

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

COTTON GUIDELINES

AVOIDING PROBLEMS WITH 2,4-D INJURY TO COTTON (*update for September, 2001*)

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NATURE OF THE PROBLEM

Although the use of growth regulator or auxenic herbicides which include 2,4-D, 2,4-DB and MCPA are generally restricted by the CA Department of Food and Agriculture from use in the San Joaquin Valley from March 15 to October 15, injury to sensitive crops such as cotton or grapes due to these types of chemicals still occurs all too often. This injury is most often caused by a pesticide application to a crop such as cotton or grapes with a spray rig that was previously used to apply a growth regulator herbicide. 2,4-D and MCPA are very common and effective herbicides used to control broadleaf weeds in small grains under CA conditions, while 2,4-DB is used to control weeds in crops such as seedling alfalfa. Dicamba (also an auxenic herbicide) is regularly used to control pigweed in corn, and because its use is not restricted between March 15 and October 15, there is a greater risk of crop injury by spray rig contamination as well as with spray drift.

These auxenic herbicides can be absorbed into the plant and their mechanism of action is basically the same as that of the naturally occurring plant growth hormone, auxin (IAA - indole acetic acid). They are translocated to the meristematic tissue (growing points) of the developing plants, and high concentrations within the tissue can inhibit growth and development. In contrast, trace applications of these materials, which can result in low tissue concentrations of 2,4-D, have been shown to stimulate cotton growth and increase flower production.

Injury symptoms from auxenic herbicide contamination are similar on most sensitive broadleaf plants, including cotton. There are no symptoms observed on monocots such as various grass species. In broadleaf plants, a variety of symptoms occur, including:

- a characteristic twisting symptom known as epinastic growth and “strapping” or “feathering” of the leaves, and changes in leaf vein orientation
- leaf chlorosis can occur
- root initiation in stem tissue and stem swelling in both cotton and beans are quite common
- flowers and fruiting structures are aborted at a higher frequency with this herbicide injury

2,4-D RETENTION STUDIES – TANK AND EQUIPMENT CONTAMINATION

In 1955 a University of California study attempted to gain information as to the best procedure for removing 2,4-D residues from spray tanks. Several metals (zinc, copper, tin, iron and aluminum) and glass were soaked in 2,4-D solutions and then rinsed by various procedures to try to remove the residue. After these materials had soaked in the 2,4-D solution for 24 hours, the solution was poured off and the materials were then rinsed and subsequently analyzed for 2,4-D.

In these early studies and subsequent investigations, nearly all the 2,4-D appeared to be rinsed from the metals and glass by the first of four rinses. However, subsequent rinse water that was used to soak the metal and glass for 24 hours showed varying amounts of absorbed 2,4-D were slowly released from the materials. The iron and zinc materials (galvanized iron) showed the greatest additional capacity to continue release of residual chemical, copper and glass trace residues and tin appeared to be free of contamination. Even rapid rinses in ammonia water did not remove the absorbed 2,4-D, but the use of ammonia for prolonged (3 days) soaking appeared to increase the release of the absorbed 2,4-D.

The conclusion of the initial study was, “It may be stated that the only really safe way to avoid 2,4-D contamination in sprayers is to maintain separate sprayers for sensitive plants”.

SPRAYER CONTAMINATION AND HOW TO AVOID IT

Cotton injury can occur from very small quantities of residual 2,4-D (or 2,4-DB) in a sprayer. University of CA researchers recommend that any sprayer previously used to apply 2,4-D or related materials not be used in the previously mentioned, 2,4-D-sensitive broadleaf crops, including cotton. If such a sprayer must be used, it should be washed thoroughly before spraying cotton.

Based upon the research mentioned and subsequent investigations, the following procedures are suggested for washing out sprayers that have been used to apply 2,4-D and similar materials:

1. Remove nozzles, nozzle strainers and in-line strainers. Using a soft brush, wash the nozzles and strainers with soapy water. Make sure any visible deposits are removed.
2. Before replacing nozzles and strainers, fill sprayer tank with water and add a strong detergent or a commercial spray tank cleaner. Agitate for several minutes and then flush about one-fourth of the water-detergent mixture through the lines. Replace nozzles and strainers and flush remainder of water-detergent mixture through the nozzles.
3. Fill the tank with water again, and add detergent. Agitate for several minutes and flush mixture through the nozzles.
4. Next, fill the tank with water and add 1 gallon of household ammonia per 25 gallons of water. Run the agitator for several minutes and then spray out about one-fourth of the mixture. Allow the remaining mixture to stand in the sprayer and the lines for a period of up to 3 days, if possible. After that time, agitate the mixture again and spray out the remainder of the water-ammonia mixture.
5. Wash at least one more time with soapy water or water plus a commercial tank cleaner, then flush again with clean water.

Also, be careful not to introduce 2,4-D from other sources, such as measuring devices for pesticides that have previously been used to measure 2,4-D. Sprayer hoses are another possible source of contamination to consider, especially older hoses that may have cracks on the inside walls. Often, it can be a wise move to replace all hoses on the sprayer before using it, especially if the sprayer will be used on one of the more 2,4-D-sensitive crops such as cotton.

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- Use CAUTION in working with and applying these materials. If materials are handled improperly or if unused materials are not disposed of in a safe manner as required by law, injury may occur. Domestic animals, desirable plants and wildlife may also be harmed or water supplies contaminated with improper use. Follow all label directions and pay attention to listed precautions.

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