2022 ANNUAL REPORT

Pest management solutions for
specialty crops and specialty uses

ANNUAL REPORT OF THE IR-4 PROJECT
January 1, 2022 - December 31, 2022

1. Introduction

The IR-4 Project's mission is to support the registration of safe and effective chemical and bio-based pesticides 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 exists because specialty crops and minor uses often lack the economic return for the private sector to justify investing research and development resources into 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 a realistic exposure estimate that they use in dietary risk assessment associated with product registrations.
- Product performance testing (efficacy/crop safety projects) on food and non-food specialty crops. This provides assurances that the use of a crop protection product is safe and effective.
- Submission to EPA proposals to expand crop groups/subgroups that allow data from a few 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 and small businesses.
- 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 2022

Food Use Program	Environmental Horticulture Program
EPA publication of actions that established 694 new tolerances for 13 active ingredients. These tolerances support 750 potential new uses on food crops (Attachment 2).	Additional data received prior to commercial label launch augmented a previous EPA registration supporting 41 additional Environmental Horticulture crop uses

3. Registration Support Actions in 2022

Food Use Program	Environmental Horticulture Program

● IR-4 submitted to EPA 13 tolerance petitions that covered 101 unique requests (PR #s) for assistance and crop group tolerance updates (Attachment 3A)
● 22 data packages were completed but not submitted (Attachment 3B)
● 48 draft final reports were submitted to IR-4's Quality Assurance Unit for Good Laboratory Practice compliance auditing
● 75 Product Performance Reports and 43 Integrated Solutions Reports were posted and/or provided to cooperating companies
● Biopesticide registration actions included:
  ○ 3 new registration submissions to EPA - AF36 Prime organic formulation, noni fruit and leaves, homeowners formulation of sucrose octanoate esters
  ○ 4 responses to EPA regulatory reviews - American chestnut, FourSure, AF36 Prime, sucrose octanoate esters
  ○ In addition, three pre-submission meetings were held with EPA
● International
  ○ Provided technical leadership in International Priority Setting Workshops, project planning and implementation
  ○ Conducted capacity building on biopesticide regulations and Good Laboratory Practices
  ○ Developed workflow plans and assisted in the structure of a new international database
  ○ Recruited countries in Europe and developed nations to promote harmonization of residue data development and MRLs
  ○ Provided technical advice in the development of an import MRL program for mutual acceptance of tolerances to promote export of US commodities to Southeast Asia
	Twenty research summaries were provided to companies to support new or update existing registrations (see summaries in Attachment 6); 5,070 field and greenhouse trials contributed to these summaries; trials came from the following IR-4 Units:
	● North Central Region 587 trials
	● Northeast Region 880 trials
	● Southern Region 1,519 trials
	● Western Region 953 trials
	● ARS Cooperative sites 1,125 trials

4. Research in 2022

Summary of Research Study / Projects

Food Use Program	Environmental Horticulture Program
● 47 Magnitude of the Residue Studies (Attachment 4); 347 total field trials (324 New/23 Carryover) ● 41 Product Performance projects (Attachment 5) involving 93 efficacy/crop safety trials ● 60 field trials that contributed to 28 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: ○ 13 Facility audits ○ 138 In-life Inspections of field sites ○ 66 In-life Inspections of analytical laboratories ○ 323 Field Databook audits ○ 37 Analytical Summary Report audits ○ 50 Final Report audits IR-4 also successfully completed 2 inspections by EPA, and QA audited two contributing scientist reports	● Environmental Horticulture Program 626 field and greenhouse trials (321 efficacy, 305 crop safety) that contributed to 50 projects (see research trial details in Attachment 7)

2022 Research Trial Distribution

Cooperating Region	Food Use Residue Trials	Food Use Product Performance Trials	Integrated Solutions Trials	Environ. Hort. Product Performance Trials
North Central Region	49	10	8	67
Northeast Region	28	12	11	73
Southern Region	90	35	16	229
Western Region	128	32	25	138
ARS Sites	46	0	0	119
Canadian Sites	6	1	0	0
TOTAL	347	90	60	626

Analytical Laboratory Status

	Awaiting Analysis	Analysis in Progress	Analysis Complete-Preparing Report
Southern Region Lab	16	8	0
Western Lab	13	6	11
ARS Tifton Lab	8	4	6
ARS Wapato Lab	13	2	9
Other Labs	19	11	3
TOTAL	69	31	29

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 that develops data required for registrations. IR-4 has many positive impacts, including:

- Based on EPA actions, IR-4 data supported 750 potential new registrations on food crops in 2022 and positively influenced 41 uses on non-food crops. These new registrations help producers grow an abundance of high-quality food and ornamental crops needed and desired by consumers, help growers remain profitable, contribute to our well-being, and help to bolster rural economies while respecting the environment. Food processors and food retailers benefit in having a consistent supply of high-quality produce and/or raw materials to meet consumer demand or keep their processing facilities open and operational. The public benefits through having an abundant choice of healthy vegetables, fruits, nuts and other foods available at reasonable prices, as well as having ornamental horticulture plants to enhance the landscape and environment. IR-4's actions also prevent food waste throughout the supply chain at the farm to the consumer.
- The IR-4 Project has been a major contributor to the advancement of Integrated Pest Management (IPM) tactics through 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 the USA/Canada Crop Groups/Sub-Groups. Once approved and implemented, these 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. The sixth Final Rule in a series of updates to pesticide crop groupings was published in the Federal Register. Revisions were made to Crop Group 6 (Legumes), Crop

Group 7 (Foliage of Legume Vegetables), Crop Group 15 (Cereal Grains) and Crop Group 16 (Forage, Fodder and Straw of Cereal Grains).

- Michigan State University's Center of Economic Analysis reported the economic impact of IR-4 Project's activities supports over 111 thousand domestic jobs with a total annual payroll of $5.34 billion in 2021 dollars. When accounting for all sources of national income, the IR-4 Project is estimated to contribute $8.97 billion to annual gross domestic product, including direct and secondary effects, which measures how dollars are re-spent throughout the economy. Several channels of economic contribution go into these measures, including direct expenditures of the IR-4 Project, anticipated crop losses mitigated under each of the two IR-4 Programs, through Biopesticide Regulatory Support and through gaining EPA exemptions for pesticide use when few or no other options for pest management exists. Recognizing that benefits realized today come from over 50 years of IR-4 Project efforts, we show that we can attribute about seven jobs today for every $1,000 in annual public investment in the IR-4 Project. See https://www.canr.msu.edu/resources/economic-impact-of-the-ir-4-project-and-programs-2022 for details.
- 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 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.

6. Congressional Appropriations and other funding

Summary of IR-4 funding

Source	Amount	Administration	Activities covered
USDA-Minor Crop Pest Management (IR4) grant	$14.5 million	Competitive four-year grant to NC State	All core IR-4 research program and activities
USDA-ARS	$3.170 million	Contribute to and supports IR-4 research priorities	Funding of USDA-ARS scientists and activities[1]
National Research Support Program	$0.481 million	Competitive five-year grant awarded to NC State	Salaries and activities of IR-4 Headquarters
Various industry contributions-Food	$1.10 million	Unrestricted donations to IR-4 Project @ NC State	All IR-4 Project activities and expenses[2]

[1] USDA-ARS allocates a small amount of its Congressional Appropriation funds to support the salary and other expenses for USDA-ARS personnel involved with high priority IR-4 research projects within IR-4's Food Use and Environmental Horticulture programs. Participating ARS scientists are given specific research assignments that complement the on-going research of the scientists at the SAES. From these funds, USDA-ARS contributes about $105,000 to IR-4 Headquarters that funds Environmental Horticulture research at Rutgers Tree Fruit & Ornamental Research and Education Center, as well as cost of travel for IR-4 Quality Assurance Unit personnel to perform required on-site critical phase audits at ARS Field Research Centers.

[2] Crop Protection companies and commodity associations provided $1.1 million of unrestricted funds that are used to supplement other IR-4 funds. This includes performing additional field trials, analytical analyses, funding purchase supplies for research (e.g. GLP level sample bags), supplementing the cost of operations for IR-4 HQ, including additional expenses associated with the move to North Carolina State University, conducting the priority-setting workshops/other meetings and miscellaneous matters.

Various industry contributions-Environmental Hort.	$0.11 million	Unrestricted donations to IR-4 Project @ Rutgers University	Expense in Environmental Horticulture Research
USDA-APHIS	$0.20 million	Grant to Rutgers University	Invasive species research on environmental horticulture crops
Minor Use Foundation	$0.1 million	Funds to NC State	Used to support IR-4 activities of global harmonization of pesticide regulations and training
USDA-Foreign Ag Service	$0.1 million		
Center for Excellence in Regulatory Science in Agriculture	$0.1 million		

Allocation of the 2022 USDA-Minor Crop Pest Management (IR4) funds

Amount	Use
$8,762,458	Distributed to the four IR-4 Regional offices and Headquarters for personnel, supplies, equipment; laboratory analysis and other core expenses
$1,942,500	Allocated for field trials that produce the necessary residue samples
$500,500	Allocated for field trials that develop product performance data in food crops
$418,500	Allocated for field trials that develop data in IR-4 Integrated Solutions research
$504,240	Allocated for field trials that develop product performance data in non-food crops
$1,025,440	Kept by NIFA to help fund their operations
$1,482,189	Provided to host institutions as indirect costs

In-kind contribution estimates to IR-4

Estimate	Source
$6,000,000	SAES/land grant universities by hosting IR-4 field research centers, analytical laboratories and management offices throughout the United States
$6,000,000	EPA Pesticide Registration Improvement Act fee waivers
$14,000,000	Crop protection industry (their in-kind contributions are based on 1:1 match of NIFA funds)
$500,000	The government of Canada also makes significant in-kind contributions

7. New requests for assistance / Plans for the future

Food Use Program	Environmental Horticulture Program
● In 2022, 203 new requests were entered into the IR-4 food use database, of which 122 were new stakeholder requests or for International needs and 81 were created by HQ for commodity/subgroup/crop group tolerance revisions, referencing old PR#s, etc. The comprehensive total at the end of 2022 was 13594. ● The IS program received 15 new requests in 2022. ● IR-4 stakeholders prioritized "researchable" Requests for Assistance at the 2022 Food Use Workshop and identified 45 Magnitude of the Residue Studies, 17 product performance projects and 18 Integrated Solution projects as the highest priority for research in 2023. ● In the 2023 Food Crop Program, IR-4 will be focusing on the new research priorities, as well as some carryover projects (370 Magnitude of the Residue trials, 141 Product Performance trials, 73	● Priorities for the Environmental Horticulture Program were established in the 2021 virtual priority setting workshop. ● Three new requests were received for EHC research projects. Two were the European Corn Borer to be able to ship plants into California. This was added as a regional project for 2023 based on regional support but was not selected by researchers. The other request was for Vascular Streak Disease; this was added as a regional project and selected for research for 2023.

Integrated Solutions trials & 581 Environmental Horticulture trials), according to the field trials distribution below • New active ingredients approved by the PMC as Biopesticide regulatory support projects included the RNAi of red palm weevil and the attenuated strain of cucumber green mottle mosaic virus	

Summary of 2023 Research Trial Distribution:

Cooperating Region	Food Use Residue Trials	Food Use Product Performance Trials	Integrated Solutions Trials	Environ. Hort. Product Performance Trials
North Central Region	76	16	7	76
Northeast Region	30	18	11	60
Southern Region	71	48	21	171
Western Region	127	59	34	157
ARS Sites	55	0	0	117
Canadian Sites	11	0	0	0
TOTAL	370	141	73	581

PUBLICATIONS IN 2022

Axtell, A. and Pedibhotla V. 2022. Pesticide use nearby rivers & other water bodies: tips for reducing pesticide loss & novel technologies. EPA webinar series: Reducing pesticide in water in indian country thru integrated pest management

Axtell, A. and Batts, R. 2022. Fall 2022 sweet potato update (handout) - the IR-4 project. NCSU sweet potato field day

Ballantyne, A. 2022. Crop Vignette: Hibiscus. Crop Vignette: Hibiscus – IR-4 Project (ir4project.org)

Ballantyne, A. 2022. Crop Vignette: Phlox. Crop Vignette: Phlox – IR-4 Project (ir4project.org)

Ballantyne, A. and Palmer, C.L. 2022. Crop Vignette: Clematis. Crop Vignette: Clematis – IR-4 Project (ir4project.org)

Batts, R.B., J. J. Baron, and V. K. Pedibhotla. 2022. IR-4: Weed Science Update - Food Crops. Weed Science Society of America annual meeting. Abstract #151

Batts, R.B., J. J. Baron, and V. K. Pedibhotla. 2022. IR-4: Weed Science Update - Food Crops. Western Society of Weed Science annual meeting. Abstract #111

Batts, R.B., J. J. Baron, and V. K. Pedibhotla. 2022. IR-4: Weed Science Update - Food Crops. North Central Weed Science Society annual meeting. Abstract #150

Braverman, M., W. Barney, P. Moore and J. Baron. 2022. Regulatory requirements for biopesticides and emerging technologies. Association of Applied Biologists Meeting, "Bringing Biocontrol and IPM to Market," Abstract, Page 29

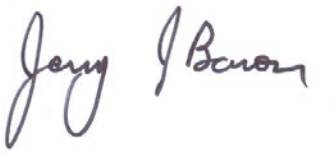
Frank S., Gilrein D., Havers M., and Palmer C. L. 2022. Box Tree Moth: Fact Sheet, Management & Visual Guide. BTM_FactSheet_VisualGuide.pdf (ncsu.edu)

Palmer, C. L. 2022. Crop Vignette: Poinsettia. Crop Vignette: Poinsettia – IR-4 Project (ir4project.org)

Salazar, C. S., LeBlanc N., Daughtrey M. L., Hausbeck M., Palmer C., Shishkoff N., Warfield C., and Crouch J. A. 2022. The impatiens downy mildew epidemic in the U.S. is caused by new, introgressed lineages of *Plasmopara destructor* with prominent genotypic diversity and high evolutionary potential. Plant Disease. https://doi.org/10.1094/PDIS-08-22-1872-RE

December 31, 2022

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. 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:

Michael Aerts, Florida Fruit and Vegetable Association
Mark Arney, National Watermelon Promotion Board
Michael Bledsoe, Village Farms, L.P.
Jennifer Clarke, California Leafy Greens Research Program
James R. Cranney, California Citrus Quality Council
Allison Crittenden, American Farm Bureau Federation
Alan DeYoung, Van Drunen Farms
Maggie Elliot, Hops Growers of America (starting 9/2022
William Frantz, Cranberry Institute
Ann E. George, Washington Hop Commission (until 9/2022)
Michele Grainger, NC Sweet Potato Commission
Bob Jones, The Chef Garden
Bob Kaldunski, Ginseng Board of Wisconsin
Michael Martin, Horticulture Research Institute
Armando Monterroso, Brooks Tropicals
Keith Pitts, Bioceres Crop Solutions
Amy Plato-Roberts, Lallemand Plant Care
Kan Quarles, National Potato Council
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.
Bob Simerly, National Onion Association
Berry Tanner, National Watermelon Association (alternative)
Dave Trinka, MBG Marketing
Amy Upton, Michigan Nursery & Landscape Association
Lee Van Wychen, Weed Science Society of America
Herman Waguespack, American Sugar Cane League

B. **Cooperating Government Departments and Agencies**

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

C. Crop Protection Industry – Companies with products involved in IR-4's research in 2022 include:

Company	Food Residue Study	Food Crop Product Performance	Integrated Solution	Environmental Horticulture
Adama	X	X	X	X
Agbiome			X	
Agrospheres			X	
Albaugh	X			
Ascribe BioScinece			X	X
AMVAC	X	X	X	X
BASF Corporation	X	X	X	X
Bayer Crop Science	X	X	X	
Bayer Environmental Sciences (Envu)				X
Belchem Crop Protection	X			
Bioworks			X	X
Ceradis			X	
Certis USA			X	
Corteva Agrisciences	X	X	X	X
Engage Agro USA				
FMC Corporation	X	X	X	X
Gowan Company	X			X
Helm Agro	X			
ISK Biosciences	X	X	X	X
Jet Harvest			X	
KI-Chemical	X	X		
Kemin Crop Technologies			X	X
Landis International	X		X	X
Marrone Bioinnovations (ProFarm)			X	X

Nichino America	X	X	X	
Nisso	X	X		X
NuFarm America	X	X		X
OAT Agro			X	X
SePro Corporation			X	X
Stepan				X
Company	Food Residue Study	Food Crop Product Performance	Integrated Solution	Environmental Horticulture
Summit Agro			X	
Syngenta Crop Protection	X	X		X
Tide International			X	
TKI Novasource	X		X	
Ultraquimia			X	
Valent USA, LLC	X	X	X	X
Vestaron			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. Matt Hengel*, University of California, Davis - Regional Director, Western Region
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. Michele Samuel-Foo, USDA-NIFA-National Program leader
Mr. Todd Scholz*, USA Dry Pea and Lentil-CLC Chair
Dr. Alvin Simmons*, USDA-ARS – Director Minor Use Program
Dr. John Wise*, Michigan State University – Regional Director, North Central Region, and PMC Chair
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 - Principal Entomologist
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 (Rutgers Univ.)
Dr. Michael Braverman – Biopesticide & Organic Support Program Manager & International Capacity Building (Rutgers Univ.)
Mr. James Byrtus – Lead Research Associate - Regulatory Sciences
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 – Quality Assurance Auditor
Ms. Shiayi Huang - Data Applications Manager
Ms. Katherine Jaworski - Research Assistant - Research Planning
Ms. Grace Lennon – Senior Regulatory Associate
Ms. Cristina Marconi - Study Director

IR-4 Project Headquarters (HQ) continued

Dr. Johanna Mazlo - National Quality Assurance Unit Manager
Mr. Philip Moore - Study Director
Mr. Scott Muir - Quality Assurance Auditor
Dr. Cristi Palmer – Environmental Horticulture Program Manager (Rutgers Univ.)
Dr. Jaimin Patel – Principal Plant Pathologist
Dr. Venkat Pedibhotla – Assist. Director for Research Planning and Product Performance
Mr. Thomas Pike – Study Director
Ms. Hannah Ross – National Information and Communications Officer
Dr. Dan Rossi - Senior Management Associate
Mr. David Schnatter - Business Operations Associate
Dr. Van Starner – Senior Management Associate
Ms. Juliet Thompson – Research Specialist, Quality Assurance
Mr. Robert Welker - Study Director

A. Regional/ARS Field Coordinators and Staff

Dr. Kari Arnold, Field Coordinator-Western Region
Dr. Michael Horak, Field Coordinator-Western Region
Ms. Megan James, Assistant Field Coordinator- Northeastern Region
Ms. Mika Pringle Tolson – Field Program Assistant- Western Region
Ms. Marylee Ross, Field Coordinator–Northeast Region
Ms. Kristen Searer-Jones, Assistant Field Coordinator-Southern Region
Dr. Alvin Simmons, Field Coordinator-USDA-ARS – ARS Office of Minor Use Pesticides
Ms. Nicole Soldan, Field Coordinator-North Central Region
Dr. Janine Spies, Field Coordinator–Southern Region

B. Laboratory Coordinators (Regional and ARS)

Dr. Sue Erhardt, Michigan State University – North Central Region
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

C. Quality Assurance Unit

Dr. Martin Beran, University of California, Davis
Dr. Zhongxiao (Michael) Chen, Michigan State University (until 11/2022)
Ms. Jane Forder, North Carolina State University
Ms. Kathleen Knight, University of Florida
Ms. Lisa Latham, Michigan State University
Dr. Johanna Mazlo, North Carolina State University
Mr. Scott Muir, North Carolina State University
Ms. Sherita Normington, University of California, Davis
Ms. Juliet Thompson, North Carolina State University
Dr. Yavuz Yagiz, University of Florida

I. IR-4 Researcher & State Liaison Representatives

SLR=State Liaison Representative (W/- F=Food and – EH=Environmental Horticulture
R= Residue Field Trials/Food Program
PP= Product Performance/Food Program
IS= Integrated Solutions
EH= Environmental Horticulture Program
*= USDA - Agriculture Research Service Researcher

North Central Region

State	Person (Role)
IA	D. Mueller (IS)
IL	
IN	J. Beckerman (P) (IS) (EH), S. Meyers (SLR)
KS	R. Cloyd (SLR-EH)
MI	S. Chaudhari (R) (P), M. Hausbeck (R) (P) (IS) (EH), D. Saha (EH), C. Wheeler (R)
MN	V. Krischik (SLR), A. Robinson (SLR)
MO	R. Smeda (SLR)
ND	A. Robinson (SLR)
NE	A. Jhala (SLR)
OH	D. Doohan (SLR), (P), F. Hand (EH), C. Herms (IS), L. Horst* (R), H. Mathers (EH), M. Reding* (EH), A. Robinson (R) (P) (EH)
SD	G. Reicks (SLR), (R) (P)
WI	S. Chapman (R) (P), D. Heider (SLR) (R) (P),

Northeast Region

State	Person (Role)
CT	J. Aulakh (SLR) (EH)
DE	B. Kunkel (EH), D. Owens (SLR), (P), (IS), M. VanGessel (P) (IS)
DC	
NH	Anna Wallingford (SLR)
NJ	T. Besancon (SLR) (P) (IS), D. Bodine (EH), J. Fisher (R), C. Rodriguez-Saona (IS)
NY	N. Catlin (EH), D. Gilrein (P) (EH), M. McGrath (P) (IS), B. Nault (P) (IS), A. Senesac (EH), C. Smart (IS), L. Sosnoskie (SLR) (P) (IS), A. Taylor (P)
MA	S. Scheufele (SLR) (IS)
ME	L. Calderwood (SLR)
MD	D. Cochran (EH), M. James (R), M. Ross (R), A. Kness (SLR)
PA	C. Brunharo (P), K. Demchak (P), G. Krawczyk (SLR), K. Peter (IS)
RI	H. Faubert (SLR),
VT	A.Hazelrigg (SLR)
WV	C. Quesada (SLR)

Southern Region

State	Person (Role)
AL	A. da Silva (IS), E. Vinson (SLR)
AR	M. Bertucci (P), N. Burgos (SLR)
FL	J. Beuzelin (P), N. Boyd (P), D. Carrillo (P), J. Crane (P), A. Dale (EH), N. Dufault (IS), J. Desaeger (IS), P. Devkota (P), P. Dittmar (P) (SLR), M. Frost (R), R. Gazis (P), S. Lahiri (P), O. Liburd (IS), M. Long (R), C. Marble (EH), D. Norman (EH), N. Peres (P), R. Raid (P), D. Sutherland (R), R. Tannenbaum (R), D. Thomas (R), G. Vallad (P), K. Viana (P)
GA	S. Culpepper (SLR), B. Fraelich* (R) (EH), A. Sial (IS),A.Sparks (IS), S. Villanassery (EH)
KY	R. Bessin (SLR) (P), N. Gauthier (P) (IS), J. Larson (EH), R. Villanueva (IS),
LA	T. Watson (SLR), B. Wilson (P)
MS	A. Henn (SLR), F. Musser (P), M. Shankle (IS)
NC	A. Huseth (P), K. Jennings (P) (IS), I. Meadows (EH), W. Mitchem (P), D. Monks (SLR), J. Neal (EH), L. Quesada (P) (IS), S. Smith (R), S. Villani (IS)
OK	C. Luper (SLR)
PR	R. Feliciano (P), D. Rivera (EH), W. Robles Vazquez (R) (P) (IS) (SLR)
SC	J.C. Chong (EH), M. Cutulle (SLR) (IS), P. Wade* (R) (EH)
TN	F. Baysal-Gurel (EH), K. Addesso (EH),, Z. Hansen (SLR), A. Witcher (EH)
TX	K. Cochran (R), P. Dotray (P), T. Jones (R), C. Ferguson (P), M. Matocha (SLR), B. Ripple (R), R. Splichal (R)
VA	J. Derr (EH), M. Flessner (IS), D. Frank (SLR)

Western Region

State	Person (Role)
AK	P. Kaspari (SLR)
AZ	A. Hu (SLR)
CA	J. Adaskaveg (P) (IS), B. Aegerter (P), S. Benzen*, (R), W. Brim-DeForest (IS), M. Bolda (P), J. Del Dastillo Munera (P) (EH), D. Ennes (R), A. Eskalen (EH), S. Fennimore (P), C. Gispert (IS), B. Hanson (P), M. Horak (SLR), C. Kron (IS), N. Leach (R), M. Lloyd (IS), , P. Mauk (P) (IS), C. Nansen (EH), J. Sidhu (P), K. Skiles (R), R. Smith (P), S. Stoddard (P) (IS), T.Tian (IS),T. Turini (IS), B. Turner (R), B. Uber (EH), S. Watkins (R), H. Wilson (P) (IS), S. Zukoff (P) (IS)
CO	C. Oman (R), J. Klett (EH), J. Stewart (SLR), A. Szczepaniec (IS)
GU	R. Miller (SLR)
HI	Z. Cheng (EH), J. Coughlin (SLR) (R) (P) (IS) , J. Kam (R)
ID	R. Hirnyck (SLR), W. Meeks (R) (P) (IS)
MT	Z. Miller (SLR) (P)
NM	C. Robbins (SLR)
NV	M. Kaur Walia (SLR)
OR	N. Andersen (P), K. Buckland (P) (IS), K. Galimba (IS), A. Hulting (P) , D. Lightle (SLR) (R) (IS), M. Moretti (P) (EH), C. Ocamb (P), E. Peachey (P), L. Santamaria (EH), V. Walton (IS), J. Weiland* (EH)
UT	C. Ransom (SLR)
WA	G. Chastagner (EH), D. Larson* (R) (EH), W. Peng (R) (IS), D. Walsh (SLR) (P)
WY	B. Stump (SLR)

ATTACHMENT 2 – 2022 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
Ethaboxam	VALENT	F	01/26/2022	Brassica, leafy greens, subgroup 4-16B		11877	20	1
				Vegetable, Brassica, head and stem, group 5-16		10680 11870	5	1
Cyprodinil	SYNGEN	F	01/27/2022	Brassica, leafy greens, subgroup 4-16B, except watercress		12964	12	1
				Celtuce	4	12966	0	1
				Fennel, Florence, fresh leaves and stalk	4	12967	0	1
				Kohlrabi	4	12936	0	1
				Leaf petiole vegetable subgroup 22B		12965	3	1
				Leafy greens subgroup 4-16A, except parsley, fresh leaves		12968	17	1
				Lemon/lime subgroup 10-10B	2	12969	10	1
				Sugar apple		07119	3	1
				Tropical and subtropical, small fruit, inedible peel, subgroup 24A		12970	18	1
				Vegetable, Brassica, head and stem, group 5-16		12962	5	1
Fludioxonil	SYNGEN	F	02/09/2022	Carrot, roots	6		0	1
				Celtuce	4	12956	0	1
				Cottonseed subgroup 20C	2	12953	0	1
				Dragon fruit		12400	0	1
				Durian		12961	1	1
				Fennel, Florence, fresh leaves and stalk	4	12957	0	1
				Jackfruit		12974	1	1
				Leaf petiole vegetable subgroup 22B		12954	3	1
				Leafy greens subgroup 4-16A		12955	18	1
				Mangosteen		12960	1	1
				Persimmon, Japanese		12900	1	1
				Sunflower subgroup 20B	2	12958	13	1
				Tropical and subtropical, small fruit, inedible peel, subgroup 24A		12996	18	1
					6		0	1

				Vegetable, legume, group 6, except bean, dry and bean, succulent	6		0	1
				Vegetable, root, except sugar beet, subgroup 1B, except carrot and ginseng	6		0	1
				Vegetable, tuberous and corm, subgroup 1C, except yam, true, tuber				
Buprofezin	NAI	I	03/10/2022	Individual commodities of Proposed Crop Subgroup 6-18A: Edible podded bean subgroup	2	12952	24	24
				Bushberry subgroup 13-07B		11983	19	1
Pest Control Agent	**Registrant**	**Type***	**Date**	**Commodity or Crop Group**	**Note**	**PR#**	**# of Uses**	**# of Tolerances**
Mandestrobin	VALENT	F	05/12/2022	Lettuce, head		11027	1	1
				Lettuce, leaf		11027	1	1
Pyriofenone	ISK	F	07/05/2022	Pepper/eggplant subgroup 8-10B		11447	0	1
				Tomato subgroup 8-10A		11448	0	1
Tribenuron-methyl	FMC, NUFARM	H	07/15/2022	Individual commodities of Proposed Crop Subgroup 6-18E: Dried shelled bean, except soybean, subgroup		11980	50	50
				Individual commodities of Proposed Crop Subgroup 6-18F: Dried shelled pea subgroup		12245	10	10
				Rapeseed subgroup 20A	2	13187	16	1
				Cottonseed subgroup 20C	2	13188	0	1
				Individual commodities of Proposed Crop Subgroup 15-20A: Wheat subgroup	2	13189	30	120
				Individual commodities of Proposed Crop Subgroup 15-20B: Barley subgroup	2	13190	7	22
				Individual commodities of Proposed Crop Subgroup 15-20C: Field corn subgroup	2	13191	2	6
				Individual commodities of Proposed Crop Subgroup 15-20E: Grain sorghum and millet subgroup	2	13192	10	30
				Individual commodities of Proposed Crop Subgroup 15-20F: Rice subgroup	2	13193	3	3
Isofetamid	ISK	F	07/29/2022	Ginseng		12000	1	1
				Individual commodities of Proposed Crop Subgroup 6-19A: Edible podded bean legume vegetable subgroup		13206	17	25
				Individual commodities of Proposed Crop Subgroup 6-		13207	3	10

				19B: Edible podded pea legume vegetable subgroup				
				Individual commodities of Proposed Crop Subgroup 6-19C: Succulent shelled bean subgroup		13208	17	22
				Individual commodities of Proposed Crop Subgroup 6-19D: Succulent shelled pea subgroup		13209	2	6
				Individual commodities of Proposed Crop Subgroup 6-19E: Dried shelled bean, except soybean, subgroup		13210	25	50
				Individual commodities of Proposed Crop Subgroup 6-19F: Dried shelled pea subgroup		13211	6	8
Glufosinate	BASF, UPL NA	H	09/21/2022	Avocado		10240	1	1
				Bushberry subgroup 13-07B		13020	14	1
				Cottonseed subgroup 20C	2	13022	0	1
				Fig		11547	1	1
				Fig, dried		11547	0	1
				Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F	2	13023	5	1
				Hop, dried cones		11525	1	1
				Melon subgroup 9A		12018	3	1
				Squash/cucumber subgroup 9B		12020	11	1
				Tomato paste		12021	0	1
				Tomato subgroup 8-10A		12021	11	1
				Pepper/eggplant subgroup 8-10B		12022	10	1
				Rapeseed subgroup 20A	2	13021	16	1
				Tropical and subtropical, small fruit, edible peel, subgroup 23A	2	13024	55	1
				Vegetable, tuberous and corm, subgroup 1C	2	13025	16	1
Novaluron	ADAMA, UPL NA	I	09/21/2022	Individual crops of proposed crop subgroup 6-22A: Edible podded bean legume vegetable subgroup	2	13053	16	25
				Individual crops of proposed crop subgroup 6-22B: Edible podded pea legume vegetable subgroup		09779	10	10
				Individual crops of proposed crop subgroup 6-22C: Succulent shelled bean subgroup	2	13054	16	22
				Individual crops of proposed crop subgroup 6-22D: Succulent shelled pea subgroup		09778	6	6

				Individual crops of proposed crop subgroup 6-22E: Dried shelled bean, except soybean, subgroup	2	13055	25	50
				Individual crops of proposed crop subgroup 6-22F: Dried shelled pea subgroup		09777	8	8
				Pea, forage			0	1
Methoxyfenozide	CORTEVA	I	10/11/2022	Vegetable, leafy, group 4-16	1	12917	18	1
				Vegetable, Brassica,, head and stem, group 5-16	1	12918	0	1
				Celtuce	4	12919	0	1
				Fennel, Florence, fresh leaves and stalk	4	12920	0	1
				Kohlrabi	4	12921	0	1
				Leaf petiole vegetable subgroup 22B	1	12923	3	1
				Tropical and subtropical, palm fruit, edible peel, subgroup 23C	2	12924	8	1
				Tropical and subtropical, small fruit, inedible peel, subgroup 24A	2	12925	18	1
				Cottonseed subgroup	2	12979	0	1
				20CIndividual commodities of Proposed Crop Subgroup 6-18A: Edible podded bean legume vegetable subgroup	1	12980	17	25
				Individual commodities of Proposed Crop Subgroup 6-18B: Edible podded pea legume vegetable subgroup	1	12981	3	10
				Individual commodities of Proposed Crop Subgroup 6-18C: Succulent shelled bean subgroup	1	12982	17	22
				Individual commodities of Proposed Crop Subgroup 6-18D: Succulent shelled pea subgroup	1	12983	2	6
				Individual commodities of Proposed Crop Subgroup 6-18E: Dried shelled bean, except soybean, subgroup, except pea, blackeyed, seed and pea, southern, seed	1	12984	23	48
				Individual commodities of Proposed Crop Subgroup 6-18F: Dried shelled pea subgroup	1	12985	6	8
				Rice, grain		11979	1	1
				Rice, hulls		11979	0	1
Sulfur Dioxide	DELTA SNOWDEN	F	11/17/2022	Blueberry		10614	1	1

	TEDMARK TESSARA							
Cyclaniliprole	ISK	I	11/18/2022	Artichoke, globe Pepper/eggplant subgroup 8-10B Sunflower subgroup 20B Tomato subgroup 8-10A		11952 11891 12264 11894	1 0 14 0	1 1 1 1
						Totals	750	694
*F=fungicide, H=herbicide, I=insecticide/acaricide, M=molluscicide, 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] 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(A) – 2022 Submissions to EPA, Registrants, Codex, and State Departments of Agriculture

Pest Control Agent	Registrant	Type*	Date	Commodity, Subgroup or Crop Group	PR#
Bifenazate	UPL NA	I	01/05/2022	Banana Bushberry subgroup 13-07B Cherry subgroup 12-12A Cottonseed subgroup 20C Nut, tree, group 14-12 Peach subgroup 12-12B Plantain Plum subgroup 12-12C Tropical and subtropical, small fruit, inedible peel, subgroup 24A Individual crops of proposed crop subgroup 6-18A: Edible podded bean legume vegetable subgroup Individual crops of proposed crop subgroup 6-18B: Edible podded pea legume vegetable subgroup Individual crops of proposed crop subgroup 6-18C: Succulent shelled bean subgroup Individual crops of proposed crop subgroup 6-18D: Succulent shelled pea subgroup	10002 11995 11462 11872 11465 11463 10002 11464 11873 13393 13394 13395 13396

				Individual crops of proposed crop subgroup 6-18E: Dried shelled bean, except soybean, subgroup	13397
Acifluorfen	UPL NA	H	03/14/2022	Edamame Berry, low growing, subgroup 13-07G	10958 13412
Spinosad	CORTEVA	I	03/31/2022	Stalk and stem vegetable subgroup 22A Spice Group 26	11830 13266
Spinetoram	CORTEVA	I	03/31/2022	Stalk and stem vegetable subgroup 22A Spice Group 26	11830 13257
Flonicamid	FMC, ISK	I	04/21/2022	Bushberry subgroup 13-07B Caneberry subgroup 13-07A Cherry subgroup 12-12A Corn, sweet, kernel plus cob with husks removed Corn, sweet, forage Corn, sweet, stover Peach subgroup 12-12B Plum subgroup 12-12C Pomegranate Prickly pear, fruit Prickly pear, pads Individual crops of proposed crop subgroup 6-18A: Edible podded bean legume vegetable subgroup Individual crops of proposed crop subgroup 6-18B: Edible podded pea legume vegetable subgroup Individual crops of proposed crop subgroup 6-18C: Succulent shelled bean subgroup Individual crops of proposed crop subgroup 6-18D: Succulent shelled pea subgroup Individual crops of proposed crop subgroup 6-18E: Dried shelled bean, except soybean, subgroup Individual crops of proposed crop subgroup 6-18F: Dried shelled pea subgroup	11969 08585 11970 11970 11970 08558 12283 11966 11966 13432 13433 13434 13435 13436 13437
Cyprodinil	SYNGEN	F	05/13/2022	Cranberry	11937
Fludioxonil	SYNGEN	F	05/13/2022	Cranberry	11937
Triclopyr	ADAMA, CORTEVA, HELENA	H	10/04/2022	Sugarcane, cane	12084
Cyflumetofen	BASF	I	10/11/2022	Berry, low growing, subgroup 13-07G Fruit, small, vine climbing, except fuzzy kiwifruit, subgroup 13-07F Vegetable, cucurbit, group 9 Pepper, bell and non-bell	13527 13526 11786, 11787, 11788 11790
Cyclaniliprole	ISK	I	10/26/2022	Vegetable, cucurbit, group 9 Greenhouse lettuce	11893 12515
Cyantraniliprole	FMC	I	12/01/2022	Herb fresh leaves subgroup 25A	12402, 12403

				Herb dried leaves subgroup 25B	12401, 12402, 12403
				Spices crop group 26	12401
				Hops, dried cones	12346
				Papaya	11300
				Edible podded bean subgroup 6-22A	13546
				Edible podded pea subgroup 6-22B	13547
				Succulent shelled bean subgroup 6-22C	13548
				Succulent shelled pea subgroup 6-22D	13549
				Pulses, dried shelled bean, except soybean, subgroup 6-22E	13550
				Pulses, dried shelled pea subgroup 6-22F	13551
				Forage and hay of legume vegetables (except soybeans) subgroup 7-22A	13552
				Field corn subgroup 15-22C	13553
				Sweet corn subgroup 15-22D	13554
				Rice subgroup 15-22F	13555
				Greenhouse lettuce	10327
				Strawberry	10328
Indoxacarb	FMC	I	12/19/2022	Brassica, leafy greens, subgroup 4-16B	13581
				Celtuce	13583
				Chickpea, dry seed	13590
				Coffee, green bean	11467
				Cottonseed subgroup 20C	13575
				Edible podded bean subgroup 6-22A	13591
				Fennel, Florence, fresh leaves and stalk	13584
				Field corn subgroup 15-22C	13588
				Fruit, pome, group 11-10, except pear	13576
				Fruit, stone, group 12-12	13577
				Kohlrabi	13585
				Leaf petiole vegetable subgroup 22B	13580
				Leafy greens subgroup 4-16A	13579
				Pear, Asian	13592
				Pulses, dried shelled bean, except soybean, subgroup 6-22E	13587
				Strawberry	09055
				Succulent shelled bean subgroup 6-22C	13586
				Sunflower subgroup 20B	11707
				Sweet corn subgroup 15-22D	13589
				Vegetable, brassica, head and stem, group 5-16	13582
				Vegetable, fruiting, group 8-10	13578
				Grass, forage	09521, A5921
				Grass, hay	09521, A9521
Saflufenacil	BASF	H	12/20/2022	Mint, fresh leaves	11921
				Mint, dried leaves	11921
				Edible podded bean subgroup 6-22A	13556
				Edible podded pea subgroup 6-22B	13557
				Succulent shelled bean subgroup 6-22C	13558
				Succulent shelled pea subgroup 6-22D	13559
				Pulses, dried shelled bean, except soybean, subgroup 6-22E	13560
				Pulses, dried shelled pea subgroup 6-22F	13561

				Forage and hay of legume vegetables (except pea, hay) group 7-22	13562
				Fruit, citrus, group 10-10	13563
				Fruit, pome, group 11-10	13564
				Fruit, stone, group 12-12	13565
				Tree nut group 14-12	13566
				Wheat subgroup 15-22A	13567
				Barley subgroup 15-22B	13568
				Field corn subgroup 15-22C	13569
				Sweet corn subgroup 15-22D	13570
				Grain sorghum and millet subgroup 15-22E	13571
				Rice subgroup 15-22F	13572
				Forage, hay, stover and straw of cereal grain group 16-22 (except barley, chia and wheat straw)	13573
				Rapeseed subgroup 20A	13574
XDE-659 (all 14 of these were submitted to the registrant for their submission to EPA)	Corteva	F	12/13/2022	Cucumber (GH)	12793
				Lettuce (GH)	12797
				Strawberry (GH)	12796
				Tomato (GH)	12792
				Pepper (GH)	12794
				Onion	12804
				Radish	12906
				Herbs (GH)	12865
				Greens (Mustard)	12909
				Carrot	12845
				Blueberry	12807
				Broccoli	12806
				Beet (garden)	12805
				Hops	12839

ATTACHMENT 3(B) – Final Reports that have been completed but not yet submitted

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	PR#
Difenoconazole	SYNGEN	F	1/28/22	Parsley	11902
Azoxystrobin + Cyproconazole	SYNGEN	F	2/10/22	Coffee	11934
Difenoconazole + Azoxystrobin	SYNGEN	F	2/9/22	Mango	11572
Difenoconazole + Azoxystrobin	SYNGEN	F	2/9/22	Bean & Pea (Edible Podded)	11604
Pronamide	CORTEVA	H	2/16/22	Grasses (Pasture)	12061
Trifloxystrobin + Fluopyram	BAYER	F	3/2022	Dragon Fruit (Pitaya)	12555
Cyantraniliprole	FMC	I	5/5/22	Papaya	11300
Cyantraniliprole	FMC	I	5/5/22	Dill (Dried Leaves)	12401
Uniconazole-P	VALENT	H	5/4/22	Crop Group 5-16 (GH Transplant)	12027
Boscalid + Pyraclostrobin	BASF	F	6/23/22	Strawberry (GH)	11752
Diquat	SYNGEN	H	7/7/2022	Sweet Potato	11889
Cyclaniliprole	ISK	I	7/21/22	Lettuce (GH)	12515
Linuron	TKI	H	8/19/22	Mint	11773
NA11630	SYNGEN	I	8/19/22	Cucumber (GH)	12297
Flupyradifurone	BAYER	I	9/22/22	Beet Greens (Garden)	12666
Bifenthrin	ADAMA, AMVAC, FMC	I	10/14/22	Coffee	11527
Abamectin	AMVAC, SYNGEN	I	10/26/22	Dragon Fruit (Pitaya)	12262

Pest Control Agent	Registrant	Type*	Date	Commodity or Crop Group	PR#
Quizalofop	AMVAC, GOWAN	H	11/2/22	Dill (dried leaves)	08690
Cyazofamid	ISK	F	11/9/22	Bean (dried shelled)	09533
Ethaboxam	VALENT	F	12/7/22	Celery (GH Transplant, Field)	12075
Clomazone	FMC	H	12/9/22	Dill (dried leaves)	11640
Sulfentrazone	FMC	H	12/9/22	Broccoli	10557

ATTACHMENT 4 – 2022 Food Use Research Projects, New Residue Studies

Chemical	Crop	PR #
2,4-D Choline	Strawberry	13304
Abamectin	Hemp	13048
BCS-CW64991	GH pepper	13089
Cyantraniliprole	Dragon fruit	13306
Cyazofamid	Hemp	13058
Cyazofamid	Turnip roots	13015
Cycloate	Garden beet	13411
Cycloate	Spinach	13406
Cymoxanil	Strawberry	13256
Difenoconazole + Azoxystrobin	Mint	13353
Difenoconazole + Azoxystrobin	GH tomato	11331
Dimethomorph + Ametoctradin	Basil	13242
Ethaboxam	Almond	13218
Ethaboxam	Avocado	13219
Ethaboxam	Grapefruit	13283
Ethaboxam	Lemon	13284
Ethaboxam	Orange	13285
Fenhexamid	Mint (GH transplants)	13158
Fluazaindolizine	Radish	13169
Fludioxonil + Pydiflumetofen	Cherry	13288
Fludioxonil + Pydiflumetofen	GH Cucumber	12673
Fludioxonil + Pydiflumetofen	GH Strawberry	11881
Fluopicolide	Almond	13217
Fluopicolide	Avocado	13241
Fluopyram	Pineapple	13019
Flupyradifurone + Spidoxamat	Hops	13311
GF-4031	Strawberry	13355

Glufosinate	Dragon fruit	13330
Glufosinate	Sesame	11148
Chemical	**Crop**	**PR #**
Halosulfuron	Stevia	13408
Indoxacarb	Grasses	12248
Inpyrfluxam	Cantaloupe	13350
Inpyrfluxam	Cucumber	13351
Inpyrfluxam	Squash	13352
Linuron	Onion, dry bulb	12816
Mefenoxam	Lettuce, head & leaf	13194
NAA	Hazelnut	13065
Picoxystrobin + Cyproconazole	Coffee	13259
Pydiflumetofen	Cranberry	13333
Pyraziflumid	GH lettuce	12975
Quinclorac	Garden Beet	10918
Thiophanate-methyl	Carrot	13360
Thiophanate-methyl	Radish	11568
Tiafenacil	Hops	13282
Trifloxystrobin + Fluopyram	Mango	12989
Trifloxystrobin + Fluopyram	Miracle fruit	13079
Zeta-cypermethrin	Lychee	08560

ATTACHMENT 5 – 2022 Food Use Product Performance Research Program

Chemical	Crop	PR#	Comments	State university trial sites
2,4-D Choline	Caneberry	13332	2022 H+ performance priority; need E/CS data before residue	AR, CA, NC, OR
2,4-D Choline	Strawberry	13304	2022 residue study	CA, FL
Broflanilide	Sugarcane	13167	2021 residue study	FL, LA
Broflanilide	Sweet potato	13137	2022 H+ performance priority; need E/CS data before residue	CA, MS, NC
Cyantraniliprole	Dragon fruit	13306	2022 residue study	FL
Cyantraniliprole	Strawberry (GH)	11679	2022 H+ performance priority; need E/CS data before residue	CA, FL, PA
Cyazofamid	Parsnip	13018	Covered by Chemsac Proposal	NY, OR
Cyazofamid	Turnip roots	13015	2022 residue study	OR, OR
Cymoxanil	Strawberry	13256	2022 residue study	FL
Dimethomorph + Ametoctradin	Basil	13242	2022 residue study	CA, CA
Diuron	Sesame	12680	2019 residue study	TX, TX
Florpyrauxifen-benzyl	Blueberry	13138	2021 H+ performance priority; need 2-yr/same plot data to add crop to label	MI, NC, NJ, OR
Florpyrauxifen-benzyl	Coffee	13262	2022 H+ performance priority; need data to add crop to label	HI, PR
Florpyrauxifen-benzyl	Papaya	13263	2022 H+ performance priority; need data to add crop to label	HI, PR
Fluazaindolizine	Banana	13222	2022 H+ performance priority; need E/CS data before residue	PR
Fluazinam	Avocado	08284	need E/CS data before residue	FL, FL

Chemical	Crop	PR#	Comments	State university trial sites
Fludioxonil + Pydiflumetofen	GH cucumber	12673	2022 residue study	CA
Flumetsulam	Clover (seed crop)	13062	2021 residue study	OR
Glufosinate	Caneberry	12051	2022 H+ performance priority; need E/CS data before residue	AR, NC, OR, OR
Glufosinate	Dragon fruit	13330	2022 residue study	FL, PR
Glufosinate	Mango	13296	2022 H+ performance priority; need E/CS data before residue	PR, PR
Glufosinate	Sesame	11148	2022 residue study	TX, TX
Indaziflam	Asparagus	13026	2021 H+ performance priority; need E/CS data before residue	CA, MI, NJ, OR
Isofetamid	Hemp	13007	2021 residue study	WI
Linuron	Brassica carinata	10974	2021 H+ performance priority; need E/CS data before residue	FL
Mefenoxam	Lettuce (head, leaf)	13194	2022 residue study	CA
Mefenoxam	Passionfruit	13046	2021 residue study	FL
NAA	Hazelnut	13065	2022 residue study	OR, OR
Penthiopyrad	Avocado	13075	2021 residue study	FL, PR
Pyraziflumid	GH lettuce	12975	2022 residue study	FL
Pyraziflumid	Tomato	13076	2021 residue study	CA
Pyroxasulfone	Asparagus	12935	2022 H+ performance priority; need E/CS data before residue	CA, CA, ID, MI, MI, NJ, OR
Pyroxasulfone	Sesame	11951	2022 H+ performance priority; need E/CS data before residue	OK, TX, TX
Quinclorac	Grape	12611	2021 H+ performance priority; need 2nd yr of E/CS data before residue	CA, MI, NJ, NY, OR

Chemical	Crop	PR#	Comments	State university trial sites
Quinclorac	Peach	12572	2022 H+ performance priority; need E/CS data before residue	CA, CA, MI, NC, NC, PA
Spiropidion	GH eggplant	12299	Need E/CS data only	NY
Sulfur dioxide	Sweet potato (post-harvest)	12521	Need E/CS data before residue	NC
Thiophanate-methyl	Asparagus	12622	Need E/CS data before residue	MI
Thiophanate-methyl	Radish	11568	2022 residue study	MI
Tiafenacil	Hops	13282	2022 residue study	MI, NY, OR, WA
Tiafenacil	Mint	13274	2022 H+ performance priority; need E/CS data before residue	CA, OR, WI
			Total	93

Attachment 6 - 2022 Environmental Horticulture Program Research Summaries

Bentazon Crop Safety

Basagran T/O has been registered for several years as a directed application and as an over-the-top application on limited plant species. However, growers have expressed the need to have additional plants added for over-the-top applications. Data collected throughout the history of the IR-4 Environmental Horticulture Program are presented here to support specific Basagran T/O applications over the top of certain ornamental horticulture plants. The rates chosen for this research were 1.0, 2.0 and 4.0 pounds of active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. In addition, early studies compared single versus two consecutive applications of 1.0 lb ai per A or 2.0 lb ai per A followed by 1 lb ai per A. Throughout the years, 104 different crop species/genera were examined for over the top applications. Of these, Seventeen exhibited no or minimal transient injury after application at all three rates. Thirty-five crops require further research because of unclear results. Fifteen crops exhibited no phytotoxicity at 1.0 lb ai per acre but did have some injury at the higher rates or with repeat applications. Thirty-six species exhibited phytotoxicity at even the 1.0 lb ai per acre rate.

Clopyralid Crop Safety

Lontrel (clopyralid) was initially registered in 1998 for environmental horticulture uses. This initial label contained an extensive list of environmental horticulture plants where Lontrel could be used without causing phytotoxicity. From 1985 to 2021, IR-4 examined 71 environmental plant species for phytotoxicity related to Lontrel applications. Of the researched crops, the following twelve can be added to the label at this time based on the data provided here: *Abies balsamea, Acer rubrum,* *Acorus* sp.*, Carex* sp.*, Hemerocallis* sp.*, Ilex cornuta, , Juncus effusus, Juniperus horizontalis, Picea pungens, Pinus mugo, Pinus strobus, Pseudotsuga menziesii.* The remaining seven crops that showed minimal or no injury are currently in the label. Forty-nine other species or genera treated with over the top applications exhibited minimal or no injury in the limited number of trials (one or two) for each crop. Ten species or genera exhibited moderate to severe negative impacts, one of which is currently in the product label.

Coleopteran Efficacy

Collectively, managing coleopteran insects can be challenging because the adult and larval stages may both cause damage and sometimes occur on different hosts or on different plant parts. While organophosphates, pyrethroids, and neonicotinoids can provide good to excellent control of coleopteran insects, not all products work equally well in all situations. Treatments for borers are very different from treatments targeting white grubs. Developing newer classes of chemistry are important to reduce the environmental consequences and to minimize the development of resistance. Starting with the 2004 Annual Workshop, screening a number of products to manage coleopteran insects became one of the high priority projects for entomology. From 2005 through 2021, 91 products representing 58 different active ingredients were tested for management of adult and larval stages of coleopteran insects. In addition, 10 products representing 10 active ingredients were evaluated for lepidopteran clearwing borers in 2008 and 2009. These products represented both biological and chemical tools. Some products were already registered but more data were needed, or they were considered standards to measure the level of efficacy achieved with other materials. Other products were in development but have not yet been registered with the EPA. While a number of coleopteran and lepidopteran species were tested, only enough experiments were able to be completed on the coleopteran species black vine weevil, Japanese beetle, oriental beetle, red headed flea beetle, Sri Lankan weevil, and viburnum leaf beetles to recommend actions to register or amend labels for these pests.

Dimethenamid-p Crop Safety

From 2007 to 2021, IR-4 completed 573 trials on Tower EC (dimethenamid-p). The data contained in this report was generated to register uses of dimethenamid-p on and around environmental 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 154 plant genera or species. Of these, 71 plant species exhibited no or minimal transient injury after application at all three rates. Twenty nine (29) 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. Fifteen crops – *Aquilegia* sp, *Catharanthus roseus, Cladrastis* sp., *Crassula ovata, Crassula* sp., *Echeveria* sp., *Echinacea purpurea, Echinacea* sp, *Epilobium canum, Helianthus annuus, Muhlenbergia dubia, Rudbeckia fulgida, Rudbeckia hirta, Teucrium chamaedrys,* and *Viburnum opulus* – exhibited significant phytotoxicity at even the lowest rate.

Dithiopyr Crop Safety

Dimension was initially registered in 1992 for environmental horticulture uses. This initial label contained an extensive list of plants for 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. This current label recommends directed spray as the application method for almost all crops. During 2014 to 2021, IR-4 conducted 252 trials with Dimension 2EW formulation applied as over-the-top spray on 101 species / genera, including ornamental grasses and sedums to further expand the treatable plant list in the current label. Of the researched crops and Dimension formulations, 16 crops (*Aronia melanocarpa, Berberis thunbergii, Eragrostis curvula*, *Eucalyptus* sp., *Euonymus fortunei, Hemerocallis* sp., *Ilex crenata, Juncus effusus, Leymus arenarius, Muhlenbergia capillaris, Narcissus* sp., *Pennisetum alopecuroides, Pseudotsuga mensiezii, Rosa sp* 'Knockout', *Taxus cuspidata, Thuja occidentalis*) can be added for over-the-top spray at this time based on the data provided here.

F6123 Crop Safety

F6123 is a fungicide being developed by FMC for the control of diseases on environmental horticulture crops such as anthracnose (*Colletotrichum* spp.), powdery mildew (*Erysiphe* spp.), black spot (*Diplocarpon rosae*), rusts (*Coleosporium, Phragmidium, Puccinia, Uromyces* spp.), leaf spots (*Alternaria, Cercospora, Cylindrocladium, Sclerotinia Septoria* spp.) and other foliar diseases. Although not yet available in the marketplace, F6123 was registered for use with EPA since November 20, 2019. The IR-4 Project completed 52 crop safety trials on 17 environmental horticulture plant species or genera from 2019 to 2021. In these trials, F6123 was applied either as a foliar spray or as a soil drench. Four genera or species (two foliar, two drench) exhibited minimal or no injury after foliar and drench applications in a minimum of three trials for each crop; these can be added to a list of tolerant plants in the new label for this active ingredient.

The fifteen remaining species or genera treated with foliar sprays exhibited minimal or no injury in the limited number of trials (one or two) for each crop.

Out of the thirteen remaining species or genera treated with a drench application, eight exhibited moderate to severe negative impacts. The other five exhibited minimal or no injury in the limited number of trials (one or two) for each crop.

Flumioxazin + Prodiamine Crop Safety

Fuerte (flumioxazin + prodiamine) has been registered in the United States since 2018. Starting in 2020, the IR-4 Project has been screening additional crops for their tolerance to over the top applications. During 2018 to 2022, 51 crop safety trials on 22 environmental horticulture plant species or genera were conducted. In general, Fuerte exhibited no or minimal negative impact in these trials. Seven plant species or genera fell into this category as did 12 additional crops so far with just 1 or 2 trials completed. For two crop species, there was no or little injury exhibited at the 1X or 2X rates, but significant phytotoxicity occurred at 4X.

Fluopyram + Trifloxystrobin Crop Safety

Broadform SC (fluopyram + trifloxystrobin) is a new fungicide for foliar plant pathogens such as leaf spots, powdery mildew, and rust. The IR-4 Project completed 24 crop safety trials on 14 environmental horticulture plant species or genera during 2020 and 2021. One species (*Antirrhinum majus*) did not exhibit injury after two consecutive drench applications. Significant injury was observed in one species (*Petunia x hybrida*) to recommend growers not apply Broadform SC.

Indaziflam Crop Safety

From 2011 through 2021, IR-4 has completed 186 trials evaluating two granular and one liquid formulations of indaziflam for crop safety. The data contained in this report was generated to register the use of indaziflam on and around environmental horticulture plants with over-the-top applications. The rates tested were 0.045, 0.089 and 0.178 pounds of active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. The indaziflam 0.03%G formulation was applied to 17 plant genera or species, the Marengo G formulation applied to 34 crops, and the Marengo 74SC liquid formulation applied to 36 genera or species. Of these crops, 9 exhibited no or minimal transient injury after application with the granular formulations at all three rates including *Aucuba japonica*, *Berberis sp*., *Liriope sp*., *Ophiopogon japonicus*, *Picea abies*, *Rhododendron sp*., *Rosa sp*., *Taxus media* and certain *Viburnum* species. The plants exhibiting no or minimal transient injury with Marengo 74C include: *Crocus* sp., *Hyacinthus* sp., *Juniperus chinensis, Juniperus horizontalis,* and *Picea abies.* The remaining crops evaluated have only been screened in 1 or two trials or exhibited minimal to significant injury. Further testing is required for additional plant species before a conclusion can be made confirming crop safety.

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 59 crop safety trials on 25 environmental horticulture plant species or genera during 2019 to 2021. This summary contains data across all reports available through IR-4 since 2019.

Twenty-five species or genera exhibited no or minimal injury after drench or foliar treatments of Mefentrifluconazole. Eight of the tested plants exhibited no injury across multiple trials, while the remaining 17 plants showed the same with less than 3 trials. All twenty-five species or genera could be added to the label based on this data, provided that BASF has similar results.

Neem Oil + Azadirachtin Crop Safety

ANEEM (neem oil + azadirachtin) is an extract from the neem plant which has insecticidal, miticidal and some nematicidal and fungicidal properties. The IR-4 Project completed 23 crop safety trials on seven environmental horticulture plant species or genera during 2020, 2021 and 2022. Overall, no or minimal transitory phytotoxicity was observed on all crops except *Anthirrhinum majus* where minor to moderate injury symptoms were detected with increasing application rates. More information should be generated on this species to better understand the phytotoxicity risks that may come from repeated applications of ANEEM.

Oxadiazon Crop Safety

Oxadiazon has been registered in the United States since the 1970's for uses in and around environmental horticulture plants in production nurseries and in landscapes. Between 1972 and 2021, the IR-4 Project has conducted over 724 trials on 184 plant species or genera using various oxidation formulations: Ronstar 2G, Oxadiazon 4G, Oxadiazon 5G, Ronstar 2EC, Ronstar 50WP/WSP, Ronstar 75WP, and Ronstar Flo. This report is a summary of all the available data generated through IR-4 since screenings began in 1972.

For granular formulations of oxadiazon, fifty-eight (58) plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top broadcast applications; thirty of these are already in the current Ronstar 2G label. Four species had no or little transient impact with applications at the low rate tested, but impacts were observed at higher rates sufficient for plants to not be marketable. Ten species exhibited significant injury at the 1X rate. For 117 crops, more information is needed because outcomes were variable among tested locations or because only 1 or 2 trials were conducted. Forty-six of these crops are already in the current Ronstar 2G label. Most of the regulatory activity occurred prior to or during the 1990s.

For Oxadiazon EC, five plant genera had no to minimal transitory injury after over the top applications. Three crops were variable in their response either due to species, cultivar or location differences. For 19 genera/species, more information is needed since less than 3 trials were conducted; of these, four crops are already on the Ronstar WSP or Ronstar Flo labels.

With wettable powder or flowable formulations, four plant species or genera exhibited no or minimal, transitory phytotoxicity to over the top applications; all are already in the current Ronstar Flo or 50WP labels. One crop, (*Sedum spurium*), was injured after applications. For 32 genera/species, more information is needed either because only 1 or 2 trials were conducted or because consistent results were not achieved among the research sites. Seven of these crops are already in the current Ronstar Ronstar Flo or 50WP/50WSP labels. The remaining crops exhibited no or minimal transitory injury. Most of the regulatory activity occurred prior to or during the 1990s.

Dimethenamid-p + Pendimethalin Crop Safety

From 2007 to 2022, IR-4 completed 700 trials on Freehand 1.75G (BAS 659 G; dimethenamid-p + pendimethalin). The data contained in this report was generated to register uses of dimethenamid-p + pendimethalin on and around environmental horticulture plants with broadcast applications, including over the top of established plants. The Freehand rates in this testing program were 2.65, 5.3 and 10.6 pounds active ingredient per acre (lb ai per A) as the 1X, 2X and 4X rates. Freehand 1.75G had been applied to 195 plant genera or species. Of these genera and species, 116 exhibited no or minimal transient injury after application at all three rates. Thirteen (13) crops exhibited little or no phytotoxicity at 2.65 lb ai per acre but did have some injury at 5.3 and/or10.6 lb ai per acre or showed injury after the second application. Seventeen (17) genera or species exhibited damage at the lowest rate sufficient to recommend growers not utilize Freehand 1.75G as an over-the-top treatment for pre-emergent weed control. Twelve (12) crops exhibited variable responses sufficient to recommend further testing of specific species or cultivars. Of

the 39 crops which IR-4 has screened in under 3 trials, BASF has sufficient information to include 18 crops on the Freehand 1.75G label. Additional trials are indicated to establish species or cultivar sensitivities for the remaining 21 crops.

Prodiamine + Isoxaben Crop Safety

Prodiamine + Isoxaben (Gemini G) is a herbicide combination developed by Everris dba ICL Specialty Fertilizers for pre-emergent control of grasses and broadleaf weeds on environmental horticulture crops. The IR-4 Project completed 65 crop safety trials on 23 environmental horticulture plant species or genera between 2017 and 2022. In these trials, four species (*Campanula sp., Nepeta x fassiana, Quercus virginiana, Rosa sp.*) exhibited no injury after over-the-top applications in a minimum of 3 trials; this species can be added to a list of tolerant plants in the new label for this product. Three species (*Phlox paniculata, Sedum acre, Sedum rupestre*) exhibited damage at the 1X rate sufficient to recommend growers not utilize Gemini G as an over-the-top treatment for pre-emergent weed control.

Pythium Efficacy

At the IR-4 Environmental Horticulture Program Workshops in 2009 and 2019, Pythium 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 1999 to 2013 on environmental horticulture crops. During this time period, numerous products representing 47 active ingredients were tested as drench, foliar or soil applications against several *Pythium* species causing root rot and damping-off. *Pythium* species tested included: *P. aphanidermatum*, *P. irregulare*, *P. mamillatum*, *P. dissotocum*, *P. ultimum* and *P. vipa.* Most trials were conducted on *P. aphanidermatum* and *P. ultimum.* Although there was insufficient data for definitive conclusions, several relatively new products that are included in the Pythium efficacy project looked promising for managing *P. aphanadermatum*. These were BW159, BW161N, Daconil ZN, MBI-121, Picarbutrazox 20WG and Picarbutrazox SC. The established standards and recently registered materials (Adorn, Fenstop,Subdue Maxx and Terrazole/Truban) generally performed well. The data from these trials suggest that the effectiveness of some fungicides in controlling Pythium root rot may vary, depending on the species of *Pythium* or crop.

S-Metolachlor Crop Safety

From 2004 to 2021, IR-4 completed 196 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 Magnus has been applied to 80 plant genera or species. Of these, 11 plant species exhibited no or minimal transient injury after application at all three rates. Ten (10) 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-two (22) crops exhibited significant phytotoxicity at even the lowest rate. For nine crops, the response among sites was variable, and 30 crops have less than three trials completed.

SP2700 Crop Safety

SP2700 is a new fungicide being developed by SePro for the control of diseases on environmental horticulture crops such as *Alternaria, Cylindrocladium*, *Fusarium, Rhizoctonia,* and *Thielaviopsis.* The IR-4 Project completed 41 crop safety trials on 14 environmental horticulture plant species or genera from 2018 through 2021. SP2700 was applied either as a foliar spray or as a drench into soilless media. In these trials, six genera or species exhibited minimal or no injury after foliar applications in a minimum of three trials for each crop; these can be added to a list of tolerant

plants in the new label for this active ingredient. The remaining eight other species or genera treated with foliar sprays exhibited minimal or no injury in the limited number of trials (one or two) for each crop.

When SP2700 was applied as a drench application, two plant species or genera exhibited moderate to severe negative impacts. The remaining six species or genera treated with drenches exhibited minimal or no injury in the limited number of trials (one or two) for each crop.

TDA01 Crop Safety

TDA-01 is a new active ingredient for foliar plant pathogens such as bacteria. The IR-4 Project has screened 3 different formulations, completing 28 crop safety trials on 9 environmental horticulture plant species or genera from 2017 through 2021. The first two formulations caused moderate to severe injury, so a third formulation was developed. For TDA-NC-1, only one crop (*Begonia sp.*) exhibited no injury after three consecutive foliar sprays applied at 2 week intervals. The eight other crops have been screened in less than three trials, so no conclusions can be drawn yet.

Thrips Efficacy

For the last 16 years, the IR-4 Environmental Horticulture Workshop has ranked developing efficacy data on new products to manage thrips as a High Priority Project either nationally or regionally. Thrips remain an important threat for several reasons: 1) the damage thrips cause to environmental horticulture plants, decreasing the value of the infested crops; 2) the tospoviruses (tomato spotted wilt, impatiens necrotic ringspot) they can vector; 3) the newly arrived invasive species which impact at least 250 different environmental horticulture species; and 4) growers lack the ability to rotate among 3 to 4 different modes of actions to effectively manage resistance development in the thrips populations they must control to maintain economic viability. From 2005 through 2021, 78 products representing 67 different active ingredients were tested for thrips management. These products represented both biological and chemical tools. Some products were already registered, but more data were needed particularly with the newly invasive thrips species or they were considered standards to measure the level of efficacy achieved with other materials. Other products were in development but have not yet been registered with the EPA. The five thrips species tested in the IR-4 program were Chilli Thrips (*Scirtothrips dorsalis*), Gladiolus Thrips (*Thrips simplex*), Privet Thrips (*Dendothrips ornatus*), Weeping Fig Thrips (*Gynaikothrips uzeli*), and Western Flower Thrips (*Frankliniella occidentalis*).

XDE659 Crop Safety

XDE-659 is a new fungicide being developed by Corteva for the control of Botrytis gray mold, powdery mildew and other foliar pathogens of environmental horticulture crops. The IR-4 Project completed 20 crop safety trials on ten environmental horticulture plant species or genera between 2020 and 2022. No injury has been observed to date on any crop screened so far, including with seven crops where fewer than three trials have been completed and with three crops in at least three trials (*Buxus sempervirens, Hemerocallis sp., Thuja occidentalis*).

Attachment 7 - 2022 Environmental Horticulture Program Research Activities

Discipline	Project	Researchers	Crops	Products	Trials
Entomology	BCS991 Crop Safety	4	6	1	10
	Borer & Beetle Efficacy	4	5	11	33
	Cyclaniliprole + Flonicamid Crop Safety	2	2	1	2
	Cyclaniliprole Crop Safety	1	5	1	8
	ISM-555 Crop Safety	3	6	1	7
	Mealybug Efficacy	3	3	12	31
	Neem oil + Azadirachtin Crop Safety	1	4	1	4
	Rosemary Oil Crop Safety	2	2	2	4
	Scale Efficacy	2	3	10	19
	Thrips Efficacy	1	1	8	8
	V-10433 Crop Safety	1	2	1	2
Pathology	Bacterial Efficacy	1	1	11	11
	BAS 640 00F Crop Safety	4	7	1	9
	Botryosphaeria Canker Efficacy	1	1	11	11
	Botrytis Efficacy	2	2	11	21
	F6123 Crop Safety	1	1	1	2
	Fluopyram + Trifloxystrobin Crop Safety	2	2	1	2
	Flutianil Crop Safety	1	2	1	3
	Fusarium Efficacy	1	1	8	8
	IKF-309 Crop Safety	2	3	1	3
	Mandestrobin Crop Safety	1	1	1	1
	Mefentrifluconazole (BAS 750) Crop Safety	5	8	1	16
	Myrothecium Efficacy	1	2	10	10
	Phytophthora Efficacy	3	3	7	21
	Picarbutrazox Crop Safety	2	2	2	7

	Pydiflumetofen + Difenoconazole Crop Safety	1	2	1	4
	Pyraclostrobin + Boscalid Crop Safety	1	1	1	2
	Pythium Efficacy	1	1	6	6
	Rhizoctonia Efficacy	3	3	11	27
	SP2478 Crop Safety	1	3	1	7
	TDA01 Crop Safety	1	5	1	5
	XDE-659 Crop Safety	3	4	1	4
Weed Science	Crabgrass Efficacy	1	1	7	9
	Dimethenamid-p + Pendimethalin Crop Safety	8	15	1	25
	Dimethenamid-p Crop Safety	5	9	1	15
	Dithiopyr Crop Safety	3	8	1	8
	Fatty Acid Herbicide Use Directions	1	1	2	4
	Flumioxazin + Prodiamine Crop Safety	1	1	1	1
	Flumioxazin Crop Safety	8	8	1	17
	General Weed Efficacy	3	1	17	79
	Indaziflam Crop Safety	1	2	1	2
	Isoxaben + Dithiopyr Crop Safety	8	11	1	29
	Isoxaben + Pendimethalin Crop Safety	1	2	1	2
	Nostoc Efficacy	2	1	8	9
	Nutsedge & Sedge Efficacy	1	1	7	9
	Pendimethalin Crop Safety	2	3	2	3
	Prodiamine + Isoxaben Crop Safety	12	15	1	29
	S-Metolachlor Crop Safety	12	30	1	65
	Spurge Efficacy	1	1	5	5
	Trifluralin + Isoxaben Crop Safety	1	2	1	2

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

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