

Controlling weeds is a critical management practice for successful corn production. There are many different approaches to weed management and some pitfalls to avoid. This issue of Between the Rows will cover some key aspects of weed management and tips to avoid costly mistakes.

Start Clean

Starting with weed-free fields is key to protecting yield potential. Research has shown that weed control within the first 4 to 6 weeks after crops are planted is critical to avoid a yield penalty. Early season weed control can be accomplished using a variety of tactics including tillage, herbicides, cover crops, or a combination.



Burndown Herbicides

Burndown herbicides need time and adequate temperature to control weeds, as they are most effective on actively growing plants. A good rule of thumb is to apply a burndown if the forecasted daily low and high temperatures add up to 90 degrees or above as plants typically have enough growth for herbicides to work effectively. In order to achieve timely control, it is recommended to apply burndown treatments at least 10 to 14 days before planting, especially if weed cover is thick.

Some burndown herbicides require an interval of time between application and corn planting to reduce the risk of crop injury. One of the most commonly used burndown herbicides is 2,4-d which requires 7 to 15 days between application and corn planting, depending on formulation and rate. Always consult specific herbicide labels for planting limitations.

Preemergence Herbicides

There are many preemergence herbicide options that provide residual control of a broad spectrum of weeds. Most preemergence herbicides need to be incorporated into soil by shallow tillage or rainfall in order to effectively control germinating weeds. Some preemergence herbicides have activity on small, emerged weeds while also being safe for emerged corn. Table 1 shows corn growth stage restrictions for some common preemergence herbicides.

Table 1. Crop stage restrictions for delayed applications of preemergence herbicides

Herbicide ¹	Maximum Corn Stage
Princep, Sharpen, Verdict	Before corn emergence
Balance Flexx	2 collars
Corvus	2 collars
Basis Blend	6 inches or 2 collars
Anthem MAXX, Anthem ATZ, Zidua	4 collars
Degree Xtra, FullTime NXT, Harness, Harness Xtra 5.6L, Keystone NXT, Keystone LA NXT, Surpass NXT, SureStart II, TripleFLEX II	11 inches
Harness MAX	11 inches
Resicore	11 inches
Atrazine	12 inches
Bicep II Magnum, Bicep Lite II Magnum, Cinch ATZ, Cinch ATZ Lite, Parallel Plus	12 inches
Acuron, Lexar EZ, Lumax EZ, Stalwart 3W	12 inches
Outlook	12 inches
Resolve SG	12 inches or 5 collars
Hornet WDG, Python, Restraint	20 inches or 6 collars
Acuron Flexi, Callisto, Stalwart 2W	30 inches or 8 collars
Prowl, Prowl H2O	30 inches or 8 collars
Dual II Magnum, Cinch, Parallel, Stalwart C	40 inches

¹ Refer to the herbicide labels for information on application rates and specific restrictions for tank mixtures. Source: 2023 Michigan State University Weed Control Guide

Postemergence Herbicides

Postemergence herbicides are an effective method to manage weeds, especially for weeds that escape preemergence herbicide applications. Application timing and weather have a large influence on herbicide performance. Larger weeds are more difficult to control and compete aggressively with corn for resources. Weed control is also more difficult in stressful environments, such as during a drought. Weed growth slows when plants are stressed, reducing the uptake and movement of most herbicides.

Some weeds will build up a waxy coating on their leaves during hot and dry conditions to conserve water. This wax buildup, often referred to as "hardening off," interferes with herbicide absorption. Adjuvants can be added to increase absorption under these conditions, but this can come at the cost of crop safety. In stressful environments, it might be better to wait for better growing conditions before spraying.

Crop safety

Crop tolerance to herbicides is achieved by several methods, with plant metabolism being one of the most common. Corn and many other crops have the ability to quickly degrade many herbicides into non-lethal compounds through specific metabolic pathways. If plant metabolism is slowed by stressful weather conditions, many commonly-used herbicides can cause crop injury.

Large temperature swings or drought stress can decrease plant metabolism causing increased risk of crop injury. Sometimes it is best to wait a few days until the stressful conditions subside and plants are able to resume normal growth.

If stressful conditions persist, other measures such as switching herbicides may be required. Safeners are included with some herbicide formulations to reduce crop injury potential, but they aren't failsafe in all conditions. Consider the following management practices to reduce the risk of crop injury to herbicides.

Management practices to reduce crop injury risk from herbicides

- Apply herbicides prior to the V5 corn growth stage.
- Use drop nozzles to reduce the amount of herbicide entering the corn whorl.
- Properly maintain and calibrate sprayers.
- Check herbicide labels for potential insecticide interactions and other restrictions.
- Avoid herbicide application when the corn plant is under environmental stress.
- Avoid application directly before or after expected large swings in daily temperature.
- Avoid application when the sum of daily high and low temperatures is less than 90 degrees.
- Avoid applications of growth regulator herbicides during periods of rapid corn growth.
- Only use label-recommended additives.
- When tank mixing herbicides, always follow the label with the most restrictive directions of use.

Weed Resistance

Weeds have developed resistance to most classes of herbicides, and once a weed develops resistance it can't be reversed. The following management practices will delay the development of resistant weed populations.

Management practices to help delay weed resistance

- Integrate non-chemical weed control strategies such as cultivation, crop rotation, cover crops
- Start with clean fields
- Rotate herbicide sites of actions (Table 2)
- Use multiple effective herbicide sites of actions for target weeds (herbicide premixes, tank mixtures, multiple pass programs)
- Use full labeled rates
- Prevent weed escapes by spraying timely. Big weeds are difficult to control
- Prevent weed escapes from going to seed

Repeated use of the same herbicide or herbicides with the same site of action will speed up the development of resistant weeds and should be avoided.

Table 2. Herbicide site of actions

Group	Site of Action	Popular Herbicide Products
1	ACCase Inhibitors	Select Max, Poast Plus, Assure II, Fusilade
2	ALS Inhibitors	Resolve Q, Accent Q, FirstRate
3	Microtubule Inhibitors	Prowl, Treflan
4	Synthetic Auxin	dicamba, DiFlexx, Clarity, 2,4-D, Enlist
5	Photosystem II Inhibitors PS2-A	atrazine, Princep, metribuzin
6	Photosystem II Inhibitors PS2-B	Basagran, Buctril
7	Photosystem II Inhibitors PS2-C	Lorox, Linex
8	Lipid Synthesis Inhibitors	Sutan+, Eptam
9	EPSP Inhibitors	glyphosate, Roundup
10	Glutamine synthetase Inhibitors	glufosinate, Liberty
13	Carotenoid biosynthesis Inhibitors	Command
14	PPO Inhibitors	Flexstar, Cobra, Spartan, Sharpen, Valor
15	Long-chain Fatty Acid Inhibitors	Harness, Surpass, Dual, Outlook, Zidua
19	Auxin Transport Inhibitor	component of Status
22	Photosystem I Inhibitors	paraquat
27	HPPD Inhibitors	Balance Flexx, Armezon, Impact, Callisto, Laudis, component of Acuron

Summary

Weed pressure can quickly reduce corn yield potential throughout the growing season. Take steps to ensure your crop emerges in a weed free environment, and be prepared to control weeds that might emerge after corn emergence. Delay the development of weed resistance by following a few key management best practices. Lastly, always read and follow the instructions and restrictions listed on the herbicide label to reduce crop injury and maximize herbicide performance. A quick and easy resource to look up herbicide labels is <http://www.cdms.net/LabelsSDS/>.

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