

Herbicide Carryover – What impact will the drought of 2012 have?

Daniel J. Heider
University of Wisconsin-Madison

The use of residual herbicides which persist and extend weed control into the growing season is considered standard practice in most field and vegetable cropping systems. The added window of weed control aids in protecting yield and often allows for a more timely post-emergence application in a two-pass weed control system. How long an herbicide persists in the soil can vary greatly depending upon climatic conditions, soil type, cultural practices and even the chemical properties of the herbicide itself. Understanding how individual factors affect herbicide persistence will aid in making informed crop rotation decisions.

Herbicide Availability

Residual soil herbicides are subject to a number of fates that can affect the extent to which herbicide carryover is expressed the following cropping year. The following processes are all known to have some effect on that fate.

- **Soil adsorption** – Herbicides which are chemically bound to soil particles. Soil adsorbed herbicides are generally not available for plant uptake. Soils with high levels of organic matter or clay, low pH, and wet soils will tend to have increased soil adsorption.
- **Herbicide leaching** – Highly water soluble herbicides and coarse soils are conditions which favor herbicide movement out of the rooting zone.
- **Chemical decomposition** – The rate at which an herbicide breaks down is highly dependent upon its original chemical structure. The decomposition increases in low pH soils and warmer temperatures.
- **Microbial decomposition** – Most herbicide degradation occurs through microbial decomposition (bacteria, fungi and algae using herbicides as a food source). High organic matter soils tend to have increased populations of microbes. pH extremes, moisture extremes and low temperatures (<40° F), reduce microbial activity.
- **Photodecomposition** – The process of herbicide degradation from sunlight affects only a limited number of herbicides; generally those requiring soil incorporation.

In a “normal” year, most of these processes play some role in reducing the active ingredient remaining in the soil. Re-crop intervals on herbicide labels provide guidelines often based on this caveat of a normal year. Was 2012 normal? Although the answer to this question will vary based on your location, many of us will answer that it indeed was not normal. Southern Wisconsin perhaps received the brunt of the drought with some locations seeing none/minimal rainfall for six to eight weeks. By mid-June the questions started rolling in and growers soon realized there are no easy answers when it comes to herbicide persistence. The following summarizes some of those questions/responses.

Will tillage help?

The prospect of tillage was the most common question raised in response to herbicide carryover from 2012. The common conception that tillage will dilute any remaining herbicide residues to less injurious levels may indeed be true for the seedling root and shoot inhibitors (s-metolachlor, acetochlor, pendimethalin, others) where seedlings would need to come into contact with high concentrations of the herbicide to cause injury. For many other herbicides such as ALS inhibitors, HPPD inhibitors, or PPO inhibitors the benefits of tillage are not as obvious. Tillage and the aeration that it provides generally

results in soils which warm more quickly in the spring which ultimately should improve degradation of herbicides which rely more heavily on microbial degradation.

Several growers expressed interest in pulling out the moldboard plow in an effort to deeply bury herbicide residues. Although initially this may sound like a good idea, concentrating the residue at soil depths that remain cooler in temperature may actually slow degradation of the herbicide. This concentrated layer may then be accessed by crop roots during the season or turned back up in subsequent years. In those instances where tillage is deemed helpful, shallow thorough mixing of the soil will likely provide the best results.

Which herbicides present the greatest risk for increased persistence?

Based on environmental and chemical properties, we can ascertain that some herbicides will pose greater risk for carryover. This list is not definitive, but only a guide based on past experience and in some cases antidotal information.

High Risk

- Atrazine (numerous products)
- Chlorimuron (Authority XL, Canopy, Envive, Valor XLT)
- Imazaquin (Scepter)
- Simazine (Princep, others)

Moderate to Slight Risk

Fomesafen (Reflex, Flexstar, Prefix)
Clopyralid (Hornet, Surestart)
Chloransulam (FirstRate)
Imazethapyr (Pursuit)
Pendimethalin (Prowl, others)
Trifluralin (Treflan, others)
Isoxaflutole (Balance Flexx)
Mesotrione (Callisto, Lumax)
Tembotrione (Laudis, Capreno)

Should I conduct a bioassay?

An herbicide bioassay is the process of collecting soil from a field and growing the intended crop and or other susceptible plants to screen for herbicide carryover. A few herbicide labels even recommend or require completing a bioassay prior to planting some crops. It is my opinion that bioassays can provide some useful information in making re-crop decisions, but should never be relied upon as the only tool in making those decisions. Please note several important points regarding bioassays:

- Correct procedures must be followed when conducting a bioassay. For more information consult UWEX publication A3819 on Herbicide persistence and carryover by Dr. Jed Colquhoun. It is important to sample several areas of each field in question including the worst case scenarios (headlands, low organic matter areas, high pH areas), targeting different soil drainage and topography areas as well as contrasting yield areas of the field. The sampling should also be replicated in these areas.
- When to collect soil. Fall collected soil provides ample time for conducting bioassays, but may not fully represent the degradation that would occur prior to planting. Spring collected soil may provide more realistic information, but may not provide enough time to adjust planting plans.
- Environmental conditions of plants grown in pots/greenhouses vary substantially from those in a field, and may further limit the usefulness of the information obtained.

Summary

If you were looking for a quick and straightforward answer on the impact of drought on herbicide carryover, I'm afraid it can't be found. Like most crop management decisions, you will need to evaluate all of the information available in making your 2013 cropping decisions.