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UT Extension
W071

Cleaning Plant Growth Regulator (PGR) Herbicides Out of Field Sprayers

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In recent years, glyphosate-resistant (GR) weeds, like horseweed and other difficult-to-control winter annual weeds such as cutleaf eveningprimrose, have forced producers in conservation-tillage programs to use plant-growth-regulating (PGR) herbicides such as dicamba (Clarity, Banvel) and 2,4-D to obtain good control. Unlike glyphosate, which is very water-soluble and can be easily cleaned out of a sprayer with water, the PGR herbicides take a lot more time, care and effort to be removed. Moreover, soybeans and cotton are extremely sensitive to certain PGRs. A recent study (Kelley and Riechers, 2003) has found that as little as 1/10,000 of the 8 ounce/A dicamba rate can produce injury symptoms on soybeans. Cotton is especially sensitive to 2,4-D. It is logical to assume that a similar level of 2,4-D residue left in the tank would show injury to cotton, since cotton is especially sensitive to 2,4-D.

The typical PGR injury symptom in cotton is leaves with parallel venation, often called "leaf strapping" (Figure 1). In soybeans, PGR injury symptoms can be identified by the characteristic cupped leaves, usually cupped upward with dicamba (Figure 2). Injury can range from cosmetic leaf injury to 80 percent yield loss, depending upon the amount of PGR residue in the tank and the growth stage of the cotton or soybeans at application. Therefore, proper sprayer cleanout is essential when switching from PGR herbicides to post-applied herbicides in soybean and cotton.

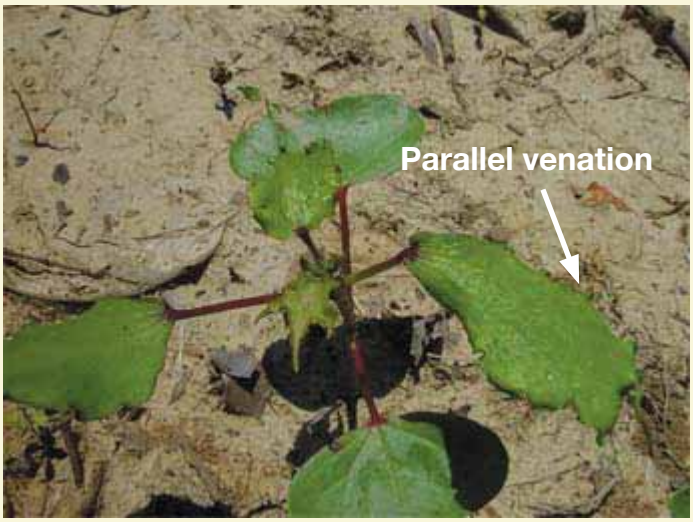

Figure 1. Leaf strapping in cotton as a result of 2,4-D contamination.

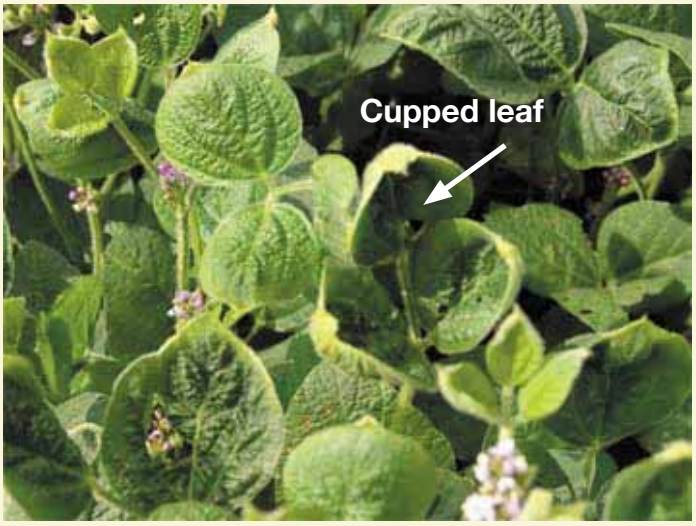

Figure 2. Leaf cupping in soybeans as a result of Clarity tank contamination.

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Injury from PGR tank residue most often occurs to cotton and soybeans with the first tank full of post-applied herbicide. Due to their chemical makeup, several herbicides (most notably glyphosate) are very effective tank cleaners for PGR herbicides. Injury can be increased when a sprayer with a post herbicide load is left standing for a few hours or overnight. Given enough time, some post herbicides, such as glyphosate, can dissolve PGR residue from the inside of a sprayer much more efficiently than water.

PGR herbicides readily adhere to the inside of a sprayer, particularly to plastic and rubber parts, and cannot be successfully rinsed out of a sprayer with only water. The PGR herbicides need a solution of household ammonia and water or a commercial tank cleaner to successfully remove all residues. Ammonia will bind to the 2,4-D molecule, changing it from a water-insoluble molecule into a water-soluble ammonium salt.

A variety of commercial tank cleaners are available and oftentimes have additives that will make 2,4-D more water-soluble. The main thing to remember is that a quick rinse with these agents will typically not do a complete job. It takes a length of time (typically overnight) for ammonia to dissolve PGR herbicides from rubber and plastic surfaces.

The only absolute way to avoid PGR tank contamination is to have a sprayer that is dedicated to burn-down and corn and pasture applications, and a second non-PGR sprayer for spraying soybeans and cotton. If this is not an option, then a thorough cleaning for the required time with proper tank cleaners can remove PGR residue. The following information provides general guidelines for cleaning a sprayer with ammonia, but it is important to remember that the best source of information is the pesticide label. Often the label will specify a particular tank-cleaning agent to use. NEVER mix ammonia and chlorine bleach. These two chemicals will produce a toxic gas when combined. Remember to use common sense when cleaning a sprayer. Make sure that it is cleaned in an area where it is not accessible to children, pets and livestock and will not contaminate water supplies. Always properly dispose of all rinsate materials.

General stepwise procedure for cleaning a sprayer with household ammonia:

1) Drain spray system. Loosen and physically remove any visible deposits.

2) Rinse the tank and flush hoses, boom and nozzles with clean water.

3) Fill with water and add 1 percent v/v of house hold ammonia. (Use a 3 percent active ammonia product.)

4) Operate the pump to circulate the solution through the sprayer for 15 to 20 minutes.

5) Spray a small amount of the solution through the nozzles.

6) Let sit for several hours. Overnight is the preferred amount of time.

7) Drain the tank and flush the solution out of the hoses, boom and nozzles again.

8) Remove and clean the nozzles, screens and strainers.

9) Repeat steps 3 and 4.

10) Drain the tank.

11) Rinse system one final time with water.

Reference:

Kelley, K.B. and D.E. Riechers. 2003. **Gene expression analysis of auxinic herbicide injury in soybeans.** Abstr. Weed Sci. Soc. Am. 43:105.

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