

EVALUATION OF AIM (CARFENTRAZONE) IN TEXAS COTTON

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Abstract

Field studies were conducted across the major cotton production regions in Texas to evaluate the effectiveness of Aim harvest aid in picker- and stripper-harvested systems. Aim was studied alone and in tankmix combinations with common harvest aid products. Results indicated that good coverage was essential. Rank plants were difficult to defoliate, leaving intact foliage on the lower third of the plant. Aim is a harsh compound compared to other defoliant, desiccating leaves in 2 to 4 days after application. The product has good activity on juvenile tissue and morning glory. Aim alone did not provide consistent results. However, Aim followed by a sequential application of Aim generally showed good results across locations. Generally, Aim did not provide regrowth suppression comparable to current standards. The current formulation (Aim 40DF) is very difficult to get into solution, which contributed to variable results.

Introduction

Aim 40DF (carfentrazone) was registered by the FMC Corporation as a cotton harvest aid in August 2001. The product also is registered as a herbicide for corn, grain sorghum, rice, soybeans, and small grains. Aim represents a new class of chemistry for cotton harvest aids that possess a mode of action that inhibits the formation of the enzyme protoporphyrinogen oxidase (PPO inhibitors). This enzyme is located in the chloroplasts and the mitochondria, and blocking formation of the enzyme in both organelles leads to reduced chlorophyll and heme synthesis. The inhibition of protoporphyrinogen oxidase results in the accumulation of singlet oxygen in the presence of light (radicals). Cell membranes are destroyed by this light peroxidation reaction, resulting in cell leakage, inhibited photosynthesis, and bleaching of chloroplast pigments. Several other products and experimental compounds possessing this mode of action are also under evaluation, including fluthiacet-methyl (Kumiai), ET-751 (Nichino America Inc.), CGA 276854 (Syngenta), and Resource (Valent).

These contact-type herbicides cause injury to cell membranes, which stimulates ethylene production in the plant. This results in the formation of an abscission layer on the petiole, leading to defoliation. Movement within the plant from leaf absorption is limited. PPO inhibitors act very quickly, showing leaf desiccation within one to four days after application, and defoliation within 8 to 14 days after application. PPO inhibitors are harsh compounds that are much different than traditional picker-cotton defoliant.

Objective

To evaluate Aim as a harvest aid for picker- and stripper-harvested cotton in the major production regions in Texas.

Methods

Field studies were conducted across the major production regions in Texas, including the Coastal Bend, Blacklands, Brazos Bottom (irrigated), Rolling Plains and South Plains (irrigated) areas (Fig. 1). Plots were four rows wide x 60 to 100 ft. length. All determinations were made from the center two rows to avoid spray drift influence. Treatments were applied at each location with self-propelled sprayers to deliver 10 gallons/acre using flat fan nozzles (11002XR/8002XR) at 30 psi. Fields were 70 to 80% open bolls at time of initial applications. All Aim treatments included crop oil concentrate at 1% v/v. Appropriate adjuvants were added to all other treatments per label recommendations. Unless otherwise specified, all products were applied at the following rates (product/acre): Aim - 0.66 oz., Dropp - 0.1 lbs., Prep - 21 oz., Ginstar - 6 oz., Finish - 16 oz., Harvade - 8 oz., Def 16 oz., and Ginstar - 4.3 oz. + Dropp - 0.1 lbs.

Results

Blacklands Location

Standard treatments (Def+Dropp, Ginstar, and Dropp+ Ginstar) provided excellent defoliation at 14 DAT (Fig. 2). Aim and Aim + Dropp treatments showed only 83% defoliation, while the sequential treatment of Aim followed by Aim provided good defoliation. Dropp followed by Aim and Dropp followed by Valor provided excellent defoliation and plant desiccation. These two treatments were harvestable at 12 days after the initial treatment. Valor and Dropp + Valor showed poor performance. Terminal regrowth suppression was excellent with the sequential treatments of Dropp followed by Aim or Valor (Fig. 3). Regrowth ratings were based on a 0 to 5 scale, with 0 representing no regrowth and 5 being severe regrowth. Aim provided excellent desiccation of juvenile tissue.

Brazos Bottom Location

Aim alone and the tankmix of Aim + Ammonium Sulfate (AMS - 17 lbs./100 gal.) showed very poor defoliation with ratings of only 51 and 41%, respectively (Fig. 4). The sequential treatments of Aim followed by Aim, and Aim + Prep followed by Aim showed good results, which were similar to the standard treatment of Def + Prep + Dropp. Aim treatments showed good desiccation of juvenile tissue, but poor overall regrowth suppression (data not shown).

Gulf Coast Location

Only 7 day evaluations were made at this location. Aim and Aim + AMS showed good results compared to other locations (Fig. 5). Aim was tankmixed with Dropp at two rates (0.05 and 0.10 lbs./A). Aim + Dropp (0.10 lbs./A) was significantly better than the lower rate Dropp treatment.

Rolling Plains Location

All treatments at this location showed poor defoliation, with the exception of Ginstar (Fig. 6). This location was under drought conditions during most of the season; however, heavy rainfall was received in September which supported a resumption of growth and the development of rank plants.

South Plains Location

Figure 7 illustrates treatments without sequential applications. Figure 8 represents the same treatment regimen with sequential applications of either Aim or Cyclone Max. The standard treatments of Def + Prep (16 and 21 oz.), and CottonQuik + Ginstar provided excellent defoliation at 22 DAT (Fig. 7). Aim alone or tankmixed with Prep provided good defoliation. Sequential applications of Aim and Cyclone Max improved overall performance of Aim treatments (Fig. 8).

Conclusions

Aim has limited systemic activity; therefore good coverage is essential. Rank plants were difficult to defoliate, leaving intact foliage on the lower third of the plant. Aim is a harsh compound compared to other defoliant, desiccating leaves in 2 to 4 days after application. The product has good activity on juvenile tissue and morningglory. Aim alone did not provide consistent results. However, Aim followed by a sequential application of Aim generally showed good results across locations. Generally, Aim did not provide regrowth suppression comparable to current standards. The current formulation (Aim 40DF) is very difficult to get into solution, which contributed to variable results.

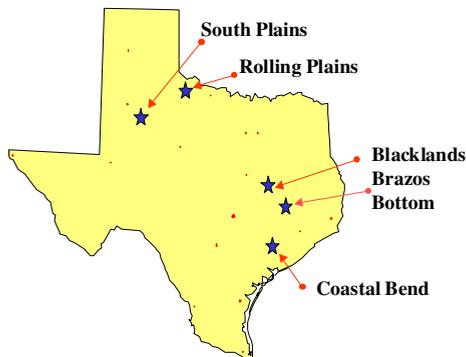


Figure 1. Study Locations.

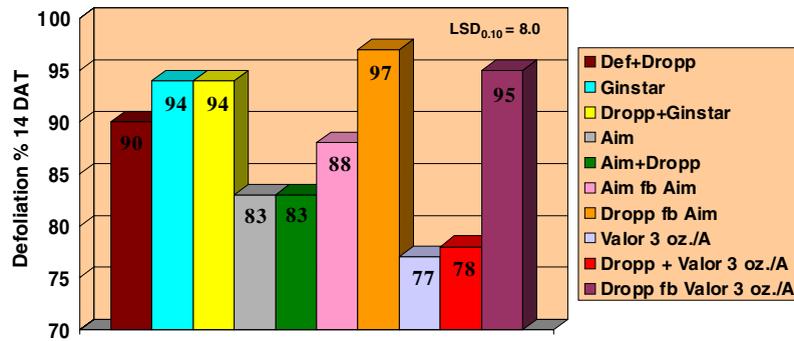


Figure 2. Aim/Valor Defoliation Evaluations – Central Texas Blacklands, 2001 – Stripper Harvested

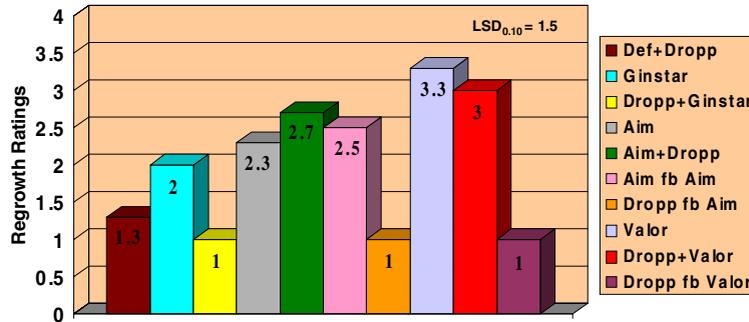


Figure 3. Aim/Valor Regrowth Evaluations – Central Texas Blacklands, 2001 – Stripper Harvested.

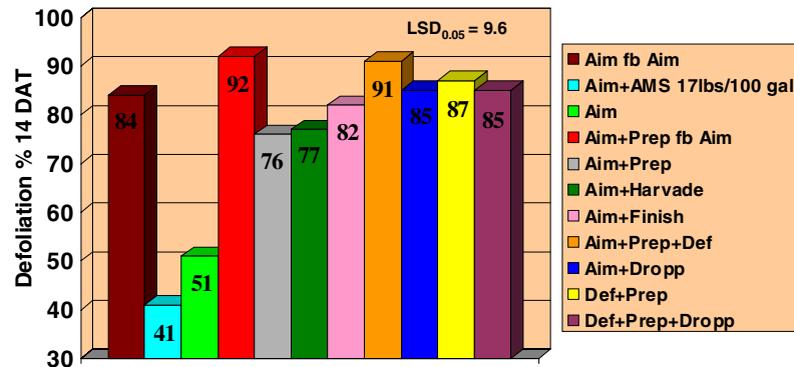


Figure 4. Evaluation Aim Tankmix Combinations Brazos Bottom, 2001 – Picker Harvested.

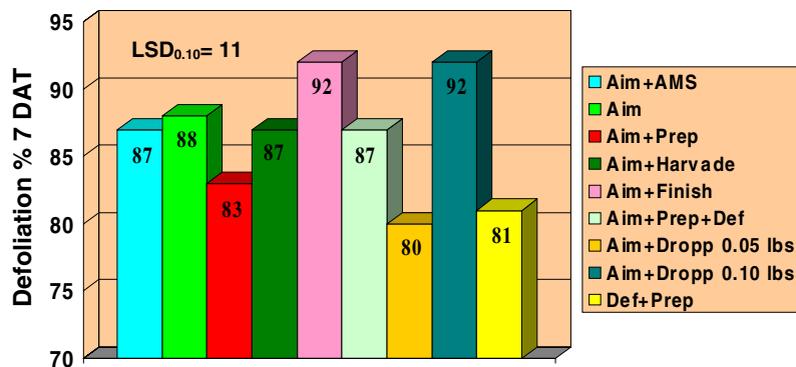


Figure 5. Evaluation of Aim Tankmix Combinations Gulf Coast, 2001 – Picker Harvested.

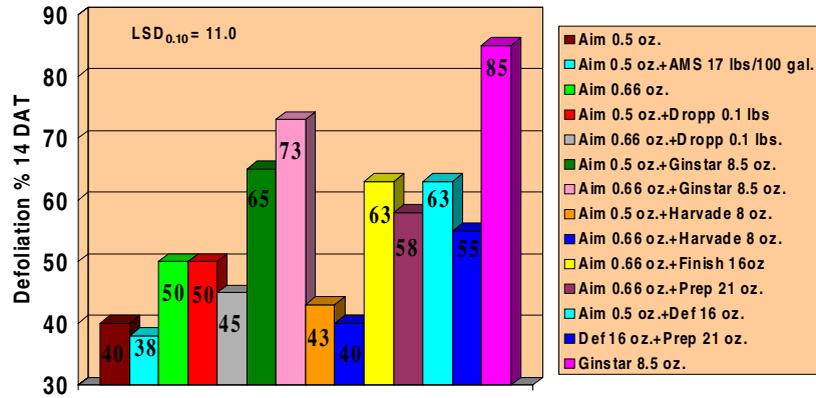


Figure 6. Evaluation of Aim Tankmix Combinations Rolling Plains, 2001 – Stripper Harvested.

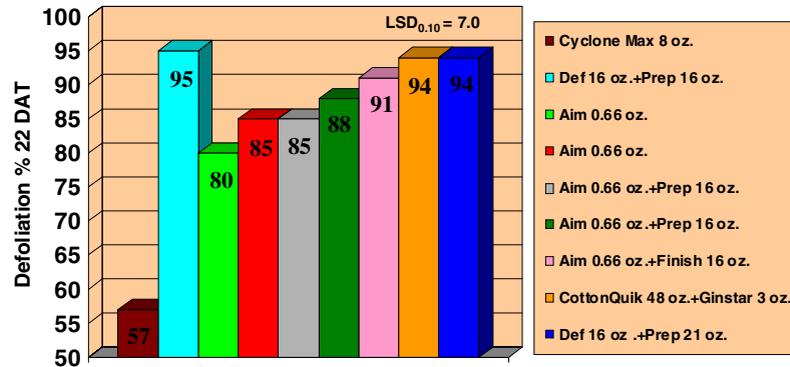


Figure 7. Evaluation of Aim Tankmix Combinations High Plains, 2001 – Stripper Harvested.

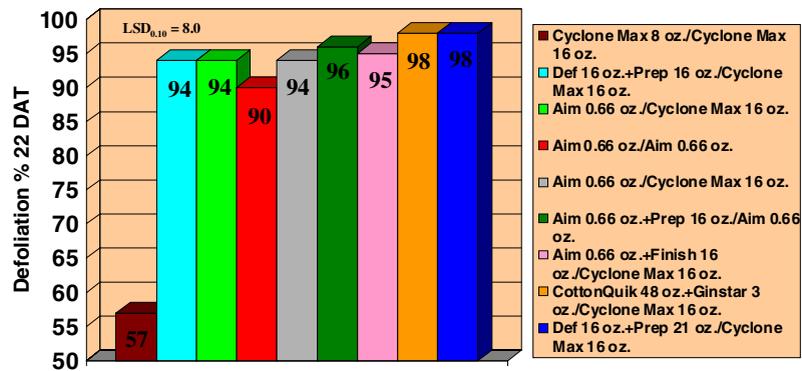


Figure 8. Evaluation of Aim Tankmix/Sequential Combinations – High Plains, 2001 Stripper Harvested.