

WHAT TO EXPECT FROM DICAMBA INJURY TO POTATO

There has been much discussion on the effects of dicamba on potato. Dicamba is a translocating herbicide that will express injury in the growing points of plants. When a low dose of unintended herbicide comes in contact with a sensitive crop, such as potato, the results can be devastating for the potato plant and tubers. New leaves become twisted, cupped and malformed, while tuber number can be reduced and malformed. Contaminated seed will be low to emerge and express epinastic leaves (where cells on top of leaf grow faster than cells on bottom of leaf, causing leaf to appear drooped). I recently recorded a [presentation explain the effects of dicamba on potato leaves, tubers and seed contaminated with dicamba planted back](#).

[Andy Robinson](#)

NDSU/U of M Extension Potato Agronomist

OFF-SITE MOVEMENT OF DICAMBA

From various sources, it appears that soybeans and other crops have been injured by drift in ND. Detailed education was done in winter meetings by both university and industry to present the best management practices (BMPs) to limit off-site movement. Many factors are associated with dicamba drift, and growers can control most of them. It is my perception that, in general, growers followed prescribed BMPs. Wind has been very strong this spring and early summer making timely applications under the 10 mph BMP requirement difficult.

One point that is rarely considered is the rapid evaporation of water from spray droplets, especially under low humidity. Large droplet nozzles required for application of dicamba on DT soybean reduces risk of particle drift but some low percentage of droplets will be small and water will quickly evaporate before droplets intercepts plant foliage. Small particles void of water may behave like vapor drift. Regardless of the cause, some drift has been reported that show classic drift patterns where the injury is diminished as it progressed across the field. Other fields show dicamba injury from border to border. Soybean showing the phenomenon of 'rapid growth syndrome' may also exhibit symptoms similar to dicamba. Yield at harvest will be the best way to determine the extent of the injury.

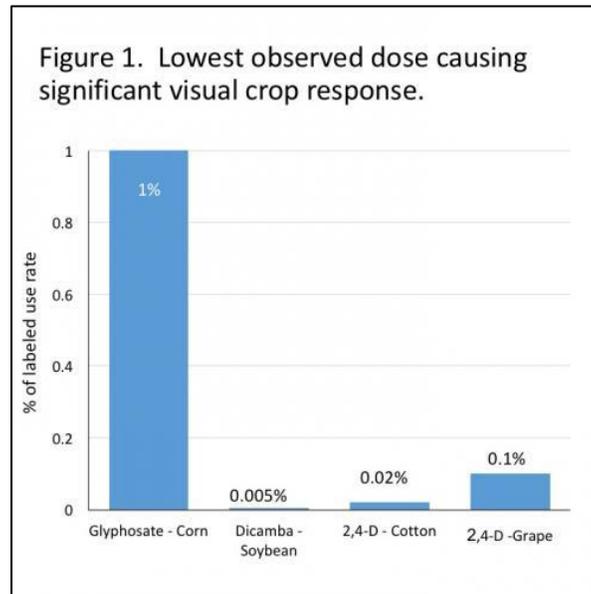
The extent of residual injury will depend on the herbicide dose the susceptible species received and the growth stage of the crop at the time of the drift. Dr. Andy Robinson, NDSU/U of MN Potato Agronomist, researched soybean response to dicamba and 2,4-D as part of his Ph.D. degree from Purdue University. From his research, he found very important points relevant to the dry condition of this summer.

1. Expression of dicamba symptoms on soybean may be delayed more (several days or weeks) in dry conditions than in wet conditions.
2. Severity of symptoms from dicamba may be greater in dry conditions than in wet conditions.
3. Plants in the vegetative stage may be less affected than those in the reproductive stage.

It appears that dry conditions have advanced soybean entering reproductive phases, making dicamba drift from recent applications more injurious.

Unfortunately, another point that has not been sufficiently emphasized is that the very crop species that dicamba resistance was transformed in (soybean), is one of the most, if not the most, susceptible species to dicamba. Dr. Bob Hartzler, Weed Scientist at Iowa State University, has recently written a good article relating the relative susceptibility of soybean to dicamba to other crop/herbicide technologies:

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In describing the graph, Dr. Hartzler stated “Soybean was 200 times more sensitive to dicamba as corn was to glyphosate, whereas cotton and soybean were at least 10 times more susceptible. Off-target injury is not limited to the growth regulator herbicides. In the first years after the introduction of Roundup Ready soybean it was not unusual to see 10 to 20 rows of corn damaged, even killed, by glyphosate drift. However, it was rare to see glyphosate injury across entire fields. Unfortunately, this is not what Iowa has experienced with the introduction of dicamba-resistant (Xtend) soybean. Dicamba poses a unique situation in that soybean is more sensitive to dicamba than nearly any other herbicide-plant combination.” <http://crops.extension.iastate.edu/blog/bob-hartzler/not-all-drift-created-equal>

Some academicians in other states have written general or detailed descriptions of the extent of dicamba drift in their state and some factors associated with drift.

The remainder of this Crop and Pest Report article includes published information written by weed scientists at Ohio State University and Purdue University on July 12, 2017. See below:

Ohio Soybeans: Dicamba Drift Injury Becoming More Evident

Dr. Mark Loux, Ohio State University

Dr. Bill Johnson, Purdue University

You would probably have to be living under a rock to not be aware of the recent issues with off target dicamba movement affecting soybeans and other plants in the states of Tennessee, Arkansas, and Missouri. The latter two states just banned any additional dicamba applications for the remainder of the growing season to avoid additional problems (subject to change probably), and some changes apparently are coming in Tennessee, also. We have seen firsthand examples of this in at least some Indiana and Ohio fields, and have heard about additional ones. It’s somewhat difficult to gauge how widespread the issue is, since there is often reluctance of an affected party to contact regulatory officials and file a complaint, to keep good relations with the offending neighbor.

This has been a trend over the years where applications of dicamba-containing products to corn have affected nearby soybeans – neighbors tolerating each other – partly based on the knowledge that soybean yield often appears to be unaffected by early-season dicamba exposure. Our conclusion at this point, based on the fields we have examined, is that the patterns of injury are indicative of both particle drift and volatility. However, an alarmingly high number of fields seem to show that we have more offsite movement due to volatility than we thought would happen based on past experience with dicamba use in corn and the development of lower volatility formulations of dicamba products labeled for use in Xtend beans.

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This is not to say that spray particle drift is not occurring. It is evident that in many situations, dicamba is being applied in too much wind, or with no buffer left between the treated field and adjacent non-Xtend soybeans. We certainly have had the “perfect storm” of limited days to spray with wet weather delaying field operations. When soil conditions were suitable for sprayer traffic, the winds were often excessive and we likely had herbicide applied during inversions as we rushed to get work done.

However, with such an abundance of fields that show uniform symptomology across the entire field, we wanted to raise awareness of this situation and attempt to explain drift vs volatility. There is certainly a lot more to learn about how volatile these new products are under varying conditions. We would most likely expect some changes in how they can be used between now and next year, at least in certain states.

The purpose of this article is to discuss particle drift versus volatility, and what history tells us about volatility and symptom development for dicamba products that have some volatility, and also explain the effect of exposure on soybean yields. This information may be helpful in the assessment of situations where dicamba injury occurs. In some fields that we have examined, the symptoms of dicamba on sensitive soybean have occurred at far greater distances, and at much more uniformity, than can be explained simply by spray particle drift.

Spray particle drift has a telling pattern, which most anyone in the industry has observed at one time or another for various herbicides. The dosage and symptoms in an adjacent sensitive crop are greatest closest to the treated field, due to the highest frequency of larger spray droplets settling out fairly rapidly. For this reason, one indicator of spray particle drift is herbicide symptomology on weeds growing along an adjacent roadside or in a fencerow between the two fields. The injury then tapers off with distance from the treated area as a decreasing number of smaller droplets continue to settle out, until the point where no injury occurs due to insufficient number of droplets and dosage to cause injury. How sensitive the affected crop also comes into play here, since it takes a lower dosage to cause injury on a more sensitive crop. Spray droplets can move well into an adjacent field, depending upon wind, temperature, nozzles, pressure, use of drift-reducing agents, etc.

But particle drift does not result in the relative uniformity of dicamba injury over a large adjacent field that has occurred in some cases. This would be more indicative of movement via dicamba volatilization from leaf or soil surfaces, occurring sometime within several days after application. Vapors then move with prevailing air currents, with potential to move far greater distances than spray particles, upwards of a half mile.

Movement of vapors does not require much wind. For example, volatilization of dicamba that occurs under relatively still inversion conditions can result in prolonged suspension and movement of vapors with gentle air currents. In one field we looked at, there appeared to be an initial volatilization event from the adjacent dicamba-treated soybeans, with some subsequent soybean recovery. This appeared to be followed by a second round of dicamba exposure and injury to the recovering soybeans several weeks later. Soybeans may not show symptoms of dicamba until 10 to 21 days following exposure, when the injury becomes evident in newest growth.

Injury takes the form of leaf wrinkling and cupping, and new leaves trying to expand emerge may remain tightly cupped and small. Higher doses can cause terminal growth inhibition (shorter plants) of plants that are slower to cover the row middles. As soybeans recover, new growth will eventually emerge without symptomology. The ability of soybeans to recover from injury, the rate of recovery, and effect of yield is dependent upon dosage and subsequent environmental conditions, and obviously whether they are exposed to dicamba again while trying to recover.

Exposure to dicamba in the vegetative stages has less long-term effect and potential to reduce yield compared with exposure in the reproductive stages. Our experience with injury during the vegetative stages is that it rarely leads to yield loss, unless there is a significant reduction in plant height. This assumption is based on continued suitable environmental conditions for soybean growth and seed fill prior to harvest. With regard to injury from most herbicides, late-planted soybeans can be generally more of a concern since they have less time to develop full yield potential anyway, especially in suboptimum environments.

<http://agfax.com/2017/07/12/ohio-soybeans-dicamba-drift-injury-becoming-more-evident/>

Rich Zollinger

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