

Travis Legleiter

Weed Science Program Specialist

Kiersten Wise

Associate Professor

Extension Field Crop Pathology

Bill Johnson

Professor of Weed Science

Extension Weed Science

Cupping leaves on soybean: Is it a pest or a pesticide to blame?

Soybeans across Indiana are curling and cupping and may have a mottled appearance. In some cases, these soybeans are also under drought stress, or suffering from other disorders. While it is easy to look at cupping and curling symptoms on soybean and claim injury from a growth regulator, it is much more difficult and important to determine the origin of growth regulator herbicide injury or determine if it is a viral disease that can cause a similar symptom. When looking at soybean fields with these symptoms, use the following information to determine if it is a pest or pesticide issue.

Plant Growth Regulator Herbicide Injury

When soybeans are exposed to low doses of growth regulator herbicides the plant leaves will cup, strap, and drawstring at the point of newest growth, rather than twisting and epinasty of stems that would be associated with lethal doses. The cupping and strapping can take up to two weeks to show up in an affected field. The sources of low dose growth regulator injury on soybeans are drift, volatilization, tank/boom contamination, or a combination these sources from growth regulator herbicides used in corn, pastures, fencerows, and home lawns.

Distinct patterns in the field of changes in injury severity, and other susceptible plants in the field and surrounding fields can assist you in determining the source of contamination. A field that received drift will have the most severe injury closest to the source of drift. Broadleaf weeds in the source field will have the twisting, curling, and epinasty expected with a full dose application. If the drift occurrence occurred across a road or fence line, look for twisting and curling of weeds in the ditches or fence line between the fields.

Volatilization can be a little trickier to identify than a drift occurrence, especially if both occurred at the same time. Look for injury patterns that follow air current pathways and changes in elevation. Injury occurring in low lying patches or valley's can be an indicator of growth regulator volatilization. As with drift, a source field of volatilization will need to be identified by looking at surrounding fields, pastures, and road side could have potentially received a growth regulator herbicide application.



Soybeans infected with soybean mosaic virus exhibit crinkled leaves and a yellow mosaic pattern on leaves



Soybean plants with cupped and strapped leaves due to potential drift, volatilization, or tank contamination of a plant growth regulator herbicide

Cupping leaves on soybean

June 29, 2012

Contamination of sprayer tanks and booms with a growth regulator herbicide can also be difficult to diagnose as the area's surrounding the immediate field will not show the signs that volatilization and drift show. Growth regulator injury from a boom that was not properly cleaned can be obvious as lethal damage will be evident where the sprayer was turned on and injury will become less severe with the distance traveled. Looking for distinct lines of the sprayer path will also indicate a growth regulator contamination of the boom. Tank contamination will typically result in fairly equal distribution of injury across the field. Use spray logs to identify fields sprayed prior to the injured field with potentially the same spray batch and look for injury in those fields as well. In some cases a sprayer that is allowed to sit over night or extended period of time with a loaded tank can cause growth regulators remaining on tank walls or plumbing to release into solution and become a contaminate in the next application.

Soybean Viral Diseases

Soybean mosaic virus (SMV) can also be present in soybeans across the Midwest, and symptoms include curling, cupping, or crinkling leaves that may or may not have a yellow or light green "mottled" appearance. Leaf margins may curl under, and stunting can occur depending on the timing of infection. Symptoms will vary with variety and environment, and are usually most apparent on youngest leaves during periods of cool weather. This virus is transmitted by seed and from plant to plant by many species of aphids, including soybean aphid. Seed transmission usually does not exceed 5%, but plants with the virus can serve as sources from which it can be transmitted by aphids to other plants. Infected plants commonly produce small, mottled, discolored seed.

Bean pod mottle virus (BPMV) and Alfalfa mosaic virus (AMV) have also been reported on soybean and may have similar symptoms. To determine if virus is the cause of the symptom, samples must be collected and submitted to a diagnostic lab for identification.

Research indicates that applying an insecticide to reduce aphid populations solely for SMV management is not effective, since aphid populations are not static and sprayed fields can be recolonized by aphids from other locations. Effective management includes planting virus free seed and timely planting of soybeans to avoid conditions that favor aphid transmission and disease development (late planting). Varieties may vary in their resistance to SMV.

Soybeans in Indiana are under a high level of environmental stress in most areas. Drought-stressed plants may be exhibiting symptoms similar to disease or herbicide injury as a result of this stress. Although growth regulator injury on soybeans is going to be more obvious than in past years, it is important to find the source of the growth regulator prior to diagnosing cupped soybeans, otherwise only a statement of potential growth regulator injury can be appropriately made. Before jumping to conclusions on which pest or pesticide might be the culprit, be sure to get an accurate diagnosis by submitting a sample to a diagnostic lab for confirmation.

Information listed here is based on research and outreach extension programming at Purdue University and elsewhere.

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