

Maximizing Glyphosate Activity in Glyphosate-Resistant Crops – Jeff Stachler and Rich Zollinger

The goal of all growers should be to maximize glyphosate activity whenever it is applied to glyphosate-resistant crops. This goal should maximize profitability and weed control and reduce the risk for herbicide resistance. Below are the most important management strategies for improving glyphosate activity. For additional information, consult pages 88 and 89 in the 2009 North Dakota Weed Control Guide and pages 52 and 53 in the 2009 Sugarbeet Production Guide.

1. Apply glyphosate to small (< 4”) annual weeds.
2. Apply glyphosate to perennial species in the bud to early-flowering stage of development.
3. Apply the most effective rate for the most difficult to control species in the field. For many annual species the minimum rate of glyphosate should be 0.75 pounds acid equivalent/acre (lb ae/A). Species such as lambsquarters, velvetleaf, wild buckwheat, common ragweed, giant ragweed, common mallow, smartweeds, biennial wormwood, horseweed/marestail, and waterhemp can be difficult to control with glyphosate. Consider using the maximum single-use rate of glyphosate for control of these species, especially if a reduction in control has been observed over time. Rates of glyphosate greater than 0.75 lb ae/A usually improves control of perennial species, compared to lower rates. Multiple glyphosate applications can also improve control of perennial species.
4. Always add ammonium sulfate (AMS) to glyphosate mixtures. Ammonium sulfate should be added at a minimum of 1.0 pound per acre if using greater than 12 gallons per acre of spray volume or 4 to 6 pounds per 100 gallons of spray mixture (lbs/100 gal) for most of North Dakota. If water hardness is greater than 1600 ppm apply minimum of 8.5 to 17 lbs/100 gal.
5. Allow at least a 6 hour rainfast period for all glyphosate formulations for maximum activity. A shorter rainfast period can be acceptable for the most susceptible species. Lambsquarters control is usually reduced if the rainfast period is less than 6 hours.
6. Apply glyphosate during the warmest and most humid weather conditions to maximize activity. Cold weather a few days before and after application usually reduces control. Increasing the rate of glyphosate during cold weather can reduce some loss of weed control.
7. Most glyphosate formulations include nonionic surfactant (NIS) at a high enough concentration for maximum activity. However, some glyphosate formulations do not include NIS. For these formulations add a quality NIS product at 0.5 to 1.0 % v/v. Some weed species, especially lambsquarters, can be more effectively controlled with the addition of NIS at 0.25 %v/v to all “surfactant-loaded” glyphosate formulations. Some glyphosate formulations prohibit the addition of NIS.
8. Glyphosate activity is influenced by the time of day of the application. Maximum activity occurs between 8:00 AM and 8:00 PM. Velvetleaf and common and giant ragweed control may be the most negatively affected by the time of day of the glyphosate application.

9. Application of glyphosate in low water volumes improves glyphosate activity. However, when spraying large weeds and/or dense weed canopies, higher spray volumes usually improves glyphosate activity.
10. Glyphosate is strongly and irreversibly absorbed to clay particles and organic matter. Therefore dust of any amount, especially initiated by the wheels of the sprayer, will cause a reduction in glyphosate activity. Two methods for decreasing this problem are to drive slower and apply higher spray volumes near the sprayer wheels. These solutions will not completely solve the problem. Do not over over-apply glyphosate if using higher volume nozzles near the sprayer wheels. The best method may be to off-set subsequent applications from the first application.
11. When mixing other herbicides with glyphosate, add the most effective adjuvant for the herbicide being added. This strategy will maximize the activity of the herbicide(s) being added to the glyphosate mixture. If the herbicide being added to the glyphosate mixture recommends the addition of an oil adjuvant for maximum activity, include a high surfactant oil concentrate (page 132 of 2009 North Dakota Weed Control Guide), increase the rate of AMS if not using maximum rates, and increase the rate of glyphosate. If possible do not mix antagonistic herbicides with glyphosate.
12. Know the concentration of glyphosate in the formulation being used. There are currently six different glyphosate concentrations available. This will ensure the application of the correct amount of product.
13. Scout fields closely for plants surviving glyphosate applications. React accordingly this growing season and subsequent seasons to eliminate these plants from the population.