

**Agronomy Technical Note #15**

**INTEGRATED PEST (WEEDS) MANAGEMENT IN HIGH RESIDUE CROPPING SYSTEMS**

**November 2018 Natural Resources Conservation Service – Indiana**

***AGRONOMY TECHNICAL NOTE – Soil Health Series***

The *Soil Health Series* provides management techniques for the successful integration of Quality No-till Cropping Systems, Adaptive Nutrient Management, Prescriptive Cover Crops, Integrated Pest (Insect / Weed / Disease) Management and Diverse Crop Rotations. This information is applicable to most Indiana soils and cropping conditions and covers broad application.

**Implementing INTEGRATED PEST (WEED) MANAGEMENT (IPM) during the Transition(s) to a High-Residue** **Cropping System**

Weed management can be challenging in all cropping systems, and significant time and money may be spent on a variety of control practices. With fewer herbicide chemistries available today coupled with less-than-optimal weed and chemistry management in the past, the number of herbicide-resistant weeds have increased. Long-term strategies are needed to deal with overall weed control and to help avoid herbicide-resistant weeds. Understand why and how extreme situations (e.g. weed outbreaks) happen prior to using to short-term fixes such as unnecessary chemical treatments and / or tillage.

High-residue cropping systems (Never-Till, No-Till, Strip-Till, and Reduced-Till and/or cover crops) require different understanding of weeds. During the first 3-4 years, the soil biology and chemistry undergoes significant changes. Soil microbial populations shift as soil disturbance decreases and the organic matter stabilizes. In addition to weeds, also understand the different changes that will happen with nutrients, insects and diseases while making the transition(s) to these cropping systems.

**Management Strategies During Transition to High-Residue Systems**

* Healthy crops are better competitors against weeds which equates to enhanced cash crop health and growth. Transition items to keep in mind include but are not limited to: improve drainage where needed; minimize compaction and surface crusting; provide proper soil pH and fertility; control insects and diseases; and pay attention to planter depth, speed and seed slot closure to promote consistent crop emergence.
* What are the current weed problems in the field? Identify “hot spots” and diagnose why those weeds are present. A review of the past year(s) is important to plan for future weed control.
* Spread harvested residues evenly across the full width of the combine header. This will better ensure more uniform soil temperatures and moisture emergence that favor crop growth and development.
* As tillage is reduced, beware of a shift from large seeded weeds to smaller seeded weeds. Do not allow pigweeds, such as waterhemp and Palmer amaranth, to go to seed if they escape control measures. Even a few escaped pigweeds will produce lots of weed seed, potentially infesting the field.
* Biennial and perennial weeds are more likely to become problematic in a high-residue cropping system because there will not be annual tillage. If these types of weeds currently exist, implement a plan to address them prior to switching to a high-residue system.
* Use fall applied herbicides (after crop harvest, but before winter freeze up) for marestail, dandelion or chickweed that are difficult to control in the spring. Ensure fall herbicides and cover crop compatibility.
* Be prepared to control actively growing perennial weeds in the bud to bloom stage in late summer/early fall. It is important to treat these weeds prior to when they die naturally at the end of season, or earlier due to frost or freeze.
* Residue can tie up soil applied herbicides not allowing them to reach weed seed in the soil if dry weather persists after application. In high residue systems, consider switching to soil applied herbicides with higher water solubility characteristics.
* Use multiple cultural methods for long-term sustainable control (narrow row soybeans for faster canopy closure, crop rotation, promote mulch and/or cover crop canopy for better weed competition, cover crops such as cereal rye seeded at higher rates, mowing).
* As with all weed control programs, important items to keep in mind include:
  + Scout and properly identify all weed species.
  + Smaller weeds are easier to terminate and take less product. Plant growth stage also impacts herbicide intake and control. Environmental conditions such as, but not limited to: rain; dew; dust; drought and temperature can impact growing weeds and effectiveness of the products to be used.
* When applications are planned, be sure to follow these recommendations, as applicable:
  + Determine if spray tank water quality (hardness, pH) is an issue and address it.
  + Pay attention to different product formulations. Determine the application rate and correctly measure the amount of product needed. Calibrate the sprayer.
  + Determine the proper coverage, spray solution volume and pressure. Select the proper nozzle (droplet size). If applicable, select the proper spray additives (AMS, surfactant).
  + Identify and follow the proper mixing order of products to be used. Beware of potential antagonism between pesticide products and additives.
  + Timing (time of day) of application is important for some products.
* For improved weed control and to reduce the potential of herbicide resistant weeds, it is important not to use herbicides with the same site of action repeatedly. Be sure to use herbicides with different mode-of-action. For more details see: [Herbicide Classification Chart](https://www.iwilltakeaction.com/uploads/files/57229-6-final-ta-hrm-classificationposter-lr.pdf), current version.
* **Be sure to follow all pesticide label instructions** and check for plant back restrictions for both the subsequent cash crops and cover crops.
* If planning to use cover crops, beware of potential possibilities of residual herbicide carry-over. Numerous factors affect the persistence (breakdown or half-life) of herbicides in the soil. These factors include but are not limited to: soil pH, soil organic matter, temperature, precipitation, exposure to sunlight, soil texture, and biological activity. (refer to Penn State Extension, Agronomy Guide)
* If planting green, planned or by last resort, weed control chemical options are greatly limited once the crop emerges. Take advantage of a wider array of preplant herbicides for early spring weeds (such as marestail, dandelion, chickweed and lambsquarter) prior to crop emergence.
* Increase predation of some weed seeds by promoting beneficial insects, especially ground beetles, with a soil health management system (no-till/strip-till and cover crops).

Proper identification and treatment of all weeds along with Integrated Weed Management strategies can reduce the weed seed bank in the soil and the potential development of herbicide-resistant weeds. Integrated Weed Management is important to maintain the gains that have been made in conservation agriculture and to improve all conservation cropping systems.

**References**

[Pest & Crop Newsletter](https://extension.entm.purdue.edu/pestcrop/) – Purdue University Extension.

[2018 Weed Control Guide for Ohio, Indiana and Illinois](https://mdc.itap.purdue.edu/item.asp?itemID=23048) - Bulletin 789, Pub WS-16, 2018.

[Take Action Herbicide Classification Chart](https://www.iwilltakeaction.com/uploads/files/57229-6-final-ta-hrm-classificationposter-lr.pdf), current version and the [Take Action](https://iwilltakeaction.com/) website.

[The Impact of Water Quality on Pesticide Performance](http://www.extension.purdue.edu/extmedia/PPP/PPP-86.pdf) - Purdue Extension, PPP-86, November 2009.

[Facts about Glyphosate-Resistant Weeds](http://www.extension.purdue.edu/extmedia/gwc/gwc-1.pdf) - Purdue Extension, GWC-1, December 2006.

[Understanding Glyphosate to Increase Performance](http://www.extension.purdue.edu/extmedia/gwc/gwc-2.pdf) - Purdue Extension, GWC-2, December 2006.

[Herbicide-Resistant Weeds Threaten Soil Conservation Gains: Finding a Balance for Soil and Farm Sustainability](http://www.cotton.org/tech/pest/upload/12castpaper.pdf) CAST Issue Paper #49, February 2012.

[Herbicide Resistance](http://wssa.net/weed/resistance/) website, Weed Science Society of America.

[Herbicides Persistence and Rotation to Cover Crops](https://extension.psu.edu/herbicides-persistence-and-rotation-to-cover-crops) - Penn State University Extension, Agronomy Guide.