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# Plant growth regulator herbicide symptoms in soybean

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# Plant growth regulator herbicide symptoms in soybean

## **Abstract**

During the past few weeks, reports have been numerous of soybean plants with symptoms mimicking plant growth regulator (PGR) herbicide damage. Leaf cupping and malformation in soybean are not well understood; however, it seems that there are at least three circumstances that may lead to these symptoms:

1. soybean plants are exposed to a plant PGR herbicide (e.g., 2,4-D and dicamba);
2. application of a postemergence herbicide to soybean induces the response, and
3. environmental conditions stimulate the symptoms.

## **Keywords**

Agronomy

## **Disciplines**

Agricultural Science | Agriculture | Agronomy and Crop Sciences | Plant Pathology

# INTEGRATED CROP MANAGEMENT

## Plant growth regulator herbicide symptoms in soybean

During the past few weeks, reports have been numerous of soybean plants with symptoms mimicking plant growth regulator (PGR) herbicide damage. Leaf cupping and malformation in soybean are not well understood; however, it seems that there are at least three circumstances that may lead to these symptoms:

1. soybean plants are exposed to a plant PGR herbicide (e.g., 2,4-D and dicamba);
2. application of a postemergence herbicide to soybean induces the response, and
3. environmental conditions stimulate the symptoms.

In some situations, it is easy to determine the cause of injury, whereas in others it may be impossible to conclusively determine why leaf cupping has developed. Interestingly, these problems have developed consistently around the middle of July for the past 5 to 10 years (see previous articles published in the ICM newsletter).

The first scenario may occur due to drift of the growth regulator herbicide from an adjacent area or may be due to use of a contaminated sprayer to apply herbicides directly to the soybean. Examples involving off-target herbicide movement, whether it is caused by spray drift or volatilization, show a pattern. If there is no pattern evident, herbicide drift is not likely to be involved.

Symptoms frequently develop within a week of a postemergence herbicide application to soybean. Sometimes the entire field is affected, whereas in other fields the damage is limited to specific sprayer loads. In these situations, it can be difficult to determine whether the sprayer contained residues of a PGR herbicide or whether the problem was induced by other factors. Concentrations of a PGR herbicide capable of inducing symptoms may remain in the sprayer even after thorough cleaning procedures or after several loads of non-PGR have been run through the sprayer. However, we have seen numerous examples where leaf cupping developed after application with a sprayer dedicated to spraying soybean, thus minimizing the possibility of sprayer contamination. Leaf cupping has been observed after applications of all types of herbicides; thus, the response does not seem to be related to the mode of action of the herbicide. Roundup Ready soybean plants seem to be as likely to show the response as traditional varieties.



**Leaf malformations in soybean.**

Some fields have developed leaf cupping in the absence of herbicide applications, most commonly during conditions of rapid growth. It is possible that heat and moisture stress induce leaf cupping and distortion. Under stressful conditions, the balance of naturally occurring hormones in the plant apparently is disrupted, resulting in symptoms characteristic of PGR herbicide damage. When this situation develops, the entire field will probably demonstrate symptoms and there will not be a drift pattern.

When PGR herbicides are not involved in the occurrence of the injury symptoms, soybean typically resumes normal growth shortly after the cupped leaves are observed. Frequently, two or three leaves develop symptoms and then normal growth resumes. Soybean yield should not be impacted under these situations.

The potential for a yield response is greater when a PGR herbicide is involved; however, it is impossible to determine the extent of yield loss by examining symptoms that develop after the exposure (see July 1, 2002, *Integrated Crop Management* article [Dicamba and soybean yields](#) [2], pages 130-131). Research has shown that low levels of injury early in the season from PGR herbicides usually do not impact yields. The only reliable method of determining a yield response is comparing the yield of the injured soybean with an area of the same field that is unaffected by the herbicide. Usually, a valid comparison is not available to help determine the impact of the herbicide damage on yield.

Over the last several years unexplainable soybean leaf cupping has occurred widely throughout the Midwest. We suspect that environmental conditions that cause rapid soybean growth, often preceded by stress conditions, are instrumental in the occurrence of the symptoms. Stress from herbicide applications also may induce this response. No one adjuvant, crop oil, seed oil, or surfactant seems to be involved. In these situations, the development of deformed leaves seems to be temporary and new leaves have not been affected, thus suggesting there is no impact on soybean yield.

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[1] <http://www.ent.iastate.edu/imagegal/plantpath/soybean/growthreg/soybeanpucker.html>

[2] <http://www.ipm.iastate.edu/ipm/icm/2002/7-1-2002/dicamba.html>

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