IR-4 Project

Pest management solutions for specialty crops and specialty uses

2024 ANNUAL REPORT

Prepared by IR-4 Headquarters

ANNUAL REPORT OF THE IR-4 PROJECT
January 1, 2024 - December 31, 2024

1. Introduction

The IR-4 Project was established in 1963 by the U.S. Congress with the mission to assist specialty crop farmers by giving them legal access to needed crop protection products to manage insect, disease, weed, and other pests in production. Specifically, the IR-4 Project facilitates the registration of chemical and bio-based pesticides as well as emerging pest management technologies on fruits, vegetables, nuts, herbs, trees, shrubs, flowers, and other specialty crops, as well as minor uses on major crops (corn, cotton, soybeans, wheat, etc.). IR-4 remains relevant because specialty crops and minor uses often lack the economic return on investment for the private sector to justify spending research and development resources on these registrations. The IR-4 Project fills such voids by developing the necessary data and cooperating with many government and non-government organizations to accomplish its mission and leverage its resources (see Attachment 1: Participants in the Process). IR-4's research projects/activities include:

- Conducting U.S. Environmental Protection Agency (EPA) guideline "Magnitude of the Residue Studies." This gives EPA an accurate exposure estimate that they use to perform dietary risk assessments associated with potential product registrations.
- Product performance testing (efficacy/crop safety projects) on food and non-food ornamental crops. This provides assurances that the use of a crop protection product is safe and effective.
- Submitting proposals to EPA and other regulatory authorities to expand crop groups/subgroups that allow data from a few representative crops to cover many crops.
- Performing Integrated Solutions research projects, which utilize all available crop protection tools (chemical pesticides, biopesticides and emerging technologies) in order to identify solutions for hard-to-manage pests, prevent or better manage pest resistance to pesticides, and mitigate pesticide residues in the final food product. Integrated Solutions projects also address management of pests in organic crop production systems.
- Assisting with the registration of biopesticide and other emerging technologies discovered/developed by public sector scientists.
- Facilitating harmonization of global pesticide regulations to assist domestic specialty crop growers' ability to export fruits, vegetables and other specialty crops to international markets.

2. Successes in 2024

Food Crop Program:
EPA publication of actions that established **52** new tolerances for **8** active ingredients. These tolerances support **1024** potential new uses on food crops (Attachment 2).

Environmental Horticulture Program:
At this time, IR-4 does not have an accurate assessment of new registrations achieved in 2024. This information will be obtained during the second quarter 2025 with responses to inquiries from cooperating industry registrants.

3. Registration Support Actions in 2024

Food Crop Program:
- IR-4 submitted to EPA **9** tolerance petitions and **1** Final Report to the registrant for Label Expansion or Conditional Registration - these covered **48** unique requests (PR #s) for assistance and crop group tolerance updates (Attachment 3).
- **10** data packages were completed but not submitted.

- **27** draft final reports were submitted to IR-4's Quality Assurance Unit for Good Laboratory Practice compliance auditing.
- **51** Product Performance Reports and **27** Integrated Solutions Reports were posted and provided to cooperating companies.
- Biopesticide regulatory support actions and activities included:

    - Biopesticide submissions were made for (1) Citrus tristeza virus Expressing Spinach Defensin Protein SoD 2 in Citrus Fruits for resistance or tolerance to citrus greening, also known as Huanglongbing (HLB); (2) an attenuated Cucumber Green Mottle Mosaic Virus Strain ON-BM3 vaccine and (3) CarriCea T1 Citrus Rootstock with resistance or tolerance to citrus greening.

    - Responded to a 75-day EPA letter for the *Helicoverpa zea* nudivirus 2 submission

    - Submitted the final printed label for FourSure

    - Biochemical classification was completed for EPA for alum with classification as a biochemical like biopesticide.

Environmental Horticulture Program:

Eleven research summaries were written and/or updated to support new or existing registrations, provided to registrants, and posted on the IR-4 website (see summaries in Attachment 6); **3,296** field and greenhouse trials contributed to these summaries; trials came from the following IR-4 Units:
- North Central Region: 314 trials
- Northeast Region: 564 trials
- Southern Region: 994 trials
- Western Region: 711 trials
- ARS cooperative sites: 713 trials

4. Research in 2024

Food Crop Program - Summary of Research Studies / Projects
- **53** new Magnitude of the Residue Studies (Attachment 4); **394** total field trials (362 New/32 Carryover)
- **74** Product Performance projects (Attachment 5) involving **148** efficacy/crop safety trials
- **62** field trials that contributed to **35** Integrated Solutions projects
- IR-4 Quality Assurance Unit performed activities to help ensure that IR-4 remained compliant with EPA's Good Laboratory Practice Regulations; activities include:
    - 1 Protocol audits
    - 11 Facility audits
    - 127 In-life Inspections of field sites
    - 54 In-life Inspections of analytical laboratories
    - 314 Field Databook audits
    - 28 Analytical Summary Report audits
    - 27 Final Report audits
    - 2 Amended Report audit
- IR-4 also successfully completed 9 inspections by EPA, and QA audited 3 contributing scientist reports.

Environmental Horticulture Program - Summary of Research Studies / Projects
- The Environmental Horticulture Program conducted **671** field and greenhouse trials (246 efficacy, 429 crop safety) that contributed to **56** projects (see research trial details in Attachment 7).

Comprehensive Summary - 2024 Research Trial Distribution

Cooperating Region	Food Use Residue Trials[1]	Food Use Product Performance Trials	Integrated Solutions Trials	Environ. Hort. Product Performance Trials
North Central Region	65 (8)	21	8	118
Northeast Region	26 (0)	18	10	58
Southern Region	84 (10)	52	20	262
Western Region	149 (13)	57	24	136
ARS Sites	52 (1)	0	0	97
Canadian Sites	18 (0)	0	0	0
TOTAL	**394 (32)**	**148**	**62**	**671**

Analytical Laboratory Status

	Awaiting Analysis	Analysis in Progress	Waiting on Storage Stability	Analysis Complete Preparing Report
Southern Region Lab	17	6	7	0
Western Region Lab	22	5	7	9
ARS Tifton Lab	10	2	1	3
ARS Wapato Lab	7	0	0	5
Other Labs	8	5	0	15
TOTAL	**64**	**18**	**15**	**32**

5. Impacts of IR-4 Activities

The IR-4 Project continues to provide tangible deliverables to growers of food and non-food specialty crops through the facilitation of registrations of safe and effective crop protection products. IR-4 is the only publicly-funded program in the United States that develops data required for registrations. IR-4's work generates many positive impacts, including:

- Based on EPA actions, IR-4 data supported 1024 potential new registrations on food crops in 2024. These new registrations help producers grow high-quality food and ornamental crops while respecting the environment. This also has significant economic benefits—helping farmers remain profitable and boosting

[1] Data presented as total number of trials with number in parenthesis being the number of carryover trials

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

- The IR-4 Project has been a major contributor to the advancement of Integrated Pest Management (IPM) tactics through the approval of crop protection tools that give producers suitable options to manage destructive pests that disrupt advanced IPM systems.
- IR-4's Integrated Solutions initiative couples bio-based products with conventional products in a defined system whose objectives are to reduce chemical residues in food, provide a means to break up pest resistance to pesticides, and, in some cases, develop a lower-risk solution to the most difficult-to-manage pests.
- IR-4 continues to work with EPA to expand and enhance US crop grouping regulations. Crop groups allow collection of residue data on a small number of representative crops, and extend the use of the exposure values to a much larger number of similar crops in the crop group or subgroup. There are huge cost savings, as crop-grouping extrapolation allows IR-4 and others in the regulated community to use resources in a smart and efficient manner. In 2024, no new Final Rules for US crop grouping updates were approved, although efforts are underway for the next phase of revisions. IR-4 has completed its efforts with the Codex Committee on Pesticide Residues (CCPR) to revise and expand the Codex Classification of Food and Animal Feeds.
- The Environmental Horticulture Program continues to support an industry valued at nearly $19.2 billion in annual sales (Horticulture Census, 2019, NASS). This industry is quite complex because growers cover 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—all of which have unique pest management needs.

6. Congressional Appropriations and Other Funding

Summary of IR-4 Funding ($20.0 million)

Source	Amount	Administration	Activities covered
USDA-Minor Crop Pest Management (IR4) grant	$15.0 million	Competitive four-year grant to NC State	All core IR-4 research program and activities
USDA-ARS	$3.1 million	Contribute to and supports IR-4 research priorities	Funding of USDA-ARS scientists and activities
National Research Support Program (NRSP-4)	$0.5 million	Competitive five-year grant awarded to NC State	Salaries and research coordination activities of IR-4 Headquarters
Various industry contributions	$1.3 million	Unrestricted donations to IR-4 Project	All IR-4 Project activities and expenses
Minor Use Foundation	$0.1 million	Funds to NC State	Used to support IR-4 activities of global harmonization of pesticide regulations

In-Kind Contributions Estimates ($22,689,800)

Estimate	Source
$2,774,800	SAES/land grant universities by hosting IR-4 field research centers, analytical laboratories and management offices throughout the United States
$2,557,409	EPA Pesticide Registration Improvement Act fee waivers
$15,000,000	Crop protection industry
$500,000	The government of Canada via joint research projects

Expenditures supported by USDA-Minor Crop Pest Management (IR4) funds[2]

Amount	Use
$5,249,627	Distributed to the four IR-4 Regional offices and Headquarters for non-laboratory personnel, supplies, equipment and other core expenses
$2,664,160	Distributed to the analytical laboratories for personnel, supplies, equipment and other expenses associated with laboratory analysis.
$2,387,539	Allocated to field trials for residue studies
$1,123,990	Allocated to field trials for product performance research
$535,560	Allocated for field trials that develop data in IR-4 Integrated Solutions research
$654,488	Allocated for field trials that develop product performance data in ornamental crops
$1,125,600	Kept by NIFA to help fund their operations

Additional Expenditures Supported by Industry Contributions

Amount	Use
$282,942	Salary and Fringe
$139,582	Travel
$71,778	Meetings
$127,467	Additional Research
$410,487	Indirect/fees to cover NC State operations

[2] All values include 11.1 % indirect costs that are shared with the various institutions involved with IR-4.

7. New Requests for Assistance / Plans for the Future

Food Crop Program

- New Requests
    - 124 new requests were entered into the IR-4 food use database, of which 113 were new stakeholder requests and 11 were created by HQ for crop group tolerance revisions, referencing old PR#s, etc. The comprehensive total at the end of 2024 was 13,831.
    - The IS program received 24 new requests.
- Priority Setting
    - IR-4 stakeholders prioritized "researchable" Requests for Assistance at the 2024 Food Use Workshop and identified 52 Magnitude of the Residue Studies. Almost 65% of these studies also require efficacy and crop safety data. The stakeholders also identified 11 product performance-only projects and 12 Integrated Solution projects as the highest priority for research in 2025.
    - Biopesticide Regulatory Support - A new biopesticide regulatory support project, *Streptomyces noursei*, for the control of a number of plant viruses, was approved utilizing the new biopesticide vetting process.
- Future Research
    - In the 2025 Food Crop Program, IR-4 will be focusing on the new research priorities, as well as some carryover projects (352 Magnitude of the Residue trials, 149 Product Performance trials, and an estimated 57 Integrated Solutions trials).
    - IR-4 has made a strategic decision to defer research on new Integrated Solutions priorities until late 2025/early 2026. The reasoning behind this decision is to allow IR-4 adequate time to develop draft research protocols and give stakeholders time to review and suggest additional options.

Environmental Horticulture Program

- IR-4 will conduct the planned second year of data development for priorities from the 2023 Environmental Horticulture Workshop which were tested in 2024. These research projects will be the focus of 2025:
    - Beneficials for Western Flower Thrips and Chemistry Lab Assay
    - NER Regional Root Aphid/Aphid Efficacy
    - New Pest Products Crop Safety - FoliarNew Pest Products Crop Safety - Soil
    - Scale Efficacy
    - Thrips Efficacy
    - WSR Regional Lygus Efficacy
    - Boxwood Foliar Disease Efficacy
    - NCR/WSR Regional Botrytis Efficacy
    - NER Regional Nematode Efficacy
    - New Disease Products Crop Safety - Foliar
    - New Disease Products Crop Safety - Soil
    - Phytophthora Efficacy
    - Pythium & Phytopythium Efficacy
    - SOR Regional Vascular Streak Dieback Efficacy
    - NCR Regional Equisetum Efficacy
    - Post-emergent Herbicide Crop Safety
    - Pre-emergent Herbicide Crop Safety for Container Production
    - Pre-emergent Herbicide Crop Safety for Field Production
    - SOR Regional Pollinator Plant Herbicide Crop Safety
    - In addition, resources are available to add three new projects:
        - European Corn Borer Efficacy
        - Nantucket Pine Tip Moth Efficacy
        - Cylindrocarpon on Conifers Efficacy

Summary of Planned 2025 Food Program Research Trial Distribution:

Cooperating Region	Food Use Residue Trials[3]	Food Use Product Performance Trials	Carryover Integrated Solutions Trials[4]	2025 Environmental Horticulture Product Performance (Crop Safety/Efficacy)
North Central Region	65 (1)	23	3	48/4
Northeast Region	30 (1)	19	2	43/2
Southern Region	72 (10)	42	3	160/8
Western Region	125 (19)	65	10	103/3
ARS Sites	45 (1)	0	0	61/1
Canadian Sites	15 (0)	0	0	0/0
TOTAL	352 (32)	149	18	420/18

PRESENTATIONS/POSTERS

Axtell, A. 2024. Integrated Solutions Deep Dive. University of Florida, Gainesville March 6, 2024 (Presentation)

Axtell, A. 2024. The IR-4 Project. University of Wyoming, October 1st, 2024 (Virtual presentation)

Batts, R.B., J. Patel, A. Axtell, J. Baron, D. Carpenter, and H. Ross. 2024. IR-4 Project: Success and Benefits to Specialty Crop Growers. 2024 Southeast Regional Fruit and Vegetable Conference, Savannah, GA. Jan. 11-14, 2024 (Poster)

Batts, R.B. 2024. IR-4: Weed Science Update - Food Crops. Annual meeting of the Weed Science Society of America's E-10 committee (Weed Control for Specialty Crops). Jan. 12, 2024. (Presentation-virtual)

Batts, R.B. 2024. IR-4: Weed Science Update - Food Crops. Proceedings of the Weed Science Society of America and Southern Weed Science Society joint meeting, San Antonio, TX. Abstract # 477. (Presentation)

Batts, R.B., J. Patel, A. Axtell, J. Baron, D. Carpenter, and H. Ross. 2024. IR-4 Project: Success and Benefits to Specialty Crop Growers. Proceedings of the Weed Science Society of America and Southern Weed Science Society joint meeting, San Antonio, TX. Abstract # 135. (Poster)

Batts, Roger B. 2024. Registration Support for Pest Management Tools in Specialty Crops, The IR-4 Project: Purpose, Process, and Productivity. Southwest Ag Summit, Yuma, AZ, Feb. 22, 2024. (Presentation)

---

[3] Data presented as total number of trials and the number of carryover trials in parenthesis

[4]IR-4 is deferring starting new Integrated Solutution projects (priorities from 2024 Food Program Workshop) until late 2025/early 2026

Batts, Roger B. 2024. Registration Support for Pest Management Tools in Specialty Crops, The IR-4 Project: Purpose, Process, and Productivity. Center of Excellence for Regulatory Science in Agriculture, Raleigh, NC. April 22, 2024. (Lecture-virtual)

Batts, Roger. 2024. 2024 IR-4 Project Sesame Update. NCSU sesame field days, Clinton, NC. Aug. 29, 2024 and Salisbury, NC. Aug. 30, 2024. (handout)

Batts, R., A. Axtell, J. Patel, K, Searer-Jones. 2024. 2024 IR-4 Project Sweetpotato Update. NCSU sweetpotato field day, Clinton, NC. Oct. 10, 2024. (handout)

Patel, J., Batts, R., Axtell, A., Ross, H., and Baron, J. 2024. Serving the specialty crop community with pest management solutions. Annual Phytopathological Society meeting, Memphis, Tennessee. (Poster)

Patel, J. The IR-4 Project: Pest Management Solutions for Specialty Crops and Specialty Uses. 2024. Association of Research Directors Fall Business Meeting, Raleigh, NC. (Presentation)

Patel J. The IR-4 Project: Pest Management Solutions for Specialty Crops and Specialty Uses. 2024. North Carolina Association of County Agricultural Agents Meeting, Wrightsville Beach, NC. (Presentation)

Patel, J., Batts, Roger, Axtell, A., Baron, J. The IR-4 Project: Pest Management Solutions for Specialty Crops and Specialty Uses. 2024. International Carrot Conference, Raleigh, NC (Presentation)

PUBLICATIONS

A. Axtell, S. Zebelo, J. Baron, H. Ross. 2024. The IR-4 Project invites involvement from minority-serving institutions. *American Entomologist*. https://academic.oup.com/ae/article/70/4/9/7934265

A. Szczepaniec, A. Lathrop-Melting, T. Janecek, P. Nachappa, W. Cranshaw, G. Alnajjar, A. Axtell. 2024. Suppression of hemp russet mite, *Aculops cannabicola* (Acari: Eriophyidae), in industrial hemp in greenhouse and field, *Environmental Entomology*, Volume 53, Issue 1, Pages 18–25, https://doi.org/10.1093/ee/nvad052

L.M. Sosnoskie, R.B. Batts, Thierry Besançon, 2024 An Evaluation of Targeted Spraying for Reducing Herbicide Use, Enhancing Crop Safety, and Improving Weed Control in Highbush Blueberry, *HortTechnology*, Volume xx, Pages https://doi.org/

S. T. Massie, B. J. Richardson, J. S. Patel, and D. H. Gent 2025. Evaluation of fungicides for hop powdery mildew, Toppenish, Washington, 2024. *Plant Health Progress* (In Press).

VIDEOS

[IR-4 HQ]. (2024, April 1). *PR#13405 & PR#13403: Efficacy of Isocycloseram against Pepper Weevils and Thrips* [Video]. IR-4 Project. https://youtu.be/cRxe7E0sNBA

[IR-4 HQ]. (2024, April 1). *IS00437: Control of Citrus Flat Mite in Pomegranate* [Video]. IR-4 Project. https://youtu.be/P3ktI8AIgkU

[IR-4 HQ]. (2024, April 1). *IS00405: Control of NOW in Almond* [Video]. IR-4 Project. https://youtu.be/sJWcvDW_MGo

[IR-4 HQ]. (2024, April 8). *IS00436: Management of Cercospora leaf spot in sugarbeet* [Video]. IR-4 Project. https://youtu.be/E0c8P_-RwGQ

[IR-4 HQ]. (2024, April 8). *IS00332 Control of Botrytis in Caneberries* [Video]. IR-4 Project. https://youtu.be/jMI_sqJubCQ

[IR-4 HQ]. (2024, April 8). *IS00370 Weed Control in Hemp* [Video]. IR-4 Project. https://youtu.be/X92JMDP1Gmw

[IR-4 HQ]. (2024, April 8). *P12611 Performance of Quinclorac in Grape* [Video]. IR-4 Project. https://youtu.be/2cOZ1ihvN04

[IR-4 HQ]. (2024, April 8). *P12935 Performance of Pyroxasulfate in Asparagus* [Video]. IR-4 Project. https://youtu.be/Tz1gJvKWAJA

[IR-4 HQ]. (2024, April 8). *P13323 Performance of Flazasulfuron in Stone Fruit* [Video]. IR-4 Project. https://youtu.be/wSzVtkE8vC4

[IR-4 HQ]. (2024, April 8). *PR13493 Performance of Fluxapyroxad + Pyraclostrobin* [Video]. IR-4 Project. https://youtu.be/jBeS7g6JTsc

[IR-4 HQ]. (2024, April 8). *IS00402 Weed Control in Wild Rice* [Video]. IR-4 Project. https://youtu.be/9rDOYyTtUzU

[IR-4 HQ]. (2024, May 3). *The IR-4 Project: Sixty Years and Beyond* [Video]. IR-4 Project. https://youtu.be/5OlEyflwkrM

[IR-4 HQ]. (2024, June 3). *IR-4's Food Use Workshop Process* [Video]. IR-4 Project. https://youtu.be/C7Gr-Nbhghs

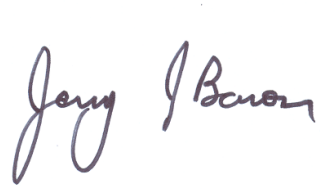
[IR-4 HQ]. (2024, August 19). *The IR-4 Priority Upgrade Proposal* [Video]. IR-4 Project. https://youtu.be/yQBPGcdAuws

[IR-4 HQ]. (2024, September 23). *Submitting a Project Clearance Request* [Video]. IR-4 Project. https://youtu.be/3BO23su4ocM

[IR-4 HQ]. (2024, June 3). *Nominating Projects for the Food Use Workshop* [Video]. IR-4 Project. https://youtu.be/ysuEL2sb2eo

December 31, 2024

Approved by:



Jerry J. Baron, Executive Director
IR-4 Project, North Carolina Agriculture Research Service
North Carolina State University

Matt Hengel, Chair,
IR-4 Project Management Committee
University of California, Davis

Douglas Buhler, Chair,
IR-4 Administrative Advisers
Michigan State University

ATTACHMENT 1 – Participants in the Process

A. **Commodity Liaison Committee (CLC)** - This advisory group provides input to the IR-4 Project Management Committee on overall operations and program direction. Members include:

Michael Aerts, Florida Fruit and Vegetable Association
Zack Bagley, California Tomato Research Institute
Michael Bledsoe, Village Farms, L.P.
John Walt Boatright, American Farm Bureau Federation
Jennifer Clarke, California Leafy Greens Research Program
James R. Cranney, California Citrus Quality Council
Maggie Elliot, Hops Growers of America
William Frantz, The Cranberry Institute
Michele Grainger, NC SweetPotato Commission
Bob Jones, The Chef's Garden
Bob Kaldunski, Ginseng Board of Wisconsin
Kevin Kudsk, National Onion Association
Michael Martin, Horticulture Research Institute
Armando Monterroso, Brooks Tropicals, LLC
Pete Nelson, Cherry Marketing Institute
Keith Pitts, Bioceres Crop Solutions
Kam Quarles, National Potato Council
Amy Plato Roberts, Lallemand Plant Care
Rachel Roberts, American Mushroom Institute
Steven Salisbury, Mint Industry Research Council
Todd Scholz, USA Dry Pea & Lentil Council and CLC Chair
Jonathan Sarager, Western Growers
Alan Schreiber, Agriculture Development Group, Inc.
Laura Shumow, American Spice Trade Association
Michelle Starke, CoverCress, Inc.
Berry Tanner, National Watermelon Association (alternate)
Amy Upton, Michigan Nursery & Landscape Association
Lee Van Wychen, Weed Science Society of America
Herman Waguespack, American Sugar Cane League
Ryan Wysocki, Michigan Blueberry Commission

B. **Cooperating Government Departments and Agencies**

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

C. **Crop Protection Industry** – Companies with products involved in IR-4's research in 2024 include:

Company	Food Residue Study	Food Crop Product Performance	Integrated Solutions	Environmental Horticulture
Adama	X	X	X	
Active Cross		X	X	

Company	Food Residue Study	Food Crop Product Performance	Integrated Solutions	Environmental Horticulture
Agbiome			X	
AgBitech			X	
Agrospheres			X	
AgroVentures			X	
Albaugh	X	X	X	
Ascribe BioScience				X
AMVAC	X		X	
BASF Corporation	X	X	X	X
Bayer Crop Science	X	X	X	
Belchim Crop Protection		X		
Biosafe Systems			X	X
Bioworks			X	X
BlackSmith BioScience INC			X	
Certis USA			X	
Corteva Agrisciences	X	X	X	X
DSM			X	
ENVU	X			X
FMC Corporation	X	X	X	X
Gowan Company	X	X	X	X
Helena Agri-Enterprises			X	
Huma			X	
ICL Specialty Fertilizers				X
ISK Biosciences	X	X	X	X
Jet Harvest				
KI-Chemical	X	X	X	

Company	Food Residue Study	Food Crop Product Performance	Integrated Solutions	Environmental Horticulture
Kemin Crop Technologies			X	X
Koppert			X	
Lallemand			X	
Landis International	X			X
MustGrow Biologicals			X	
NanoCrops			X	
Nichino America	X	X	X	
Nisso			X	X
NuFarm America			X	X
OAT Agrio	X			
OHP				X
Oro Agri			X	
Plant Health Care		X	X	
PreZero			X	
Profarm			X	X
Rainbow Treecare Scientific				X
SAN Agrow			X	
SAS			X	
SePRO Corporation			X	X
Sipcam Agro			X	
Stepan				X
Summit Agro			X	
SymAgro			X	
Syngenta Crop Protection	X	X	X	X
TDA				X

Company	Food Residue Study	Food Crop Product Performance	Integrated Solutions	Environmental Horticulture
Terramera			X	
Tidal Grow AgriScience			X	
Trece			X	
TKI Novasource	X	X	X	
TLC Products				X
UPL	X		X	
Valent Bioscience		X	X	
Valent USA, LLC	X	X	X	X

D. <u>Project Management Committee</u>

Dr. Jerry Baron*, IR-4 Project Headquarters – IR-4 Project Executive Director
Dr. Douglas Buhler, Michigan State University – Administrative Advisor, North Central Region
Dr. John Davis, University of Florida - Administrative Advisor, Southern Region
Dr. Liwei Gu*, University of Florida – Regional Director, Southern Region
Dr. Mary Hausbeck*, Michigan State University — Regional Director, North Central Region
Dr. Matt Hengel*, University of California, Davis - Regional Director, Western Region and PMC Chair
Dr. Marcel Holyoak, University of California, Davis – Administrative Advisor, Western Region
Dr. Moses Kairo, University of MD Eastern Shore - Administrative Adviser, Northeast Region
Dr. Steven Lommel, North Carolina State University –Advisor
Dr. Joseph Munyaneza, USDA-ARS - Administrative Advisor
Dr. Chris Philips, USDA-NIFA-National Program Leader for IR-4
Mr. Todd Scholz*, USA Dry Pea and Lentil-CLC Chair
Dr. Alvin Simmons*, USDA-ARS – Director Minor Use Program
Dr. Simon Zebelo*, University of MD, Eastern Shore - Regional Director, Northeast Region
*Voting member

E. <u>IR-4 Project Headquarters (HQ)</u>

Dr. Alice Axtell - Research Planning Manager and Integrated Solutions Platform Lead
Ms. Allison Ballantyne – Senior Operations Associate
Mr. Bill Barney – Biopesticide Regulatory Manager
Dr. Jerry Baron – Executive Director
Mr. Roger Batts - Principal Weed Scientist
Ms. Susan Bierbrunner – Data Administrator
Ms. Donna Bouffard - Program Operations Coordinator
Dr. Michael Braverman – Senior Manager Associate - Biopesticide Regulatory
Mr. Jimmy Byrtus – Study Director and Acting Environmental Horticulture Program Manager
Dr. Debbie Carpenter – Assoc. Director for Regulatory Sciences and National Laboratory Director
Dr. Krystal Chojnacki - National Chief of Staff
Ms. Christina Dineen – Chemist and Study Director
Ms. Jane Forder – Lead Quality Assurance Auditor - Northeast and North Central Region
Ms. Shiayi Huang - Data Applications Manager

Ms. Grace Lennon – Senior Regulatory Associate
Ms. Jessica Macari — Study Director
Ms. Cristina Marconi - Registration Manager and Senior Study Director
Dr. Johanna Mazlo - National Quality Assurance Unit Manager
Mr. Philip Moore - Lead Entomologist
Mr. Scott Muir - Lead Quality Assurance Auditor - Analytical Chemistry
Ms. Sherita Normington, Senior Quality Assurance Auditor
Dr. Jaimin Patel – Principal Plant Pathologist
Mr. Josh Peterson - Quality Assurance Auditor
Mr. Thomas Pike – Submission Manager and Senior Study Director
Ms. Hannah Ross – National Information and Communications Officer
Mr. David Schnatter - Research Assistant
Dr. Van Starner – Senior Management Associate
Ms. Juliet Thompson – Research and Audit Specialist, Quality Assurance
Mr. Robert Welker - Study Director

F. Regional/ARS Field Coordinators and Staff
Dr. Kari Arnold, Regional Field Coordinator - Western Region
Ms. Megan James Hickman, Assistant Regional Field Coordinator - Northeast Region
Ms. Mika Pringle Tolson, Assistant Regional Field Coordinator - Western Region
Ms. Marylee Ross, Regional Field Coordinator – Northeast Region
Ms. Kristen Searer-Jones, Regional Field Coordinator - Southern Region
Dr. Alvin Simmons, Regional Field Coordinator- USDA-ARS
Ms. Nicole Soldan, Regional Field Coordinator - North Central Region

G. Laboratory Coordinators (Regional and ARS)
Dr. Matt Hengel, University of California, Davis – Western Region
Dr. Gail Mahnken, University of Florida – Southern Region
Ms. Tamara Snipes, USDA-ARS – Tifton, GA
Mr. T. Todd Wixson, USDA-ARS – Wapato, WA

H. Quality Assurance Unit
Mr. Martin Beran, University of California, Davis
Ms. Jane Forder, North Carolina State University
Ms. Laurel Hsieh, University of California, Davis
Ms. Kathleen Knight, University of Florida
Dr. Johanna Mazlo, North Carolina State University
Mr. Scott Muir, North Carolina State University
Ms. Sherita Normington, North Carolina State University
Mr. Josh Peterson, North Carolina State University
Ms. Juliet Thompson, North Carolina State University
Dr. Yavuz Yagiz, University of Florida

I. IR-4 Researcher & State Liaison Representatives[5]

North Central Region

State	State Liaison Rep.	Research Area
IA	S. Slack	
IL	M. Babadoost	K. Gage (IS)
IN	S. Meyers	J. Beckerman (EH), S. Meyers (P) (IS)
KS	R. Cloyd	
MI	N. Soldan	M. Hausbeck (P) (IS) (EH), T. Miles (P), N. Rothwell (P), D. Saha (EH), N. Soldan (SLR) (R) (P), C. Wheeler (R), M. Quintanilla (EH)
MN	Vacant	M. Bernards (P)
MO	I. Valmorbida	
ND	B. Jenks	Q. Jia (R)
NE	N. Lawrence	
OH	A. Leach	L. Canas (IS) (EH), L. Horst* (R), A. Leach (IS), A. Robinson (R) (P), C. Taylor (IS), F. Hand (EH), M. Reding*(EH)
SD	G. Reicks	G. Reicks (IS)
WI	D. Heider	S. Chapman (R), D. Heider (R)

Northeast Region

State	State Liaison Rep.	Research Area
CT	S. Kodati	S. Kodati (P)
DE	D. Owens	D. Owens (P) (IS), M. VanGessel (P) (IS)
MA	S. Scheufele	S. Scheufele (IS)
MD	A. Kness	D. Cochran (EH), M. Hickman (R), M. Hu (P) (IS), M. Ross, (R), K. Vollmer (P)
ME	L. Calderwood	
NH	Vacant	
NJ	T. Besancon	T. Besancon (P) (IS), W. Bouchelle (R), J. Fisher (R)
NY	L. Sosnoskie	N. Catlin (EH), D. Gilrein (EH) (P) (IS), D. Heck (P), H. Keagan (R), B. Nault (P), L. Sosnoskie (P) (IS), Jared Dyer (EH) (P) (IS)

[5] R= Residue Field Trials/Food Program, P= Product Performance/Food Program, IS= Integrated Solutions, EHC= Environmental Horticulture Program, *= USDA - Agriculture Research Service Researcher

State	State Liaison Rep.	Research Area
PA	G. Krawczyk	
RI	Vacant	
VT	A. Hazelrigg	
WV	C. Quesada	M. Rahman (EH)

Southern Region

State	State Liaison Rep.	Research Area
AL	E. Vinson	D. Held (EH), O. Ajayi (P),
AR	H. Wright-Smith	A. Bowden(EH), N. Burgos (P), A. Cato (P), H. Wright-Smith (P),
FL	P. Dittmar	J. Beuzlin (P), N. Boyd (P), D. Carrillo (P), A. Dale (EH), J. Desaeger (P), P. Dittmar (P), R. Gazis (P) (IS), M. Haseeb (IS), R. Kanissery (P), O. Liburd (P) (IS), M. Long (R), C. Marble (EH), A. Meszaros (P), D. Norman (EH), L. Osbourne(EH), N. Peres (P) (IS), K. Stauderman (P), D. Sutherland (R), D. Thomas (R), G. Vallad (P), K. Xavier (P)
GA	S. Culpepper	B. Blaauw (IS), P. Brannen (IS), P. Brenneman (IS), S. Culpepper (P), B. Dutta (P), B. Fraelich* (R), (EH), S. Joseph (EH), J. Oliver (P), A. Sial (P), P. Yu (EH)
KY	R. Bessin	R. Villanueva (IS), C. Wilson(EH),
LA	T. Watson	D. Wright (R)
MS	A. Henn	T. Ayankojo (IS), P. Knight (EH)
NC	D. Monks	W. Cline (P), S. Frank (EH), A. Gorny (P), K. Jennings (P) (IS), R. Leon (P), L. Lopez (P) (IS), I. Meadows (EH), W. Mitchem (P), J. Neal (EH), L. Quesada (P), C. Smith (R) (P), S. Villani (IS), J. Walgenbach (IS)
OK	C. Luper	
PR	W. Robles Vazquez	E. Martinez (P), D. Rivera (EH), W. Robles Vazquez (R) (P)
SC	M. Cutulle	M. Cutulle (P), P. Wade* (R) (EH)
TN	M. Gireesh	F. Baysal-Gurel (EH) (P), A. Witcher (EH)
TX	M. Matocha	T. Baughman (P), K. Cochran (R), G. De la Fuente (P), J. Grichar (P), Y. Jo (IS), T. Jones (R), R. Khan (EH), K. Ong (EH),
VA	D. Frank	S. Acimoivic (IS), J. Derr (EH), D. Higgins (P) (IS), T. Kuhar (IS), D. Pfeiffer (IS)

Western Region

State	State Liaison Rep.	Research Area
AK	P. Kaspari	
AZ	A. Hu	B. Tickes (P), A. Hu (P), J. Pena (P)
CA	K. Arnold	J. Adaskaveg (P), M. Bolda (P), K. Blauer (P) (IS), S. Benson* (R), N. Clark (P), O. Daugovish (P), J. DelCastillo (P), D. Ennes (R), S. Fennimore (P), I. Grettenberger (P), B. Hanson (P), P. Lazicki (IS), N. Leach (R), P. Mauk (IS),, B. Michailides (P), C. Nansen (EH), J. Rijal (IS), J. Sidhu (P), K. Skiles (R), S. Stoddard (IS), T. Turini (IS),B. Uber (EH), A. Wang (P), S. Watkins (R), A. Westphal (P), H. Wilson (IS), S. Zukoff (P)
CO	B. Tonnessen	C. Oman (R), A. Szczepaniec (IS), B. Tonnessen (IS)
GU	R. Miller	
HI	J. Coughlin	Z. Cheng (EH), J. Coughlin (P) (Processing), J. Kam (R), (P), Z. Zhang (R) (P)
ID	R. Hirnyck	W. Meeks (P) (R) (IS), T. Salaiz (IS), P. Hutchison (IS)
MT	Z. Miller	
NM	C. Robbins	C. Robbins (EH) (R)
NV	Vacant	
OR	D. Lightle/A. Rasmussen	J. Felix (P), N. Kaur (P), D. Lightle (R), M. Mattsson (R), M. Moretti (EH) (P), S. Reitz (P) (IS), G. Shresta (P) (IS), J. Weiland* (EH), A. Becerra-Alvarez (EH), A. Rasmussen ®, M. Robinson (R),K. Buckland (P), D. Gent (P), T. Hoskins (EH)
UT	C. Ransom	
WA	D. Walsh	D. Larson* (R) (EH), R. Liu (P), W. Peng (R)
WY	C. Beiermann	

ATTACHMENT 2 – 2024 Tolerance Successes; Permanent Tolerances Published in the Federal Register

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	Note*	PR#	# of Uses	# of Tolerances
Triclopyr	ADAMA, CORTEVA, HELENA	H	02/28/2024	Sugarcane, cane		12084	1	1
Cyclaniliprole	ISK	I	04/23/2024	Vegetable, cucurbit, group 9	6	11893	1	1
				Greenhouse lettuce		12515	1	1
Cyflumetofen	BASF	I	05/10/2024	Berry, low growing, subgroup 13-07G	2	13527	8	1
				Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	2	13526	5	1
				Vegetable, cucurbit, group 9		11786, 11787, 11788	14	1
				Pepper/Eggplant subgroup 8-10B		11790	10	0
Cyantraniliprole	FMC	I	05/15/2024	Edible podded bean subgroup 6-22A		13546	17	1
				Edible podded pea subgroup 6-22B		13547	3	1
				Forage and hay of legume vegetables (except soybeans) subgroup 7-22A		13552	0	1
				Herb fresh leaves subgroup 25A		12402, 12403	205	1
				Herb dried leaves subgroup 25B		12401, 12402, 12403	213	1
				Hops, dried cones		12346	1	1
				Papaya		11300	1	1
				Pulses, dried shelled bean, except soybean, subgroup 6-22E		13550	25	1
				Pulses, dried shelled pea subgroup 6-22F		13551	6	1
				Spices crop group 26		12401	205	1
				Succulent shelled bean subgroup 6-22C		13548	17	1
				Succulent shelled pea subgroup 6-22D		13549	2	1
				Greenhouse lettuce		10327	1	0
				Strawberry		10328	0	0
Indoxacarb	FMC	I	08/08/2024	Brassica, leafy greens, subgroup 4-16B		13581	13	1
				Celtuce	4	13583	0	1
				Chickpea, dry seed	4	13590	0	1
				Coffee, green bean		11467	1	1
				Cottonseed subgroup 20C		13575	0	1
				Fennel, florence, fresh leaves and stalk	4	13584	0	1

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	Note*	PR#	# of Uses	# of Tolerances
Indoxicarb (continued)				Field corn subgroup 15-22C		13588	1	1
				Fruit, pome, group 11-10, except pear		13576	5	1
				Fruit, stone, group 12-12		13577	11	1
				Kohlrabi	4	13585	0	1
				Leaf petiole vegetable subgroup 22B		13580	3	1
				Leafy greens subgroup 4-16A		13579	18	1
				Pear, asian		13592	0	1
				Strawberry		09055	1	1
				Sunflower subgroup 20B		11707 11569	14	1
				Sweet corn subgroup		13589	1	1
				Vegetable, brassica, head and stem, group		13582	0	1
				Vegetable, legume, bean, edible podded, subgroup		13591	17	1
				Vegetable, legume, bean, succulent shelled, subgroup 6-22C		13586	17	1
				Vegetable, legume, pulse, bean, dried shelled, except soybean, subgroup 6-22E		13587	25	1
				Vegetable, fruiting, group		13578	12	1
Indoxacarb	FMC	I	08/08/2024	Brassica, leafy greens, subgroup 4-16B		13581	13	1
Ethaboxam	VALENT	F	08/23/2024	Leaf petiole vegetable subgroup 22B		12075	7	1
Saflufenacil	BASF	H	09/09/2024	Fruit, citrus, group 10-10		13563	14	1
				Fruit, pome, group 11-10		13564	5	1
				Fruit, stone, group 12-12		13565	11	1
				Mint, dried leaves		11921	1	1
				Mint, fresh leaves		11921	0	1
				Nut, tree, group 14-12		13566	26	1
Cyazofamid	ISK	F	12/05/2024	Chick pea,	4	13616	0	2
				Edible podded bean subgroup 6-22A		13617	17	1
				Parsnip root		13018	1	1
				Pulses, dried shelled bean, except soybean, subgroup 6-22E		09533	50	1
				Succulent shelled bean subgroup 6-22C		13618	17	1
2024 Totals							**1015**	**52**

*F=fungicide, H=herbicide, I=insecticide/acaricide, M=molluscicide, N=nematicide, P=plant growth regulator	
** Note Code 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 to a crop group or subgroup tolerance ***and*** submission of new data to complete the requirements for a crop group or subgroup 4=Individual commodity tolerance established in response to crop group revision 5=Response to EPA request for Codex harmonization 6=Revised tolerance 7=Tolerance for indirect or inadvertent residues	

ATTACHMENT 3 – 2024 Submissions to EPA, unless otherwise noted as submitted to Registrants, Codex or State Departments of Agriculture

Pest Control Agent	Registrant	Type*	Date	Commodity, Subgroup, Crop Group	PR#
Fenhexamid	UPL NA	F	01/31/2024	Basil, fresh leaves Basil, dried leaves	12062 12062
Tolfenpyrad	NAI	I	04/26/2024	Edible podded bean subgroup 6-22A	11299
Potassium phosphite[6]	HELENA, LUXEM, VLSCI	F	04/17/2024	Peanut	12705
Saflufenacil	BASF	H	05/20/2024	Pennycress, seed	13522
Fluazinam	ISK, SYNGEN	F	07/17/2024	Grape Strawberry Vegetable, brassica, head and stem, group 5-16 Vegetable, legume, bean, edible podded, subgroup 6-22A Vegetable, legume, bean, succulent shelled, subgroup 6-22C Vegetable, legume, pea, edible podded, subgroup 6-22B Vegetable, legume, pea, succulent shelled, subgroup 6-22D Vegetable, legume, pulse, bean, dried shelled, except soybean, subgroup 6-22E Vegetable, legume, pulse, pea, dried shelled, subgroup 6-22F	12715 11920 07091 13834 13835 13836 13837 13838 13839 13840
Clopyralid	CORTEVA	H	07/30/2024	Hazelnut (filbert)	12720
Flumioxazin	VALENT	H	08/06/2024	Avocado Banana Berry, low growing, subgroup 13-07G, except cranberry Celtuce Cottonseed subgroup 20C Cranberry Fennel, florence, fresh leaves and stalk Fig Fig, dried Guava Leaf petiole vegetable subgroup 22B Lychee Pulses, dried shelled bean, except soybean, subgroup 6-22E Pulses, dried shelled pea subgroup 6-22F Stevia, fresh leaves Stevia, dried leaves Sugar apple Swiss chard	10253 11289 13878 13443 13444 11962 13445 11545 11545 10254 13446 11290 13876 13877 12542 12829 12542 12829 11292 13447 11132

[6] Submitted to Registrant

				Vegetable soybean, edible podded Vegetable soybean, succulent shelled Cabbage Broccoli Tomato Cucumber	11132 12927 12928 12929 12930
Flutianil	LANDIS, NAI, OATAGRIO	F	12/06/2024	Brassica leafy greens subgroup 4-16B Hop, dried cones Lettuce, head Lettuce, leaf Peach subgroup 12-12B Vegetable, fruiting, group 8-10 Greenhouse cucumber	09184, 09187 12655 09180, 12388, 12374 10220 12289, 12288, 12287 12511
Ethephon	ADAMA	P	12/19/2024	Fig	10115
Prometryn	ADAMA, SYNGEN	H	12/20/2024	Leek	12131

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

ATTACHMENT 4 – 2024 Food Use Research Projects, New Residue Studies

Chemical	Crop	PR #
Afidopyropen	Grapefruit	13761
Afidopyropen	Lemon	13760
Chlorantraniliprole	Hemp	13000
Clethodim	Fig	13740
Cyclaniliprole	Onion, bulb and green	13595
Difenoconazole + Azoxystrobin	Avocado	13771
Ethephon	Ginseng	12613
Ethofumesate	Swiss chard	12714
Fluazaindolizine	Hops	13093
Fluazaindolizine	Pineapple	13665
Fluazifop-p-butyl	Pepper (bell & nonbell)	13798
Fludioxonil + Pydiflumetofen	Guava	13776
Flumioxazin + Pyroxasulfone	Cantaloupe	12582
Flumioxazin + Pyroxasulfone	Cucumber	12580
Flumioxazin + Pyroxasulfone	Squash	12581
Fluopicolide	Cherry	13281
Fluopyram	Fig	13744
Flutianil	Mint (field & GH)	13783
Flutriafol	Blueberry	13706
Flutriafol	Pistachio	13664
GF-4031	Cucumber (GH)	13290
GF-4031	Pepper (GH)	13545
GF-4031	Tomato (GH)	13289
Indaziflam	Camas	13689
Indoxacarb	Clover (seed crop)	13718
Isocycloseram (ISM-555)	Cucumber (GH)	13404
Isofetamid	Strawberry (GH)	12609
Linuron	Mint	13732
Linuron	Onion (green)	13734

Chemical	Crop	PR #
Linuron	Stevia	13733
Mefentrifluconazole	Broccoli	13741
Mefentrifluconazole	Cabbage	13779
Mesotrione	Sesame	13750
Metribuzin	Potato	13027
NAA	Hazelnut (filbert)	13705
NAA	Plum	13668
Norflurazon	Clover (seed crop)	13092
Oxathiapiprolin	Peach	13633
Oxathiapiprolin	Plum	13632
Oxathiapiprolin + Mandipropamid	Cacao bean	13635
Propamocarb-HCL	Hops	13736
Pyridaben	Lychee	08266
Pyridaben	Pepper (bell & nonbell) (GH)	08037
Quinclorac	Grape	12611
S-Metolachlor/Metolachlor	Carinata (Brassica carinata)	13631
S-Metolachlor/Metolachlor	Field pennycress	12868
Tolpyralate	Blueberry	13682
Tolpyralate	Hazelnut (filbert)	13679
Tolpyralate	Sweet potato	13703
Trifloxystrobin + Fluopyram	Pomegranate	11693
Zeta-cypermethrin	Beet greens (garden)	13648
Zeta-cypermethrin	Dragon fruit (pitaya)	13305
Zeta-cypermethrin	Hemp	13011

ATTACHMENT 5 – 2024 Food Use Product Performance Research Program

Chemical	Crop	PR#	Research Trial location
1-Aminocyclopropane-1-carboxylic acid (ACC)	Cherry	13334	CA, CA, MI
AC203	Strawberry	13756	CA, FL, MD
Afidopyropen	Safflower	13459	CA
Azoxystrobin	Cabbage (GH transplants)	13112	CA, MI
Azoxystrobin	Lettuce (GH transplants)	13109	CA, MI, VA
Azoxystrobin	Mint (GH transplants)	13108	TN
Bifenthrin	Onion	13485	OR
Chlorantraniliprole	Hemp	13000	AL, OR
Cyazofamid	Parsnip	13018	OR
Cyclaniliprole	Onion	13595	NY, OR
Cyflumetofen	Caneberry	11808	AR, CA
Difenoconazole + Azoxystrobin	Avocado	13771	FL
Ethephon	Ginseng	12613	MI, MI
Ethofumesate	Swiss chard	12714	NY, OH
Flazasulfuron	Peach	13323	CA, CA, MI, NC, NC, WA
Flazasulfuron	Strawberry	13322	AL, NC
Florpyrauxifen-benzyl	Pomegranate	13331	CA
Fluazaindolizine	Banana	13222	PR
Fluazaindolizine	Onion (dry bulb)	12770	CA
Fluazaindolizine	Pineapple	13665	HI
Fluazinam	Avocado	08284	CA
Fludioxonil + Pydiflumetofen	Basil	13078	NC
Fludioxonil + Pydiflumetofen	GH cucumber	12673	VA
Fludioxonil + Pydiflumetofen	Guava	13766	FL
Flumioxazin + Pyroxasulfone	Strawberry	12579	AL, FL, MD
Fluopyram	Fig	13744	CA
Fluroxypyr	Blueberry	13709	IN, NJ, OR
Flutriafol	Blueberry	13706	GA, MI, NC

Chemical	Crop	PR#	Research Trial location
Flutriafol	Pistachio	13664	AZ
GF-4031	Pepper (GH)	13545	AZ, FL
GF-4031	Strawberry	13355	CA
GF-4031	Tomato (GH)	13289	KY, WV
Glufosinate	Asparagus	13499	CA
Glufosinate	Strawberry	13455	CA, WA
Indoxacarb	Clover (seed crop)	13718	OR, OR
Inpyrfluxam	Tomato	13511	CA, FL
Isocycloseram (ISM-555)	Bean (snap)	12800	DE, NY
Mefenoxam	Passionfruit	13046	FL
Mefenoxam	Strawberry (GH transplants)	13716	MI, MI
Mefentrifluconazole	Broccoli	13741	AZ, CA, VA
Mefentrifluconazole	Cabbage	13779	AZ, CA, GA
Mefentrifluconazole	Hops	13505	OR
Mesotrione	Sesame	13750	AR, TX, TX
Novaluron	Blueberry	13532	FL, GA
Novaluron	Caneberry	13502	CA, GA
Novaluron	Celery	13614	FL, FL
Oxathiapiprolin	Peach	13633	CA, FL
Oxathiapiprolin	Plum	13632	CA
Oxathiapiprolin + Mandipropamid	Cacao bean	13635	HI
Penthiopyrad	Avocado	13075	PR
Penthiopyrad	Pomegranate	13514	CA
PHC68949 (PHC)	Sweet potato	13755	FL, NC
Pyraflufen-ethyl	Onion (dry bulb)	13642	CA, OR, WA
Pyraziflumid	Lettuce (GH)	12975	CT, NY
Pyridaben	Lychee	08266	FL, HI
Pyridaben	Miracle fruit	12562	FL, FL
Pyridaben	Pepper (bell & nonbell) (GH)	08037	NC, NY
Pyridate	Pea (edible podded and succulent shelled)	05295	DE, MD, NJ, NY

Chemical	Crop	PR#	Research Trial location
Pyroxasulfone	Bean, lima (succulent & dried shelled)	13382	DE, IN, MD, OH
Pyroxasulfone	Carrot	13723	CA, NY
Pyroxasulfone	Sesame	11951	TX
Quinclorac	Strawberry	11611	AL, OR, SC
Saflufenacil	Field pennycress (oil seed)	13522	MN, MN, MO
S-metolachlor/metolachlor	Carinata (Brassica carinata)	13631	GA, NC
Sulfentrazone	Pepper (nonbell)	09025	FL, FL, FL
Terbacil	Caneberry	11128	AR, NC, OH, OH, OR
Tiafenacil	Cucumber	13498	CA, CA, FL, OH
Tiafenacil	Hops	13282	ID
Tiafenacil	Tomato	13500	AZ, AZ
Tolpyralate	Blueberry (highbush)	13682	NJ, OR
Tolpyralate	Hazelnut (filbert)	13679	OR, OR
Uniconazole-P	Mint (GH transplants)	13530	FL, MI
Zeta-cypermethrin	Beat greens (garden)	13648	CA
Zeta-cypermethrin	Dragon fruit (pitaya)	13305	FL, PR
		Total	**148**

Attachment 6 - 2024 Environmental Horticulture Program Research Summaries

Pendimethalin Crop Safety- Pendimethalin has been registered in the United States since 1994 for uses in and around environmental horticulture plants in production nurseries and in landscapes. Between 1981 and 2023, the IR-4 Project has conducted 559 trials using two granular formulations (Corral 2.68G and Pendulum 2G), three liquid formulations (Pendulum AquaCap, Pendulum 3.3EC and Prowl 4E) and a wettable dry granular formulation (Pendulum WDG). Between 2014 and 2018, Pendulum 2G was examined for use on ornamental grasses. During 2020 and 2021, Pendulum 2G was a part of a project to examine options for field in-ground cut flower growers. This summary contains data across all the reports available through IR-4 since screenings began in 1981. Two hundred twenty-four (224) genera or species have been screened with the six different pendimethalin formulations. Sixty-three plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of Corral 2.68G and Pendulum 2G formulations, eight plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of Pendulum AquaCap and Pendulum WDG formulations, and six species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications of Pendulum 3.3 EC or Prowl 4E. This research has been beneficial for adding new crop to the Pendulum 2G and Pendulum WDG formulations.

S-Metolachlor Crop Safety- From 2004 to 2023, IR-4 completed 258 trials on Pennant Magnum (s-metolachlor). The data contained in this report was generated to register uses of s-metolachlor on and around environmental horticulture plants with over-the-top applications. The s-metolachlor rates in the testing program were 2.5, 5.0, and 10.0 pounds active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates with 4, 6, or 8 week intervals between applications. Pennant Magnum has been applied to 136 plant genera or species. Of these, 14 plant species exhibited no or minimal transient injury after application at all three rates. Thirteen (13) crops exhibited no phytotoxicity at 2.5 lb ai per acre but did have some injury at 5.0 and/or 10.0 lb ai per acre. Twenty-five (25) crops exhibited significant phytotoxicity at even the lowest rate. For 11 crops, the response among sites was variable, and 40 crops have less than three trials completed.

Flumioxazin Crop Safety- Flumioxazin has been registered in the United States since 2003 for uses in and around environmental horticulture plants in production nurseries and in landscapes. Between 2000 and 2023, the IR-4 Project has conducted 641 trials using three granular formulations (BroadStar 0.17G, BroadStar 0.25G and BroadStar 0.25G VC1604) and a wettable dry granular formulation (SureGuard 51WDG). During these trials, 168 crop species or genera were studied, although not all crops with all formulations: 149 with BroadStar formulations and 75 with SureGuard 51WDG). Sixty-seven plant species or genera exhibited no or minimal transitory phytotoxicity to applications of BroadStar G formulations. Twenty-five are not currently on the commercial BroadStar 0.25G registered label and can be added. For SureGuard 51WDG, seven plant species or genera exhibited no or minimal, transitory phytotoxicity to over-the-top applications; all these are already in the current label. Seven crops demonstrated significant phytotoxicity at all tested rates of SureGuard 51WDG with 3 or more trials. Twenty-four other crops exhibited significant injury in one or two trials. If a list of 'Sensitive Species' is added to the current label, these crops could be included.

Afidopyropen Crop Safety- Ventigra (afidopyropen) is an insecticide registered by BASF for the control of piercing and sucking insect pests such as aphids, whiteflies, psyllids, scales and leafhoppers. The IR-4 Project completed 120 crop safety trials on 46 environmental horticulture plant species or genera from 2015 through 2019. In these trials, 28 genera or species exhibited minimal or no injury after foliar applications in a minimum of 3 trials for each crop. Nineteen species or genera exhibited minimal or no injury in a limited number of trials (one or two) for each crop, and two crops exhibited variable responses (Aquilegia sp. and Dahlia sp.) so further screening for cultivar or species differences is necessary.

Mefentrifluconazole Crop Safety- Avelyo (mefentrifluconazole) is a fungicide developed by BASF that has been registered for use since May 2020. It is used for the control of diseases such as anthracnose, powdery mildew, leaf spot, scab, rust, and blight of environmental horticulture crops. The IR-4 Project has completed 111 crop safety trials on 27 environmental horticulture plant species or genera during 2019 to 2023. This summary contains data across all reports available through IR-4 since 2019, including efficacy experiments

where crop safety data were collected. Thirty-five species or genera exhibited no or minimal injury after drench or foliar treatments of Mefentrifluconazole. Twenty-five of the tested plants exhibited no injury across multiple trials, while the remaining ten plants showed the same with less than 3 trials. Crop species or genera not currently present on the label could be added based on this data, provided that BASF has similar results.

Fluopicolide Crop Safety- Fluopicolide was registered as Adorn 4SC in the United States in 2008 for control of Pythium, Phytophthora and downy mildew in environmental horticulture plants. State registrations in California and New York occurred in 2010 and 2011, respectively. Adorn 4SC may be applied on container, bench, or bed grown ornamentals in greenhouses, lathehouses, shadehouses or outdoor landscapes, and on conifers including Christmas trees in outdoor landscapes. The commercial label contains a list of 22 ornamental plants exhibiting no or minimal injury. During 2008 to 2011, the IR-4 Project completed 84 trials on 24 environmental horticulture plant species or genera examining phytotoxicity related to drench and foliar applications of Adorn 4F. In all trials except one, treated plants exhibited minimal or no injury to drench and foliar applications. Sufficient trials showed 16 species or genera exhibiting minimal or no injury. Of these, 5 are already on the Adorn label; Acer palmatum, Begonia sp., Calibrachoa sp., Juniperus sp., Petunia sp, Pinus sp., Quercus sp., Syringa sp, Taxus sp, Thuja sp, and Viburnum sp. are the 11 crops not yet listed. Based on this information, it is recommended that these be added to the list of tolerant plants on the Adorn 4F label.

Nematode Efficacy- Nematodes are typically known for the damage they cause when feeding on or residing inside roots. However, they also can impact foliage. The host range of foliar and soil dwelling nematodes is wide, affecting various environmental horticulture crops, and causing economic losses in greenhouses, nurseries, and residential and commercial landscapes. Soil dwelling nematodes feed on roots and depending on species can reduce root mass or cause root enlargement such as root knot nematodes. Foliar nematodes feed on mesophyll cells causing chlorosis which eventually turns into necrosis which is a serious problem. This summary and literature review is a compilation of experiments sponsored by IR-4 and published literature from 1999 through 2023. The only prospective nematicides for soil-dwelling nematodes with good to excellent efficacy in more than one IR-4 trial is Indemnify, but several show promise including Bountify, NemaFix, NMG-787, Reklemel, and Rootshield Plus. Products with good efficacy for foliar nematodes include: abamectin, acephate, clothianidin, dimethoate, insecticidal soap, isofenphos, methiocarb, neem oil, oregano oil, oxamyl and lambda-cyhalothrin. Active ingredients with excellent efficacy included: ammonia hydroxide, Burkholderia cepacia, chlofenapyr, cinnamon + clove + thyme oils (32% + 8% + 15%), diazinon, ethoprophos, grapefruit seed extract, imidacloprid, peroxyacetic acid, potassium permanganate, sodium dichloroisocyanurate, sodium hypochlorite, and trichlofon.

Bacterial Disease Efficacy- From 2008 to 2022, 83 products were tested through the IR-4 Environmental Horticulture Program as foliar or drench applications against bacterial pathogens. In addition to research collected through the IR-4 program, this summary includes a review of experiments conducted from 2005 to 2017, mainly on tree crops. Species tested included: Agrobacterium tumefaciens, Erwinia amylovora, E. chrysanthemi, Pseudomonas cichorii, P. marginalis, P. syringae, Pseudomonas sp., Xanthomonas axonopodis, Xanthomonas campestris, and Xanthomonas spp. In general, all products, including the standard copper containing bactericides (Camelot, CuPRO, Cuprofix, Cuprofix MZ, Junction, Kocide, MasterCop, Phyton 27, ReZist, etc.), mancozebs (Dithane, Penncozeb, Protect) and biologicals (Cease, Regalia, Rhapsody and Serenade), provided variable efficacy on these bacterial pathogens. Several new products that looked promising based on their efficacy relative to standards including, CG100, Citrex, HM-0736, Insimmo, Postiva, Proud 3, Stargus, Taegro, Tril-21 and ZeroTol. Further research is needed to obtain additional efficacy data to recommend actions to register or amend labels for these pests.

Mollusc Efficacy- Molluscs (slugs and snails) can cause significant feeding damage of environmental horticulture plants in production. Baits containg metaldehyde or iron phosphate are the primary means to manage molluscs. This project was initiated to examine the potential for active ingredients with less risky environmental and mammalian toxicity profiles to be effective molluscicides. To study options for managing snails, eleven (11) products with eight (8) different active ingredients were screened against the brown garden snail (Cyptomphalus apersus). Of these, two baits with metaldehyde (Deadline T&O and Metarex) provided

generally good management of the brown garden snail, although not strictly by causing mortality; in experiments where mortality was limited, plant damage was reduced to commercially acceptable levels. TC Powder provided variable efficacy, but further studies are warranted to determine how efficacy could be improved. SpinOut also provided inconsistent efficacy, but later studies demonstrated better plant protection than earlier experiments.

Fatty Acid Herbicide Efficacy- Fatty acid herbicides represent potential alternatives for managing glyphosate resistant weeds as well as an option for less environmental impacts for post emergent weed management. However, optimal use patterns have not been fully established. From 2020 to 2023, five different fatty acid herbicides were examined with and without adjuvants to determine optimal use patterns to manage grassy and broadleaf weeds as directed applications. The two different active ingredients screened were pelargonic acid (Axxe and Scythe) and the combination of caprylic acid + capric acid (FireWorxx, HomePlate, and Suppress). The weeds studied were annual bluegrass, (Poa annua), chickweed (Stellaria media), crabgrass (Digitaria sp.), smooth crabgrass (Digitaria ischaemum), field horsetail (Equisetum arense), redroot pigweed (Amaranthus retroflexus), and spotted/prostrate spurge (Chamaesyce maculata). Not all products were screened against all weeds, and no herbicide-weed combination was tested in three or more trials. Either solo or in combination with adjuvants, FireWorxx and Suppress provided excellent efficacy of smooth crabgrass, field horsetail, redroot pigweed and spotted spurge. Scythe provided great to excellent efficacy of these same weeds. HomePlate provided excellent efficacy for annual bluegrass and chickweed but variable efficacy for crabgrass. Axxe exhibited good to great efficacy for these same weeds.

Phytophthora Efficacy- Root rots caused by Phytophthora species are often not noticed until foliar symptoms of wilting and stunting are observed. Phytophthora root rots are difficult to manage there are multiple species with differential sensitivities to fungicides.Plus, they are classified as Oomycetes in the kingdom Chromista, commonly known as water molds, and can have a propensity to develop resistance to single site mode of action fungicides. Thus, Phytophthora diseases have been prioritized for research periodically at IR-4 workshops since 2003. From 2003 to 2015, 74 products representing 65 active ingredients were tested through the IR-4 Program as drench or foliar applications against eleven Phytophthora species causing root rots and stem/leaf blights in a total of 926 trials. Phytophthora species tested included: P. cactorum, P. cinnamomi, P. citricola, P. cryptogea, P. drechsleri, P. nicotianae/parasitica, P. palmivora, P. plurivora, P. ramorum, P. syringae, and P. tropicalis. For certain more prevalent and well-studied species, multiple products within several modes of action exhibited good to excellent management: P. cinnamomi, P. cryptogea, P. drechsleri, P. nicotianae, P. palmivora, P. ramorum, and P. tropicalis. For P. cactorum, none of the experiments provided separation among the treatments and controls. Control of P. 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 P. citricola, Adorn and the phosphorus acid generators provided good to great efficacy, but none of the typical oomycete fungicides were acceptable. For P. drechsleri root rot, the good to excellent efficacy was achieved with several products including BioPhos, Segway, Stature DM, and Terrazole. For P. 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. For P. ramorum blights, Subdue MAXX provided the most consistent control. Adorn, Fenamidone, Insignia, Segway, and Stature also provided good control. For P. plurivora, 7 products provided good to excellent activity, but only two experiments have been completed so far. For P. syringae, only the phosphorous acid generators provided acceptable reduction in disease in two experiments. For P. tropicalis, the best control was achieved with Adorn and Stature. Several products have good to excellent efficacy across multiple Phytophthora species: Adorn, Disarm, Fenstop, Micora, Orvego, Segway, Stature, and Subdue Maxx, plus certain phosphorous acid generating products.

Attachment 7 - 2024 Environmental Horticulture Program Research Activities

Discipline	Project	Researchers	Crops	Products	Trials
Entomology	Aphid Efficacy	2	1	12	21
	Beneficial Insect Chemistry Screen	1	N/A	3	6
	Borer & Beetle Efficacy	1	1	1	1
	Lygus Efficacy	1	1	5	5
	Scale Efficacy	5	6	12	46
	Thrips Efficacy	6	2	13	44
	BW400 Crop Safety	3	9	1	14
	Cyclaniliprole Crop Safety	3	3	1	6
	Horticulture/Mineral Oil Crop Safety	2	1	6	7
	ISM-555 Crop Safety	5	6	1	8
	Neem oil + Azadiractin Crop Safety	1	5	1	5
	NI02ES-1 Crop Safety	4	8	1	21
	Rosemary Oil Crop Safety	1	3	1	4
	V-10433 Crop Safety	3	3	1	3
	RM-1963K Crop Safety	5	14	1	21
Plant Pathology	Botrytis Efficacy	2	6	11	22
	Phytophora Efficacy	4	2	8	32
	Pythium Efficacy	2	2	7	14
	Vascualr Streak Dieback	1	1	12	12
	Nematode Efficacy	1	1	14	14
	Boxwood Blight, Decline and Volutella	4	1	8	29
	Fluazaindolizine Crop Safety	1	2	1	2
	TDA01 Crop Safety	3	6	1	8
	BAS 673 Crop Safety	6	10	1	21
	BW159 Crop Safety	5	8	1	14
	F6123 Crop Safety	1	2	1	4
	XDE-659 Crop Safety	4	4	1	4

	Flutianil Crop Safety	2	2	1	2
	Mandestrobin Crop Safety	3	5	1	5
	ND05AS-1 Crop Safety	3	6	1	8
	Picarbutrazox Crop Safety	4	5	2	12
	Pyriofenone Crop Safety	4	7	1	8
	SP2478 Crop Safety	2	4	1	4
	SP2700 Crop Safety	1	1	1	2
	Thyme Oil Crop Safety	3	4	1	8
Weed Science	Dimethenamid-p Crop Safety	6	13	1	16
	Dimethenamid-p + Pendimethalin Crop Safety	8	16	1	20
	Dithiopyr Crop Safety	2	5	1	5
	Flumioxazin + Prodiamine Crop Safety	1	3	1	3
	Flumioxazin + Pyroxasulfone Crop Safety	3	1	1	3
	Flumioxazin Crop Safety	1	1	1	1
	Imazapic Crop Safety	3	7	1	13
	Indaziflam Crop Safety	2	3	2	3
	Isoxaben + Dithiopyr Crop Safety	5	8	1	8
	Oxyfluofen + Pendimenthalin Crop Safety	3	5	1	5
	Oxyfluorfen + Prodiamine Crop Safety	4	7	1	8
	Pendimethalin Crop Safety	11	24	3	39
	Prodiamine + Isoxaben Crop Safety	4	5	1	5
	S-Metolachlor Crop Safety	9	18	1	37
	SP1182/SP1190 Crop Safety	6	27	1	34
	Tiafenacil Crop Safety	4	3	1	8
	Tolpyralate Crop Safety	4	2	1	6
	Topramazone Crop Safety	4	3	1	8
	Trifluralin + Isoxaben Crop Safety	4	8	1	10

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