

2022 WSSA Committee Report

Committee Code and Name: E-12b Herbicide Resistance Education

Committee Chair: Jill Schroeder

Committee Members, 2021 (includes sub-committee members)

- Amy Asmus
- Michael Barrett
- David Ervin
- George Frisvold
- Todd Gaines
- Raymond Jussaume
- Andrew Kniss
- Ramon Leon
- John Madsen
- Jill Schroeder
- Francois Tardif
- Lee VanWychen
- Muthu Bagavathiannan
- David Shaw
- Katie Dentzmann
- Ian Burke
- Aaron Hagar
- Clint Pilcher (ESA representative)
- Mark VanGessel (EPA liaison)
- Lindsay Haines (NRCS)
- Bill Chism (EPA)
- Cameron Douglass (USDA-OPMP)
- Chandra Aradhya (HRAC)
- Caren Schmidt (Public Awareness)
- Lynn Sosnoskie (Extension)
- Neil Hoffman and/or Rebecca Fletcher (APHIS - (Ex off))

Board Coordinator: Lynn Sosnoskie

Committee Members Rotating Off:

- Raymond Jussaume
- Bill Chism (EPA)

Recommended Replacements/Additions:

- Bill Chism
- EPA representative - TBD

Summary of Activities

Goals for 2021:

- Develop and execute plans for continuing the efforts to increase stakeholder involvement.
- Expand efforts to include other pest disciplines.
- Expand the offerings from the herbicide resistance web portal once the portal is active.
- Continue the work in the PNW once funding is secured for a postdoc at University of Idaho under Chloe Wardhopper, Assistant Professor of Human Dimensions of Ecosystem Management.

List the committee's accomplishments (since the last annual meeting):

Planned activities: The COVID 19 pandemic continued to affect many of the planned activities of committee members in 2021. In spite of the pandemic, outreach and engagement across a broad range of stakeholders, many of which were not previously familiar with resistance issues, was broadly initiated by members of the committee. The activities that we are aware of are listed below.

- The primary outcome of the 2021 activities was to inform and engage scientists, regulators, and practitioners, some for the first time, opening the door to follow up discussions and activities.

Industry Stakeholders

Crop Life-RISE

- The Crop Life/RISE 2021 conference was held virtually the week of April 19, 2021. Dr. Clint Pilcher (Entomology Society and co-organizer of the 2019 Iowa Policy Tour) arranged a session entitled “Challenges and Best Practices in Resistance Management” in which Amy Asmus and David Shaw spoke on the need for community approaches to resistance management as well as the importance of aligned messaging around resistance management. Bill Chism from EPA also participated in the panel discussion.

International Certified Crop Advisors

- Committee members had been planning (2020 and 2021) to hold a listening session with ICCA board members; however, the ICCA meeting continue to be held virtually. Katie Dentzman (rural sociologist and member of this committee) took a faculty position at Iowa State University in fall 2021 and agreed to coordinate a series of virtual listening sessions with crop advisors from 5 regional cropping systems to be completed by early 2022. The five cropping systems and collaborators on recruiting participants include permanent crops (Brad Hanson and George Frisvold), wheat/grain crops (Ian Burke, Muthu Bagavathiannan, and others), row crops in the Midwest (Amy Asmus and Clint Pilcher), row crops of the mid-south (Darren Dodds and David Shaw), specialty crops (Mark VanGessel). Participants will be recruited to represent a diverse cross section of the crop advisor community. The first listening session, with wheat/grain growers, was completed in early December of 2021 and was highly successful. Dr. Dentzman has applied for additional funding from the North Central IPM Center to conduct a follow-up national survey of crop advisors’ perspectives and experiences with pest resistance.

E-12b committee member updates:

Lynn Sosnoskie (Cornell University) – I guess my most significant activities was a series of pigweed identification classes that I took on the road (with live specimens for hands-on exposure) to teach growers how to tell Palmer amaranth and waterhemp apart from the other commonly occurring species in NY (Palmer and waterhemp are still limited in distribution). These events occurred across the state from Orange County (SE NY) to Niagara County (NW NY) to Cattaraugus County (SW NY) to Seneca County (C NY). We reached 600+ stakeholders, in-person. We also discussed herbicide resistance in the species, including our preliminary NY data (populations of both species are resistant to glyphosate and ALS-inhibiting herbicides). We also discussed BMPs for control, including combine cleanout strategies.

Todd Gaines (Colorado State University)

- I gave a webinar to USDA staff in March 2021 on the basics of herbicide resistance and resistance management

- I met with the EPA Pesticide Program Dialogue Committee to discuss the idea of using an incentive-based policy for herbicide registrants to proactively manage resistance risk for new products; the plan is that I'll be working with Cameron Douglass next year to explore that idea some more.
- I've developed an online class called "AB 529: Pesticide Resistance Evolution and Management" that will be offered through CSU Online in Spring 2022 for 3 credits, targeted for graduate students and professionals looking for continuing education on this topic.

Katie Dentzman (Iowa State University)

- Joined an ongoing USDA AFRI CARES grant project at Iowa State University assessing the social and economic determinants of community engagement in pest resistance management in Iowa
 - Became the Principal Investigator for this project
- Assisted in organizing the 2022 Statewide Iowa Pest Resistance Meeting
- Planned and began arranging a series of listening sessions on pest resistance with crop advisors in 5 cropping regions of the US [see ICCA bullets and USDA-APHIS funding sections].
- Became an Associate Editor for the Journal of Integrated Pest Management
- Organized a team of social scientists from across the US to submit a Working Group proposal on the social science of pest resistance management to the North Central IPM Center
- Submitted a Critical Issues proposal on surveying Certified Crop Advisors about their attitudes/practices related to pest resistance to the North Central IPM Center
- Presented on the sociology of pest resistance management for the American Association for the Advancement of Science annual conference and the Integrated Crop Management meeting
- Became the Principal Investigator on a resubmission of a proposal assessing interdisciplinary work on community management of pest resistance to the NSF's Convergence Acceleration grant program

GROW Initiative

GROW (Getting Rid of Weeds) is a publicly led network coordinating research and outreach, providing science-based information and decision support tools to make agriculture more sustainable and precise.

GROW has three research initiatives: harvest weed seed control through seed impact mills and chaff lining, cover crops for weed suppression, and digital solutions for weed identification, mapping, and precision management. Each research area has robust outreach and technology transfer activities, notably through growiwm.org and leading social media platforms.

GROW is excited to be among the first to bring novel IWM technologies like seed impact mills (Redekop's Seed Control Unit and the Integrated Harrington Seed Destructor) and chaff-lining (Westoz Boilermaking Chaff Lining Kits) to the region and nation in a multi-

state, on-farm, collaborative approach. More details can be found at:
<https://growiwm.org/>

Professional Scientific organizations

Weed Science Society of America

Jill Schroeder was an invited speaker at the 2021 WSSA symposium “Sustainable Weed Management - What Is It and How Are We Doing?” and presented on the topic “Perspectives on Sustainability from the WSSA-Herbicide Resistance Education Committee”. She has contributed a section to a paper from the symposium that is currently under development.

Entomology Society of America – Clint Pilcher hosted a graduate student mentoring session at National ESA meeting in November where approximately 20 students were involved with a discussion around preparation for industry employment. Clint discussed the need for a balance of socio-economic training along with the biological sciences.

- George Frisvold gave an On-Demand Presentation “The economics of insect resistance management” for Uncomfortable Conversations about Insecticide Resistance, a Physiology, Biochemistry, and Toxicology Section Symposium at ESA 2021 and participated in a follow-up ESA sponsored webinar.

AAAS

- David Ervin is the organizer of a session for the 2022 AAAS Annual Meeting. Muthu Bagavathiannan is the co-organizer and will be the moderator of the session. The live panel discussion session at the 2022 Annual Meeting has been scheduled for Sunday February 20, 2022 at 2:00 p.m. EST. The title of the session is **Converging Lab and Field Evidence to Empower Cooperative Pest Management**. Panel members include Katie Dentzman (rural sociology), Clint Pilcher (entomology), George Frisvold (agricultural economics), and Muthu Bagavathiannan, moderator, (weed science). All are members of the herbicide resistance education committee.

International IPM Symposium

- Clint Pilcher and co-organizers Katie Dentzman and George Frisvold submitted a symposium to this conference for 2021, which was postponed to March of 2022. The title is: **Approaching IPM and Resistance Management Through Understanding How Community Social Dynamics Can Affect Adoption**. The 10th International IPM Symposium has a theme of “Implementing IPM across Borders and Disciplines” so we have pulled together the following slate of speakers to address this topic: Amy Asmus (Ag Retail), Jill Schroeder (Weed Scientist), Daren Mueller (Plant Pathologist), George Frisvold (Ag Economist), Katie Dentzman (Sociologist), Alicia Rosburg (Economist), and Clint Pilcher (Entomologist)

Federal Agencies

EPA

- Amy Asmus (sponsored by WSSA) and David Shaw are currently members of the Pesticide Program Dialogue Committee (PPDC), a FACA advisory group. One of the activities of the PPDC is to propose workgroups to develop strategies on issues of concern to the agency. Amy and David spearheaded the creation of a resistance management committee at EPA PPDC in 2020.
- The EPA’s Pesticide Program Dialogue Committee (PPDC) recognized the challenges that resistance creates and established a working group with the charge to “**Develop recommendations to EPA on how the agency can assist stakeholders in addressing the challenges of conventional pesticide resistance.**” Members of the workgroup were recruited to represent a very diverse cross section of the agricultural community and included representatives from industry, grower groups, government, universities. The members had expertise in production, all pest management disciplines, and the social sciences. Several members of the E-12b committee were on the workgroup: David Shaw and Bill Chism (co-chairs with Alan Reynolds), Amy Asmus, Chandra Aradhya, Cameron Douglass, David Ervin, George Frisvold, Katie Dentzman, Jill Schroeder. The workgroup presented their recommendations to the PPDC in October 2021; the committee voted to approve the report and send it to EPA for further action. The report and presentation slides can be found at <https://www.epa.gov/pesticide-advisory-committees-and-regulatory-partners/pesticide-program-dialogue-committee-4> under the bullets for Resistance Management Workgroup. The workgroup has been asked to continue in an advisory capacity as EPA develops the next steps to implement the recommendations.

USDA

- David Shaw, Amy Asmus and Jill Schroeder have continued to have virtual conversations with Cameron Douglass (USDA-OPMP) and Lindsay Haynes (USDA-NRCS) to discuss ways that WSSA can assist NRCS with resistance training efforts. Todd Gaines, Colorado State University, has agreed to develop a basic webinar on resistance for presentation to the agency. Details of how to proceed are still being worked out.

Funded projects

- David Shaw is the PI on an USDA-APHIS grant awarded to WSSA to address community engagement in resistance management. We received a one-year no-cost-extension for the APHIS grant due to COVID-19. The committee worked with APHIS to repurpose the funds to support the development of additional listening sessions with regional stakeholders. Plans for those efforts are continuing beyond the grant period.
- The PNW project is also supported by grants from the Washington Grain Commission.

What information was posted on the WSSA website?

- Nothing new at this time.

What amount of funds were requested? How much was spent?

- \$90,000 grant received from USDA-APHIS is ongoing due to COVID-19
- WSSA funding in the amount of \$10,000 was requested to cover additional expenses not allowed under the APHIS grant in 2021; the funds were not spent due to COVID-19 travel restrictions.

What was the impact of the committee activities/accomplishments on the following: membership, publication, policy, legislation, and/or education?

- Herbicide resistance has received substantial attention from a number of federal agencies, as well as Capitol Hill. WSSA has been placed in a prominent leadership role because of our efforts.
- Educational products have been used extensively for training purposes. We have partnered with a number of commodity groups to extend our reach.
- Many members have been involved in committee and subcommittee activities and have engaged with new groups of stakeholders. The activities have engaged audiences (examples include AAAS and NAS) that were not aware of resistance as an issue comparable to the antibiotic resistance that has been an issue of great concern to these scientists. A number of additional members have been involved in 2021.
- EPA and USDA agencies continue to look to WSSA as the authoritative source for technical information and education in regards to herbicide resistance management strategies.
- Members of the Entomology Society of America have been engaged as a partner to continue collaboration and partnership on resistance outreach activities.
- The PNW has been working with local partnership NRCS reps to brainstorm outreach and education, as well as designing a herbicide resistance program for integration into their current Conservation Activity Plan program.

What is the current state of the committee's projects and activities?

- The crop advisor listening sessions are ongoing with Dr. Dentzman as the lead.
- The three-herbicide resistance community working groups are established in the Pacific Northwest, gaining further support within their respective areas, and are creatively working to improve herbicide resistance management within their respective communities. Dr. Nick Bergman, in collaboration with Dr. Chloe Wardropper (University of Idaho) is managing the community project. The Palouse region group has met twice in Winter 2022 and has additional meetings planned for February and March 2022. The group is particularly focused on engaging with NRCS to improve HR management and working to spread expertise and knowledge related to harvest weed seed control across the community. The Camas Prairie region group has met once in Winter 2022 and has additional meetings planned for January, February, and March 2022. This group is working with university researchers to create a 2-pager focused on herbicide resistance and best management practices to disseminate across their community. The group is also interested in working to increase access to preemergence herbicides as a way to improve weed control and HR management. The Northern Douglas County group has met twice in Winter 2022 with additional meetings planned for January, February, and March 2022. This group is focused on planning an outreach event to growers for March 2022 to help disseminate herbicide resistance information and improve knowledge within the community. The group is also particularly interested in improving the institutional

reporting mechanisms that exist for herbicide resistance. Specifically, the group is working to create an integrated and improved spatial database and mapping display that interactively illustrates herbicide resistance across the PNW.

- Committee members continue to interact with other organizations through symposia and meetings.

2022 Plan for Committee Activities

Goals for 2022:

- Complete the crop advisor listening sessions and finalize the report.
- Amy Asmus and Katie Dentzman are working with the Iowa Pest Resistance Management Program (IPRMP) group. Members of this committee will collaborate with the Iowa project when possible and will look to learn from this group as a case study in community engagement.
- PNW community efforts are continuing.
- Continue to engage with federal partners and other professional organizations.

Recommendations for Board/Society Action:

Funds requested for 2022:

- The committee requests \$10,000 to support activities that could not be undertaken due to COVID-19 in 2022. The activities may include a tour of the PNW projects for USDA and EPA staff, follow up to the listening sessions for CCA members/crop advisors, or travel for other outreach activities. The board will be kept apprised of proposed activities with requests for approval if restrictions due to COVID-19 allow planning to go forward.

Other requests for the Board:

- Consider developing additional mechanisms to remain in a leadership position addressing and articulating the complex issues impacting agriculture and natural resources because of pest resistance.
- Feedback on directions the committee is taking, on partnerships being developed, and on the published material we have developed.
- The PPDC Resistance Workgroup recommended to EPA that pesticide label reform is needed to address resistance issues. The E-12b committee requests that the Board support the label reform movement by ensuring stakeholder input to the ongoing work and small sub groups that are moving forward based on the workgroup recommendations.

AGENDA WSSA Committee E-12b Herbicide Resistance Education February 10, 2022
See 2022 Committee report for additional information.

Discussion and action items -February 10, 2022

1- Updates

Take Action educational initiative (Aaron Hager represented by Mark Loux)

Question: How can committee assist with awareness of Take Action materials?

Improve interaction with committee through Aaron Hager.

Question: Are any metrics available to document the audience reached?

They have attendance information for webinars, recordings viewed. Likely have information on fact sheet downloads that can be shared. Color coded MOA guide has been very well received.

Action: Take Action Committee will share metrics.

Crop Advisor Listening sessions (Katie Dentzman)-

Update: One of five listening sessions complete; PNW wheat advisors. Two are scheduled for February. Received NCIPM Center funding to develop a national survey; will base questions on outcomes of focus group listening sessions.

Initial finding: crop advisors are getting different information than growers. Crop advisors felt it was their role to provide accurate information to growers.

Pacific Northwest Community project (Ian Burke)

Update: Newly hired post doc, Nick Bergmann, is organizing and reenergizing communities. Tool kit for community organization has evolved based on experience. Challenge is how to equalize the conversation between the farmer participants and the scientists. Each (of 3) community is organized differently in terms of leadership style. Working to identify practices that farmers are willing to adopt and finding resources to incentivize adoption.

Crop Life/RISE workshop (Clint Pilcher)

Update: Remote workshop with regulators; about 30 attended. Very little engagement and feedback.

International IPM symposium session (Clint Pilcher and organizing committee)

Update: Scheduled for March 2. Will report what we learn from the panel discussion.

GROW initiative (Muthu Bagavathiannan)

Update: www.growiwm.org product of an areawide ARS grant program led by Steve Mirsky. Goal is to promote integrated strategies for weed management. Five year grant moving into phase 2 where the goal is to move beyond original geographic region. Looking for partners in this expanded effort.

HRAC educational initiatives (Chandra Aradhya) – technical issues prevented an update. He sent slides which are included with this report.

AAAS session (Dave Ervin) – co-organizer with Muthu Bagavathiannan. Spotlight videos have been recorded and will be available for viewing. Muthu will share information once released.

2- Federal updates

EPA - PPDC and resistance workgroup (David Shaw and Bill Chism)

Update: Report found at <https://www.epa.gov/system/files/documents/2021-10/resistance-management-workgroup-report-and-recommendations-for-ppdc-review.pdf>.

Bill – within agency enthusiasm is high; however, need to create a path forward with limited resources.

David – Key convergence with WSSA efforts:

- Addressing labelling inconsistencies – can HR be offered as a way to test electronic labelling?
- Agencies are having conversations about HR and are interested in working with stakeholders and academia.
- The need for community involvement was present in all recommendations.

Question: Can the workgroup come up with a fixed set of topics to be addressed on a label – an outline for the electronic labeling committee to use as they develop the program?

Action Item: The HRE committee volunteer to work with the workgroup to develop this outline.

Question: Any thought about types of incentive programs that could be developed and how to fund?

Response: This needs further thought but likely requires a joint agency effort. Need to think about how to take advantage of current government programs.

Comments: Other efforts may be more productive than label initiative. How do ‘we’ move the needle on the need to address resistance? Has there been discussion around ecosystem services – how do we include biodiversity within the discussion of ecosystem services so that attention to pest management issues becomes part of the larger discussion?

USDA (Cameron Douglass)

Update:

- USDA is forming a pesticide resistance management workgroup composed of all federal agencies involved with resistance, including microbial resistance. How can USDA promote resistance management practices within federal programs?
- Phone discussions with Lindsay Haines, NRCS, David Shaw, Jill Schroeder, and Amy Asmus – discuss opportunities to collaborate on herbicide resistance and provide webinars/training materials for NRCS staff. Would like to bring Katie Dentzman into the conversation.
- Working on a Conservation Enhancement for resistance management – funding and technical assistance to improve on resistance management activities.

Actions:

- Cameron will bring information on Conservation Enhancement to committee for assistance in publicizing it once it has been reviewed and approved by NRCS.
- Lynn Sosnoskie will provide the committee with a list of current extension specialists as a resource for NRCS staff.
- Ian Burke offered to help regionalize the US map – with help from this committee – to assist NRCS staff with identifying which resources are best suited for their region.
- Need to consider how to engage Take Action and GROW initiatives to make their materials available/known to USDA.

4 - **Update on resistance vs tolerance definitions** (Lee Van Wychen) – no action to report; waiting for requested information from Crop Life to organize a committee to discuss updating these terms.

5- How are we addressing the need to act when observing reduced control in the field before official confirmation of resistance (suspected resistance)?

Challenge: Depending on the size of the geography/community, it is very difficult to address. If widespread, it is handled differently than a first report. Many sensitivities around first reports, also privacy issues must be considered.. Personal conversations are handled differently than reports. Also scale of report is a consideration – some are comfortable reporting at a county level.

Emphasis, overall, should shift to reducing seed production rather than managing populations. Need to recognize also that monitoring is a broader issue than resistance – Endangered species requirements include monitoring, as well as other issues.

6- Discussion on path forward to integrate/improve communication among initiatives to further HR education to compliments the current work, reduce redundancy, and avoid working at cross purposes. *See action items above.*

Feb 10, 2022



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WSSA HR Education Committee - Update

HRAC Education/ Awareness

Chandra Aradhya; Bayer CropScience and Chair, US HRAC

Webinars on resistance management



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- Partnered with Take Action and sponsored key webinars
- Webinar recordings will be/ are available on HRAC and Take Action sites

<https://iwilltakeaction.com/news/inside-weed-management-webinar-series>



December 21st, 2021

Don't let weed management tools pass you by. Join Take Action for Inside Weed Management, a webinar series hosted by Take Action, providing helpful tools to help you manage herbicide resistance on your farm. This year, join weed scientists from land-grant universities across the country as they share information about harvest weed seed control, the value of residuals and metabolic herbicide resistance.

Recordings of Past Webinars:

[Why Care About Metabolic Herbicide Resistance?](#) – Original broadcast date: 1/13/2022

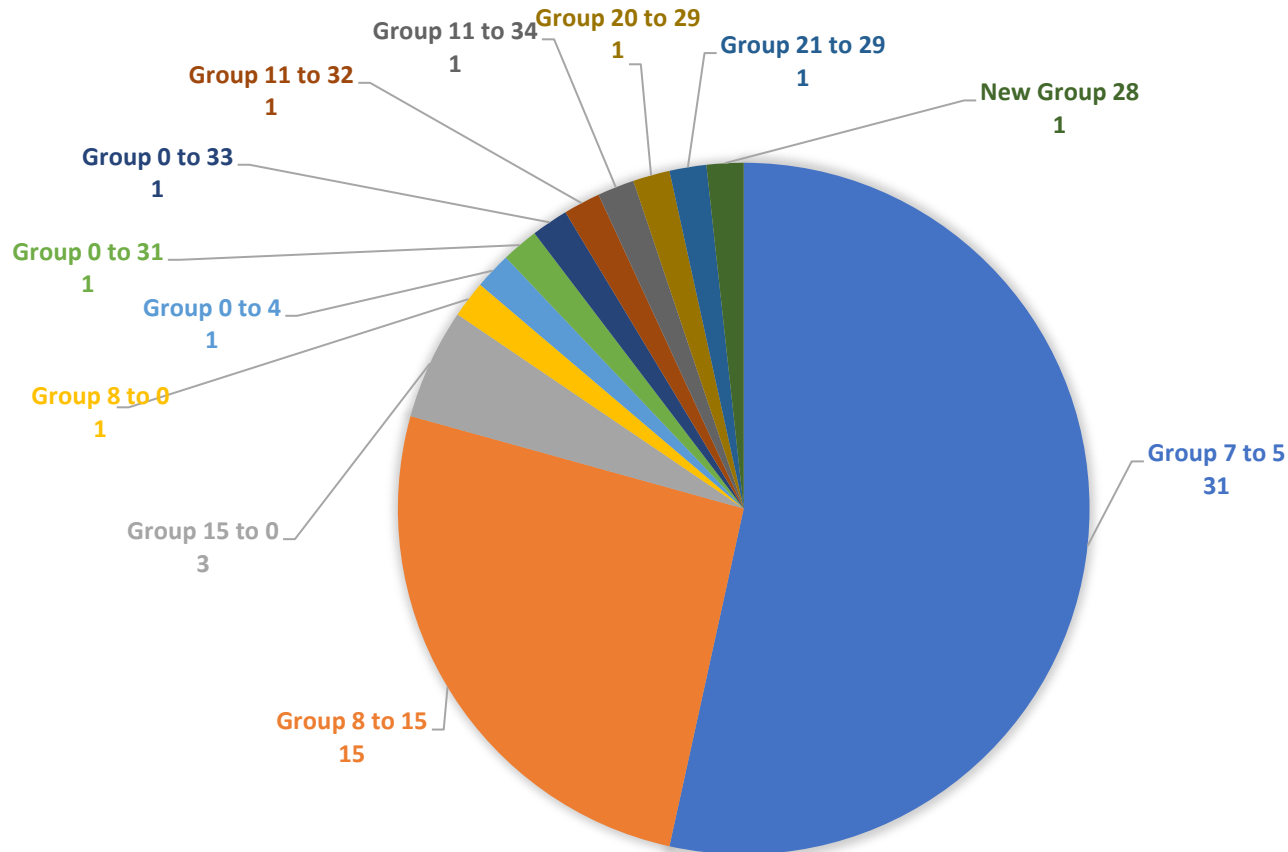
[Value of Residuals in Herbicide-Resistant Weed Problems](#) – Original broadcast date: 1/20/2022

[Harvest Weed Seed Control Practices](#) – Original broadcast date: 1/27/2022

Legacy WSSA vs. HRAC's universal MOA code



- Summary of changes at the MOA group level
- Total 58 active ingredients having new MOA codes
- Will be presenting posters in scientific societies



List of impacted herbicides within HRAC members



- Only 7 active ingredients impacted among CLA members
- Impacted companies (see below) have already notified / initiated/ planned to notify EPA on MOA group changes

Company	Active ingredient*	New MOA Group	Legacy MOA Group
Syngenta	None impacted	N/A	N/A
BASF	None impacted	N/A	N/A
Valent	None impacted	N/A	N/A
FMC	None impacted	N/A	N/A
Adama	None impacted	N/A	N/A
Bayer	Ethofumesate	15	8
Corteva	Isoxaben	29	21
AMVAC	Diuron	5	7
UPL	Propanil	5	7
UPL	Ethofumesate	15	8
UPL	Dichlobenil	29	20
UPL	Endothall	31	NC
UPL	Napropamide	0	15

* As a standalone and/or premix component

HRAC's communication with key stakeholders



Communication on MOA reclassification:

- **WSSA:** Ensure alignment on communication with WSSA committees.
 - Updated WSSA herbicide MOA chart: <https://wssa.net/wssa/weed/herbicides/> (link to the Excel sheet)
 - WSSA Public Release Committee- [Public Release - Herbicides MOA](#)
 - Included in one of the WSSA Newsletters
 - WSSA Science Policy Committee – provided an overview of changes
 - WSSA Herbicide Resistance Plant Committee- provided an overview of changes

- **EPA:**
 - Seminar on MOA reclassification (virtual) in May 2021
 - Seminar was recorded for internal sharing by EPA; Canada's PMRA personnel participated.
 - Information shared via email and circulated within EPA and PMRA.
 - EPA formed a small sub-group for regular updates (met only once; need to revisit)

- **Take Action** – supported revising and updating MOA chart
 - [Updated Take Action Herbicides MOA Chart](#)

Key HRAC resources

These HRAC documents below will provide detailed information:

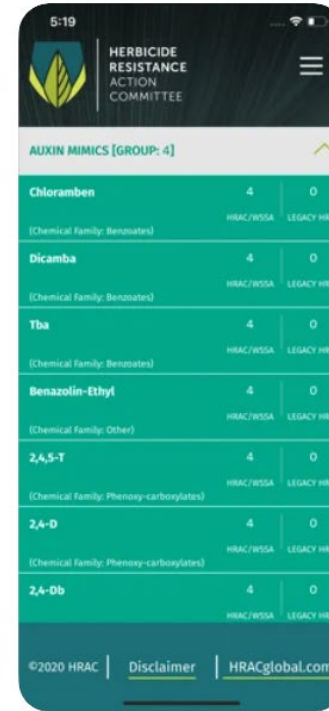
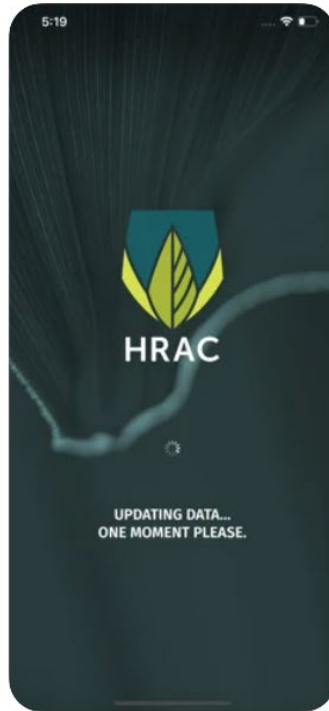
- Technical description of the MOA changes (those who want to know detail on chemistry): [https://hracglobal.com/files/GHRAC MOA UPDATE 2020.pdf](https://hracglobal.com/files/GHRAC_MOA_UPDATE_2020.pdf)
- Updated herbicides MOA poster: <https://hracglobal.com/tools/hrac-mode-of-action-classification-2020-map>
- MOA Classification Look-Up App or webtool: <https://hracglobal.com/tools/classification-lookup>

MOA Lookup App for Android and iOS

<https://hracglobal.com/tools/classification-lookup>



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Updating MOA code on the herbicide labels

Goal is to make gradual implementation **by 2023**

- Label change notification to EPA by the individual company
 - Next cycle of printing product labels
- Make MOA code changes during Registration renewal and proposed interim decision.
- Registration review

WSSA HR Education Committee

- Multiply the message and share many available information.
- Companies outside of CropLife need to be made aware and be engaged.
- Develop one-page fact sheet on MOA changes
- Encourage using the MOA App.

Thank-you

