North Central IPM Center

PART 2 OF 5

Frequently Asked Questions

FIGURE 1 | Emerging grape leaves that received herbicide injury in the previous season continue to show damage early the next season.

Dicamba and 2,4-D drift damage has captured national attention in recent years. Could your farm be at risk? And if so, what should you know to prevent, prepare, and respond? In this fact sheet, we look at some frequently asked questions from specialty crop growers. There is still much for researchers to learn, particularly surrounding crop-specific and long-term effects.

Are there times when plants are more susceptible to drift damage?

Yes, but it varies greatly by plant. For example, early spring herbicide applications coincide with bud break and leaf emergence in many woody and perennial plants–a time when these plants are highly susceptible to 2,4-D and dicamba drift. For most vegetable and fruit crops, yield is especially vulnerable during flower and fruit set. If harvested products could be tested for pesticide residues (for processing or organic produce), drift damage close to harvest may also be cause for increased concern.

Can damage last more than one season?

This is a question rich for further research. For woody plants and other perennial species, the potential for long-term or accumulating effects is a concern. Herbicide drift may reduce winter hardiness and long-term vigor, which can result in high replacement costs and years of lost revenue waiting for new plants to produce. Research has also shown second generation damage from 2,4-D and dicamba exposure on some annual crops, including potatoes and soybeans. (Jones, et al., 2018; Geary, et al., 2019).

Does visible damage always mean lower yield?

The effects on yield depend on the crop species, growing stage and overall health, and the concentration of dicamba or 2,4-D in the drift plume. High concentrations of off-target dicamba or 2,4-D may lead to stunting or plant death with obvious effects on yield. But dramatic-looking injury may occur on highly sensitive species

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FIGURE 2 | Probable drift damage in a greenhouse tomato plant.

Dicamba and 2,4-D typically persist in the soil for a month or less.

even when exposed to very low doses. Early season drift damage may disappear in a few weeks and leave no trace of damage or yield losses. Other times the condition of plants may continue to deteriorate. Alternatively, a damaged crop may appear to recover, until harvest reveals misshapen and stunted produce, or uneven maturity. Again, there is a great degree of variation between species, making it important to monitor your plants for damage throughout the growing season.

How long does herbicide residue persist in the soil?

Again, this depends on many factors such as application rate and weather. Dicamba and 2,4-D typically persist in the soil for a month or less. Therefore, the primary concern would come from foliar contact with drift. There are other herbicides that can persist in the soil for a year or more (Derr et al. 2016).

How far can drift travel?

Most drift is from spray droplets moved by wind. This type of drift has a relatively short reach and is generally limited to adjacent fields. However, dicamba and 2,4-D are also likely to drift as a gas or within a temperature inversion. Temperature inversions can be especially damaging, moving suspended pesticides in a fog-like fashion for longer distances. With a 2–3 mile per hour breeze, drift within a temperature inversion could potentially move several miles over night.

Are my plants safe inside a greenhouse or hoop house?

Drift can enter these enclosed (or partially enclosed) spaces and become trapped. In fact, running ventilation fans can actually increase the concern by bringing in outside air that may be contaminated. Herbicides can also enter on contaminated irrigation water, composts, and mulches.

Can crops be sold after receiving drift damage?

Legally, if drift residues can be detected at harvest, the crop cannot be sold as food unless the levels are below the US EPA's Maximum Residue Limit or "tolerance" for the pesticide and crop. Since dicamba is not labeled for use in horticultural food crops, there are currently few established tolerances for dicamba residues on fruits and vegetables (except for asparagus and sweet corn). Therefore, any detectable dicamba residue would make your crop unsellable. Food processors may test your produce for pesticide residues. If you are concerned, private labs also offer residue testing. MRLs for dicamba and 2,4-D may be viewed in the Code of Federal Regulations, Title 40, Part 180. A link is provided in the resources section. For ornamental crops, tolerance limits are not a concern, but physical damage alone will reduce marketability.

Can organic growers lose their certification over drift?

Transitioning to organic certification is a detailed three-year process, involving new production methods, recordkeeping, and patience. Organic growers must only apply products approved for use in organic production that are part of their Organic System Plan. Drift residues above acceptable levels will not only prevent organic crops from being marketable but may cause problems with your organic certification. If you have taken proper precautions to avoid drift (buffer zones, notification of utility companies and road crews, agreements with neighbors, posting "no spray" signs, etc.), your organic certifier may be able to work with you to find solutions that do not involve the loss of your organic certification or the need

2,4-D damage on peach.

2,4-D damage on tomato.

Dicamba damage to a young pin oak.

Photos courtesy of Dr. Kevin Bradley, University of Missouri

Virtually all broadleaf crops are susceptible to dicamba and 2,4-D damage in high enough doses.

for re-transition of your land. Talk to your certifier before drift happens. Find out if they have encountered this problem with other growers they certify and how they handled it.

Which crops are most susceptible to dicamba or 2,4-D?

Aside from crops with engineered resistance, virtually all broadleaf crops are susceptible to dicamba and 2,4-D damage in high enough doses. Grassy plants tend to be more tolerant than broadleaf plants and are unlikely to be injured by the doses typically associated with drift. While we've talked about these two herbicides together, keep in mind they are two distinct chemicals. Some crops are highly sensitive to one, yet fairly resistant to the other.

For extremely sensitive crops, a small amount of drift can produce devastating results. For example, researchers have documented injury symptoms on grapes sprayed with 1/800th the labeled rate of both dicamba or 2,4-D. Tomatoes, peppers, and watermelon showed symptoms at 1/300th the labeled rate for dicamba and 2,4-D. (Culpepper 2017; Culpepper et al. 2018).

Resources

Plant Injury from Herbicide Residue
Virginia Cooperative Extension Service Publication PPWS-77P
Discusses effects and persistence of several growth regulator herbicides, including dicamba and 2,4-D.
https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/PPWS/PPWS-77/PPWS-77P-pdf.pdf

U.S. Tolerances and Exemptions for Pesticide Chemical Residues in Food
Code of Federal Regulation, Title 40, Part 180
https://www.govinfo.gov/content/pkg/CFR-2014-title40-vol24/xml/CFR-2014-title40-vol24-part180.xml#seqnum180.142

University of Missouri Herbicide Damage Trials
Excellent photos of dicamba and 2,4-D drift injury at various levels of severity.
Investigations of Sensitivity of Ornamental, Fruit, and Nut Plant Species to 2,4-D and Dicamba
https://weedscience.missouri.edu/2017-2018TreeResults.pdf
Evaluations of Dicamba and 2,4-D Injury on Common Vegetable and Flower Species
https://weedscience.missouri.edu/Vegetable%20Injury%20with%20Dicamba%20and%202,4-D%202018.pdf

Dicamba and 2,4-D Visual Sensitivity Scale for 2017
The University of Georgia
A short list of comparative sensitivities among horticultural crops
http://gaweed.com/HomepageFiles/Visual%20Sensitivity%20Scale%20for%20Dicamba%20and%202_4-D%20in%20GA.pdf

Sources

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