Weed Resistance Risk Assessment

Best Management Practices
Canadian version of weedtool.com

1. The crop rotation generally used in this field could be described as:

- Crop rotation allows for diversification with crops with different competitive abilities and life cycles that keeps weeds off balance and helps prevent weed species from becoming established, competitive, or dominant in a field. Rotations consisting of cereals, oilseeds, and pulses, including winter annual (winter wheat) or perennial crops (forages), would be considered highly diverse and sustainable.
- Crop rotation encourages herbicide rotation because several different modes of action (MOA) are typically available for weed control in a variety of crop species.

2. How would you describe the tillage intensity used in this field?

- Tillage is another weed management practice that reduces the reliance on herbicides for weed control. The more weed control tools utilized (eg. crop rotations, proper fertility, seeding rates, sanitation), the lower the selection pressure for resistant weeds.
- Surveys in western Canada by Beckie et al, 2009, have demonstrated that weed resistance is more associated with low disturbance tillage than high disturbance tillage, and there are other management practices that are more highly correlated with the development of weed resistance, such as short rotations consisting of few crops or repeated use of the same MOA for weed control.
- It's important to note that zero tillage has many significant benefits including soil and moisture conservation, which increases yield potential, as well as savings on fuel, equipment, and labour. Because these benefits are significant, it is very important to take steps to reduce the risk of selecting for glyphosate resistant weeds as much as possible.

3. How many years did you apply a glyphosate (ALONE) burn-off treatment in this field?

- A high frequency of herbicide applications applied alone (not tank-mixed) in a field will increase the selection pressure for herbicide-resistant weeds.
- Although glyphosate is considered a low risk MOA with regards to the development of herbicide resistance, the inclusion of an alternate mode of action in a tank-mix would serve to further slow the rate of resistance evolution through early removal of any rare glyphosate resistant individuals in the population.
- Early removal of weeds is an effective strategy to help manage weed populations, and maintain high yield potentials.
- Where possible use tank mixes with other herbicide groups to reduce the weed resistance selection pressure of your glyphosate pre-seed burn-off application. To be successful, both the glyphosate and the tank-mix partner need to be effective on the target weeds in the field.
- Periodic tillage can substitute for glyphosate-based burn-down programs

Weed Resistance Risk Assessment

4. When you use glyphosate (ALONE) in a burn-off treatment, the weed control in this field (not including crop volunteers) is:

- The use of an effective herbicide such as glyphosate early in the season to limit weed competition is an important weed control strategy.
- Uncontrolled weeds can go to seed and provide a much larger weed seed bank for next season, thus increasing the size of the weed population in that field and the probability of finding rare resistant individuals.
- Always follow label recommendations for timing of herbicide applications and appropriate rate of application.
- Where possible use tank mixes with other herbicide groups to reduce weed resistance selection pressure for glyphosate resistance.

5. For the burn-off treatment, do you tank-mix glyphosate with another herbicide (or use a premix with the glyphosate)?

- Tank-mixing herbicides with multiple modes of action is an effective strategy to delay the evolution of herbicide resistance.
- Although glyphosate is considered a low risk mode of action with regards to the development of herbicide resistance, the inclusion of an alternate mode of action in a tank-mix would serve to further slow the rate of resistance evolution through early removal of any rare glyphosate resistant individuals in the population.
- To be successful both the glyphosate and the tank-mix partner need to be effective on the target weeds in the field.
- Whenever possible, tank-mix glyphosate with other mode of action herbicides for your pre-seed burn-off applications.

6. How often do you grow a Roundup Ready crop (e.g. canola, corn, soybean, sugarbeet) in this field?

- A high frequency of glyphosate tolerant crops in the rotation can increase selection pressure for glyphosate resistant weeds.
- Be sure to include other crops (including glyphosate tolerant and non-glyphosate tolerant crops) in rotation with Roundup Ready crops to allow greater opportunity for the inclusion of other modes of action.
- Where possible use tank mixes with other herbicide groups to reduce the selection pressure of glyphosate

Weed Resistance Risk Assessment

7. Typically, how many times is in-crop glyphosate applied to a Roundup Ready crop in this field?

- Make glyphosate applications at the optimum time and rate required to achieve good weed control, but caution should be taken if glyphosate alone is used more than two times per season for in-crop early season weed control
- Moving from one in-crop application to two results in less of an increase in selection pressure on glyphosate as compared to an increase of two in-crop applications to three.
- Other mode of action products or tillage may be used to reduce reliance on glyphosate applications
- Periodic tillage can substitute for glyphosate-based burn-down programs
- Rotation to other crops, including Roundup Ready crops where other chemistries are used, can break the cycle of multiple glyphosate applications

8. When you use glyphosate in a Roundup Ready crop, the weed control at harvest (not including crop volunteers) is:

- Uncontrolled weeds can go to seed and provide a much larger seed bank for next season, thus increasing the size of the weed population in that field and the probability of finding rare resistant individuals.
- Weeds that are not controlled can be a result of numerous factors such as environmental conditions, sprayer misses, incorrect application rates, but they could also suggest a resistance problem.
- Weeds present early in crop development are competing with your crop and could be reducing yield
- Weeds can make harvesting difficult and seeds may be distributed to additional fields via the harvesting equipment
- Weeds at harvest can affect grain quality, lead to higher dockage and result in grain storage problems.

Weed Resistance Risk Assessment

9. In past years, how often did you use a post-harvest glyphosate application in this field?

- Post harvest application of glyphosate targets primarily perennial weeds. These weeds are not considered high risk to develop resistance to glyphosate because they lack genetic variability and propagate vegetatively or have fewer generations over time than annual weeds.
- Post harvest glyphosate applications are considered significantly lower risk for contribution to glyphosate resistance versus an in-crop application which targets annual weed species.
- Post harvest application is a great way to control perennial weeds with minimal selection pressure for glyphosate resistance.

10. Over the past few years, how would you describe the weed problem in this field?

- The goal is to reduce weed populations from year to year, allowing for more efficient use of herbicides and other cultural practices to control weeds
- If weeds are allowed to survive and set seed, dramatically higher weed populations may result the next year.
- If you allow certain tough-to-control weeds to survive you may accelerate weed population shifts to species that are more difficult to control. Shifting weed problems may require a substantially different weed management approach
- Weed species that escape glyphosate applications should be seen as a flag for obtaining more details as to why the weed was not controlled.