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Weed management update for 2015

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Introduction

Given the environmental conditions in 2013 resulting in delayed herbicide applications and drought later in the summer, the increasing use of "alternative" herbicides and the cool wet conditions in 2014, conditions were excellent for many interesting occurrences. Herbicide carryover was a factor for several products, several products provided evidence why farmers preferred using glyphosate alone, and herbicide-resistant weed populations continue to evolve. It appears that the message of diversity in order to manage herbicide resistance is gaining traction but to the extent that the focus is primarily on herbicides which was the reason that herbicide resistance became such a big issue. There is a need to expand the acceptance of more diversity in weed management.

Selected industry updates

ADAMA (formerly MANA) – Latir is a premix of flumioxazin (herbicide group 14 - HG14) and imazethapyr (HG2) for preplant/preemergence applications in soybean. It is labeled at rates of 3.2 to 4.25 oz/A. Pummel is a premix of metolachlor (HG15) and imazethapyr (HG2) for preplant/preemergence use in soybean. Use rate ranges from 1.6 to 2.0 pt/A. Torment is a premix containing fomesafen (HG14) and imazethapyr (HG2) labeled for preplant/ preemergence/postemergence application in soybean. Use rates range from ¾ to 1 pt/A.

BASF – The Sharpen (HG14) label now allows used as a harvest aid and desiccant for soybean. The use rate for this purpose is 1 to 1.5 oz/A and can be applied when >65% of pods are brown and >70% leaf drop, or when seed moisture is less than 30%. No data is available to establish how effective it would be on enhancing dry down of waterhemp, the biggest potential target for this use in Iowa.

Bayer CropSciences is planning to introduce DiFlexx for the 2015 season, label is pending at this time. DiFlexx contains dicamba (HG4) and the safener cyprosulfamide. It will be labeled for both preemergence and post applications up to the V9 stage. Use rates are 6-16 fl oz per acre, and it will be registered for field, white, seed and popcorn.

Balance GT soybean were deregulated by the USDA in the summer of 2013, but commercial release will not be until 2016. The soybean are resistant to isoxaflutole (HG27) and glyphosate (HG9). Balance Bean is a formulation of isoxaflutole pending registration for use on soybean with the Balance GT trait.

Cheminova – Bestow (25% rimsulfuron – HG2) replaces Solida for use in corn. Solida is still labeled for use on specialty crops. Harrow is a mixture of 50% rimsulfuron (HG2) and 50% thifensulfuron (HG2) for preplant/ preemergence/ postemergence applications in corn. Statement is a premix of metolachlor (HG15) and fomesafen (HG14) for preplant/ preemergence applications in soybean.

Dow AgroSciences – The Enlist trait providing resistance to 2,4-D (HG4) in soybean was approved by the USDA in September, 2014 and EPA recently registered Enlist Duo, a premix of glyphosate (HG9) and 2,4-D choline (HG4). Full launch of the product line will be delayed until the trait is approved overseas.

DuPont – Afforia is a recently registered premix of flumioxazin (HG14), thifensulfuron (HG2) and tribenuron (HG2) for preplant applications in soybean. It provides burndown and residual control, use rates range from 2.5 to 3.75 oz/A. Revulin Q is a premix of nicosulfuron (HG2), mesotrione (HG27) and a safener for postemergence use in corn. Registration is anticipated early in 2015. Use rates will be 3.4 to 4.0 oz/A. The use rate for Enlite {chlorimuron (HG2), flumioxazin (HG14) and thifensulfuron (HG2)} has been changed from 2.8 oz/A to a range of 2.8 oz-4.25 oz/A.

FMC – Solstice was introduced in 2014 and is a premix of mesotrione (HG27) and fluthiacet (HG14). It is labeled for postemergence use in corn at rates of 2.5 to 3.15 oz/A up to the V8 growth stage. Authority Elite was introduced in 2014 and is a premix of sulfentrazone (HG14) and S-metolachlor (HG15). It is labeled for preplant/preemergence applications in soybean at rates between 19 and 38.7 fl oz/A.

Monsanto – TripleFlex II contains the same concentrations of acetochlor (HG15), flumetsulam (HG2) and clopyralid (HG4) and same use rates as the original formulation. It contains a new safener and has improved stability. Monsanto has introduced two products containing flumioxazin (HG14), Rowel and Rowel FX. The labels are equivalent to Valor and Valor XLT.

NuFarm – Spitfire is a combination of dicamba and 2,4-D ester (both HG4). It is labeled for preplant and preemergence applications in corn, preplant applications in soybean, and for use in pastures, CRP and general farmstead applications. It is an ester formulation of the Weedmaster product line with a lower rate of dicamba. Cheetah contains glufosinate (HG10) at the same concentration present in Liberty. Registration for use on LL soybean is anticipated for 2015 and LL corn for 2016. Cheetah Max is a premix of glufosinate (HG10) and fomesafen (HG14). It is labeled for preplant/preemergence applications in soybean and postemergence applications in LL soybean.

Syngenta – Callisto GT is a premix of mesotrione (HG27) and glyphosate (HG9). It is labeled for postemergence applications in glyphosate resistant corn at a rate of 2 pt/A. Callisto (HG27) is now cleared for aerial applications in corn, a minimum of 2 gal/A carrier must be used. Sequential applications of a PRE and POST application of Dual II Magnum are now allowed in soybean. The combined rate is not to exceed 2.5 pt/A. The V3 restriction for POST application in soybean has been removed and replaced by a 90 day preharvest interval (PHI) on both the Dual II Magnum and Prefix labels. Sequence is a premix of S-metolachlor (HG15) and glyphosate (HG9) labeled for preplant and preemergence application in corn and soybean, and may also be applied postemergence in glyphosate resistant corn and soybean. Syngenta is anticipating registration of Acuron for 2015. It contains the same actives as Lumax (S-metolachlor (HG15), mesotrione (HG27), atrazine (HG5)) plus the new group 27 a.i. bicyclopyrone.

UPI – Broadloom is a product containing bentazon (HG6) for postemergence broadleaf control in corn and soybean. Satellite is an encapsulated formulation of pendimethalin (HG3) for use in corn, soybean and alfalfa.

Valent – Fierce XLT recently obtained federal registration for PRE weed control in soybean. It is a premix of flumioxazin (GH14), pyroxasulfone (HG15) and chlorimuron (HG2).

Herbicide crop responses and carryover

Another wet spring in 2014 complicated weed management by compressing the time available for planting and applying herbicides. However, fewer growers chose to skip the preemergence herbicide applications in 2014 than in previous years and reduced the problems with weed escapes later in the season. Probably the biggest issue in 2014 was widespread crop response from preemergence herbicides, particularly in soybean.

The increase in unfavorable crop response was due to a combination of increased acres treated with preemergence herbicides, an increase in actual use rates applied, and the cool, wet conditions early in the growing season which caused stress on the developing crop. The potential for crop response is determined by: 1) the inherent tolerance of the crop to the herbicide, 2) the amount of herbicide the crop is exposed to, and 3) the vigor of the crop. Another factor that may be important is the herbicide applied during the past year. Information regarding crop tolerance is available in the Herbicide Effectiveness Rating Tables provided in WC 94. With some herbicides there may be differences in relative tolerance among corn hybrids or soybean varieties. Some seed companies provide information on the relative tolerance of their products to various herbicides. In most situations the range of tolerance within a crop is relatively small compared to the influence environment can have on crop tolerance.

Herbicide exposure to the crop is also influenced by the herbicide rate applied, uniformity of application (i.e. sprayer overlaps), and availability of the herbicide to the developing crop. For preemergence herbicides, availability is determined primarily by soil characteristics and soil moisture. In most Iowa soils, soil organic matter is primarily responsible for herbicide adsorption which reduces herbicide availability to the crop. Herbicide availability increases as soil organic matter decreases. Thus, risk of an unfavorable crop response increases in eroded areas or other areas of a field with low soil organic matter. The amount of herbicide available for absorption by plants also increases with soil moisture since excess water displaces herbicide from the soil adsorptive sites, therefore increasing the amount of herbicide in solution and the potential for an unfavorable crop response. Saturated soils early in the spring 2014 resulted in much greater availability of soil-applied herbicides than what typically occurs in most growing seasons.

Finally, most crops gain their selectivity to herbicides via their ability to rapidly metabolize the herbicide before it reaches the site of action. Environmental conditions that stress a crop reduce herbicide metabolism and increase the

potential for an unfavorable crop response. The prolonged periods of saturated soils this spring increased herbicide availability while reducing the ability of the crop to metabolize the herbicide. The combination of increased use of preemergence herbicides, increased herbicide availability, and reduced crop vigor created a scenario where the number of fields with significant unfavorable crop response should not be a surprise. In some fields crop stands were not reduced and the plants recovered relatively quickly, thus yield potential was less likely affected. Undoubtedly, there were some fields where the problems persisted and yields were reduced.

Specific herbicides causing crop responses

The most common unfavorable crop response from preemergence herbicides observed in 2014 was from HG 14 herbicides applied in soybeans. A number of products were found to cause unfavorable soybean response including sulfentrazone (e.g., Authority products), saflufenacil (e.g., OpTill) and flumioxazin (e.g., Fierce). It is possible that products that are included in some of the pre-mixtures that have the HG 14 herbicides listed may have contributed to the issues but generally, a major factor was the environmental conditions. Cool soils and rains that splashed soil containing the HG 14 products was likely an important factor in the crop response. Soybean stand reductions were observed and replanting did occur. Soybean yields were affected in some fields.

Herbicide carryover

A number of instances of HG 2 (e.g., chlorimuron) and HG 14 (e.g., fomesafen) carryover to corn were observed in 2014. Again, the environmental conditions were a primary factor but not just the 2014 conditions but also those that occurred in 2013. Postemergence herbicide applications to soybeans in 2013 were delayed due to the wet conditions early in the spring and then the dry conditions that followed did not provide a good opportunity for the herbicides to degrade. The result was sufficient carryover herbicide was available to the corn in 2014 to cause an unfavorable response. The response was likely enhanced by the cool, wet conditions under which the corn was developing. Another factor that may have contributed was the HG 2 herbicide applied preemergence to the corn this spring. If the product included an HG 2 herbicide, the crop response to the previously applied HG 2 herbicide was exacerbated.

In the case of fomesafen, the late application in 2013 and the conditions that did not favor the degradation of the herbicide, in concert with the conditions that the 2014 corn crop experience resulted in a carryover response.

Herbicide-resistant weeds

Herbicide resistance continues to be a major topic in agriculture and has even gotten the attention of politicians in Washington DC. Secretary of Agriculture Vilsack issues a proclamation about the importance of herbicide-resistant weeds and indicated that the new herbicide-tolerant crop cultivars were important tools to help combat herbicide-resistant weeds. The Weed Science Society of America sponsored a second Herbicide Resistance Summit that was hosted by the National Academy of Sciences in Washington DC and the event was extremely well-received. The United Soybean Board has developed the “Take Action” campaign and the Iowa Soybean Association has also been very aggressive about the need for improved herbicide-resistant weed management. There is, however, a need for research and education to better address the issue of herbicide resistance. Also, based on anecdotal information, farmers recognize that the herbicide resistance is a major problem but are reticent to do anything about it on their farms until it becomes a serious problem.

In Iowa there was a greater adoption of alternative herbicides which may have slowed the rate of herbicide resistance evolution but the problem is still very prevalent across the state. No new weed species with herbicide resistance have been identified but the three that are most troublesome are serious enough. Waterhemp continues to be the biggest problem in the state and giant ragweed populations are expanding. Marestail/horseweed is still a major problem in the south and southwest where most of the no tillage production is practiced. All three of these weeds have resistant populations to glyphosate (HG 9) and ALS inhibitor herbicides (HG 2), and many of the populations have multiple resistances.

The HG14 herbicides (PPO inhibitors) have been used more widely and often recurrently. While HG 14 resistance occurs at a low percentage of the Iowa fields, increasing use will likely result in more HG 14 resistance. This is a serious problem as the only herbicide group that can be applied postemergence in soybeans other than glufosinate (HG 10) is the HG 14 products. If resistance to these herbicides becomes widespread such as it is in Illinois, soybean weed management in Iowa will be in trouble.

Greater diversity of tactics is needed to combat herbicide-resistant weeds. Rotation of herbicide mechanisms of action is beneficial but inclusion of multiple effective herbicide mechanisms of action for every herbicide application is a much more robust tactic. True diversification in weed management requires the inclusion of non-herbicidal tactics. Cultural tactics such as crop rotation, narrow-row spacing and the inclusion of cover crops reduce the selection pressure on weeds placed by herbicides. Mechanical weed control is an important option for Iowa farmers to use in the management of herbicide-resistant weeds and the benefits and risks should be evaluated to determine if mechanical tactics has a fit in specific fields.

Assessment of herbicide pre-mixtures

Herbicide pre-mixtures of two or more active ingredients have been major part of herbicide-based weed management. As more herbicides move off patent, companies are creating more pre-mixtures to support their proprietary product lines. In general, the benefits of the pre-mixtures reflect the convenience of not having to mix several herbicides together which requires knowing the proper mixing procedures, pre-wetting and other potentially time-consuming and difficult tasks. The risks of using herbicide pre-mixtures include having only one rate of the component herbicides available. The rates of the component herbicides may not be the best rate for specific field situations. Furthermore, companies will often look at the economics of the component products as an important criteria when they determine the rates included in the pre-mixture.

Generally the herbicide rates in a pre-mixture will be lower than labeled as a single product. As such, the rates of the herbicides in the pre-mixture may not be the best choice for specific fields or weed infestations, particularly if the weeds have evolved herbicide resistance. For example, Authority Elite is a pre-mixture of sulfentrazone and s-metolachlor, HG 14 and HG 15 herbicides, respectively. This pre-mixture would be a good choice to manage waterhemp with resistance to HG 2 and HG 9 herbicides except that the rates of the component herbicides are approximately ½ the labeled rates for Spartan and Dual Magnum.

Given the extended germination period for waterhemp, the reduced rates of herbicides in this pre-mixture would not provide the needed residual control. Please note that many of the herbicide pre-mixtures available for corn and soybean have reduced herbicide amounts compared to the individual products. It is important to review the pre-mixtures and determine if the rates of the component herbicides are high enough to provide the desired weed control.

Another concern about available herbicide pre-mixtures is they are often advertised as a good tactic to manage herbicide-resistant weeds based on the fact that they have two or more herbicide groups included in the product. Given the prevalence of waterhemp with evolved resistance to HGs 2, 5 and 9, it is important to know the susceptibilities of the targeted waterhemp populations as well as the herbicide groups included in the pre-mixtures under consideration.

HG 2 herbicides (e.g., imazethapyr and chlorimuron) are essentially useless for waterhemp control in Iowa. Resistance to HG 5 (e.g., atrazine) and HG 9 (e.g., glyphosate) herbicides in waterhemp occurs in about half of the fields in Iowa and often the waterhemp populations will have multiple resistances to several herbicide groups. Knowing the herbicide groups included in the pre-mixtures as well as the herbicide resistance profile of the target weed population is critically important when developing an effective herbicide program.

Assessment of new GE crop traits for weed management

The genetically engineered trait for tolerance to 2,4-D (HG 4) (Dow AgroSciences) is now deregulated and available for commercial sales. Also, the herbicide system developed for the traits is labeled. However, globally, the trait is not yet accepted by major markets. As a result, it is unclear how widely available the Enlist series of crops will be in 2015. The genetically engineered trait for tolerance to dicamba (HG 4) (Monsanto and BASF) is not deregulated at this time but deregulation is anticipated early in 2015. The dicamba-based technologies are not likely to be commercially available in 2015. The HPPD (HG 27) tolerance for soybean (Bayer CropScience and Syngenta) are still under development and will not be available in 2015. Commercialization of these soybean cultivars is likely several years in the future.

These new HG 4 traits represent useful tools for weed management and are important to help better manage

evolved herbicide resistances in many important weeds such as waterhemp. However, despite the development of improved herbicide formulations and stewardship programs by the companies, there are still risks attributable to off-target movement from physical drift and to a lesser extent volatilization drift. An important concern reflects the contamination of spray tanks and nurse tanks and whether current sanitary procedures (e.g., triple rinse) will be effective or actually employed by applicators.

Another concern is with farmer expectations and willingness to adopt the stewardship programs developed by the companies. While the auxin herbicides (HG 4) are active on target weeds such as waterhemp, the level of control that they will consistently provide is likely lower than farmer expectations; these traits and herbicides are not the answer to herbicide-resistant waterhemp but rather should be considered a component of a more diverse weed management program. It is important to remember that waterhemp has already demonstrated the ability to evolve resistance to the HG 4 herbicides.

Community-based weed management – is this a possibility?

Herbicide-resistant weeds continue to be a problem in Iowa and are widely distributed across the landscape. Efforts to manage the herbicide-resistant weed problem have been historically based on the efforts of individual farmers and generally have not been as successful as desired. Survey information suggests that often the individual feels his or her efforts are overwhelmed by the lack of efforts by others and as a result, does not move forward with a diversified weed management plan. Also, the primary if not sole approach to managing herbicide-resistant weeds continues to be with herbicides. Given the existence of waterhemp populations with multiple resistances, an approach that is strictly based on herbicides has little chance of durable success. Herbicide-resistant weeds are an example of a common pool resource; if an individual in the area has herbicide-resistant weeds, those weeds have the potential to impact everyone in the area. Thus, efforts need to be organized within the community and supported by the community.

In order for community-based weed management to work, the leadership must be local and the individuals participating must be dedicated to an agreed upon goal. Information and economic support of the community-based program will likely be external (i.e., Cooperative Extension Service) but the local effort is of paramount importance. The local leadership will establish the “boundaries” of the community, set up how local fields (the community) will be monitored and managed, and provide the momentum to keep the program functioning and possibly expanding in scope.

However, to initiate a new concept like community-based weed management on herbicide-resistant weeds in Iowa is daunting and likely impossible to sustain. Measurement of success metrics would be difficult at best given the ubiquitous nature of herbicide-resistant weeds across the Iowa landscape. A community-based management pilot program directed at Palmer amaranth should have a greater chance of success given the currently isolated and rare infestations that have been identified in Iowa. A study is currently underway to evaluate the feasibility of a pilot community-based Palmer amaranth project in specific locations. It is hoped that the pilot project can be established in 2015 at yet-to-be identified communities.

Palmer amaranth update

Palmer amaranth was confirmed in Harrison, Fremont, Page and Muscatine counties in 2013. A suspected infestation in Davis County turned out to be spiny amaranth rather than Palmer amaranth. Two different infestations were found in Lee County this year. We suspect there are more unknown infestations than those that have been reported. As might be expected, some of the growers with Palmer amaranth infestations are making good efforts at eradicating the invader before it becomes a permanent component of the weed community, but others are treating it like any other weed.