ROUNDUP READY PLUS®
CROP MANAGEMENT SOLUTIONS

MAXIMIZING GLYPHOSATE EFFICACY

What You'll Learn...

- Annual weeds should be actively growing when using a Roundup agricultural herbicide.
- Understanding factors that can negatively affect Roundup® agricultural herbicides performance can help to maximize the herbicide efficacy.
- Using the full labeled rate of a Roundup agricultural herbicide for the weed species and its size, while considering environmental conditions at application, is important to maximize product performance.
- Using higher rates and ammonium sulfate can help to improve herbicide efficacy.

Roundup® Agricultural Herbicides

The active ingredient in Roundup agricultural herbicides is glyphosate. The products are foliar applied for the control of a broad spectrum of weeds in crop and non-crop situations. Understanding the following factors that influence the performance of glyphosate can help to maximize product efficacy:

1. Use the Full Labeled Rate

Weed Size. The rate of Roundup agricultural herbicides should be determined by the size and type of weed species and by the largest or most tough-to-control weed in the field or spray situation. In general, the bigger the weed species, the higher the rate needed for control. Annual weeds are best controlled when they are actively growing and less than four inches tall. Perennial weeds are often controlled better when they are taller and in later growth stages. In most situations, a minimum rate of 32 fl oz/acre can provide good weed control. Always refer to the product label for rate recommendations for particular weed species.

Larger and older annual weeds can be more difficult to control. More mature or hardened-off annual weeds may require 44 fl oz/acre, even if they are smaller in size. Dry weather can cause weeds to be short for their age, which requires a higher rate for good control. Perennial weeds may require 64 fl oz/acre or more for an effective control.

Check the herbicide label for application restrictions and use full rates to help achieve complete control of existing weeds.

Weed Response. Weed species can also differ in their sensitivity to glyphosate. Certain weed species can have natural tolerance to glyphosate, while others are resistant and control is unlikely, regardless of the application rate. Tank-mixing herbicides with different Effective Modes of actions and other weed resistance management practices in these situations can help to provide more consistent control of tolerant or resistant weeds. Using lower than labeled rates can lead to poor weed control and potentially select for resistant weeds. Always use the full, labeled rate of Roundup agricultural herbicides for best results.

2. Spray Additives and Tank Mixtures

Surfactant. Adding surfactants can increase spray solution spreading on leaves and improve glyphosate translocation. Roundup agricultural herbicides have surfactant already included in the formulation. However, depending on the situation, additional non-ionic surfactant can be added to Roundup PowerMAX® herbicide to help control weeds. In general, the addition of crop oil concentrates (COC) and methylated seed oils (MSO) is not recommended. Follow recommendations on the product label for using additional surfactant and other additives.

Ammonium sulfate (AMS). Adding AMS to the spray tank can help to mitigate the adverse effects of hard water on weak acid herbicides, such as glyphosate. Addition of AMS increases herbicide adsorption by the plant, which helps increase the effectiveness of a herbicide. In areas where hard water is an issue, AMS is recommended to be used with Roundup agricultural herbicides.

Ammonium sulfate should be added to the spray tank at 8.5 to 17 pounds (1 to 2% by weight) of spray grade AMS or equivalent rate of liquid AMS product per 100 gallons of spray solution. These products should be added to the water in the spray tank and thoroughly mixed before adding a Roundup agricultural herbicide.

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MAXIMIZING GLYPHOSATE EFFICACY (continued)

Tank Mix Partner. Labels for Roundup agricultural herbicides include approved tank mix partners. Avoid tank mixtures with other herbicides that can reduce the efficacy of Roundup agricultural herbicides (through antagonism) or tank mixture recommendations that encourage application rates below the label recommendations. Tank mixing with insecticides, fungicides, and nutrients or foliar fertilizers is not recommended.

3. Water Quality and Spray Volume

Water Quality. Hard water contains large amounts of calcium, magnesium, sodium or iron that can reduce herbicide efficacy. Not all herbicides are affected by hard water but weak acid herbicides such as glyphosate can experience antagonism in hard water. Water pH should be lower than 7 prior to mixing with glyphosate. Clean water should also be used with Roundup agricultural herbicides since soil, organic matter, and clay particles in dirty water can bind and deactivate glyphosate.

Spray Volume. For most situations, spray volumes of 10 to 15 GPA allows adequate coverage of weeds. Higher volumes (15-20 GPA) can be beneficial in dense weed infestations, well developed crop canopies, or large weeds. Coverage can be improved by choosing the proper nozzles, adjusting the boom height, and spraying at an appropriate ground speed.

If spray volume decreases, a potential risk for spray drift and insufficient weed coverage is more likely to occur. Nozzle selection for glyphosate application should be based primarily on managing droplet size and drift potential rather than optimizing spray coverage.

4. Absorption and Translocation

Dry Weather. Weeds develop thicker cuticles in dry weather, which can reduce herbicide penetration. Dry weather can also increase dust particles that can bind with glyphosate, making it less available for absorption into the plant. Higher rates plus AMS can help to improve efficacy of Roundup agricultural herbicides on stressed plants.

Cold Weather. It would take glyphosate longer to work when applied during or after cold temperatures. When applied in the fall after a frost, green leaves must be firmly attached to the plant to absorb and translocate glyphosate. Application of the herbicide to new growth after a frost is needed for optimum activity.

Weed Translocation System. Glyphosate translocation within the plant requires actively growing weeds with intact xylem and phloem systems. Mechanical damage from tillage, planting, spray or harvesting equipment can compromise the system. Tillage, planters, and drills can injure the weeds making them appear shorter because much of the plant is below the soil surface. Lack of weed control in wheel tracks can be due to a restricted plant translocation system and/or the presence of dust.

When weeds that have been sprayed with a Roundup agricultural herbicide are injured by stem boring insects, the portion of the plant above the insect damage should die. Below the insect damage, the weed often remains green and may regrow. Giant ragweed and marestail are two examples of weed species where this phenomenon has been noticed (Figure 1). Tillage should be delayed for at least one day after treating annual weeds and three days after treating perennial weeds to allow for good translocation of glyphosate within the plant.

When re-treatment of a Roundup agricultural herbicide is necessary, allow time for weeds to recover and resume growth. Use the right rate, considering weeds are older, taller, and will probably be even more difficult to control. If wheel tracks were the problem, avoid the previous tracks. Always keep in mind that weeds need to be actively growing for the best results when using a Roundup agricultural herbicide.

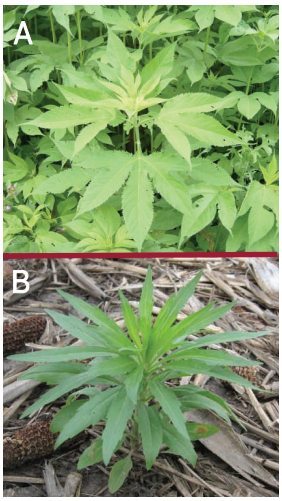

Figure 1. Giant ragweed (A) and marestail (B) weed species.