You can prevent resistance to herbicides

Part II of Chemical-resistant Weeds

by Meryl Rygg McKenna

Note: Part I of this series addressed the development of herbicide resistance. Part II focuses on the prevention and management of herbicide resistance.

At least seven species of weeds in Montana are already identified as resistant to specific herbicides. These include kochia (also known as fireweed, burningbush, or summer cypress), wild oat, Persian darnel, downy brome (cheatgrass), Russian thistle, horseweed, and green foxtail.

Chuck Gatzemeier, a Certified Crop Adviser in the Cut Bank area, said herbicide-resistant weeds are now a significant issue across the country. Some Midwestern and Southern states have pigweeds such as Palmer amaranth and waterhemp that have developed resistance to several herbicide groups (also called modes of action).

Kochia resistance to glyphosate (Group 9), dicamba (Group 4), and sulfonylurea (Group 2) has been confirmed in Montana. Wild oat and Persian darnel biotypes resistant to Group 1 and Group 2 herbicides are an increasing concern for Montana cereal producers. Resistant kochia has been confirmed in Wyoming. Herbicide resistance is increasing in the provinces of Saskatchewan, Alberta, and Manitoba, with 68 percent of Manitoba's fields having at least one herbicide resistant weed.

Diagnosing resistant weeds

If you applied herbicide and your weeds did not die, consider these questions:

1. Is the weed species in question listed on the herbicide label?

2. Have you used the same herbicide or herbicide group number on the same field for several consecutive years? Repetition increases the chance for resistance.

3. Has the level of weed control decreased recently, even when following label instructions? If the species is listed on the herbicide label, then surviving plants may be resistant to the herbicide's mode of action.

4. Are there other cases of herbicide-resistant weeds in your area? Seed from resistant plants can spread to or from your fields.

The Weed Lab at Montana's Southern Agricultural Research Center offers free resistance testing for growers across the state. If you suspect any herbicide-resistant issues, please contact Prashant Jha, MSU Weed Scientist, for information on sending samples. Jha can be reached by phone, 406-348-3400, or email, pjha@montana.edu.

Countering resistance

- Most importantly, sprayer speed, spray volume, and application rate (product rate per acre) must be followed according to the herbicide label.
- Secondly, avoid spraying below 10 gallons of tank mix per acre to ensure adequate coverage and minimal weed escapes and regrowth. Remember that driving too fast while spraying can prevent the weeds from getting a full dose of herbicide.
- Don't rely solely on herbicides. Integrate different management practices, such as diverse crop rotations and occasional mechanical plowing; both can break up weed life-cycles. Tillage is especially effective in reducing small-seeded kochia and Russian thistle seed banks.
- If you must use herbicides, use them in rotation or in mixtures; vary the group numbers so you employ different modes of action. Jha said that herbicide mixtures are better than annual herbicide rotations in preventing or delaying herbicide resistance.
- Scout your fields for live weeds after herbicide application.
- Clean your equipment before leaving a field to prevent spread of resistant biotypes from one field to another.
- Make post-harvest weed control part of your regular field practice. Take steps to manage weeds, especially those going to seed, as quickly as possible after harvest.
- If you apply herbicide in very hot, dry weather, the product may volatilize to the air before it touches the plant. You must add the full recommended rates of adjuvants, water conditioners, or pH buffers (acidifiers) to allow better penetration and movement of the herbicide into the plant in hard water situations or hot, dry weather. Avoid spraying under dusty conditions.
- Timing of herbicide application is also key to reducing resistance. Spray weeds before they are 4 inches tall; they are most susceptible at this stage. At 6 to 8 inches tall, they are more tolerant to herbicide and harder to kill. Herbicide is then wasted.
- Effectively manage weed infestations in field borders, fence lines, and roadsides/ditch banks by all possible means — herbicides, mowing, cutting, or tilling. Borders are common areas for the

spread of herbicide-resistant weeds, especially for weeds that can tumble across the landscape, such as kochia and Russian thistle.

- Spray within seven days after a rain while newly germinated weeds are small and easy to kill. Remove survivors by any possible means, and definitely before they set seed. Remember that some weed seeds are only viable for one or two years, while others remain viable for decades.

Gatzemeier said, "The use of soil-applied herbicides with pulse crops is an excellent management practice incorporating different modes of action. Usually these products perform much better applied in fall than in spring. Look at the label for plant-back restrictions to plan ahead for the next cereal or oilseed crop," to account for residual herbicide in the soil.

The "Golden Triangle," a high wheat-production area in north central Montana, is a current hot spot for resistant weeds mostly because there's a lot of chem-fallow, Gatzemeier said. Other areas have gone to a more diverse crop rotation and have less chemical resistance. A long-term study conducted by Jha at the Southern Agricultural Research Center shows that a more diverse crop rotation can drastically reduce the proportion of resistant weed seeds in the soil seed bank.

The same recommendations apply to fungicide applications. Change or mix modes of action for consecutive chemical applications to avoid developing fungus resistance. Gatzemeier said that a few years ago, chickpeas that had the disease Ascochyta blight were sprayed with Headline. Within two years, the fungus causing Ascochyta blight became resistant and Headline no longer worked. Scout all fields for recurring disease.

Chemical resistance is a growing problem. Everyone who uses agricultural chemicals will contribute — either to the problem or to the solution.

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http://www.certifiedcropadviser.org.

FIGURE 1. Where do resistant weeds come from?