

## **WSSA Liaison to EPA-OPP (Office of Pesticide Programs)**

### **Interim Report to the WSSA Board of Directors**

#### **Quarter 1, 2016**

##### **February WSSA Annual Meeting**

Major interactions between the WSSA and EPA staff occurred during the WSSA annual meeting. Attending the WSSA meeting were Bill Chism, Mark Suarez, and Sunil Ratnayake from the Biological and Economic Assessment Division (BEAD) and Sujatha Sunkula for the Environmental Fate and Effects Division (EFED) of the EPA Office of Pesticide Programs (OPP). Prior to the meeting, I participated on a conference call to plan the activities and meetings for the EPA staff at the WSSA meeting.

At the meeting, I met first with the WSSA Board of Directors on Saturday to present my report on the EPA Liaison activities to them. As part of the report, I requested permission to bring in speakers to the EPA office to address two subjects of concern for OPP: 1. Herbicide-herbicide interactions and especially the question of how to test for, analyze for, and, most of all, demonstrate herbicide synergism and, 2. Modern application technologies and especially, drift reduction technologies. Beyond the presentations at EPA, I suggested that refereed reviews on these subjects would be useful for OPP.

At the Sunday BOD meeting, Bill Chism and Mark Suarez made a presentation to the members on the elements of an OPP proposal for a herbicide resistance management plan structure that would be used as part of herbicide registrations and labeling and that is now open for public comment (<https://www.epa.gov/pesticide-registration/prn-2016-xx-draft-guidance-herbicide-resistance-management-la>). Comments are due by September 1, 2016. An updated (March 2016) copy of that information is attached to this report. As part of this presentation, WSSA was asked to maintain a list of herbicides and their mechanism of action (MOA) on its website that EPA could refer registrants to as plan of the process for establishing individual herbicide resistance management plans. As a follow-up to the meeting and working with Muthu and Scott Senseman, this list was created and posted (<http://wssa.net/wp-content/uploads/WSSA-Herbicide-MOA-20160626.pdf>).

The EPA staff interactions and discussion concerning the resistance management proposal continued throughout the meeting. They attended a joint meeting of the Herbicide Resistant Plants Committee (E12a) and Herbicide Resistance Education Committee (E12b). They had multiple meetings with the two special WSSA committees, one charged with responding with suggestions on behalf of WSSA on the EPA resistance management plan proposal and chaired by Larry Steckel and the other that is chaired by Andrew Kniss and which charged with making recommendations on a reporting system for new cases of resistance required in the EPA resistance management proposal. All four EPA staff met with the Application Technologies Committee to discuss questions concerning this subject that OPP has and how to get WSSA to respond with needed information. Finally, Bill Chism presented the EPA resistance management proposal in a presentation (#473) in the WSSA Regulatory session Wednesday morning of the meeting. Overall, this was incredible interaction between the agency and WSSA. Having a public presentation of the resistance proposal at the meeting with an opportunity to discuss it with some of

the authors was an unprecedented opportunity to prepare WSSA for commenting on this new policy. The proposal follows.

### **Herbicide Resistance Management – Stewardship Checklist with References**

**DATE:** March 03, 2016  
**FROM:** Chism, Becker, Berwald, Mallampalli, Yourman, and Jones  
 Biological and Economic Analysis Division, EPA, Office of Pesticide Programs

As part of the registration and reregistration review of some herbicides BEAD reviews the stewardship and resistance management plans to determine if they have addressed the elements of concern to the Agency. The following table lists items that BEAD will consider when reviewing these plans.

Nine of the eleven items will be instructions placed on the label to provide information to the user (elements 1 through 7, 10 and 11 where applicable), and three of the elements will be instructions to the registrant (elements 8, 9, and 11 where applicable).

**Table 1. Elements of resistance management or stewardship plan**

Element	Description
1	List Mechanism of Action (MoA) Group Number. ➤ Registrant is responsible to place on label.
2	List seasonal and annual maximum number of applications and amount. ➤ Registrant is responsible to place on label.
3	Resistance Management language from PR Notice 2001-5, and/or Best Management Practices (appropriate to crop) from Weed Science Society of America (WSSA) & Herbicide Resistance Action Committee (HRAC), and/or HRAC proposed guidelines for herbicide labels. ➤ Registrant is responsible to place on label.
4	Include instructions for scouting before and after application. ➤ Registrant is responsible to place on label. ➤ User is responsible to follow recommendations.
5	Definition of Likely Resistance. ➤ Registrant is responsible to place on label.
6	User should report lack of performance to registrant or their representative. ➤ Registrant is responsible to place on label. ➤ User is responsible to follow recommendations.
7	List confirmed resistant weeds in a separate table and list effective or recommended rates for these weeds with the table. ➤ Registrant is responsible to place on label.
8	Registrant report new cases of likely and confirmed resistance to EPA and users yearly. This will be in addition to any adverse effects reporting. ➤ Registrant is responsible.
9	For sites of high concern provide growers with: <ul style="list-style-type: none"> <li>• Resistance Management Plan</li> <li>• Remedial Action Plan (to control resistant weeds this season or next season)</li> <li>• Educational materials on resistance management</li> </ul>

	Plans should be locally developed and easily modified. We recommend registrants work with Extension, Consultants, Crop Groups, HRAC, & USDA. ➤ Registrant is responsible to provide educational materials
10	For combination products with multiple MoA, list which herbicide is controlling which weed (a 3 way mixture may only have 1 effective MoA for some problem weeds). List minimum recommended rate if resistance is suspected. ➤ Registrant is responsible to list on label or otherwise provide information.
11	Any additional specific requirements (e.g. mandatory crop rotation, unique agronomic aspects, additional training, time limited registration, etc.). ➤ Registrant is responsible.

**Footnote:** Mechanism of Action Group number comes from the WSSA.

**Table 2. Herbicide Resistance Categories of Concern\***

Low Concern	Moderate Concern	High Concern
MOA with no resistance weed species in the U.S.	MOA with a few resistant weed species in the U.S.	<ul style="list-style-type: none"> <li>• Any new herbicide with a new or novel mechanism of action, or</li> <li>• Herbicide resistant crop(s) for that technology (conventionally bred or GM), or</li> <li>• MOA with the most resistant weeds in U.S.</li> </ul>
<ol style="list-style-type: none"> <li>1. MoA on Label</li> <li>2. List seasonal and annual maximum number of applications and pounds</li> <li>3. Resistance management language from PRN 2001-5 or BMPs</li> <li>4. Scout before and after application</li> </ol>	<ol style="list-style-type: none"> <li>5. Definition of likely and confirmed resistance</li> <li>6. Farmer should report lack of performance to registrant or its agent</li> <li>7. List confirmed resistant species in separate table and list effective or recommended rates for these weeds with the table</li> <li>8. Registrant report new cases of likely and confirmed resistance to EPA &amp; users yearly</li> </ol>	<ol style="list-style-type: none"> <li>9. Provide growers with: Resistance Management Plan, Remedial Action Plan, Educational materials on resistance management</li> <li>10. For combination products with multiple MoAs, list which herbicide is controlling which weed and minimum recommended rate</li> <li>11. Any additional specific requirements (e.g. mandatory crop rotation, unique agronomic aspects, time limited registration, etc.).</li> </ol>

\* If new resistant weed species are found a MoA may move to higher level of concern.

## REFERENCES

EPA. 2001. Guidance for Pesticide Registrants on Pesticide Resistance Management Labeling. Pesticide Registration (PR) Notice 2001-5. <http://www.epa.gov/sites/production/files/2014-04/documents/pr2001-5.pdf>

HRAC. 2015. Herbicide Resistance Management, Proposed HRAC Stewardship Guidelines for Herbicide Labels. Accessed online on September 24, 2015 at <http://www.hracglobal.com/pages/hracstewardshipguidelinesforherbicidelabels.aspx>

Norsworthy, J.K., S. M. Ward, D. R. Shaw, R. S. Llewellyn, R. L. Nichols, T. M. Webster, K. W. Bradley, G. Frisvold, S. B. Powles, N. R. Burgos, W. W. Witt, and M. Barrett. 2012. Reducing the Risks of Herbicide Resistance: Best Management Practices and Recommendations. *Weed Science* 2012 Special Issue:31–62. Available online at: <http://www.wssajournals.org/doi/pdf/10.1614/WS-D-11-00155.1>

## **APPENDIX I. Guidance for Pesticide Registrants on Pesticide Resistance Management Labeling (EPA, 2001)**

### **Herbicides**

1. The following general resistance management labeling statements are recommended for herbicide products containing only a single active ingredient or only active ingredients from the same group:
  - a. “For resistance management, (name of product) is a Group (mode of action group number) herbicide. Any weed population may contain or develop plants naturally resistant to (name of product) and other Group (mode of action group number) herbicides. The resistant biotypes may dominate the weed population if these herbicides are used repeatedly in the same field. Other resistance mechanisms that are not linked to this mode of action but are specific for individual chemicals, such as enhanced metabolism, may also exist. Appropriate resistance-management strategies should be followed.”

For products containing active ingredients from different groups, the statement should be modified to reflect the situation, for example:

- b. “For resistance management, please note that (name of product) is both a Group (mode of action group number) and a Group (mode of action group number) herbicide. Any weed population may contain plants naturally resistant to Group (mode of action group number) and/or Group (mode of action group number) herbicides. The resistant individuals may dominate the weed population if these herbicides are used repeatedly in the same fields.”
2. The following additional resistance management labeling statements are recommended for herbicides, although each bulleted statement may not be appropriate or pertinent for every product label:

“To delay herbicide resistance:

- a. Rotate the use of (name of product) or other Group (mode of action group number) herbicides within a growing season sequence or among growing seasons with different herbicide groups that control the same weeds in a field.
- b. Use tank mixtures with herbicides from a different group if such use is permitted; Use the less resistance-prone partner at a rate that will control the target weed(s) equally as well as the more resistance-prone partner.
- c. Adopt an integrated weed management program for herbicide use that includes scouting and historical information related to herbicide use and crop rotation, and that considers tillage (or other mechanical control methods), cultural (e.g., higher crop seeding rates; precision fertilizer application method and timing to favor the crop and not the weeds), biological (weed-competitive crops or varieties) and other management practices.
- d. Scout after herbicide application to monitor weed populations for early signs of resistance development. Indicators of possible herbicide resistance include: (1) failure to control a weed species normally controlled by the herbicide at the dose applied, especially if control is achieved on adjacent weeds; (2) a spreading patch of non-controlled plants of a particular weed species; (3) surviving plants mixed with controlled individuals of the same species. If resistance is suspected, prevent weed seed production in the affected area by an alternative herbicide from a different group or by a mechanical method such as hoeing or tillage. Prevent movement of resistant weed seeds to other fields by cleaning harvesting and tillage equipment when moving between fields, and planting clean seed.
- e. If a weed pest population continues to progress after treatment with this product, discontinue use of this product, and switch to another herbicide with a different target mode of action, if available.
- f. Have suspected resistant weed seeds tested by a qualified laboratory to confirm resistance and identify alternative herbicide options.
- g. Contact your local extension specialist or certified crop advisors for additional pesticide resistance-management and/or integrated weed-management recommendations for specific crops and weed biotypes.
- h. For further information or to report suspected resistance, contact (company representatives) at (toll free number) or at (Internet site).”

## **APPENDIX II. Definition of Resistance and Likely Resistance**

According to the Weed Science Society of America “Herbicide resistance is the inherited ability of a plant to survive and reproduce following exposure to a dose of herbicide normally lethal to the wild type. In a plant, resistance may be naturally occurring or induced by such techniques as genetic engineering or selection of variants produced by tissue culture or mutagenesis.”

“Herbicide tolerance is the inherent ability of a species to survive and reproduce after herbicide treatment. This implies that there was no selection or genetic manipulation to make the plant tolerant; it is naturally tolerant.” (<http://weedsociety.org/documents/resistancecriterion.pdf>).

Indicators of likely herbicide resistance (called possible resistance in Norsworthy et al 2012, Page 39) include (1) failure to control a weed species normally controlled by the herbicide at the dose applied, especially if control is achieved on adjacent weeds; (2) a spreading patch of noncontrolled plants of a particular weed species; and (3) surviving plants mixed with controlled individuals of the same species.

## **APPENDIX III. Best Management Practices for Herbicide Resistant Weeds**

### **Crop Selection and Cultural Practices:**

1. Understand the biology of the weeds present.
2. Use a diversified approach toward weed management focused on preventing weed seed production and reducing the number of weed seeds in the soil seed-bank.
3. Emphasize cultural practices that suppress weeds by using crop competitiveness.
4. Plant into weed free fields, keep fields as weed free as possible, and note areas where weeds were a problem in prior seasons.
5. Incorporate additional weed control practices whenever possible, such as mechanical cultivation, biological management practices, crop rotation, and weed-free crop seeds, as part of an integrated weed control program.
6. Do not allow weed escapes to produce seeds, roots or tubers.
7. Manage weed seed at harvest and post-harvest to prevent a buildup of the weed seed-bank.
8. Prevent field-to-field and within-field movement of weed seed or vegetative propagules.
9. Thoroughly clean plant residues from equipment before leaving fields.
10. Prevent an influx of weeds into the field by managing field borders.
11. Fields should be scouted before application to ensure herbicides and application rates will be appropriate for the weed species and weed sizes present.
12. Fields should be scouted after application to confirm herbicide effectiveness and to detect weed escapes.
13. If resistance is suspected, treat weed escapes with an alternate mode of action or use non-chemical methods to remove escapes.
14. Avoid outcrossing to weedy relatives, in crops that outcross. Control weedy relatives in surrounding field margins. Research has demonstrated that the pollen can move \_\_\_\_\_ feet.

## **Herbicide Selection:**

1. Use a broad spectrum soil applied herbicide with a mechanism of action that differs from this product as a foundation in a weed control program.
2. A broad spectrum weed control program should consider all of the weeds present in the field. Weeds should be identified through scouting and field history.
3. Difficult to control weeds may require sequential applications of herbicides with alternative mechanisms of action.
4. Fields with difficult to control weeds should be rotated to crops that allow the use of herbicides with alternative mechanisms of action.
5. Apply full rates of this herbicide for the most difficult to control weed in the field. Applications should be made when weeds are at the correct size to minimize weed escapes.
6. Do not use more than two applications of “this herbicide” or any herbicide with the same mechanism of action within a single growing season unless mixed with another mechanism of action herbicide with overlapping spectrum for the difficult to control weeds.
7. Report any incidence of non-performance of this product against a particular weed species to the \_\_\_\_\_ representative (list contact information here).

**Footnote:** Most items are taken from the Herbicide Resistance Action Committee / Weed Science Society of America list of Best Management Practices.

## **March 1-3**

I visited the offices of EPA-OPP in Arlington, VA from March 1 to March 3. During this visit to EPA, I visited with personnel from the Registration Division (RD) and the Biological and Economic Assessment Division (BEAD). One interesting point of discussion was how to describe and identify benefits associated with new pesticides or pesticide uses. We also discussed weighing the advantages and disadvantages of new uses and pesticides.

One of the first challenges of this visit was finding where everyone had their office. The space occupied by EPA-OPP has been compressed due to loss of staff and many of the persons I interact with were moved to new locations.

On March 2, I attended a meeting between the American Phytopathological Society (APS) Public Policy Board and BEAD. The APS committee made a presentation on the Phytobiomes Initiative and the formation of the International Phytobiome Alliance 501(c).

During this visit, I had lunch with Lee Van Wychen, Ray McAllister, and Janet Collins to discuss regulatory issues of concern at Crop Life.