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*In This Issue...*

## COTTON AND PHENOXY HERBICIDES YIELD REDUCTIONS

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## Cotton and Phenoxy Herbicides Yield Reductions

D. Munier and D. Bayer

Phenoxy herbicides severely decreased cotton yields in this trial in the Sacramento Valley. These are not surprising results. Trials in the 1950's clearly showed the extreme sensitivity of cotton yields to very low amounts of phenoxy herbicides.

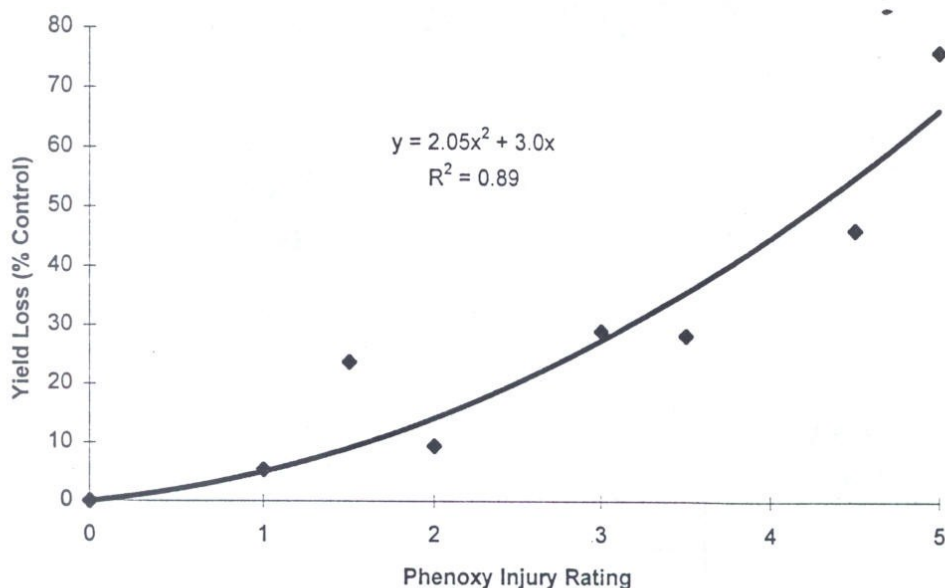
The yield results for this large scale field trial are shown in Table 1. These yields are based on field seed cotton weights and six pound gin turnout samples for each plot run through the UC/USDA Shafter Research Station gin. The yield loss ranged from 5 to 76 percent of the control yields. Four, 30 inch rows by 1200 feet of phenoxy injured cotton rows were machine picked, and the yield compared to four, 30 inch by 1200 foot adjacent, relatively uninjured rows.

**Table 1: Cotton yield losses from phenoxy injury.**

The relationship between visual injury symptoms and cotton yield loss shown in Figure 1 is very significant. This curve can be used to calculate the amount of yield loss which occurred in this test between an injury rating of one to five. This curve cannot be used to project cotton yield losses beyond a phenoxy injury rating of five.

| Avg. Phenoxy Injury Rating | % Yield Loss |
|----------------------------|--------------|
| 1                          | 5            |
| 1.5                        | 24           |
| 2                          | 9            |
| 3                          | 29           |
| 3.5                        | 28           |
| 4.5                        | 46           |
| 5                          | 76           |

Figure 1: Cotton Phenoxy Herbicide Injury



The relative scale used to assess visual injury is shown in Table 2.

Table 2. Phenoxy Herbicide Injury Rating Descriptions.

| Injury Rating | Description   |
|---------------|---|
| 1 Light       | Only a few leaves, those developed soon after phenoxy contact show symptoms.<br>Leaf symptoms are rough, bumpy surface, ruffled margins, and slightly elongated leaf tips.<br>Later growth "normal".      |
| 2 Moderate    | Few to many leaves have bumpy surfaces, ruffled leaf margins, elongated tips, and parallel veining.   |
| 3 Moderate    | Increasing severity of #2 moderate rating.<br>Symptoms continue on new growth all season.   |
| 4 Moderate    | Increasing severity of #3 moderate rating with widespread parallel veining.<br>Plants are taller.<br>Symptoms continue on new growth all season.  |
| 5 Severe      | Almost all leaves are small with parallel veining, elongated tips and downward cupping.<br>Very narrow plants.<br>Symptoms continue on new growth all season.<br>At harvest, plants show severe symptoms. |



Range of phenoxy herbicide symptoms, 0 at left to 5 on right.  
Use in conjunction with descriptions of injury in Table 2.

Continue to page 4 ->

### **Trial Design**

These treatments of phenoxy herbicide were accidentally applied by a commercial ground truck sprayer. The spray equipment was a modified dual wheeled truck with inside duals removed to span three, 30 inch rows while spraying an area 29 rows wide. This spray truck had been used extensively in the past to spray phenoxy herbicides. The inside of the stainless steel tank and galvanized pipe spray boom were aggressively cleaned with hot water and Nutrisol.

The outside of the equipment was not cleaned. Phenoxy injury occurred on the three rows straddled by the spray truck. The middle only showed injury in the first few passes. One of the two outside straddled rows showed more injury than the other. The tops of cotton plants in the lesser affected straddled row only contacted the wheel and brake casting where the inside dual would normally be located. The row with more injury also contacted the underside of a typical barrel shaped fuel tank attached to the truck frame.

The phenoxy herbicide symptoms were worst where the sprayer started at one end of the field and got progressively less as the sprayer moved across the field. The yields of the first 14 passes and the adjacent relatively uninjured 14 passes were harvested for the yields reported in Table 1 and Figure 1.

This spray truck was used in this and several other fields for only one early insecticide spray. The field of this trial was planted April 10, 1996, sprayed with the phenoxy contaminated spray truck on June 18, 1996, and picked on November 5, 1996.

The lint samples from the gin turnouts for each plot have been sent for fiber grade and quality analysis and will be reported when available.

### **Discussion**

There were spotty areas, most visible at the ends, other than those straddled by the spray truck which showed phenoxy injury across all 29 rows. This injury was likely due to the movement of residual phenoxy material from the interior surfaces of the galvanized spray boom, which is much more difficult to clean than the stainless steel tank. While turning and lining up a large sprayer at the ends of the field, there is much more time for the residual phenoxy to move from the galvanized boom into the spray solution and thus show phenoxy herbicide symptoms.

Because of the obvious spotty areas of phenoxy injury across all 29 rows, there was no strictly zero phenoxy control treatment. This means these measurements underestimate the yield loss due to phenoxy herbicides since the control strips had some degree of phenoxy injury also.

This trial shows the economic loss which can occur to cotton from phenoxy herbicides. The most severe injury was associated with season-long symptoms, but significant yield reductions occurred with only mild symptoms for a short period of time during the season. Trials will be conducted in 1997 to measure the amount of phenoxy herbicide which causes these different levels of injury.