2019 WEST TEXAS AUXIN HERBICIDE DRIFT EVALUATION TRIAL AND DEMONSTRATION

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Introduction

Recent years have seen a major increase in the use of auxin-tolerant cotton varieties in West Texas and Texas High Plains Cotton production, primarily for the purpose of combating glyphosate-resistant Palmer amaranth (*Amaranthus palmeri*). Crop sensitivity to damage from 2,4-D and dicamba herbicides have made producers hesitant to fully accept or properly adapt to using the corresponding auxin herbicides in Enlist Cotton and XtendFlex Cotton, despite improvements in formulations limiting volatility. Off-target movement remains a major concern for regional producers, despite recommended practices and performance demonstrations from company sources. Independent trials from other cotton growing regions have proven effective in answering producer concerns over proper use and application of these herbicide technologies. This trial was conducted in the unique West Texas and High Plains cotton-production regions to demonstrate potential and limitations of these products and address technical aspects of possible off-target movement to facilitate proper stewardship of the technologies in area cotton production.

Methods

The trial was conducted at two locations. The High Plains location was at the Halfway Experiment Station in Hale County while the West Texas site was near Wall, TX in Tom Green County. Two blocks were planted with cotton at each location. One block consisted of Enlist Cotton, PHY 350 W3FE, and the other of XtendFlex Cotton, DP 1820 B3XF. At the Halfway site, the blocks were planted in the two inside pivot towers of the research farm's irrigation pivot with 48 rows per block for each cotton line. At the Wall site, each block was 60 x 60 ft square in a dryland production field. Each site was managed with commonly accepted local agronomic and entomological inputs applied except for any large scale over the top auxin herbicide treatments.

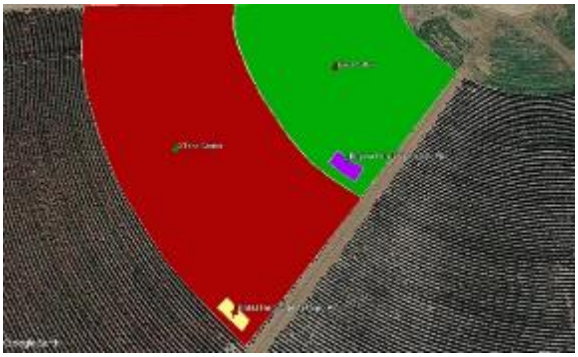


Figure 1. Aerial view of plot areas at Halfway, TX.

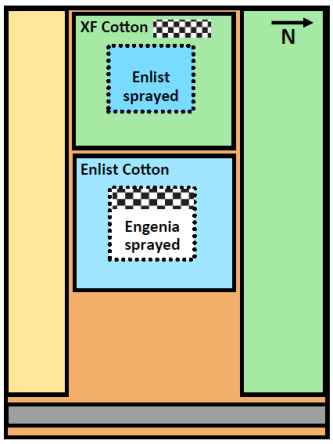


Figure 2. Illustration of plot layout at Wall, TX.

Within each planted block a plot area was designated for treatment application and subsequent data collection. Plots at Halfway were 8 40-inch rows wide by 40-feet in length, and plots at Wall were 6 40-inch rows wide and 20 feet long. Within treated areas the opposing or wrong auxin herbicide was sprayed at the maximum labeled rate in a tank mix with Roundup (32 oz/acre). Auxin rates were as follows: 1) Xtend cotton treated with Enlist One (32 oz/acre), and 2) Enlist cotton treated with Engenia (12.8 oz/acre). At Halfway, the treated areas were sprayed via backpack CO_2 sprayer on 16 July at 16.2 GPA in 8 mph SSW winds. At Wall, the treated areas were sprayed on 8 August with the Enginia treatment at 17 GPA and the Enlist at 15 GPA (due to different/separate spray boom configurations) in 9 MPH SSE winds. All label restrictions and nozzle requirements were followed for all treatments (except for the direct treatment of a susceptible crop) and cross-contamination was avoided through clothing, tank, hose, nozzle, and boom rotations.

Figure 3. Application and wind speed measurement at Halfway.

Prior to plot treatments, plants from within each treatment area, adjacent row plants, and plants downwind at 13.3 feet, 30 feet, and 60 feet were shielded and covered completely from having direct spray or direct physical spray drift. These coverings were removed 30 minutes after each application to monitor for any post-application volatilization of the auxin herbicides. At Halfway, there were additional plants within each treated area and on adjacent rows that were shielded but not completely covered (cut-open milk jugs not sealed or covered at the base) from the direct spray to evaluate any potential dangers of shielded sprays of the herbicides. All shielded or covered plants were marked for subsequent damage ratings (due to secondary movement) and were contrasted by data gathered from neighboring plants that would have additionally been exposed to physical drift.

Figure 4. Resulting undamaged completely shielded and covered cotton plant in the Enlist plot at Wall.

Figure 5. Photo of completely shielded and covered plants at Halfway.

Figure 6. Photo of milk-jug covered plants at Halfway showing slight opening at bottom.

Potted plants, conventional cotton and soybeans at Halfway and tomatoes at Wall, were also placed within the treated plot areas and downwind at 13.3 and 30 feet 30 minutes after application for additional volatility detection from either product. The potted plants were left and cared for in their designated areas for 3 days when they were moved to a greenhouse or protected area. Ratings were collected from the potted plants at 3, 7, and 10 DAT.

Damage ratings were recorded at Halfway from the shielded and covered, shielded and area plants for all marked locations at pretreatment, 3, 10, 23, 36, and 50 DAT and at Wall at pretreatment, 3, 7, 14, 22, and 28 DAT. All data from covered and shielded plants, shielded plants, potted plants, and exposed plants from all assigned areas were rated on a 0-10 auxin herbicide damage scale. On this scale, 0 represents no damage, 10 represents dead plants, and economic or fruit damage begins at 2.

With inadequate replicates, all data should be viewed for comparison and demonstration value only, as no statistical analyses were performed. Both locations served as a demonstration for area producers at 3 different field days, 2 at Halfway and 1 at Wall.

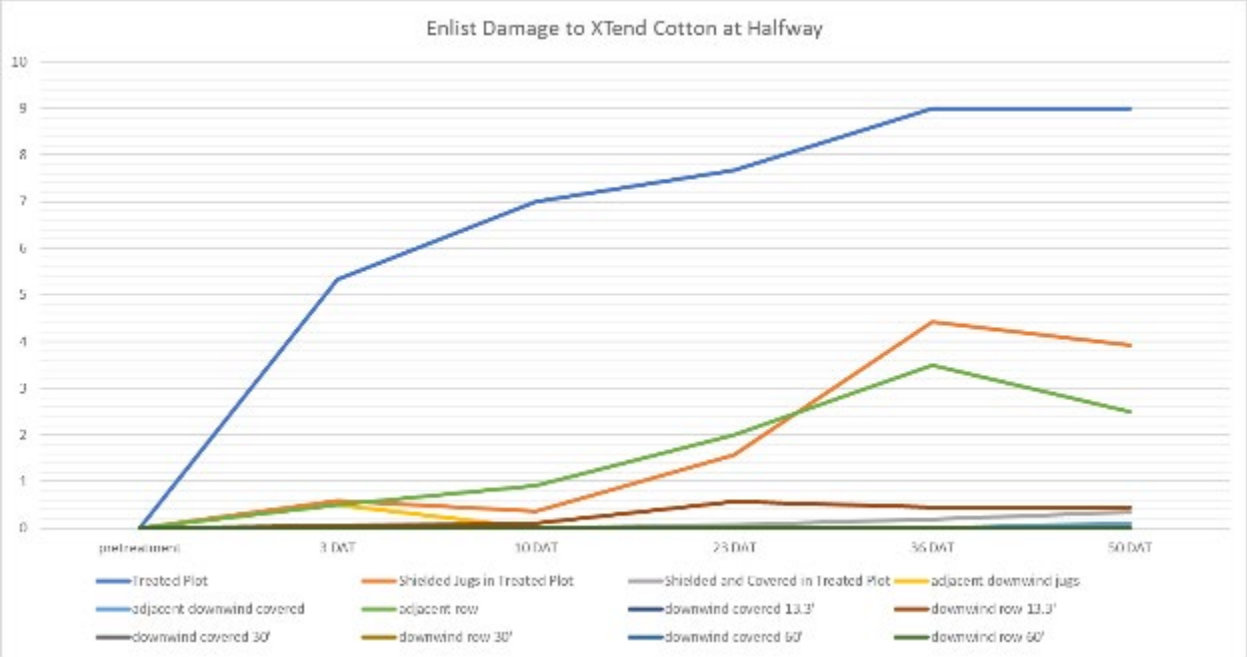
Results

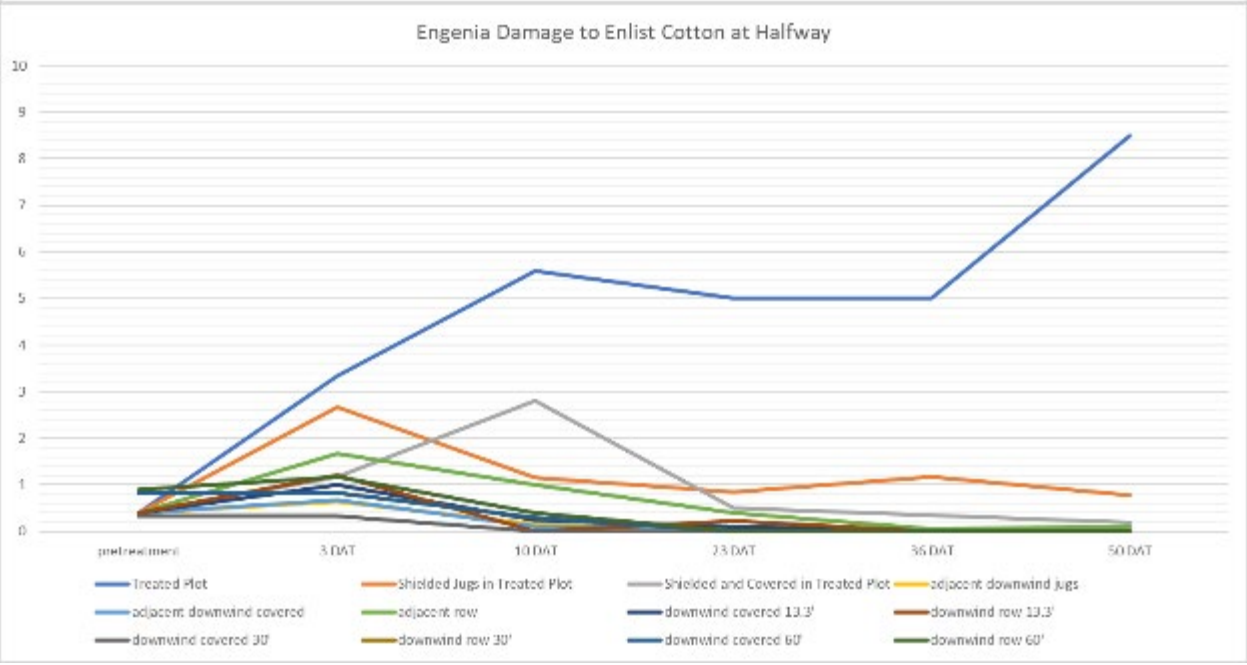
All Enlist cotton plots and conventional potted plants for both locations experienced pretreatment and posttreatment dicamba drift damage from off site. This damage was minor in all cases and was not considered economic but does appear in early damage ratings for the Enginia treatment until the damage could be differentiated from the intended treatment damage. No other damage to note was recorded on the potted plants, therefore no further data from these plants is reported.

Halfway, TX Results

Damage to all exposed plants in both the Enlist and Enginia treatment areas was severe and increased with time with the Enlist damage being more severe early resulting in eventual death of most plants and the complete loss of fruit of any surviving plants while the Enginia damage mostly resulted in the loss of all fruit production from the many surviving plants. Physical drift for both the Enlist and Enginia treatments was measured on the adjacent row (40-inches) and to a lesser extent at 13.3-feet while no drift for either product was noted at the 30 and 60-foot marks. All physical drift damage from the Enginia treatment recovered over time with negligible effects as did the damage from the Enlist drift at 13.3-feet with more pronounced and bit longer lasting leaf strapping impact. Damage from Enlist physical drift to the adjacent row increased over time with all affected plants showing heavy leaf strapping at all growing points for the duration of the data-collection period.

The Enlist treatment showed no damage to the sheltered and covered plants in the treated area or at any point downwind from the Enlist application. This indicates that volatilization did not occur in levels detectable by plant response from the Enlist treatment. The Enginia treatment did show some minor volatility damage at 3 DAT and at the 10 DAT but damaged plants quickly grew out from the damage. Plants covered only by milk jugs received slight damage for both the Enlist and the Enginia treatments. The Enginia-damaged milk-jug-covered plants recovered over time similarly to the Enginia downwind adjacent row but the Enlist-damaged milk-jug-covered plants continued to show severe leaf strapping for the duration of the trial, affecting all new growing points and resulting in the loss of all fruit developed post-treatment.



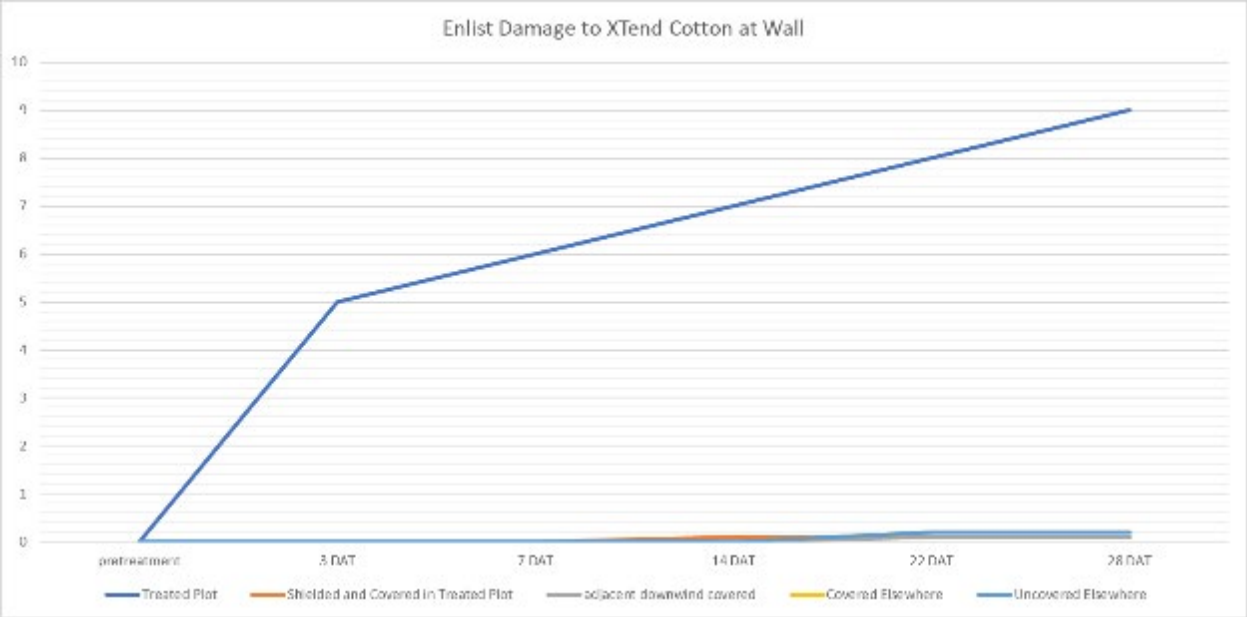


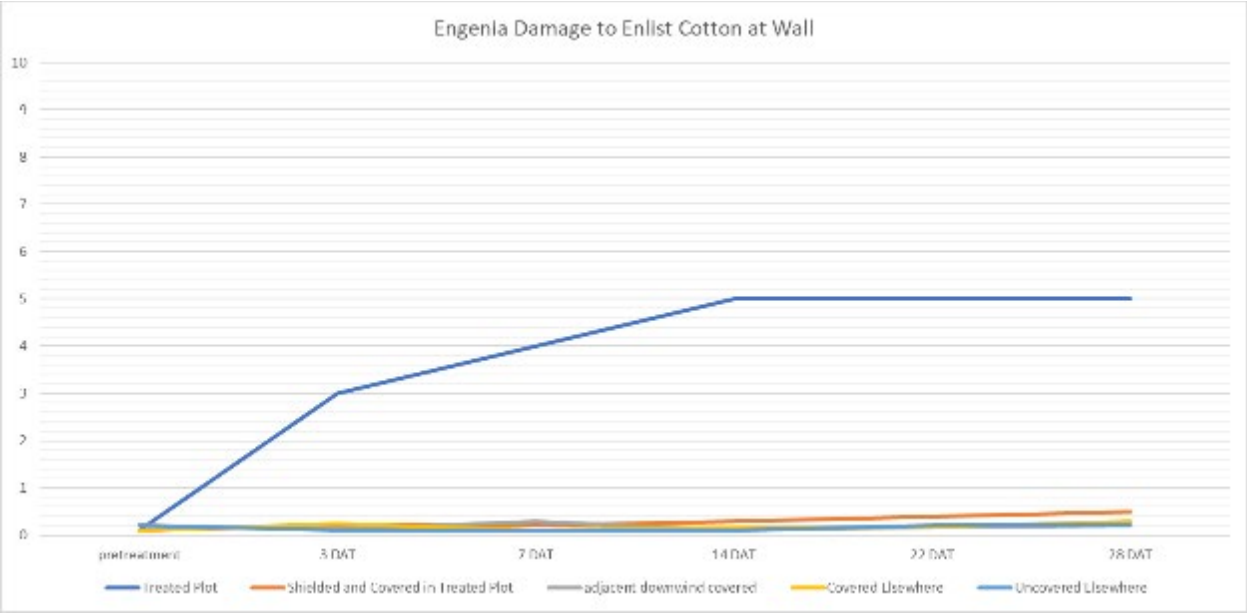
Wall, TX Results

Results at Wall were very similar to Halfway, with severe damage to exposed plants for both the Enginia and Enlist. Ultimately Enlist resulted in death of most plants and fruit-loss for all surviving plants, and Enginia resulted in fruit loss but general plant survival. No physical drift for either treatment was recorded past the adjacent downwind row at Wall. Drift damage to adjacent-row plants was observed in both treatments, and some square abortion occurred with Enlist drift, but overall drift damage was considerably less than at Halfway.

Overall, no evidence of appreciable secondary movement (via volatilization or otherwise) was observed in either technology. Similar to Halfway, no injury was observed on covered plants in the Enlist treatment area or downwind. Very slight dicamba injury existed in the Enlist cotton prior to treatment applications. Extremely minor foliar damage was recorded for covered plants in the Engenia treatment, however this cannot be attributed to secondary movement

of the applied treatment, as some level of dicamba exposure had occurred prior. Ultimately, no moderate or severe foliar symptoms or damage to fruit was observed in plants protected from direct spray or physical drift.





Conclusions

Plant-detectable secondary movement of these herbicides (including volatilization) was negligible under the conditions of these experiments in the West Texas and High Plains environments. These findings indicate that physical drift is more likely to cause issues of off-target movement from either Enlist or Engenia. However, the severity of cotton damage from slight Enlist drift (adjacent row), and from exposure to extremely low amounts of Enlist in the milk-jug-covered plants at Halfway demands careful, drift-conscientious applications. The same conclusion applies for Engenia if applications are made in an area with plants or crops more susceptible to the dicamba than cotton.