

Herbicide Rates In Corn: Questions and Answers for Your Farm



Every corn grower wants to reduce inputs and produce the highest yield with the least expense, without increasing risk. Unfortunately, low crop prices over the last several years have made it more difficult to cover input costs. A logical approach to optimize inputs is to evaluate current management practices.

Can money be saved by reducing inputs without reducing yields? One of the most overlooked areas to cut cost without reducing yields or increasing risk is reducing herbicide rates. This bulletin answers many of the questions needed to build a successful weed management program using reduced herbicide rates.

Matching inputs to need.

Most people don't use a 5 lb sledge hammer to drive a 2 penny nail.

Why spend \$45 for herbicides where \$20 and a \$5 cultivation will do?

4 Keys to a Successful Reduced Rate Program

- 1. Choose fields correctly.** Reduced rate programs are not designed for tough perennials, no-till systems, or high weed densities.
- 2. Know your weed spectrum** to select the most effective herbicides.
- 3. Make timely applications,** especially with postemergence herbicides, by doing your own spraying.
- 4. Use cultivation and management** to reduce herbicides for corn.

What constitutes a successful weed management program?

A weed management program is successful if it accomplishes these goals:

- Limits yield loss due to weed competition.
- Limits weed seed production to prevent a greater problem in subsequent years.
- Protects both farm profits and the environment.

A successful weed management program does not rely exclusively on herbicides to reach these goals. Part of chemical control can be replaced with increased management of the following factors:

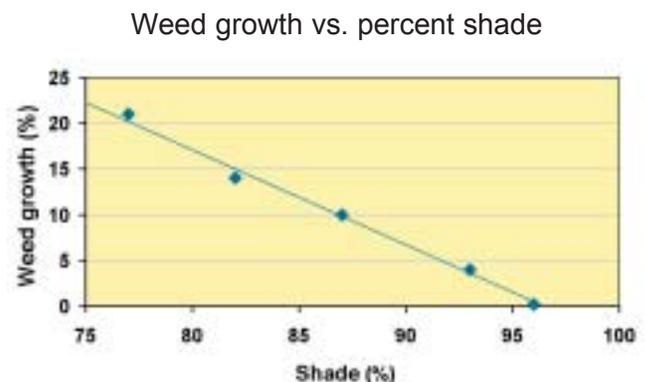
1. **Proper planting** - Getting the crop off to a quick start gives it a competitive advantage against weed growth. Planter maintenance and calibration will ensure uniform seed placement, depth, and furrow closure for improved germination.
2. **Row spacing, seeding rate and crop canopy** - Shading provided by the crop canopy is extremely important in reducing the growth and competitiveness of emerged weeds. Narrower rows and higher seeding rates increase the rate of canopy development.



Increased shade greatly limits weed growth compared to unshaded weeds. This shade tent simulated canopied corn (92% shade).



After 30 days of shade with no herbicide, weed number and growth was minimal.



Adapted from Kilkenny, 1995.

3. **Fertility management for vigorous crop development** - Well managed fertility and correct soil pH is critical for vigorous crop development and early canopy closure. A properly written nutrient management plan assures sufficient fertility.
4. **Mechanical weed removal** - Rotary hoeing can remove the first flush of small weeds and may aid in the activation of soil-applied herbicides in dry years. Row cultivation will remove late emerging weeds and may increase yields by increasing water infiltration and soil aeration under certain conditions.
5. **Crop rotation** - Diversified rotations limit the build up of many weeds. In fact, some weeds decrease greatly in some rotations. Corn after alfalfa is often an excellent time to reduce grass herbicide rates because annual grass density is often much lower after three or four years of alfalfa.

What fields are candidates for a reduced herbicide rate program?

A reduced rate program can be successful in most fields; although, some fields will require more management than others. Other fields may not be good choices if trying reduced rate programs for the first time. Factors to consider include:

1. Type of tillage -

Fields with conventional and reduced tillage are excellent candidates for reduced rate programs because perennials are less of a problem and cultivation is often readily available.



No-till fields are a poor choice for reduced rate programs unless mechanical cultivation is an option.

2. Weed spectrum - A field's weed spectrum is an important factor in determining candidates for a reduced herbicide rate program. Fields with high densities of perennial or hard-to-control annual weeds require a higher degree of management than fields with low or moderate densities of annual grasses and broadleaves. It is best to reduce the populations of tough-to-control weeds before initiating a reduced rate program. For example, fields with woolly cupgrass and wild proso millet are not good candidates for using reduced rates of preemergence herbicides because they are difficult to control, even with full herbicide rates. Also, fields with high densities of late emerging weeds like crabgrass and waterhemp are also poor choices for using reduced rates of preemergence herbicides.

A reduced rate program is not just using less herbicide. The program replaces part of the chemical control with increased management and at least one timely cultivation.

Can I legally apply herbicides at rates lower than written on the label?

Yes. The law allows herbicides to be applied at lower than labeled rates. However, the herbicide manufacturer will not guarantee the product's performance at below-labeled rates.

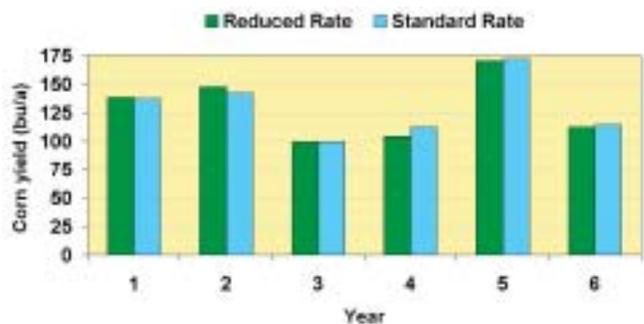
How successful have reduced rates programs been?

The UW Nutrient and Pest Management Program (NPM) conducted 35 on-farm demonstrations of reduced rate of preemergence herbicides plus cultivation in corn versus standard rates for six years. Across that range of farms, years, and weeds, these reduced rates programs increased profits by \$6 per acre.

What are the main risks?

Regardless of herbicide rate, there is a risk that dry weather may reduce the control from preemergence programs. Without rain, some weeds will escape control and growers will need to rotary hoe, cultivate, or apply a sequential

Average corn yields of 35 on-farm demonstrations with reduced rate preemergence programs compared to standard herbicide rates.



Proost and others, 1995.

postemergence herbicide. Postemergence programs using reduced rates require early applications. Late applications are less effective on larger weeds. If an early application with a reduced rate is missed, you can still switch to the label rate.

Will more weeds go to seed?

The old saying that one year of seeding is worth seven years of weeding may suggest that reduced rates programs are riskier than the cost of a standard rate program. UW researchers have studied the effect of reduced rate programs on the number of weed seeds in the soil. After four continuous years of reduced rate programs, weed seed numbers did not increase in the soil. A key component in this success was a single cultivation. Without cultivation, weeds escaping control will produce more seed than standard rate herbicide programs. The bottom line is that the fear of increasing the weed seed bank with a reduced herbicide program is unfounded if timely mechanical cultivation is a part of the program.

Reduced herbicide rate programs don't mean less weed control. Rather, some of the control provided by herbicides is replaced with cultivation.

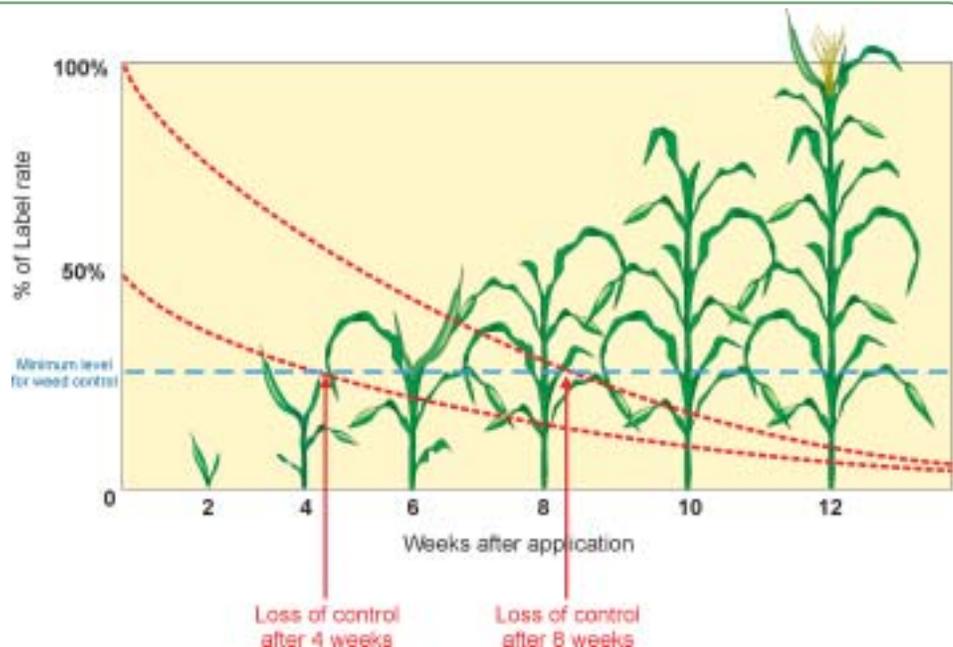
How do reduced rate programs work using preemergence herbicides?

Preemergence herbicides - Two important aspects of soil-applied herbicides need to be remembered when planning a reduced rate program. First, preemergence herbicides require moisture for activation; most require a minimum of 0.25 inch of rainfall within five to seven days after application. If this activating rainfall does not occur, timely rotary hoeing can remove small weeds that have germinated.

Second, preemergence herbicides degrade over time and reach a point where the remaining concentration can no longer control weeds. Reducing the herbicide rate reduces the length of control activity. Look at the chart below showing how the weed control of a soil-applied herbicide breaks down. Compared to a standard rate, a 50% reduction of a preemergence herbicide will provide about one-half the length of weed control. With a reduced rate program, a timely cultivation is used to provide the control needed until the corn canopy shades weeds for the rest of the season.

Generalized graph of the breakdown of a soil-applied herbicide.

If a herbicide at normal rate gives 8 weeks or more of activity, then the reduced rate will generally give 4 or more weeks of activity.



How do reduced rate programs work using postemergence herbicides?

Postemergence herbicides - A reduced rate strategy can also be used with postemergence herbicides. The key is understanding that smaller weeds can be controlled with less herbicide. This means a reduced rate must be applied to smaller weeds earlier in the growing season.

However, spraying earlier means there is a longer time period until the corn canopy will close. Therefore, a follow-up cultivation when corn is 14 to 20 inches tall is necessary to control any surviving weeds or weeds that emerged after the application. Do not use reduced herbicide rates if weeds are already at or past the labeled height or under stress. Do not reduce adjuvant rates when applying postemergence herbicides at reduced rates.



How do I start a reduced rate program?

When followed with timely cultivation, preemergence and postemergence reduced rate programs have been successful with rates as low as 50% of the labeled rates. The postemergence treatments were sprayed when weeds were half the height listed on the herbicide label. Start a reduced rate program by dropping your current rate to the lowest labeled rate. From there, you can try a 25% rate reduction and then a 50% rate reduction as you gain experience.

Use steps in starting a reduced rate program

1. Try lowest labeled rate
2. Reduce by 25%
3. Reduce by 50%

Do herbicide resistant hybrids fit into a reduced rate program?

Yes. Roundup Ready, Liberty Link, and Clearfield hybrids can be used in reduced rate programs. Glyphosate, Liberty, and Lightning are the herbicides used on these respective hybrids. All are postemergence herbicides; so if using reduced rates, small weeds must be treated and followed with a cultivation to control late emerging weeds. Remember that glyphosate and Liberty are postemergence herbicides without residual activity. A reduced rate of a residual herbicide could be tank mixed with these herbicides to provide control of later emerging weeds.

What else should be considered before starting a reduced rate program?

Expectations - Determine the weed control expectations of everyone involved in the decision process, including landlords, farm managers, and crop consultants. This is an important step in determining if a reduced rate program is right for your farm. A landlord who has zero tolerance for weeds may require a detailed explanation on the benefits and risks of a reduced rate program.



Time - Reduced rate programs require more management and time commitment than many standard rate programs. Time must be allocated for field scouting to ensure the herbicides match the weed spectrum and that postemergence herbicides are applied on time. Time is also needed for row cultivation. For growers that have significant time commitments, such as milking and forage harvest, a reduced rate program may be appropriate for only a portion of their acres.

Weather - The success of any weed control system that uses mechanical cultivation can be adversely affected by the weather.

Wet weather will not jeopardized the effectiveness of reduced rates of preemergence herbicides. However, if extended periods of wet weather delay cultivation, a postemergence herbicide treatment may be necessary for weed control.



Remember, postemergence reduced rates must be applied to smaller weeds earlier in the growing season. If a postemergence application is delayed beyond this reduced rate window, the rate can be increased to a standard rate.

A coat of paint covers mistakes made when making a birdhouse. A standard herbicide rate covers the mistakes made in calibration.

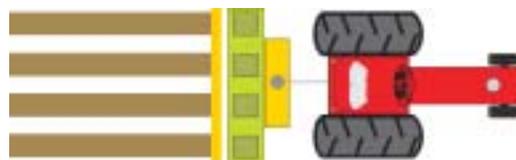
Sprayer calibration - Proper sprayer calibration is critical to maximize dollars spent on weed control. A sprayer that is poorly calibrated and under applies in a standard rate program may not cause serious problems. However, an under application with a reduced rate program could lead to poor weed control right from the start.



If you are unsure of how to calibrate your sprayer, consult your Pesticide Applicator Training manual or county extension agent for a simple and effective method.

Do all reduced rate programs use broadcast applications of herbicides?

There are other methods of reducing herbicide rates. So far, this publication has discussed broadcast application of herbicides. Banding over the row at planting reduces herbicide use 50% to 67%, depending on the width of the band and row spacing.



Banding over the row at planting

Examples of Reduced Rate Programs

(The following scenarios are not endorsements of any particular herbicide and represent just a few of the endless combinations for reduced rate programs.)

Single herbicide pass - A viable preemergence option if the weed spectrum consists of annual grasses and broadleaves (excluding the hard-to-control annuals) is to apply a reduced rate of a preemergence grass herbicide and a half rate of a preemergence broadleaf herbicide for early season control. Rotary hoeing will aid weed control if no rainfall occurs within five to seven days after application. Cultivate once when corn is 14 to 18 inches tall. This should provide the weed control that is needed until the canopy closes.

Sequential applications - Grass populations are often less after alfalfa. Consider applying a half rate of a preemergence grass herbicide in the year after alfalfa and using a standard rate of a postemergence broadleaf herbicide. This gives an opportunity to match the broadleaf herbicide with the actual weed spectrum. This option provides a great degree of flexibility with little risk.

Postemergence single pass - Reduced rates of postemergence herbicides rely on treating small weeds. In a field that has a history of grass weeds, an option would be to apply a half rate of glyphosate to 4 inch tall Roundup Ready corn when the grasses are still small, only 2 to 3 inches tall. The glyphosate can be tank mixed with a half rate of a preemergence grass or broadleaf herbicide to provide some short-term residual activity before the corn is cultivated later.

Reduced rate programs do not need to be used in the same field each year. This year's reduced rate program can be followed by a standard program next year.

Summary:

- Successful weed control without corn yield loss can be obtained with a reduced preemergence or postemergence herbicide rate program.
- Reduced rates allow growers to optimize inputs and minimize the potential negative environmental impacts from herbicides.
- Adoption of a reduced rate herbicide program must be done with common sense, a spirit of experimentation, and a commitment to use cultivation or sequential applications when appropriate.



No matter how much money you spend, weeds will emerge next year. The key is learning to manage weeds.

References:

Kilkenny, Z. 1995. Emergence and growth of common annual weeds under varied levels of shade. M.S. thesis. University of Wisconsin.

Proost and others. 1996. A summary of six years of on-farm demonstration focusing on reduced preemergence herbicide rates. Proc. Wisconsin Fertilizer, Aglime, and Pest Management Conf. pp. 179-182.

For more information:

Protecting Wisconsin's Resources through Integrated Weed Management - A3690, January 1998, 80 pages. Contact the Wisconsin NPM Program at 608-265-2660

Training Manual for the Private Pesticide Applicator, 4th ed., January 1998. 297 pages. Contact the Wisconsin PAT Program at 608-262-7588

http://ipcm.wisc.edu/uw_weeds

The University of Wisconsin Weed Science website is designed to present the research, teaching, and Extension activities of the Weed Science program in the University of Wisconsin Departments of Agronomy and Horticulture.



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