

## Weed management update for 2016 and other thoughts

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### Introduction

Many of the issues that have been problems in the past continue to remain problems. Herbicide resistance continues to evolve, diversity of weed management tactics is slowly changing, and herbicides that attach to new and novel sites of action in weeds have yet to be developed. However, there are some perspectives that are favorable, notably an increase in the use of soil-applied herbicides that provide residual control and the occasional sighting of a row-crop cultivator in 2015. The problem is, in my opinion, overcoming the tendency of farmers to wait until weed problems have increased to the point that resolution is costly and difficult. Generally, weed management is “OK” across the state and the locations with Palmer amaranth have not changed, based on the yearly road trip survey. Certainly the number of soybean fields with weeds visible above the canopy prior to harvest is increasing, but there has not been a notable increase across the state in major weed management failures.

However, it is noteworthy that random surveys suggest that a high percentage of the fields with weeds visible above the soybean canopy have evolved resistance to one or more herbicides. It is important to recognize that the questions concerning waterhemp not responding to Group 14 (PPO) and Group 27 (HPPD) herbicides continue to increase. Given the high use of Group 14 herbicides and the prevalence of Group 27 herbicides in seed corn production, this increase in suspected and known resistant populations is not surprising.

Overall, the increases in herbicide-resistant (HR) weed populations have moved forward somewhat slowly. The tillage treatments commonly used in the fall and immediately prior to planting are not unlike a “reset” button that serves to dilute the annual weed seed rain and slow the annual growth in weed population density. However, once the weed seed bank achieves a level of seeds that allows the population curve to move from additive to exponential, weed population densities across the state may become unmanageable.

Most Iowa fields currently have manageable weed population densities but how much longer that will be the case remains to be seen. Now is the time to make adjustments in weed management programs including as much diversity beyond herbicides as possible, but also paying particular attention to which herbicides are included in the program and how and when they are used. There are no new herbicides with novel sites of action available now or in the foreseeable future.

### Selected industry updates

#### BASF

New for 2016 from BASF is Armezon Pro herbicide for corn (field, sweet, seed corn and popcorn). Armezon Pro is an EC formulation containing topramezone (Group 27) and dimethenamid-P (Group 15). Armezon Pro may be applied from corn emergence up to V8 stage or 30-inch tall corn (12-inches tall for sweet corn) and provides burndown and residual control of some annual broadleaf and grass weeds. Use rate range is from 14 to 24 oz/A, depending on soil texture and organic matter.

### ***Bayer Crop Science***

DiFlexx was registered for field, white, seed and popcorn last spring and is a dicamba (Group 4) formulation with the safener, cyprosulfamide. DiFlexx is registered for preplant burndown, preemergence and postemergence application in corn without any planting restrictions because of the safener included in the formulation. Postemergence applications can be made to corn up to the V10 stage of development. Observe the DiFlexx label recommendations for adjuvants. Use 8 to 16 oz/A with a seasonal maximum of 32 oz/A total.

Capreno is a premixture of tembotrione (Group 27) and thienencarbazone-methyl (Group 2) and a safener isoxadifen-ethyl and is now registered to be applied to V7 corn stage. Apply Capreno to field corn, silage and white corn from emergence to 20 inches tall. Do not apply corn is taller than 20 inches or has 7 or more leaf collars, whichever is more restrictive. MSO was also added as an adjuvant choice.

All Bayer Crop Science labels will include new pest resistance management language. The language is generally more detailed and reflects the need to diversify weed management. Importantly managing the weed seed bank is emphasized as are scouting, controlling weed escapes and the rotation of crops and herbicide-tolerant traits as well as herbicide sites of action.

### ***DuPont***

DuPont received registration approval from the U.S. Environmental Protection Agency (EPA), Revulin Q herbicide early in the first quarter of 2015. Revulin Q is a premixture of dry mesotrione (Group 27), nicosulfuron (Group 2), and a safener. Revulin Q is labeled for postemergence grass and broadleaf weed control in numerous types of corn including field corn grown for grain, silage or seed, yellow popcorn and sweet corn.

Cinch herbicide (Group 15) can now be applied as part of a sequential soybean weed control program. If Cinch was applied as a preplant surface, preplant incorporated, or a preemergence treatment, a second treatment of Cinch can be applied postemergence provided that the total rate during any one crop does not exceed 2.5 pt/A. No more than 1.33 pt/A of Cinch can be applied postemergence, and the total Cinch rate applied preplant, preemergence or postemergence to soybeans during any one crop should not exceed 2.5 pt/A (2.4 lbs a.i./A of S-metolachlor). Postemergence applications must be made at least 90 days before harvest. Cinch does not provide any control of emerged weeds.

### ***FMC***

Anthem Maxx is a premixture of fluthiacet-methyl (Group 14) and pyroxasulfone (Group 15) and replaces Anthem. Anthem Maxx has 4.3 lbs a.i./gallon which is twice the a.i. that was in Anthem. The rates of application for Anthem Maxx will be one half of the rates for Anthem. Anthem Maxx is registered for preplant burndown, preemergence, preplant incorporated and postemergence application in field corn, sweetcorn, popcorn and soybeans. Postemergence applications in corn should be made through the V4 stage of corn development and in soybeans, through the V3 leaf stages. Weeds should be small and actively growing. Observe application restrictions listed on the Anthem Maxx label.

### ***Monsanto***

Warrant Ultra is a premixture of encapsulated acetochlor (Group 15) and fomesafen (Group 14). This product can be applied preemergence and postemergence before soybeans reach growth stage R2 and will provide control of many annual grass and broadleaf weeds. The encapsulation of the acetochlor provides a slow release of the herbicide and increases the potential for the herbicide to remain effective for a longer period of time.

Warrant can now be applied to corn postemergence for extended residual control of some annual grass and broadleaf weeds. Warrant does not have any activity on weeds that have emerged at the time of application.

### ***Syngenta***

Syngenta introduced Acuron herbicide for control of annual grass and broadleaf weeds in field corn, seed corn, silage corn, sweet corn and yellow popcorn. Acuron is a premixture of S-metolachlor (Group 15), atrazine (Group 5), mesotrione (Group 27) and bicyclopyrone (Group 27). Acuron can be applied preemergence in all corn types listed. Acuron may also be applied early postemergence in field, seed and silage corn but not to emerged sweet corn or yellow popcorn because of potential severe crop injury. Acuron may also be applied in split application. Postemergence applications must be made before the corn is 12 inches in height.

Most of the Syngenta proprietary herbicides now have the Weed Science Society of America (WSSA) mode of action herbicide group numbers and revised resistance management language included in the label. Flexstar (Group 14) and Flexstar GT (Groups 9 and 14) labels now include an adjuvant statement that requires adjuvant products to meet the standards of the Chemical Producers and Distributors Association certification program.

### ***Valent***

Valent has a new premixture Fierce XLT registered for use in soybeans. Fierce XLT includes chlorimuron (Group 2), flumioxazin (Group 14) and pyroxasulfone (Group 15) and can be applied as an early preplant, preplant or preemergence application. Preemergence applications must be made within 3 days after planting and prior to soybean emergence. Applications of Fierce XLT after soybeans have begun to crack or are emerged will result in severe injury. Do not apply Fierce XLT on soils with a composite pH of greater than 7.6. Do not perform any tillage operation after application or residual weed control will be reduced.

## **New herbicide-resistant crops**

### ***Dow AgroScience***

Dow continues to move forward with plans to market the Enlist corn and soybeans but are waiting on deregulation by China before full commercial availability. Enlist crops are tolerant to 2,4-D (Group 4) and glyphosate (Group 9). Enlist corn is available to a select group of farmers who can meet the stringent stewardship program developed by Dow. Enlist soybean are available only for seed production.

### ***BASF***

Dicamba-tolerant soybean cultivars are deregulated in the US, but not yet in China. Furthermore, the herbicide that will be registered for application to the dicamba-tolerant soybean (Engenia is a low volatility formulation of dicamba [Group 4]) is pending registration with the EPA.

### ***Monsanto***

Monsanto reports that the soybean cultivars with tolerance to dicamba are deregulated in the US, but not yet in China. Furthermore, the herbicides that will be registered for application to the dicamba-tolerant soybeans (Roundup Xtend, a premixture of glyphosate (Group 9) and dicamba (Group 4) with anti-vapor drift component) and Extendimax (dicamba with anti-vapor drift component) are waiting on EPA registration.

If China deregulates these genetically-engineered crop cultivars at the next opportunity, and if EPA follows quickly with registration of the dicamba-based herbicides, it is possible that these crop/herbicide “systems” may be commercially available in 2016. However, there is much speculation and many dominos must fall in a timely fashion. Regardless, the new “systems” will provide many opportunities and challenges for growers and applicators if they are to be used safely and effectively. Following the stewardship requirements as stated by the companies will be paramount to the success of the technologies.

### ***Bayer Crop Science***

Bayer Crop Science continues to move forward with the Balance GT soybean that has tolerance to the Group 27 herbicide isoxaflutole, a potent HPPD inhibitor. Pending approval in China, a 2017 commercial launch is anticipated.

### ***Syngenta***

Syngenta anticipates that the soybean cultivars with tolerance to mesotrione, a Group 27 herbicide, will be available in the latter part of this decade. The soybean cultivars will allow the preemergence application of mesotrione for control of important annual broadleaf weeds.

## **Marestail/horseweed management**

Marestail, also known as horseweed (*Conyza canadensis*), is one of the more troublesome weeds in no tillage crop production systems. As a seedling or small rosette, there are many soil-applied herbicides (i.e., atrazine) that have activity on marestail, however burndown activity is the primary concern of most farmers who use no tillage production systems. While marestail is described as a winter annual weed, most of the marestail in Iowa behaves like a spring annual weed with germination in April and May. Also, after marestail “bolts” (moves from the rosette stage of development to flowering), it becomes extremely difficult to control with any postemergence herbicide application.

Adding to the difficulty of managing this weed with herbicides are populations that have evolved resistance to herbicides and multiple-resistant populations have been identified. Marestail populations with resistance to glyphosate (Group 9) and ALS inhibitor herbicides (Group 2) are common in Iowa. While not reported in Iowa, marestail populations with resistance to atrazine (Group 5) have been identified and given the prevalence of atrazine use in Iowa, the likelihood of atrazine-resistant marestail in Iowa is high.

Herbicide that are effective as postemergence burndown applications include the auxin herbicides (Group 4). Banvel, Clarity, Status and 2,4-D, all auxin herbicides, provide good control of small rosette-stage marestail. Atrazine (Group 5) is also good on small marestail. Similarly, glyphosate (Group 9) is effective on small rosette-stage marestail although populations with evolved resistance to glyphosate are common in Iowa. The Group 14 herbicides Sharpen (saflufenacil), Optill (saflufenacil + imazethapyr) (Groups 14 and 2, respectively) and Verdict (saflufenacil + dimethenamid) (Groups 14 and 15, respectively) can be effective as a burndown treatment on small rosette-stage marestail.

Tillage is an effective tactic to control marestail. If the marestail populations are high, it may be good to consider tilling the fields in order to lessen the ecological advantage that marestail has in a no tillage crop production system. One tillage trip may be sufficient to significantly reduce the marestail populations and allow the resumption of no tillage systems.

## **Palmer amaranth**

There have not been any new infestations of Palmer amaranth discovered in 2015 and some of the previously identified fields have been managed effectively. Of course, some known fields have not been effectively managed and Palmer amaranth in those fields continues to be a problem and potentially jeopardizes neighboring fields. It is important to remain vigilant and continue to scout for suspected infestations of Palmer amaranth, particularly in south eastern, southern and southwestern Iowa counties, given the proximity to states with serious Palmer amaranth problems.

## **Other thoughts**

### ***Grower perspectives on herbicide resistance***

A multi-state project is underway to determine farmers perspectives on HR weeds, management practices utilized, barriers to managing HR weeds and other related areas. The project includes Iowa, Minnesota, Arkansas, Arizona, and North Carolina and one of the initial efforts involved conducting focus group meetings with farmers from each of the states. Crop systems and farming practices were very different in many of these states yet there are a number of perspectives that were consistent with farmers who participated in the focus group meetings. Awareness about HR weeds was high and concerns about herbicide resistance was consistently high in every focus group. All farmers reported similar general management practices and most farmers focused on herbicide use. Cultural practices were uniformly less popular due to the increased labor costs and time involved.

Not surprisingly, when asked about government involvement in HR weed issues, the majority of farmers agreed that the government should not be involved. Farmers felt that the solution to HR weeds was the development of new herbicides and many participants expressed faith in the chemical industry to develop new products. However, some growers, particularly in North Carolina and Arkansas, had little faith in the chemical industry. Farmers were also quick to suggest that weeds would likely evolve resistance to any new herbicide. Generally, farmers indicated a hesitancy to discuss herbicide resistance problems with neighbors who had HR weeds and would not speak with their neighbors directly. While farmers understood that a neighbor's weeds can easily become their problem, most farmers would rather communicate concerns through a third party.

There were a number of interesting regional differences in the perspectives of farmers concerning HR weeds. Farmers from Iowa and Minnesota were more optimistic about the potential for the development of new herbicides, whereas farmers from Arkansas and North Carolina were more negative about any potential new herbicides. Importantly southern farmers were worried that chemical companies are not doing enough to develop new herbicides, and that even if these herbicides are developed, they will be overused and lead to resistance. Farmers in the south were more likely to place responsibility for HR weeds on nearby farms and what they considered to be poor management strategies. Northern farmers suggested that herbicide resistance had spread to their area from the south. Regardless of region, farmers suggested that part of the responsibility for herbicide resistance were the chemical and seed companies.

### ***Community-based weed management***

A consideration for the future is farmer organized and managed community-based weed management programs. Community-based efforts have demonstrated considerable success in addressing significant agricultural problems (i.e., boll weevil in cotton and soil conservation/water quality issues) and it is suggested that weed management, particularly HR weed management, may benefit from farmer led community-based programs. However, farmers must address HR weeds at the landscape level if programs are to have any likelihood of success. This will require that farmers band together and approach HR weed

management as a community. Given that farmers are hesitant to discuss HR weed issues with neighbors, this will be challenging. Furthermore, the fact that many farmers believe that they are doing all that they can to manage HR weeds and the agricultural chemical companies continue to promote products that may not be effective for current HR weed management is a barrier to the success of community-based programs. Regardless, farmer organized efforts should be initiated and maintained to address HR weed management.

### ***Statewide pest resistance management***

The Iowa Department of Agriculture and Land Stewardship, Iowa State University, farmers and a broad range of agricultural organizations are currently in the process of assessing options for addressing pest resistances in Iowa including weeds, insects, nematodes and diseases and determining the feasibility of statewide recommendations. It is anticipated that conclusions about the feasibility of an Iowa pest resistance management plan will be determined in 2016.

## **Conclusions**

Weeds continue to remain the most important pest complex in Iowa crop production and resistance to herbicides continues to be a significant problem that impacts effective weed management and profitability. There will not be any new herbicides with novel sites of action in the foreseeable future. While the availability of new crop cultivars with tolerance to herbicides (e.g., Group 4) will provide farmers with options, it will be important to set expectations appropriately. Group 4 products will provide some benefits but also have risks that must be considered. These risks include, but are not limited to, drift and spray tank and nurse tank contamination. It will be important to follow all the stewardship precautions put forward by the companies in order to minimize the issues that may occur with the new technologies. While it does not appear that Palmer amaranth is spreading rapidly in Iowa, vigilance is still required to keep this weed from gaining greater distribution. Finally, based on farmer opinions, it is clear that there is still work to be done in move weed management forward in order to better address herbicide resistance. It is suggested that farmer organized and managed, community-based efforts will a more effective way of addressing weed management at the landscape level.