data requirements.

Wide publicity in 2016 regarding the Zika virus led to a substantial interest in developing, registering, and evaluating new tools to control the Aedes mosquitoes that transmit the virus, and IR-4 was an active participant in efforts to expand the toolbox. IR-4 continues to serve as regulatory consultant for the primary producers of lethal ovitrap (LOT) and attractive toxic sugar bait (ATSB) products, which have both moved from the lab into the market in recent years; and for developers of IGR autodissemination devices and Wolbachia-based sterile insect techniques (SIT), both of which are nearing market. In particular, EPA granted in 2016 an extension and expansion of Experimental Use Permits for Wolbachia SIT trials, and IR-4 had provided both regulatory support and efficacy trial funding in conjunction with our Biopesticides Program. We helped develop data on all these interventions for a WHO efficacy review that concluded with a recommendation for additional trials on LOT, ATSB, and SIT; we followed up that recommendation by developing a research team, identifying a test site in Florida, drafting protocols, and applying for funding for extensive comparative efficacy testing for

these and other potentially useful interventions. We also continue to work with these developers in expanding their product lines and preparing for regulatory submittals on end-use products.

IR-4 has long applied our traditional strength in pesticide deposition research in the vector control realm, and in 2016 we submitted final reports for a multi-year study program on incidental deposition of the mosquito adulticide etofenprox on multiple crops following aerial and ground-based spraying. In addition, there was substantial public and regulatory interest about mosquito adulticides generally in light of expanded spray programs to combat Zika virus, and IR-4 devoted significant effort this year to analyzing mosquitocide droplets, drift, and deposition. We initiated a research program in collaboration with ARS to improve characterization of ultra-low volume (ULV) air spray droplet sizes, using a laser diffraction instrument installed in a high-speed wind tunnel. This test platform had not previously been applied to mosquitocides, and preliminary results have been provided to EPA to help refine risk assessments for these products. In addition, IR-4 work identified a number of significant limitations of standard computational models for drift and deposition when applied to mosquito control applications, and IR-4 staff collaborated with USFS to develop and test an improved version of AgDISP, which is now in final evaluation. Using the new data and modeling capabilities, as well as user group and registrant surveys, IR-4 worked with EPA and other regulators in 2016 to help refine risk assessments for human health and for endangered species and other sensitive environmental concerns. This is increasingly critical given expanding resistance to many AI classes.

Given the great diversity of actual and potential vector control tools, a major focus of the IR-4 PHP program has been the maintenance and expansion of the IR-4 PHP Database, and we particularly emphasized in 2016 the identification of underutilized materials with significant potential benefits and the development of decision support tools. During 2016, the IR-4 PHP database (http://ir4.rutgers.edu/PublicHealth/publichealthDB.cfm) was revised and expanded, with the addition of over 10,000 data records, mostly on end-use products and on the biological activity of AI's. Specific targeted queries this year included larvicides suitable for use in drinking water, indoor sprays registered for uses which might target *Aedes aegypti*, products that can control insect pests in aircraft, and area-wide mosquito control products suitable upwind from organic agriculture.

Impact

The Program reports, above, include the successes, accomplishments and deliverables of the IR-4 Project. IR-4 assists in the registration of the latest generation of chemical and biopesticide pest management products. These products are compatible with Integrated Pest Management systems, and have little hazard or degrade rapidly after use. They allow farmers to maximize yields of quality fruits, vegetables and nuts, making products available to the public at an affordable price. With IR-4's assistance, specialty crop growers provide the public a consistent supply of nutritious foods, essential to good health, as well as aid in the production of ornamentals that enhance the environment. Additionally, IR-4 helps provide tools to manage pests like mosquitoes, ticks and fleas that transmit diseases to humans. What IR-4 delivers to society is extremely important and necessary. Equally important, IR-4 remains a highly accountable and responsive organization that services the needs of its stakeholders.

As noted previously, Michigan State University's Center of Economic Analysis conducted a study in 2012 on the economic impact of IR-4 Project's activities in the Food, Ornamental Horticulture and Biopesticide and Organic Support programs. According to the report, "***When well-established methods of measuring direct and secondary economic impacts are used to gauge the contributions of the IR-4 Project and its three primary programs, including the Food Crops, Ornamental Horticulture, and Biological and Organic Support programs in terms of sales, employment and gross domestic product is significant. Each program posits real economic benefits to growers and the economy as a whole. Specifically, growers benefit in higher yields with higher quality output, consumers benefit by more varieties and lower costs of food and ornamental crops, and the industry benefits through better global competitiveness of US output. Including all secondary impacts, the IR-4 Project is anticipated to support research and industry sales sufficient to support 104,650 U.S. jobs and bumps annual gross domestic product by as much as $7.2 billion."*** Though the data is over four years old, it is highly likely that the economic impact of IR-4's activity in 2016 is equal to or higher than the values reported in 2012.

Specialty crop producers have provided antidotal evidence of Impact of IR-4 Project:

"Everyone who eats has an interest in the IR-4 Project whether they know it or not. The IR-4 Project is a vital part of the country's food safety security system and should be considered a national strategic imperative" Bob Simerly, McCain Food USA, Inc. and representing the National Onion Association.

"The US greenhouse hydroponic vegetable industry has developed in the last 25 years. The IR-4 Project is a shining example of an agency helping growers to meet the ever-changing pest challenges in agriculture. Our industry is getting the tools it needs to meet these challenges, thanks to the IR-4 Project" Mike Bledsoe Ph. D, Senior Vice President Food Safety and Regulatory Affairs, Village Farms.

"*I do not know how we would survive raising vegetables without IR-4. IR-4 has been able to get us new chemicals labeled, along with better use rates and lower PHIs that we need to keep our vegetables weed free, insect free while keeping our bees safe and our diseases under control."* Bruce Buurma, Buurma Farms, Willard Ohio.

"IR-4 has been and continues to be integral in helping to provide guidance in pest management options to the greenhouse, nursery and landscape industries. Through IR-4's focus on product registrations, our industry has greater options for pest management tools that are safe for plants and pesticide resistance management." Jill Calabro, PhD. Science & Research Program Director, American Hort/Horticulture Research Institute.

"The dedicated individuals representing the IR-4 Project have delivered many tools that our industry needs in order to provide consumers safe, healthy and nutritious products, at an affordable price. A new administration will bring with it challenges, but also opportunities as we see new leaders at the top of the EPA and USDA. Now more than ever, our stakeholders need the good work that the IR-4 Project does to continue to be the voice on behalf of all the specialty crop producers that feed the country and, in many cases the world." Mark Arney, CEO, National Watermelon Promotion Board.

"***The IR-4 staff has done a great job preparing research summaries for the coordinated ornamental trials. I use those summaries in my extension program as they are a great source of information on nursery crop tolerance to herbicides."*** Jeffery Derr, Professor of Weed Science, Virginia Tech.

"Through their singular efforts, IR-4 continues to ensure that public health professionals will have the tools that they need to enhance the quality of life and protect the health of citizens." Stanton E. Cope, Ph.D. Captain (Retired), United States Navy and President, American Mosquito Control Association.

2016 Appropriations and other funding

The IR-4 Project receives funds by various Services/units within USDA in partnership with the SAES as well as others. Funding is broken down into two buckets, "Core Programs" and "Enhanced Mission". Total funding received in calendar year 2016 in these two areas was approximately $17,914,182. Below are some details:

Core Programs

Amount	Source	Comment
$11.913,000	Congressional Appropriation via Special Research Grant administrated by USDA-NIFA	Support operations within the Food, Ornamental Horticulture and Biopesticide and Organic Support programs. In 2016, approximately $7.541 million was distributed to the four IR-4 Regional offices and Headquarters for personnel, supplies, equipment, laboratory analysis and other core expenses. Nearly $2.4 million was allocated for field trials that produce the necessary residue samples and product performance data; $518,000 for ornamental trials; $400,000 for biopesticide/organic support grants, $250,000 for new analytical instruments and the remaining $820,000 was mandatory NIFA holdback
$481,182	State Agriculture Experimental Station Directors (NRSP-4)	Multi-State Research Funds/NRSP-4 grant. NRSP-4 funds directly pay salaries for IR-4 HQ management who provide overall leadership and coordination of the IR-4 Project's on-going research efforts.
$3,170,000	Congressional Appropriation via USDA-Agriculture Research Service	Funds support salary and other expenses for USDA-ARS personnel involved with high priority research within IR-4's Food and Ornamental Horticulture programs. Participating ARS scientists are given specific research assignments that fully complement and do not duplicate the on-going research at the SAES
$15,564,182	**TOTAL FUNDING**	CORE PROGRAMS

Enhanced Missions

Amount	Source	Comment
$225,000	**Department of Defense/USDA-Agricultural Research Service**	Cooperative agreement between IR-4 and USDA-ARS based on allocation through Deployed Warfighter Protection Program. Funding is provided exclusively for the Public Health Pesticide Registration Support Program and pays for personnel costs, travel and subcontracts to research groups who conduct priority research projects.
$650,000	**USDA-Foreign Agriculture Service and other global partners**	Resources to support activities that promote global pesticide regulatory harmonization and remove barriers to US specialty crop exports. This includes funds for capacity building training programs in Africa and Latin America and Technical Assistance for Specialty Crops grant to develop additional data in the US that is required by trading partners to allow domestic exports.
$225,000	**USDA-Animal and Plant Health Inspection Service**	Resources to perform research on invasive pests that attack ornamental horticulture crops.
$1,250,000	**Industry support**	Unrestricted funds-the crop protection industry and some grower groups/commodity associations also contribute direct financial resources as well as significant in-kind resources. IR-4 used these resources to supplement USDA funds, specifically additional research activities, additional IR-4 HQ operations, priority setting/research planning workshops, EPA training tour, and related meetings.
$2,350,000	**TOTAL FUNDING**	ENHANCED MISSIONS

IR-4 also receives 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 million annually)
- EPA Pesticide Registration Improvement Act fee waivers ($5,398,561in Federal Fiscal Year 2016)
- Crop protection industry (their in-kind contributions are estimated to be a 1:1 match).
- The government of Canada also makes significant in-kind contributions (>$750,000).

The IR-4 Project remains prudent with the use of resources while it continues to search for opportunities to gain efficiencies in all aspects of its research and regulatory affairs. Over the last several years, there have been substantial process improvements that allow IR-4 to get the most out of the funding.

Additionally, in May 2016, IR-4, following up on a recommendation of its current strategic plan, ***IR-4 Project-Vision 2020*** established an independent organizational assessment (OA). The charge to the OA panel was to:

- Evaluate the organization structure of the regional centers, their field research centers/cooperators and the dedicated IR-4 analytical laboratories, and the coordinating operations of the IR-4 Project Headquarters.
- Determine based on the various impacts on the IR-4 Project, if the present organizational structure is appropriate to meet the current and future needs of the specialty crop producers, processors and consumers.
- Examine how USDA-ARS operates within the IR-4 Process and what role it has in the future reorganizational models.
- Collect information and appraise if operational efficiencies and/or savings can be achieved through reorganization of IR-4's units while maintaining IR-4's ability to meet its mission.
- Propose to the IR-4 Project Management Committee any changes to the current organizational structure as well as operational efficiencies/savings that can be achieved through reorganization by recommending models, along with positive/negative impacts of such changes.

The Organizational Assessment Panel recommended that the IR-4 Project maintain its basic structure at this time and engage in thorough review of many of its processes to determine if any modification could lead to operational efficiencies and financial savings. They found that the major limiting factor in serving the future need of IR-4 constituents is not the structure of the organization but the projected shortfall in financial resources.

In response to the recommendations, IR-4 has established two ad-hoc working groups to start the examination of processes. The first group is exploring the opportunities for efficiencies within the collection and reporting data from the field research sites, and the second group is looking at efficiencies in the analytical laboratories. These groups are expected to report on their findings in mid-2017. New working groups will be established to examine additional processes.

Future Directions

IR-4 facilitates a research prioritization process to gain direction on what are the most important pest management voids in specialty crop agriculture and what crop protection product is best suited to manage/control that pest. This is necessary because IR-4 does not have adequate resources to answer all documented pest management needs in specialty crops. This project prioritization provides IR-4 clear guidance on resource allocation. The process in the Food, Ornamental Horticulture and Biopesticide and Organic Support Programs are somewhat different.

Food Program

The majority of priorities for 2017 research in the Food Program were determined at the September 22-23, 2016 Food Use Workshop held in Orlando, Florida. Because of the large number of "needs" and the limited resources to answer these needs, IR-4 facilitates an internet-based process prior to the workshop where stakeholders identify and nominate projects for consideration at the workshop. Only projects identified by at least one stakeholder during the on-line process as "A Priority" are discussed at the workshop.

Approximately 165 participants (growers, commodity organizations, university research and extension specialists, and representatives from EPA and crop protection industry) attend the workshop where they deliberate and develop consensus on the most important chemical/crop research projects. Assessment is based on:

1. Availability and efficacy of alternative pest management tools (including ongoing projects for the same need);
2. Pest damage potential of target pest(s);
3. Performance and crop safety of the chemical tool in managing the target pest(s);
4. Compatibility of the proposed chemical candidate with Integrated Pest Management and safety to pollinators;
5. Uses currently covered by Section 18 emergency exemptions and;
6. Harmonization implications due to lack of international MRLs.

Recognizing certain high priority needs that are regionally based or certain high priority needs that might be missed at the workshop, IR-4 has a secondary process where stakeholders can write a comprehensive justification document to upgrade a particular project. This upgrade process serves as a safety net to ensure that IR-4 remains responsive to the specialty crop growers and their pest management needs.

Based on priorities established at the IR-4 Food Use Workshop and the upgrade process, the 2017 food program consists of 453 field trials involved in residue studies. This trial plan includes 350 trials to be conducted at IR-4 Field Research Centers/other University sites, 70 field trials at ARS sites and 30 trials conducted by Canadian partners (CN-PMC). Additionally, IR-4 is conducting 108 field trials to develop product performance data. The majority (105) of these trials are at University sites.

The 2017 Food Use Workshop to identify 2018 research priorities is scheduled for September 20-21, 2017 in Denver, Colorado.

Ornamental Horticulture Program

The Ornamental Horticulture Program also utilizes a priority-setting workshop to establish priorities. Workshops are scheduled every two years to support multi-year research plans. Research priorities balance crop safety and efficacy testing for new active ingredients and expanded current registrations for new and important pest species.

Priorities established at the October 2015 Ornamental Horticulture Workshop drive the Ornamental Horticulture research in 2017. Planned work in 2017 includes efficacy testing work for thrips efficacy, foliar feeding beetle efficacy, botrytis efficacy, and bacterial disease efficacy. In addition, IR-4 will conduct plant safety or phytotoxicity screening on a wide variety of ornamental crops with specific fungicides, insecticides and herbicides.

IR-4 has scheduled the next Ornamental Horticulture Priority Setting Workshop on October 17-19, 2017 in San Diego, CA. This workshop will provide priorities for IR-4's 2018 and 2019 Ornamental Horticulture research.

Biopesticide and Organic Support Program

The priority setting for the Biopesticide and Organic Support Program was held in combination with the IR-4 Food Use Workshop on September 21, 2016 in Orlando, FL. During the workshop, there were discussions concerning the outcome

of the 2015/2016 projects including if any of the results looked promising enough to fund for a 2nd/3rd year. Projects for 2017 include:

- Black rot (*Xanthamonas*) on Organic Brassica,
- Spotted Wing Drosophila on all crops (conventional and organic production)
- Fireblight on apple, pear and other pome fruit
- Chestnut blight,
- Downy mildew on organic spinach,
- *Agrobacterium tumefaciens* on greenhouse vegetables,
- *Pythium* and *Cylindrocarpon* management on conifer seedlings,
- Phorid fly management/ mushroom growing room and exterior,
- Varroa mite on honeybee,
- Stem gall wasp / Blueberry,
- Weeds
- Residue mitigation of malathion with biopesticides

The priorities established at the 2016 Biopesticide and Organic Support Workshop will cover IR-4's 2017 2018 field research.

IR-4 continues to focus its efforts in concert with strategic plan, ***IR-4 Project - VISION 2020.*** This plan details the IR-4 Project background, vision, mission, values, culture, objectives and funding needs and identifies strategic benchmarks and the goals in each program area. See the IR-4 website for details.

IR-4 remains relevant and needed. Specialty crop growers/minor use stakeholders still face challenges in managing critical pests that consume their crops and profits. At the same time, adequate funding remains the most critical current and future challenge for IR-4. IR-4 funding in 2016 was lower than in 2009. The impact of multiple years of flat funding and escalating costs is affecting IR-4's ability to maintain research levels needed to address grower demands. It is further noted that:

- There is a drastic need for new pest management tools to fight the every-increasing number of invasive pests (e.g. Brown Marmorated Stink Bug, Spotted Winged Drosophila, Boxwood Blight,) that attack specialty crops as well as an urgent need to provide alternatives to manage the increased problem of weed, insect and plant disease resistance to pesticides.
- Opportunities for exports of U.S. produced specialty crops are expected to double by 2025. It is often difficult to export certain specialty crops because standards of allowable pesticide residues (MRLs) vary across nations. IR-4's international involvement plays a major role in harmonizing MRLs for allowable pesticide residues in specialty crops. Enhanced activities by IR-4 are needed to remove pesticide residues as trade barriers.
- Research studies supporting registrations have become more complex and costly. The average cost of each IR-4 study has increased by over 30% in the past five-years.
- Industry and some states (e.g. California) are requiring extensive product performance data for registrations. IR-4 has to cover this new cost by having to prove the efficacy and safety of some products before registrations are approved.
- Consolidation within the crop protection sector (e.g. DuPont/Dow, Bayer/Monsanto, Syngenta/ChemChina, etc.) will reduce company investments in specialty crops. Mega-companies will focus on major crops resulting in less interest in specialty crops/minor uses.
- Public institutions and small business often depend on IR-4 for regulatory support through the EPA approval process. There has been a doubling of demand for IR-4 regulatory support services.

IR-4 faces additional challenges; many of the land-grant universities that host IR-4 research units are struggling with paying the mandatory cost of co-funding IR-4. Because of this issue, Cornell University terminated their IR-4 activities in 2015. There is real fear other institutions will be forced to follow the same path as Cornell.

IR-4 is addressing this devastating impact of the loss of cooperating research institutions as well as other relevant challenges through a "Path Forward" study. The focus of the study is to evaluate the impacts and opportunities for transitioning from the current funding authorization to a new approach that will lessen the financial burden on the host institutions.

IR-4 takes pride in these accomplishments: providing over 48,000 registrations for food and non-food crops over the 53-year history of the Project. Our nation's leadership must recognize that the IR-4 Project is a critical component of our nation's food security research infrastructure. An investment in IR-4 will help the agriculture sector meet the demands for high-quality food now and into the future.

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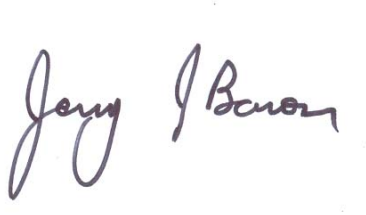
Approved by:



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ATTACHMENT 1

Participants in the Process

Stakeholder Representatives

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
Mr. Kirk Baumann, Ginseng Board of Wisconsin
Dr. Lori Berger, Ag Business Resources
Dr. Michael Bledsoe, Village Farms, L.P. and CLC Chair
Mr. Bruce Buurma, Buurma Farms Inc.
Dr. Jill Calabro, AmericanHort
Mr. James R. Cranney, California Citrus Quality Council
Mr. Alan DeYoung, Van Drunen Farms
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. John Keeling, National Potato Council
Mr. Phil Korson, Cherry Marketing Institute
Mr. Eric Maurer, Engage Agro
Mr. Allen Mize, Del Monte, USA
Mr. Armando Monterraso, Brooks Tropicals
Mr. Dennis Nuxoll, Western Growers Association (alternative)
Ms. Laura Phelps, American Mushroom Institute
Mr. Keith Pitts, Marrone Bio Innovations
Mr. Ray Ratto, Ratto Brothers
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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. Department of Defense, Deployed Warfighter Protection Program (DWFP)
U.S. Environmental Protection Agency (EPA)

ATTACHMENT 1 Continued

Crop Protection Industry

ADAMA
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
BetaTec
BioBest
Bio HumaNetics
BioProdex
BioSafe Systems
Bioworks
CAI Limited
Certis USA
Dow AgroSciences
DuPont Agricultural Products
Engage Agro
FMC Corporation
Gowan Company
Hacco, Inc.
Isagro, USA
ISK Biosciences
Janssen Pharmaceutica
K-I Chemical USA Inc.
MGK
Landis International
Lonza Inc.
Luxembourg-Pamol, Inc.
MacDermid Agricultural Solutions, Inc.
Marrone BioInnovations, Inc.
Monsanto Company
Natural Industries
Neudorff
Nichino America, Inc.
Nisso America, Inc.
Novozymes, Inc.
Nufarm Americas, Inc.
OHP
Pace 49, Inc.
SePro Corporation
Sipcam Advan
Summerdale, Inc.
Syngenta Crop Protection Inc.
Syngenta Flowers
TKI Novasource
UPI
Valent Biosciences
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ATTACHMENT 1 Continued

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ATTACHMENT 1 Continued

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ATTACHMENT 1 Continued

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S. Miller	OH
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Northeastern Region

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T. Freiberger	NJ
C. Hoepting	NY
Z. Jacimovski	NY
M. McGrath	NY

ATTACHMENT 1 Continued

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M. VanGessel	DE
J. Wilson	MA
C. Wyenandt	NJ

Southern Region

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N. Boyd	FL
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C. Cahoon	VA
P. Dittmar	FL
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R. Feliciano	PR
F. Gallardo	PR
C. Marconi	TX
S. Meyers	MS
W. Mitchem	NC
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A. Orgeron	LA
A. Palmateer	FL
N. Peres	FL
L. Quesada	NC
J. Renkema	FL
D. Riley	GA
W. Robles Vazquez	PR
A. Rodriguez	TX
D. Sekula-Ortiz	TX
H. Smith	FL
S. Sparks	GA
R. Tannenbaum	FL
G. Vallad	FL
S. Yates	FL
S. Zhang	FL

Western Region

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M. Bolda	CA
J. Coughlin	HI
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D. Ennes	CA
J. Felix	OR
R. Firoved	CA
D. Gent	OR
D. Groenendale	WA
C. Hamilton	NM
B. Hanson	CA
S. Joseph	CA
J. Kam	HI
M. Kawate	HI
G. Koskela	OR
M. Krugner	CA
G. Kyser	CA

ATTACHMENT 1 Continued

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N. Leach	CA
R. Long	CA
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M. Matheron	AZ
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T. Michilaides	CA
T. Miller	WA
M. Mitchell	CA
C. Oman	CO
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S. Salisbury	OR
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P. Lemoyne	QC
D. Nield	BC
H. Peill	NS
G. Riddle	ON
R. Riddle	ON
C. Szentimrey	ON
M. Weber-Henricks	ON
R. Wismer	ON

ATTACHMENT 2
2016 Food Use Research Projects - Residue Trials*

Chemical	Crop	PR #
2,4-DB	Clover (Seed Crop)	11842
Acequinocyl	Banana	10001
Acequinocyl	Blueberry	11867
Acetamiprid	Pomegranate	11724
Afidopyropen	Cucumber (GH)	11675**
Afidopyropen	Pepper (GH)	11676**
Afidopyropen	Strawberry (GH)	11680**
Afidopyropen	Tomato (GH)	11677**
Benzovindiflupyr + Difenoconazole	Ginseng	11760
Bicyclopyrone	Onion (Dry Bulb)	11619**
Bicyclopyrone	Onion (Green)	11829**
Bifenthrin	Grapefruit	11165
Bifenthrin	Orange	11166
Chlorothalonil	Beet (Garden)	391
Chlorothalonil	Cranberry	11846
Clethodim	Chia	11672
Clofentezine	Hops	11735
Cyflumetofen	Cherry	11747**
Cyflumetofen	Peach	11761**
Cyflumetofen	Plum	11762**
Cyprodinil + Fludioxonil	Sugar Apple	7119
Cyromazine	Pea (Edible Podded & Succulent Shelled	11503
Difenoconazole + Azoxystrobin	Bean & Pea (Edible Podded)	11604
Difenoconazole + Azoxystrobin	Dragon Fruit (Pitaya)	11271
Difenoconazole + Azoxystrobin	Passion Fruit	11573
Ethaboxam	Broccoli	10680
Ethaboxam	Pea (Dry)	11715**
Fenpyroximate	Peanut	11748
Fluazifop-P-Butyl	Broccoli	11861**
Fluazifop-P-Butyl	Cabbage	11862**
Fluazinam	Papaya	8274
Flumioxazin	Fig	11545
Flumioxazin	Guava	10254
Fluopyram + Tebuconazole	Ginseng	11756
Fluopyram + Tebuconazole	Pomegranate	11020
Flupyradifurone	Asparagus	11318**
Flupyradifurone	Coffee	11712
Flupyradifurone	Date	11831
Flupyradifurone	Grasses (Seed Crop)	11755
Flupyradifurone	Pineapple	11711
Flupyradifurone	Sesame	11725
Flupyradifurone	Sorghum (Sweet)	11709
Flupyradifurone	Sunflower	11674
Fluxapyroxad + Pyraclostrobin	Pomegranate	11754

Chemical	Crop	PR #
Fomesafen	Onion	11620
Indoxacarb	Coffee	11467
Indoxacarb	Sunflower	11707
Isoxaben	Hops	11743
Linuron	Mint	11773
Linuron + Diuron	Sesame	11858
Nitrapyrin	Grapefruit	11316
Nitrapyrin	Orange	11315
Novaluron	Pea (Dry)	9777
Oxathiapiprolin	Avocado	11795
Oxathiapiprolin	Hops	11759**
Oxathiapiprolin	Strawberry	11719**
Oxytetracycline	Olive	11737
Potassium Phosphite	Blueberry (High Bush)	11886
Potassium Phosphite	Caneberry	11885
Propamocarb-HCl	Broccoli	11717
Propamocarb-HCl	Cabbage	11847
Prothioconazole	Grasses (Seed Crop)	11718
Pydiflumetofen (FTH 545)	Blueberry	11763
Pydiflumetofen (FTH 545)	Cherry	11812**
Quizalofop	Pear	10032
Saflufenacil	Fig	11841
Spinetoram	Dragon Fruit (Pitaya)	11514
Spinetoram	Grape	11413
Tebuconazole	Avocado	11160
Thiabendazole	Sweet Potato (Post Harvest)	11859
Tolfenpyrad	Artichoke (Globe)	11698
Trifloxystrobin	Bean (Snap)	9916
*Four flubendimide studies were immediately terminated and are not reported in this table		
* *indicates joint studies with Canada PMC.		

ATTACHMENT 3
2016 Product Performance Research Program

Research in 2016 to complete performance needs for pre-2016 residue studies:

Chemical	Crop	PR#	Comments	State university trials
quizalofop	grape	10031	2nd year trial NY	NY
fluazifop	chives	02087	2014 residue study; 2nd year trial MI	MI
saflufenacil	caneberry	11079	2014 residue study; 2nd year trials NC/OR/WA	NC, OR, WA
clopyralid	dry bulb onion	11600	2015 residue study	FL, MI, NY, OH
pyroxasulfone	celery	11324	2015 residue study	CA, FL
acifluorfen	oea	06301	2015 residue study	AR, NC
cyflumetofen	GH tomato	11450	2015 residue study	FL
cyflumetofen	GH pepper	11451	2015 residue study	FL
pyriofenone	GH cucumber	11446	2015 residue study	FL, OH
kasugamycin	almond	11461	2015 residue study	CA
indazaflam	asparagus	11429	2015 residue study	CA
saflufenacil	fig	11557	2015 residue study	CA, CA
rimsulfuron	pomegranate	10606	2015 residue study	CA
			Total	22

Research in 2016 for continuing PPWS (Pest Problem Without Solution) studies:

Chemical	Crop	PR#	Comments	State university trials
Fungicides	fruiting vegetables	10713	bacterial disease control	FL, FL, MI, NY, OH
Fungicides	sweet potato	11848	*Rhizopus* root rot control	NC
Insecticides	bean	10644	Cowpea curculio control	GA, GA
			Total	8

Research in 2016 to complet high-priority pre-2016 Regional performance needs:

Chemical	Crop	PR#	Comments	State university trials
pendimethalin	fava bean	09959	need CS data to add fava bean to label	CA
valifenalate	basil	10296	need new tools for resistance management	NJ, NY
			Total	3

Research in 2016 for performance needs for new 2016 residue studies:

Chemical	Crop	PR#	Comments	State university trials
benzovindiflupyr + difenoconazole	ginseng	11760	2016 residue study	MI
fluridone	sweet potato	11775	2016 residue study	CA, DE
fomesafen	dry bulb onion	11620	2016 residue study	AR, OR, WA
fomesafen	green onion	11857	in 2016 residue study 11620	AR, FL, OR
afidopyropen	GH tomato	11677	2016 residue study	CA
afidopyropen	GH pepper	11676	2016 residue study	CA
afidopyropen	GH cucumber	11675	2016 residue study	CA, FL

cyflumetofen	cherry	11747	2016 residue study	CA, MI
cyflumetofen	peach	11761	2016 residue study	CA, NJ
cyflumetofen	plum	11762	2016 residue study	CA, OR
afidopyropen	GH strawberry	11680	2016 residue study	CA, FL
linuron	mint	11773	2016 residue study	OR, WA
flupyradifurone	sesame	11725	2016 residue study	CA, TX
flupyradifurone	banana	11710	2016 residue study	FL, PR
flupyradifurone	coffee	11712	2016 residue study	PR
flumioxazin	fig	11545	2016 residue study	CA, CA
flumioxazin	lychee	11290	2016 residue study	PR
oxytetracycline	olive	11737	2016 residue study	CA, CA
famoxadone + cymoxanil	papaya	09315	2016 residue study	FL, PR
flupyradifurone	pineapple	11711	2016 residue study	PR
flupyradifurone	grasses (seed)	11755	2016 residue study	OR, WA
fluxapyroxad + pyraclostrobin	pomegranate	11754	2016 residue study	CA, CA, FL
			Total	41

Research in 2016 for new high-priority Regional performance needs:

Chemical	Crop	PR#	Comments	State university trials
bicyclopyrone	carrot	11621	need performace data before approvl for residue	FL,MI,OR,WA
indoxacarb	strawberry	09055	need performace data before approvl for residue	CA,CA
bifenthrin	coffee	11527	need performace data before approvl for residue	HI, PR
			Total	8

ATTACHMENT 4
2016 Submissions to EPA, Registrants, Codex, and State Departments of Agriculture

Pest Control Agent	Type*	Date	Commodity or Crop Group	PR#
Etofenprox	I	1/20/2016	Fungi, edible, group 21	10577
			All food commodities (including feed commodities) not otherwise listed (inadvertent residues resulting from mosquito control applications)	11254
Kasugamycin	F	2/3/2016	Cherry subgroup 12-12A	10230
			Walnut	09772
Indaziflam	H	2/18/2016	Coffee	10654
			Caneberry subgroup 13-07A	10909
			Bushberry subgroup 13-07B	10882
			Hops	11071
			Fruit, stone, group 12-12	11654
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	11655
			Nut, tree, group 14-12	11656
			Commodities within proposed Fruit, tropical and subtropical, small, edible peel, subgroup 23A	11868
Pyroxasulfone	H	2/25/2016	Sunflower subgroup 20B	10932
Pyrethrins + PBO	I	3/1/2016	Stone fruit (registration review)	10852**
Fluopicolide	F	3/31/2016	Basil	10121
				11658
			Bean, succulent	10323
			Hops	10916
			Fruit, citrus	11021
				11022
				11110
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	11190
			Vegetable, fruiting, group 8-10	11191
Spirotetramat	I	4/11/2016	Carrot	10788
			Fruit, stone, group 12-12	11455
			Nut, tree, group 14-12	11456
Ethofumesate	H	4/28/2016	Sugar beet	11126
Fluensulfone	N	5/3/2016	Potato, processed, storage stability	A10904
Chlorantraniliprole	I	5/13/2016	Teff	11854
			Quinoa	11914
Piperonyl butoxide	I	5/24/2016	Fungi, edible, group 21	05954
				10577
Bifenthrin	I	6/1/2016		11016
			Fruit, pome, group 11-10, except mayhaw	
			Peach	11017
			Avocado	10578
			Brassica, leafy greens, subgroup 4-16B	08490

Pest Control Agent	Type*	Date	Commodity or Crop Group	PR#
			Pomegranate	11249
			Tomato subgroup 8-10A	11835
			Pepper/Eggplant subgroup 8-10B	11860
			Fruit, citrus, group 10-10	11836
			Caneberry subgroup 13-07A	11837
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	11887
			Berry, low growing, subgroup 13-07G	11000
				11888
			Nut, tree, group 14-12	11838
Benzovindiflupyr	F	6/3/2016	Onion, bulb, subgroup 3-07A	11130
			Onion, green, subgroup 3-07B	
Difenoconazole	F	6/6/2016	Guava	10172
			Papaya	10802
			Cranberry	10828
			Vegetable, brassica, head and stem, group 5-16	11863
			Brassica, leafy greens, subgroup 4-16B,	11864
			except Chinese Broccoli	11703
			Broccoli, Chinese	11923
			Kohlrabi	11922
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	11866
Quinclorac	H	6/17/2016	Bushberry subgroup 13-07B	10435
			Caneberry subgroup 13-07A	10436
			Asparagus	08295
Hexazinone	H	7/1/2016	Blueberry (shorter PHI)	08325**
Prometryn	H	7/7/2016	Sesame	11178
			Cottonseed subgroup 20C	11991
			Leaf petiole vegetable subgroup 22B	11987
			Florence fennel	11988
			Celtuce	11989
			Swiss chard	11990
Potassium phosphite	F	7/07/2016	Walnut (support EU exports)	11504**
		7/07/2016	Almond (support EU exports)	11529**
		7/07/2016	Pistachio (support EU exports)	11530**
Rimsulfuron	H	7/20/2016	Fescue and Ryegrass	10657
			Berry, low growing, except strawberry, subgroup 13-07H	07888
			Fruit, citrus, group 10-10	11379
			Fruit, pome, group 11-10	11380
			Fruit, stone, group 12-12	11381
			Nut, tree, group 14-12	11382
			Vegetable, tuberous and corm, subgroup 1C	11377
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	11378
Oxathiapiprolin	F	8/11/2016	Cacao	11883
Clethodim	H	8/25/2016	Okra	10383

Pest Control Agent	Type*	Date	Commodity or Crop Group	PR#
			Nut, tree, group 14-12	11093
				11094
			Vegetable, fruiting, group 8, except okra	11954
			Stalk and stem vegetable subgroup 22A	11957
			Vegetable, brassica, head and stem, group 5-16	11956
			Brassica, leafy greens, subgroup 4-16B	11955
				12011
			Leaf petiole vegetable subgroup 22B	11958
			Leafy greens subgroup 4-16A	11959
			Onion, green, subgroup 3-07B	11960
Sulfur dioxide	F	8/26/2016	Fig	10114
Ethaboxam + Fluopicolide	F	9/1/2016	Potato	A11113**
Isoxaben	H	9/6/2016	Apple	07603
			Bushberry subgroup 13-07B	10247
			Nut, tree, group 14-12	11684
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	11685
Spinetoram	I	9/16/2016	Blueberry	11284**
Spinosad	I	9/16/2016	Onion	10988**
6-Benzyladenine	P	10/17/2016	Avocado	10922
				1050B
Clopyralid	H	10/28/2016	Fruit, pome, group 11-10	A3624
			Radish, roots	10437
			Berry, low growing, subgroup 13-07G	11682
				12088
			Fruit, stone, group 12-12	11681
			Vegetable, leaves of root and tuber, group 2	12089
			Vegetable, brassica, head and stem, group 5-16	12086
			Stalk and stem vegetable subgroup 22A	12085
			Brassica, leafy greens, subgroup 4-16B	12087
Bentazon	H	11/15/2016	Pea (Dry) (JMPR subission)	11510**
Sulfentrazone	H	12/1/2016	Mint	10636
			Chia	11729
			Teff	11917
			Stalk and stem vegetable subgroup 22A	11929
			Vegetable, brassica, head and stem, group 5-16	11930
			Brassica, leafy greens, subgroup 4-16B	11931
			Nut, tree, group 14-12	11932
Oxytetracycline	F	12/14/2016	Cherry, sweet	11311
			Cherry, tart	

*F=fungicide, H=herbicide, I=insecticide/acaricide, M=molluscide, N=nematicide, P=plant growth regulator
All reports submitted to EPA unless indicated with "**" where these were completed final reports submitted to registrants for label expansion or to regulatory authorities to address conditional registrations

ATTACHMENT 5
2016 Tolerance Successes - Permanent Tolerances
Published in the *Federal Register*

Pest Control Agent	Type*	Date	Commodity or Crop Group	Note	PR#	No. of Uses	No. of Tolerances
Pronamide	H	1/13/2016	Lettuce, leaf**		08709 11278	1	1
Cyazofamid	F	2/03/2016	Herb subgroup 19A**	3	10265	39	1
Diflubenzuron	I	2/12/2016	Cottonseed subgroup 20C	2	11421	0	1
			Carrot		08643	1	1
			Pepper/Eggplant subgroup 8-10B	2	05526 08910	8	1
			Peach subgroup 12-12B	1	08664 09599 10110 10112	8	2
			Plum subgroup 12-12C		10111		
			Nut, tree, group 14-12	1	11420	26	1
			Alfalfa (Regional Registration for west of the Mississippi only)		08678	1	3
Penoxsulam	H	3/02/2016	Fruit, pome, group 11-10**		10944	12	1
			Fruit, stone, group 12-12**		10899	22	1
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F**	2	11609	5	1
			Nut, tree, group 14-12**	1	11610	26	2
			Olive**		10866	1	1
			Pomegranate**		10867	1	1
Zoxamide	F	3/08/2016	Ginseng		09708	1	1
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	2	11616	5	1
			Tomato subgroup 8-10A	2	11615	9	1
			Vegetable, tuberous and corm, subgroup 1C	2	11617	16	1
Fluazinam	F	4/08/2016	Mayhaw		06796	1	1
			Cabbage	6	07093	0	1
			Vegetable, tuberous and corm, subgroup 1C	2	11618	16	1
			Vegetable, cucurbit, group 9		08916 09238 09269 09555	14	1
Abamectin	I	5/02/2016	Vegetable, fruiting, group 8-10 **(add greenhouse tomato)	3*	05076 11058	12	1
			Caneberry subgroup 13-07A**	*	06475	5	1
			Fruit, citrus, group 10-10**	2	11057	14	1
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F**	2	11059	5	1
			Berry, low growing, subgroup 13-07G**	2	11186	8	1
			Fruit, stone, group 12-12**	1	11184	11	1
			Fruit, pome, group 11-10**	2	11242	10	1
			Nut, tree, group 14-12**	1	11185	26	1
			Papaya**		04078	1	1
			Star apple		07825	1	1

Pest Control Agent	Type*	Date	Commodity or Crop Group	Note	PR#	No. of Uses	No. of Tolerances
			Black sapote		07826	1	1
			Sapodilla		07827	1	1
			Canistel		07828	1	1
			Mamey sapote		07829	1	1
			Guava**		06435	1	1
			Feijoa		11578	1	1
			Jaboticaba		07832	1	1
			Wax jambu		07833	1	1
			Starfruit (Carambola)		07819	1	1
			Passionfruit		07835	1	1
			Acerola		07836	1	1
			Lychee**		07831	1	1
			Longan		11574	1	1
			Spanish lime		11575	1	1
			Rambutan		11576	1	1
			Pulasan		11577	1	1
			Pineapple**		08439	1	1
			Bean**	3	05478 07271	14	1
			Onion, green, subgroup 3-07B**	*	A4068	15	1
Carfentrazone-ethyl	H	5/02/2016	Artichoke, globe		10721	1	1
			Asparagus		10278	1	1
			Mint		09427	2	2
			Teff		10196	1	4
			Banana (amended tolerance)			0	1
			Vegetable, bulb, group 3-07	1	11486	15	1
			Vegetable, fruiting, group 8-10	1	11487	11	1
			Fruit, citrus, group 10-10	1	11488	13	1
			Fruit, pome, group 11-10	1	11489	5	1
			Fruit, stone, group 12-12	1	11490	11	1
			Caneberry subgroup 13-07A	1	11491	1	1
			Bushberry subgroup 13-07B	1	11492	11	1
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	2	11493	4	1
			Berry, low growing, subgroup 13-07G	2	11494	8	1
			Nut, tree, group 14-12	1	11495	26	1
			Psyllium		11850	1	1
			Quinoa		11851	1	1
			Rapeseed subgroup 20A	2	11145	16	1
			Sunflower subgroup 20B	2	11496	13	1
			Cottonseed subgroup 20C	2		0	1
Clethodim	H	5/06/2016	Fruit, pome, group 11-10		06873 06874	12	1
			Fruit, stone, group 12-12	3*	06876 06877 06878 06948	20	1
			Berry, low growing, subgroup 13-07G, except cranberry	2	09127 10546	7	1
			Cottonseed subgroup 20C	2	11613	0	1
			Onion, bulb, subgroup 3-07A	2	10545	3	1
			Stevia, dried leaves		11205	1	1

Pest Control Agent	Type*	Date	Commodity or Crop Group	Note	PR#	No. of Uses	No. of Tolerances
			Vegetable, fruiting, group 8-10	1	10373 10543	12	1
			Rapeseed subgroup 20A, except flax seed	2	09748 10210 10544	14	1
			Sunflower subgroup 20B	2	11612	13	1
Fluensulfone	N	06/01/2016	Vegetable, tuberous and corm, subgroup 1C		10904 10905 11127	17	3
			Vegetable, root, except sugar beet, subgroup 1B		10907 11657	18	2
Clofentezine	I	06/14/2016	Avocado		09321	1	1
			Cherry subgroup 12-12A	2	11532	4	1
			Fruit, pome, group 11-10	2	11531	10	1
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	2	11534	5	1
			Papaya		09322	1	1
			Peach subgroup 12-12B	2	11533	0	1
Chlorantraniliprole	I	06/14/2016	Artichoke, globe (revised tolerance)		10083	0	1
			Hops (revised tolerance)		A10491	0	1
			Nut, tree, group 14-12	1	11201	26	1
			Fruit, stone, group 12-12	3	11200	18	1
Chlorantraniliprole	I	09/07/2016	Quinoa		11914	1	4
			Teff		11854	1	4
Flupyradifurone	I	09/23/2016	Caneberry subgroup 13-07A**		10860	5	1
			Cilantro, fresh leaves**			1	1
			Kava**		11713	1	2
			Quinoa**			1	1
			Tropical and subtropical, medium to large fruit, smooth, inedible peel, subgroup 24B**		11710 11714 10770	42	1
Pyridaben	I	10/14/2016	Cucumber		08036	1	1
			Fruit, pome, group 11-10	2	11659	10	1
			Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	2	11660	5	1
			Berry, low growing, subgroup 13-07G, except cranberry	2	11661	7	1
			Nut, tree, group 14-12	1	11662	26	1
			Fruit, stone, group 12-12	1	11663	11	1
			Fruit, citrus, group 10-10	1	11664	14	1
Metaldehyde	M	10/18/2016	Beet, garden, roots and leaves		10338	6	5
			Rutabaga Turnip, roots and greens (Tolerances for regional registration in the Pacific Northwest)**				
			Wheat (Tolerances for regional registration in the Pacific Northwest)		10335	2	4
			Hop		11038	1	1
Penflufen	F	10/19/2016	Vegetable, bulb, group 3-07	*	10865	26	1
Clomazone	H	11/10/2016	Asparagus	*	10279	1	1
			Soybean, vegetable, succulent		11614	1	1

Pest Control Agent	Type*	Date	Commodity or Crop Group	Note	PR#	No. of Uses	No. of Tolerances
Oxathiapiprolin	F	12/05/2016	Basil	*	10772	1	2
			Leafy greens subgroup 4-16A	1	11855	18	1
			Brassica leafy greens subgroup 4-16B	*	11125	20	1
			Vegetable, Brassica, head and stem, group 5-16	1	11856	0	1
			Caneberry subgroup 13-07A	*	11720	5	1
			Stalk and stem vegetable subgroup 22A	*	10623	12	1
Flumioxazin	H	12/19/2016	Berry, low growing, subgroup 13-07G	2	11370	8	1
			Caneberry subgroup 13-07A	*	09700 10229 10249	5	1
			Fruit, citrus, group 10-10		10753 10764 10799	28	2
			Fruit, pome, group 11-10	1	11366	5	1
			Fruit, stone, group 12-12	1	11367	11	1
			Nut, tree, group 14-12	1	11608	26	1
			Onion, bulb, subgroup 3-07A	2	11369	3	1
			Fruit, small, vine climbing, except for fuzzy kiwifruit, subgroup 13-07F	2	11368	5	1
			Vegetable, Brassica, head and stem, group 5-16	3*	10224	3	1
			Vegetable, fruiting, group 8-10	1	11371	11	1
			Clover (regional registration in the Pacific Northwest)		10605	1	2
					Totals	1000	157

*F=fungicide, H=herbicide, I=insecticide/acaricide, M=molluscide, N=nematicide, P=plant growth regulator

[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

*Joint workshare or joint review with CN-PMC

ATTACHMENT 6
Pending Food Program Submissions to EPA

PR #	Chemical	Commodity (Full name)
07732	2,4-D	STRAWBERRY (ANNUAL)
00275	2,4-DB	GUAR
08992	2,4-DB	LENTIL
10893	ABAMECTIN	CARROT
08600	ACEQUINOCYL	GUAVA
08602	ACEQUINOCYL	LYCHEE
10214	ACETOCHLOR	BEAN & PEA (SUCCULENT)
06300	ACIFLUORFEN	BEAN, LIMA (SUCCULENT & DRIED SHELLED)
09613	ANTHRAQUINONE	CORN (FIELD)
03735	ATRAZINE	SORGHUM (SWEET)
08052	AVG	CHERRY
11055	AZOXYSTROBIN	BLUEBERRY
11510	BENTAZON	PEA (DRY)
09026	BETA-CYFLUTHRIN	FLAX
10002	BIFENAZATE	BANANA
11465	BIFENAZATE	CROP GROUP 14-12
11462	BIFENAZATE	SUBGROUP 12-12A
11463	BIFENAZATE	SUBGROUP 12-12B
11464	BIFENAZATE	SUBGROUP 12-12C
11872	BIFENAZATE	SUBGROUP 20C
11873	BIFENAZATE	SUBGROUP 24A
11164	BIFENTHRIN	LEMON
08849	BOSCALID + PYRACLOSTROBIN	CUCUMBER (GH)
11751	BOSCALID + PYRACLOSTROBIN	EGGPLANT (GH)
11750	BOSCALID + PYRACLOSTROBIN	LETTUCE (GH)
08876	BOSCALID + PYRACLOSTROBIN	PEPPER (BELL & NONBELL) (GH)
08878	BOSCALID + PYRACLOSTROBIN	SQUASH (GH)
09338	BROMOXYNIL	MILLET
08162	BUPROFEZIN	PEPPER (BELL) (GH)
10087	CHLORFENAPYR	BASIL & CHIVES (GH)
11062	CHLORFENAPYR	CROP GROUP 08-10 (GH)
09215	CHLORFENAPYR	CUCUMBER (GH)
11606	CHLORFENAPYR	TOMATO (GH) (SMALL)
10367	CHLOROTHALONIL	ALMOND
10859	CHLOROTHALONIL	CHERRY, SOUR
10164	CHLOROTHALONIL	GRAPEFRUIT
05423	CHLOROTHALONIL	GREENS (MUSTARD)
10100	CHLOROTHALONIL	GUAVA
10165	CHLOROTHALONIL	LEMON
00147	CHLOROTHALONIL	LETTUCE (HEAD & LEAF)
06420	CHLOROTHALONIL	LYCHEE
10163	CHLOROTHALONIL	ORANGE
00148	CHLOROTHALONIL	RADISH
00397	CHLOROTHALONIL	SPINACH
10839	CLOMAZONE	CANOLA

PR #	Chemical	Commodity (Full name)
11091	CLOMAZONE	DILL
11046	CYANTRANILIPROLE (HGW86)	CANEBERRY
10874	CYANTRANILIPROLE (HGW86)	COFFEE
10199	CYANTRANILIPROLE (HGW86)	CRANBERRY
10327	CYANTRANILIPROLE (HGW86)	LETTUCE (GH)
10328	CYANTRANILIPROLE (HGW86)	STRAWBERRY
01548	DCPA	ASPARAGUS
08332	DCPA	CARROT
11433	DCPA	CROP GROUP 03-07
10245	DCPA	PRICKLY PEAR CACTUS
11434	DCPA	SUBGROUP 09A
11435	DCPA	SUBGROUP 13-07G
11689	DIMETHOMORPH + AMETOCTRADIN	CUCUMBER (GH)
11688	DIMETHOMORPH + AMETOCTRADIN	LETTUCE (GH)
08595	DINOTEFURAN	BASIL
11305	DINOTEFURAN	CHERRY
10998	DINOTEFURAN	CUCUMBER (GH)
11304	DINOTEFURAN	PEACH
10816	DIQUAT	AVOCADO
10818	DIQUAT	BANANA
10817	DIQUAT	GUAVA
10815	DIQUAT	LYCHEE
10766	DIQUAT	ONION (DRY BULB)
10669	DIQUAT	PEPPER (BELL & NONBELL)
10814	DIQUAT	SUGAR APPLE
10668	DIQUAT	TOMATO
09737	DIQUAT	WATERCRESS
02399	DIURON	CHERRY
03071	DIURON	PLUM
10863	EMAMECTIN BENZOATE	ARTICHOKE (GLOBE)
07137	EMAMECTIN BENZOATE	BASIL
10685	EMAMECTIN BENZOATE	CHERRY
10115	ETHEPHON	FIG
10049	ETHOPROP	MINT (FUTURE: HERBS)
04124	ETHYLENE	PINEAPPLE
11233	ETOXAZOLE	BEET (SUGAR)
11099	ETOXAZOLE	CORN (SWEET)
07262	FAMOXADONE + CYMOXANIL	BEAN, LIMA (SUCCULENT & DRIED SHELLED)
08875	FAMOXADONE + CYMOXANIL	CARROT
10812	FAMOXADONE + CYMOXANIL	GINSENG
08759	FAMOXADONE + CYMOXANIL	GREENS (MUSTARD)
10677	FAMOXADONE + CYMOXANIL	MANGO
09741	FENHEXAMID	KIWIFRUIT (PREHARVEST)
07149	FENHEXAMID	ONION
08243	FENHEXAMID	ONION (GH TRANSPLANT)
10506	FENHEXAMID	SUBGROUP 13-07A
10507	FENHEXAMID	SUBGROUP 13-07B
10508	FENHEXAMID	SUBGROUP 13-07E

PR #	Chemical	Commodity (Full name)
10509	FENHEXAMID	SUBGROUP 13-07F
10510	FENHEXAMID	SUBGROUP 13-07G
11332	FENPROPATHRIN	CROP GROUP 14-12
09266	FENPROPATHRIN	GREENS (MUSTARD)
11333	FENPROPATHRIN	SUBGROUP 12-12A
11334	FENPROPATHRIN	SUBGROUP 12-12B
11335	FENPROPATHRIN	SUBGROUP 12-12C
07946	FENPROPATHRIN	SWEET POTATO
09517	FENPROPATHRIN	TURNIP (ROOTS)
10008	FENPYROXIMATE	BANANA
11100	FENPYROXIMATE	CELERY
08097	FENPYROXIMATE	CANEBERRY
11246	FENPYROXIMATE	CROP GROUP 14-12
09033	FENPYROXIMATE	SQUASH (SUMMER)
09943	FLONICAMID	ALFALFA, CLOVER
11705	FLONICAMID	LETTUCE (GH)
11247	FLONICAMID	WATERCRESS
11363	FLUAZIFOP-P-BUTYL	CROP GROUP 10-10
11364	FLUAZIFOP-P-BUTYL	CROP GROUP 12-12
11231	FLUAZINAM	PEA (EDIBLE PODDED, SUCCULENT & DRIED SHELLED)
10374	FLUDIOXONIL	CELERY (GH)
10686	FLUMIOXAZIN	GUAYULE
10885	FLUMIOXAZIN + PYROXASULFONE	GRASSES (SEED CROP)
10807	FLUROXYPYR + FLORASULAM + PYROXSULAM	TEFF (FUTURE: CEREAL GRAINS)
11650	GLYPHOSATE	CROP GROUP 12-12
11651	GLYPHOSATE	CROP GROUP 14-12
08056	GLYPHOSATE	ONION (DRY BULB)
10285	GLYPHOSATE	PEPPER (CHILI)
09494	IMAZALIL	MUSHROOM (WHITE BUTTON)
7669	IMIDACLOPRID	BLUEBERRY (HIGH BUSH)
10248	ISOXABEN	CANEBERRY
10705	KASUGAMYCIN	APRICOT
08742	LAMBDA-CYHALOTHRIN	ASPARAGUS (FERN)
10255	LAMBDA-CYHALOTHRIN	BROCCOLI RAAB
10343	LAMBDA-CYHALOTHRIN	BULB VEGETABLES SUBGROUP 03-07A
09390	LAMBDA-CYHALOTHRIN	CARROT
09926	LAMBDA-CYHALOTHRIN	GREENS (MUSTARD)
09430	LAMBDA-CYHALOTHRIN	MILLET, PEARL
09852	LAMBDA-CYHALOTHRIN	OKRA
09381	LAMBDA-CYHALOTHRIN	RADISH
08850	LAMBDA-CYHALOTHRIN	RICE, WILD
09380	LAMBDA-CYHALOTHRIN	RUTABAGA
10344	LAMBDA-CYHALOTHRIN	TEA
09379	LAMBDA-CYHALOTHRIN	TURNIP (ROOTS)
10540	LAMBDA-CYHALOTHRIN + THIAMETHOXAM	AVOCADO
06684	LAMBDA-CYHALOTHRIN + THIAMETHOXAM	GUAVA

PR #	Chemical	Commodity (Full name)
10221	LINURON	BASIL
11139	MANDIPROPAMID	LEMON
11138	MANDIPROPAMID	ORANGE
01703	MEFENOXAM	CUCUMBER (GH)
01699	MEFENOXAM	LETTUCE (HEAD & LEAF)
01698	MEFENOXAM	PEPPER (BELL & NONBELL) (GH)
11376	MESOTRIONE	CROP GROUP 13-07
06388	METRIBUZIN	PEA (EDIBLE PODDED & SUCCULENT SHELLED)
10671	METRIBUZIN	POTATO
03524	NAA	ALMOND
03523	NAA	PLUM
03525	NAA	WALNUT
02188	NITRAPYRIN	BROCCOLI
02022	NITRAPYRIN	CABBAGE
02024	NITRAPYRIN	CELERY
11316	NITRAPYRIN	GRAPEFRUIT
02660	NITRAPYRIN	GREENS (MUSTARD)
11314	NITRAPYRIN	LEMON
02659	NITRAPYRIN	LETTUCE (HEAD & LEAF)
11309	NITRAPYRIN	ONION
11315	NITRAPYRIN	ORANGE
02658	NITRAPYRIN	SPINACH
10956	NOVALURON	LYCHEE
03616	OXYFLUORFEN	CANEBERRY (RASPBERRY)
09822	OXYFLUORFEN	COFFEE
06318	OXYFLUORFEN	KENAF
03574	OXYFLUORFEN	ONION (GREEN)
03573	OXYFLUORFEN	SHALLOT
09352	OXYFLUORFEN	STRAWBERRY (TRANSPLANTS)
07377	OXYFLUORFEN	TI PALM
04132	OXYFLUORFEN	TOMATO
11282	PENOXSULAM + OXYFLUORFEN	ARTICHOKE (GLOBE)
10694	PENTHIOPYRAD	BLUEBERRY (HIGH BUSH)
10695	PENTHIOPYRAD	CANEBERRY (RASPBERRY)
10022	PENTHIOPYRAD	CILANTRO
11444	PENTHIOPYRAD	LETTUCE (GH)
10840	PERMETHRIN	TEA
03152	PRONAMIDE	CRANBERRY
07171	PROPAMOCARB-HCL	GUAVA
11499	PROPAMOCARB-HCL	SPINACH
11078	PROPICONAZOLE + CHLOROTHALONIL	TOMATO (GH)
11159	PYDIFLUMETOFEN	STRAWBERRY
11445	PYMETROZINE	LETTUCE (GH)
12079	PYRAFLUFEN-ETHYL	CROP GROUP 12-12
12078	PYRAFLUFEN-ETHYL	CROP GROUP 14-12
08708	PYRAFLUFEN-ETHYL	HOPS
12081	PYRAFLUFEN-ETHYL	SUBGROUP 01C
12080	PYRAFLUFEN-ETHYL	SUBGROUP 13-07F

PR #	Chemical	Commodity (Full name)
12083	PYRAFLUFEN-ETHYL	SUBGROUP 20C
12082	PYRAFLUFEN-ETHYL	SUBGROUP 23A
10793	PYRIFLUQUINAZON	CUCUMBER (GH)
11447	PYRIOFENONE	PEPPER (GH)
11448	PYRIOFENONE	TOMATO (GH)
11133	PYROXASULFONE	EDAMAME (VEGETABLE SOYBEAN)
10792	PYROXASULFONE	MINT (FUTURE: HERBS)
10036	QUIZALOFOP	CHERRY
10031	QUIZALOFOP	GRAPE
10034	QUIZALOFOP	PEACH
10035	QUIZALOFOP	PLUM
11875	RIMSULFURON	SUBGROUP 08-10A
08345	SETHOXYDIM	WERNONIA (IRON WEED)
10480	S-METOLACHLOR/METOLACHLOR	CHICORY (ROOTS & TOPS)
11697	S-METOLACHLOR/METOLACHLOR	CROP GROUP 02
11897	S-METOLACHLOR/METOLACHLOR	CROP GROUP 05-16
09872	S-METOLACHLOR/METOLACHLOR	STEVIA (FUTURE: HERBS)
11895	S-METOLACHLOR/METOLACHLOR	SUBGROUP 04-16A
11896	S-METOLACHLOR/METOLACHLOR	SUBGROUP 04-16B
11899	S-METOLACHLOR/METOLACHLOR	SUBGROUP 20C
11900	S-METOLACHLOR/METOLACHLOR	SUBGROUP 22A
11901	S-METOLACHLOR/METOLACHLOR	SUBGROUP 22B
10673	S-METOLACHLOR/METOLACHLOR	SWISS CHARD
11898	S-METOLACHLOR/METOLACHLOR	TREE NUTS
10039	SPIRODICLOFEN	BANANA
10482	SPIRODICLOFEN	DATE
09330	SPIRODICLOFEN	SUGAR APPLE
09971	SPIROMESIFEN	CANTALOUPE
09970	SPIROMESIFEN	CUCUMBER
10800	SPIROMESIFEN	FRUITING VEGETABLES
09842	SPIROMESIFEN	GRASSES
09290	SPIROMESIFEN	OKRA
09972	SPIROMESIFEN	SQUASH (SUMMER)
10551	SPIROMESIFEN	WATERCRESS
11321	SULFOXAFLOR	ASPARAGUS
11296	SULFOXAFLOR	BLUEBERRY (HIGH BUSH)
11279	SULFOXAFLOR	CANEBERRY
11095	SULFOXAFLOR	SUNFLOWER
10134	TEBUCONAZOLE	TOMATO (GH)
06481	TEBUCONAZOLE	WATERCRESS
11235	TERBACIL	OREGANO
09017	TERBACIL	PEACH
08959	TERBACIL	STRAWBERRY (ANNUAL)
09709	THIOPHANATE METHYL	BEAN (SNAP)
08614	THIOPHANATE METHYL	PEPPER (FIELD & GH)
11974	TOLFENPYRAD	ARUGULA
11263	TOLFENPYRAD	CANEBERRY
11975	TOLFENPYRAD	CELTUCE

PR #	Chemical	Commodity (Full name)
11976	TOLFENPYRAD	CRESS, GARDEN
11977	TOLFENPYRAD	CRESS, UPLAND
108442	TOLFENPYRAD	CUCUMBER (GH)
11978	TOLFENPYRAD	FENNEL, FLORENCE
11972	TOLFENPYRAD	SUBGROUP 04-16A
11973	TOLFENPYRAD	SUBGROUP 22B
11644	TRIFLURALIN	CARDOON
11645	TRIFLURALIN	CELERY, CHINESE
11628	TRIFLURALIN	CROP GROUP 03-07
11629	TRIFLURALIN	CROP GROUP 08-10
11630	TRIFLURALIN	CROP GROUP 10-10
11631	TRIFLURALIN	CROP GROUP 12-12
11633	TRIFLURALIN	CROP GROUP 14-12
11646	TRIFLURALIN	FUKI
11647	TRIFLURALIN	RHUBARB
10820	TRIFLURALIN	ROSEMARY
11632	TRIFLURALIN	SUBGROUP 13-07F
11648	TRIFLURALIN	UDO
11649	TRIFLURALIN	ZUIKI
09736	ZINC PHOSPHIDE	GRASSES (SEED CROP)

ATTACHMENT 7 – 2016 ORNAMENTAL HORTICULTURE PROGRAM

FIELD COOPERATORS

NORTHCENTRAL REGION

Dr. Raymond Cloyd	KS
Dr. Diana Cochran	IA
Mr. Terry Davis	MI
Dr. Francesca Hand	OH
Dr. Mary Hausbeck	MI
Mr. Chengsong Hu	OH
Dr. Hannah Mathers	OH
Dr. Anand Persad	OH

NORTHEAST REGION

Dr. Jatinder Aulakh	CT
Dr. Ed Beste	MD
Dr. Nora Catlin	NY
Dr. Dan Gilrein	NY
Dr. James LaMondia	CT
Ms. Carrie Mansue	NJ
Dr. Todd Mervosh	CT
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SOUTHERN REGION

Dr. Karla Addesso	TN
Dr. Fulya Baysal-Gurel	TN
Dr. Yan Chen	LA
Dr. JC Chong	SC
Dr. Adam Dale	FL
Dr. Jeffrey Derr	VA
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SOUTHERN REGION (continued)

Dr. Charles Gilliam	AL
Dr. Chris Marble	FL
Dr. Joe Neal	NC
Dr. Dave Norman	FL
Dr. Kevin Ong	TX
Dr. Aaron Palmateer	FL
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WESTERN REGION

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Dr. Joe DeFrancesco	OR
Dr. Cai-Zhong Jiang	CA
Dr. James Klett	CO
Dr. Marja Koivunen	CA
Dr. Dustin Meador	CA
Dr. Tim Miller	WA
Dr. Christian Nansen	CA
Dr. Buzz Uber	CA
Dr. Cheryl Wilen	CA

USDA-ARS

Mr. Ben Fraelich	GA
Mr. Tom Freiberger	NJ
Dr. Nik Grunwald	OR
Mr. John Harvey	WA
Dr. Mike Reding	OH
Mr. Paul Wade	SC

ATTACHMENT 8 – 2016 ORNAMENTAL HORTICULTURE PROGRAM

RESEARCH ACTIVITIES

Discipline	Project	Researchers	Crops	Products	Trials
Entomology	Afidopyropen (BAS 440I) Crop Safety *	12	40	1	83
Entomology	Borer & Beetle Efficacy*	5	4	14	35
Entomology	Cyflumetofen Crop Safety*	5	6	1	9
Entomology	Pyrfluquinazon Crop Safety*	1	2	1	2
Entomology	Scale Efficacy	1	1	2	4
Entomology	Thrips Efficacy*	5	3	4	14
Entomology	Tolfenpyrad Crop Safety *	4	2	1	4
Pathology	Algal Leaf Spot Efficacy	1	1	10	10
Pathology	Azoxystrobin + Benzovindiflupyr (A18126B) Crop Safety*	7	8	1	10
Pathology	Azoxystrobin + Difenconazaole (A13703G) Crop Safety*	5	5	1	6
Pathology	Bacterial Efficacy*	3	3	13	32
Pathology	Botrytis Efficacy*	6	7	21	75
Pathology	Cyflufenamid Crop Safety*	4	4	1	5
Pathology	Downy Mildew Efficacy	1	1	9	18
Pathology	Fluopyram (ESP 715) Crop Safety*	6	7	1	18
Pathology	Fluxapyroxad + Pyraclostrobin Crop Safety *	7	15	1	22
Pathology	Mandestrobin Crop Safety*	3	11	1	12
Pathology	Metconazole Crop Safety*	7	10	1	13
Pathology	Mono and di potassium salts of phosphorus acid + hydrogen peroxide Crop Safety	5	9	1	22
Pathology	Nematode Efficacy	1	1	1	1
Pathology	Oxathiapiprolin Crop Safety	1	5	1	5
Pathology	Phosphorous Acid Salts & Generators Crop Safety	1	1	1	1
Pathology	Powdery Mildew Efficacy	1	2	6	12
Pathology	Pydiflumetofen + Azoxystrobin + Propiconazole Crop Safety*	3	17	1	18
Pathology	Pydiflumetofen + Fludioxonil Crop Safety*	3	15	1	17
Pathology	Pydiflumetofen Crop Safety*	3	11	1	12
Pathology	Triticonazole Crop Safety*	4	4	1	5
Weed Science	Dimethenamid-p Crop Safety*	12	24	1	32
Weed Science	Dithiopyr Crop Safety*	13	29	1	38
Weed Science	Flumioxazin + Pyroxasulfone Crop Safety	1	10	1	10
Weed Science	Indaziflam Crop Safety*	2	9	1	9
Weed Science	Iron HEDTA Crop Safety	1	2	1	2
Weed Science	Isoxaben Crop Safety*	10	18	1	23
Weed Science	Oxadiazon Crop Safety*	3	5	1	7
Weed Science	Oxyfluorfen + Prodiamine Crop Safety*	14	27	1	43
Weed Science	Pendimethalin + Dimethenamid-p Crop Safety*	12	12	1	17
Weed Science	Pendimethalin Crop Safety*	8	14	1	18
Weed Science	SP1770/SP1772 Crop Safety*	7	5	1	9
Weed Science	Sulfentrazone + Prodiamine Crop Safety*	4	3	1	4

* National Priority Projects

For a detailed list of research activities visit ir4.rutgers.edu.

ATTACHMENT 9 – ORNAMENTAL HORTICULTURE RESEARCH SUMMARIES FOR 2016

Azoxystrobin + Difenoconazole 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. During 2014 and 2015, the IR-4 Project conducted 34 trials on 12 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 ornamental horticulture plants. The rates tested were 8 (1X), 14 (2X) and 28 (4X) fl oz per 100 gal.

Alibi Flora was applied to twelve (12) plant species or genera. Seven 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. Five species or genera exhibited no injury in one or two trials; all of them are already in the label. Five additional species can be considered for labelling: *Aquilegia* spp*., Calibrachoa* spp*., Lavandula* spp*., Monarda didyma* and *Osteospermum* sp..

Botrytis Efficacy

At the IR-4 Ornamental 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 2015 on ornamental horticulture crops. During this time period, numerous products representing 42 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, four relatively new products that are included in this research project project, Orkestra Intrinsic, Mural, NUP 09092, and S2200 looked effective, while Proud 3 and SP2770 looked ineffective. Data on other relatively new products (F9110, MBI-110, Regalia, SP2773, Torque, Tourney, Trinity, ZeroTol) were limited to provide some conclusions. Of the registered products, 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.

Dimethenamid-p Crop Safety

From 2007 to 2016, IR-4 completed 504 trials on Tower EC (dimethenamid-p). The data contained in this report was generated to register uses of dimethenamid-p on and around ornamental horticulture plants with over-the-top applications. The dimethenamid-p rates in the testing program were 0.97, 1.94 and 3.88 pounds active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. Tower EC had been applied to 146 plant genera or species. Of these, 62 plant species exhibited no or minimal transient injury after application at all three rates. Twenty crops exhibited no phytotoxicity at 0.97 lb ai per acre but did have some injury at 1.94 and 3.88 lb ai per acre. Nine crops – *Aquilegia sp., Catharanthus roseus, Cladrastis sp.*, *Echeveria sp.*, *Echinacea sp.*, *Epilobium canum, Muhlenbergia dubia, Teucrium chamaedrys* and*Viburnum opulus* – exhibited significant phytotoxicity at even the lowest rate.

Dithiopyr Crop Safety

Dimension was initially registered in 1992 for ornamental horticulture uses. This initial label contained an extensive list of ornamental horticulture plants in landscapes where Dimension could be used without causing phytotoxicity. From 1992 through 2004, IR-4 conducted 68 trials on 42 species / genera, including several different fern species grown in field containers, to contribute crop safety data for dithiopyr formulations. In 2006, the new Dimension 2EW label contained registered uses for field container and in ground nursery production, the first dithiopyr product to have these use sites. A revised label was published in 2015 adding more crop species to the label. During 2014 and 2015, IR-4 conducted 148 trials with Dimension 2EW formulation on 86 species / genera, including ornamental grasses to further expand the treatable plant list in the current label. Of the researched crops and Dimension formulations, only two crops (*Pennisetum alopecuroides* and *Pseudotsuga mensiezii*) can be added at this time based on the data provided here. It is recommended the trials conducted using emulsifiable concentrate formulations be repeated with Dimension 2EW.

ATTACHMENT 9 – Continued

Downy Mildew Efficacy

In 2008, IR-4 initiated a high priority project to determine efficacy of several fungicides on downy mildew pathogens so data can be obtained to support current and future registrations. This research was conducted in 2008 and in 2009. Subsequently, Impatiens Downy Mildew (IDM) emerged, and studies on this disease sponsored in part by USDA-APHIS occurred from 2013 through to 2016. In addition to research collected from 12 studies through the IR-4 program from 2008 to 2016, this summary includes a review of 38 experiments conducted from 2000 to 2014 on ornamental horticulture crops. During this time period, numerous products representing 41 active ingredients were tested as foliar or drench applications against several species causing downy mildew on ornamentals. Most products are registered and commercially used. Most tests were conducted on *Plasmopara obducens* (impatiens downy mildew); other species tested included *Peronospora lamii* (lamium downy mildew), *Peronospora sp.*(coleus downy mildew), *Peronospora sparsa* (rose downy mildew), *Peronospora statices* (limonium downy mildew), *Peronospora antirrhini* (snapdragon downy mildew), and *Plasmopara viburni* (viburnum downy mildew). Although there were insufficient data for definitive conclusions, five relatively new products that are included in the Downy Mildew efficacy project: Adorn (V-10161) was effective for impatiens, lamium and snapdragon downy mildews; Orvego (BAS 651F) provided good to excellent control of coleus, impatiens, lamium and snapdragon downy mildews; Micora (NOA 446510) provided good to excellent control of coleus, impatiens, lamium and snapdragon downy mildews; Regalia exhibited excellent control of impatiens downy mildew, and good control of lamium, snapdragon and viburnum downy mildews at the higher rate; and Segovis applied as drench provided excellent control of impatiens downy mildew.

Flumioxazin Crop Safety

Flumioxazin has been registered in the United States since 2003 for uses in and around ornamental plants in production nurseries and in landscapes. Between 2000 and 2013, the IR-4 Project has conducted 618 trials using three granular formulations (BroadStar 0.17G, BroadStar 0.25G and BroadStar 0.25G VC1604) and a wettable dry granular formulation (SureGuard 51WDG). This is the first summary across all the available data for these 4 formulations generated through the IR-4 Project.

Sixty-three plant species or genera exhibited no or minimal transitory phytotoxicity to applications of BroadStar G formulations. Of these, nine are not currently listed on the current BroadStar 0.25G label. It is recommended that these be added to the label. Sixteen crops exhibited significant damage after over the top applications of BroadStar G formulations at all tested rates. Of these, thirteen are not currently in the list of 'Sensitive Species' on the current BroadStar 0.25G label. It is recommended that these be added to the label.

Eleven plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of SureGuard 51WDG formulation; all these are already in the current label. Thirty-three crops demonstrated significant phytotoxicity at all tested rates of SureGuard 51WDG. If a list of 'Sensitive Species' is added to the current label, these crops could be included.

Flumioxazin + Pyroxasulfone Crop Safety

Between 2013 and 2015, IR-4 conducted twenty-seven (27) trials evaluating V-10336 61.5 WG and V-10233 76 WG (flumioxazin + pyroxasulfone) for crop safety. The data contained in this report was generated to register the use of this active ingredient combination with directed spray applications around ornamental horticulture plants. The rates tested were either 0.35, 0.71 and 1.42 pounds active ingredient per acre (lb ai per A) or 0.29, 0.58 and 1.15 lb ai per A as the 1X, 2X and 4X rates.

V-10336 and V-10233 were applied to twenty-three (23) plant species or genera. One genus (*Cornus* spp.) exhibited no or minimal transient injury in 3 trials across both formulations. None of the tested species exhibited injury or growth reduction at either the 2X or 4X rate with the exception of *Cercis canadensis* which exhibited moderate injury at all rates and stunting at 2X. Further testing is required before a conclusion can be made confirming crop safety on these crops.

ATTACHMENT 9 – Continued

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. During 2014 and 2015, IR-4 completed 42 trials on 22 ornamental plant species examining phytotoxicity related to foliar applications of Orkestra (fluxapyroxad + pyraclostrobin). In these trials, 4 species or genera 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 sixteen other species or genera exhibited minimal or no injury in the limited number of trials (one or two) for each crop; BASF can consider adding these to the label.

Fusarium Efficacy

From 2001 to 2015, numerous products representing 31 active ingredients were evaluated in greenhouse and field trials as soil drench, soil incorporation, foliar,in-furrow, drip irrigation or tuber soakapplications against several *Fusarium* species causing rots (crown, stem and tuber rots) and wilt on ornamentals, andwilt and root rot on vegetables. *Fusarium* species tested included: *F. avenaceum, F. commune, F. oxysporum, F. solani* and *F*. sp. Most trials were conducted on *F. oxysporum* on larkspur, lisianthus and watermelon. Although there were insufficient data for definitive conclusions, several relatively new productsshowed promising, though inconsistent, efficacy comparable to the standards. These include acibenzolar, Heritage (azoxystrobin), Compass (trifloxystrobin), Hurricane (fludioxonil+mefenoxam), Insignia (pyraclostrobin), SP2169, Tourney (metconazole) and Trinity (triticonazole). BW240/RootShield Plus (*Trichoderma harzianum & T. virens*), CG100 (caprylic acid), Pageant (boscalid+pyraclostrobin), Palladium (cyprodinil+fludioxonil) and SP2550 provided no to mediocre efficacy. Proline (prothioconazole) provided consistently good control of *F. oxysporum* in watermelon trials. The established standards3336 and Medallion generally provided inconsistent efficacy while Terraguard was effective in one trial.

Imazamox Crop Safety

Imazamox (Clearcast™) was registered for the control of vegetation in and around aquatic sites and terrestrial non-crop sites. in the United States in 2008. In 2009 and 2010, the IR-4 Project through researchers Beste & Frank conducted 17 trials on 14 ornamental plant species / genera examining phytotoxicity related to imazamox applications. For all 14 genera/species in these trials, more information is needed because only 1 or 2 trials were conducted.

Leaf Spot and Anthracnose Efficacy

At the IR-4 Ornamental Horticulture Program Workshop in 2013, leaf spots and anthracnose 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 1987 to 2015 on ornamental horticulture crops. Species tested included: *Alternaria alternata, Apiognomonia quercina, Cercospora cornicula, Cercospora lythracearum, Colletotrichum navitas, Colletotrichum* sp.*, Corynespora cassiicola, Diplocarpon rosae, Discula destructiva, Drechslera setariae, Elsinoe corni, Entomosporium mespilii, Marssonina populi, Myrothecium roridum, Phaeocryptopus qaeumannii and Septoria* sp. During this time period, numerous products representing 45 active ingredients were tested as foliar applications against these species causing various leaf spots and anthracnose. Most products are registered and commercially used. Although there were insufficient data for definitive conclusions, two new products that were included, Orkestra, and Mural, looked promising. Compass, Pageant and Palladium provided variable efficacy depending on species. F9110, Proud 3, MBI-110, *Milsana,* Disarm, SP2770, SP2773 and ZeroTol were generally ineffective. Limited data on other relatively new products (NUP 09092, S2200, Tourney and Trinity) were inconclusive. The established standards Daconil and Eagle generally provided excellent efficacy; Chipco 26019 provided good efficacy, and Medallion provided variable efficacy depending on species. The data from these trials suggest that the effectiveness of some fungicides in controlling leaf spots and anthracnose is variable, depending on the pathogen species.

ATTACHMENT 9 – Continued

Oxyfluorfen + Prodiamine Crop Safety

From 2009 through 2015 IR-4 completed 126 trials evaluating Biathlon (oxyfluorfen + prodiamine) crop safety. The data contained in this report were generated to register uses of oxyfluorfen + prodiamine as over-the-top applications on and around ornamental horticulture plants. The rates tested were 2.75 (1X), 5.5 (2X) and 11.0 (4X) pounds active ingredient per acre (lb ai per acre).

Biathlon was applied to forty-one (41) plant species or genera. Fifteen (15) genera or species exhibited no or minimal transient injury in at least 3 trials. One species exhibited phytotoxicity or growth reduction in at least one trial at the 2X and/or 4X rate, but it may not affect the marketability of the crop. No species tested consistently exhibited significant phytotoxicity or growth reduction in more than one trial. Thirty (30) species require further testing. 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 'Abbotwood' but is not recommended on 'Goldfinger'. More data is needed to establish the actual varietal sensitivities within *Potentilla fruticosa*, and identify other species with the same difficulty. We recommend *Lantana camara, Rosmarinus officinalis, Rudbeckia spp., Salvia nemorosa,* and *Sedum spp.* be added to the Biathlon label along with 12 additional varieties of species already listed in the label.

Pendimethalin Crop Safety

Pendimethalin has been registered in the United States since 1994 for uses in and around ornamental 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 2015, 43 trials were conducted on ornamental grasses to determine crop safety of the Pendulum 2G formulation. This summary is an update of the first summary across all the available data generated through IR-4 between 1981 and 2008 issued in 2009.

Seventy-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, 15 species or genera are not on the current Pendulum 2G label. 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.

Pythium Efficacy

From 2003 to 2015, 66 products representing 59 active ingredients were tested through the IR-4 Program as drench or foliar applications against nine *Phytophthora* species causing root rots and stem/leaf blights. *Phytophthora* species tested included: *P. cactorum*, *P. cinnamomi*, *P. citricola*, *P. cryptogea*, *P. dreschleri*, *P. nicotianae*/*parasitica*, *P. palmivora, P. plurivora, P. ramorum*, *P. syringae,* and *P. tropicalis*. Control of *Phytophthora cinnamomi* root rot was achieved primarily with drench applications onto azaleas. When this pathogen was tested on rhododendrons, the data were either inconclusive or the products did not perform as well as on azaleas with the exception of Magellan and Fenamidone. For *Phytophthora dreschleri* root rot, the good to excellent efficacy was achieved with several products including BioPhos, Segway, Stature DM, and Terrazole. For *Phytophthora nicotianae*, consistent efficacy across crops was difficult to achieve, but the best performers included Adorn, Aliette, Alude, Biophos, Fenamidone, Insignia, Micora Segway, Stature DM, Subdue MAXX, and Vital. The best control of *Phytophthora citricola* blight was achieved with foliar applications of the phosphorus acid generators Aliette, Biophos and Magellan. For *Phytophthora ramorum* blights, Subdue MAXX provided the most consistent control. Adorn, Fenamidone, Insignia, Segway, and Stature also provided good control. For *Phytophthora tropicalis*, the best control was achieved with Adorn and Stature. Micora and Segovis provided effective control of *Phyotopthora plurivora* in two rhododendron experiments.

ATTACHMENT 9 – Continued

Pyrfluquinazon Crop Safety

Pyrifluquinazon was registered for use on greenhouse ornamental 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 2015, the IR-4 Project conducted 127 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 and Mealybug Crop Safety

Managing scale and mealybug insects presents unique challenges. Products with contact modes of action have to 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.

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 and gloomy scale, generally mediocre to excellent control of false oleander scale and Fletcher scale, and poor control of armored scale. Control of Florida wax scale was excellent with Flagship, Safari and TriStar, and good with Talus. Excellent magnolia white scale control was obtained with Distance, Talus, Xxpire and Mainspring. Talus was the only foliar product providing excellent control of oystershell scale; Safari applied as drench also provided excellent control. Cottony maple scale control was mediocre to good with Flagship, none to mediocre with Safari and TriStar, and poor with Talus. Control of cottony cushion scale was good to excellent with Distance, Flagship, Kontos, Rycar and TriStar, and variable with Talus, A16901B, Safari, GF-2626 and Xxpire. Euonymus scale control was good to excellent with Aloft and Distance, mediocre to good with Flagship, Safari and TriStar, and variable with Talus, A16901B and Xxpire. Calico scale control was mediocre to excellent with Safari/Transtect, good with Mainspring, and mediocre with Xxpire and Kontos. Control of false Florida red scale was good with Flagship and Safari, mediocre with Distance, and poor with Talus and TriStar. Tea scale control was excellent with Distance, Xxpire and Mainspring, and good to excellent with Safari, Kontos and Talus. Aloft was the only product providing good holly pit scale control; Distance, Flagship, Safari, Talus and TriStar provided mediocre control. Pine needle scale control was excellent with Aloft, Distance, Kontos, Rycar, Safari, Talus and Tristar; A16901B, GF-2626 and Xxpire and Kontos were less effective. In a camellia scale trial, all products tested provided poor control most likely because of unfavorable environmental conditions.

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. A trial 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 trials.

Three recently registered products (Mainspring, Rycar and XXpire) 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.

ATTACHMENT 9 – Continued

Sulfentrazone + Prodiamine Crop Safety

Since 2007 IR-4 has completed 372 trials with products containing sulfentrazone + prodiamine (F6875 0.3G and F6875 4SC) on 92 crops. The data contained in this report was generated to register uses of sulfentrazone + prodiamine formulation on and around ornamental horticulture plants with over-the-top applications. The rates tested were 0.375, 0.75 and 1.5 pounds active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. The F6875 0.3G formulation was applied to 75 plant genera or species. Of these crops, 22 exhibited no or minimal transient injury after application at all three rates. Nine crops (*Buddleia davidii, Echinacea sp., Hemerocallis sp., Hosta sp., Iris sp., Lobularia maritima, Ophiopogon sp., Phlox paniculata,* and *Phlox subulata*) exhibited phytotoxicity at even the lowest rate. F6875 4SC was tested on 59 genera or species of which 13 species exhibited little to no injury at all three rates. Thirteen species (*Buddleia davidii, Chasmanthium latifolium, Dryopteris sp., Echinacea purpurea, Forsythia sp., Helianthus sp., Hemerocallis sp., Heuchera sanguinea, Hibiscus sp., Hosta sp., Hydrangea sp., Phlox paniculata*, and *Rudbeckia sp.)* demonstrated significant injury even at the lowest rate.

Tolfenpyrad Crop Safety

Tolfenpyrad was first registered in the United States as Hachi-Hachi 15 EC on July 28, 2010, and Hachi-Hachi 15 SC on March 30, 2015 for the control of aphids, leafhoppers, scales, thrips, whiteflies, and early instar lepidopteran larvae on ornamental horticulture crops grown in greenhouses. An expansion of this label for outdoor uses is planned. The IR-4 Project completed 191 trials on 28 ornamental plant species from 2010 through 2015 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; five 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.*). Two crops should be included in listing of crops where treatments are not recommended: *Impatiens* sp. and *Impatiens*, New Guinea Hybrids.

Triticonazole Crop Safety

Triticonazole was registered as Trinity 2SC in the United States in 2007 as a turf fungicide. Since that time it has been under development to expand to ornamental horticulture diseases, and use on ornamental horticulture crops was added to the label in 2013. Because triticonazole is in the triazole class, it could cause symptoms similar to plant growth regulators and testing is warranted on additional herbaceous and woody ornamental species. Between 2010 and 2016, the IR-4 Project completed 180 trials on 44 ornamental plant species examining phytotoxicity related to foliar applications of Trinity 2SC. In these trials, 30 species or genera exhibited minimal or no injury after foliar applications. Of these, nine are not yet listed on the label: *Alyssum sp., Buxus sp., Cornus sp., Dahlia sp., Hedera helix, Ilex sp. Lantana sp., Osteospermum sp*., and *Pseudotsuga menziesii.*

ATTACHMENT 10- Biopesticide and Organic Support Program

2016 Grant Awards

- Efficacy evaluations of biopesticides for management of Spotted Wing Drosophila.
- Efficacy evaluations of biopesticides for management of Fire Blight in organic apple production.
- Efficacy evaluations of chestnut transformed with the OxO gene for management of Chestnut Blight.
- Development of hypovirulent strains of Chestnut Blight for topical applications in Chestnut.
- Efficacy evaluations of biopesticides for management of Varroa mite in Honeybees.
- Efficacy evaluations of biopesticides for management of Clavibacter in tomato.
- Efficacy evaluations of biopesticides for management of Bacterial tomato spot and speck in tomato.
- Efficacy evaluations of biopesticides for management of Downy mildew in organic spinach.
- Efficacy evaluations of biopesticides for management of Root Rot in ginseng.
- Efficacy evaluations of biopesticides for management of Whitefly in GH tomato.
- Efficacy evaluations of biopesticides for management of Striped Cucumber Beetle in organic cucurbits.
- Efficacy evaluations of biopesticides for management of Weeds in Ornamental Horticulture.
- Efficacy evaluations of biopesticides for management of Weeds in Sweet Potato.

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Biopesticide Regulatory Support Packages Approved in 2016

Product	Crop	PR Number	TYPE	Registration Type	Uses
9,10 Anthraquinone	Rice	09687	Insecticide	Section 3	1
Potassium salts Hop Beta Acids	Honeybees	0432B	Insecticide	Amendment	2
Aspergillus flavus AF36	Fig	1049B	Fungicide	Section 3	1
Aspergillus flavus AF36	Almond	1049B	Fungicide	Section 3	1
Aspergillus flavus TC16F, TC35C, TC38B, TC46G	Corn	1048B	Fungicide	Section 3	1
Bacillus mycoides isolate J	Potato	0822B	Plant Growth Regulator	Section 3	1
Bacillus mycoides isolate J	Pecan	0541B	Plant Growth Regulator	Section 3	1
Bacillus mycoides isolate J	Table beet	0322B	Plant Growth Regulator	Section 3	1
Bacillus mycoides isolate J	Cantaloupe	0542B	Plant Growth Regulator	Section 3	1
Bacillus mycoides isolate J	Vegetable, cucurbit, group 9	0321B	Plant Growth Regulator	Section 3	14
Bacillus mycoides isolate J	Sugarbeet	0107B	Plant Growth Regulator	Section 3	1

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"IR-4 is an extremely important resource for the mushroom industry. The expertise of the staff helps to guide our growers toward effective pest control solutions. They provide a much needed link between growers, researchers, chemical registrants and EPA."

—Laura Phelps
Consultant, American Mushroom Institute