WATER VOLUME AND DEPOSITION EFFECTS ON HARVEST AID EFFICACY

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Abstract

Efficacy of harvest aids are dependent on many variables namely weather, chemistries utilized and methods of application. In this study, application methods will be examined further due to changes in herbicide application methods. Previous herbicide traits have called for finer deposition and greater water volumes, but new auxin regulations mandate courser water droplets and lower water volumes to reduce off-site movement of the herbicide. The objective of this project is to compare standard application methods, higher water volumes and finer water droplets, to the new ultra-coarse nozzles being used for application of the auxin chemistries. In this study, Turbo Teejet Induction nozzles were used to produce the ultra-coarse water droplets to compare to previous standards of hollow cones (fines) and Turbo Teejet (medium). Water volumes of 5, 10, 15 and 20 gallons were also used to further evaluate the significance of coverage and deposition needed to fully maximize efficacy of harvest aids. After applications were made, using a standard of 8 fl. oz. Tribufos, 24 fl. oz. Ethephon, and 2 fl. oz. Thidiazuron, visual ratings of percentage leaf defoliation, leaf desiccation, open bolls, terminal and basal regrowth were conducted at the 7, 14 and 21 days after application intervals. The replicated plots were then harvested after the 21 day application ratings and ginned at one location, University of Tennessee Research Center in Jackson, TN. After being ginned they were classified at the USDA Classification office in Memphis, TN. The visual ratings and fiber quality were statistical analyzed using the Tukey-Kramer HSD compare means method.

Introduction

Harvest aids are used to defoliate and desiccate unwanted branches, leaves, brackets, and other organic extraneous matter reducing the amount of trash and staining. Harvest aids also provide the ability for farmers to harvest in an effective timely manner while also improving overall fiber quality by reducing cellulose degradation (Ray and Minton, 1973). This is achieved by boll openers forcing less mature bolls to open, allowing earlier harvesting reducing harmful environmental factors affecting lower position open bolls. Factors effecting efficiency of harvest aids include weather, plant condition, and application timing (Brecke, 2001). In this study, varying water volumes and nozzle deposition will be reviewed.

Spray coverage is widely believed to improve efficacy of harvest aids due to most harvest aids not translocating throughout the cotton plant (Warrick, 2002). Therefore it is paramount to get a high volume of water and use correct nozzles to obtain optimum coverage. Although this is thought to be true, most harvest aid labels do not give a specific recommendation for water volume or nozzle tip. It is also reasonable to consider farmers will utilize lower water volumes to maximize acres that can be treated in a minimum amount of time. This is especially true with the average size of farms and the usage of module builder pickers continuing to grow.

Finally with the onset of Auxin resistant transgenic crops, farmers are regulated to purchase and use coarser water droplet size nozzles. Previous herbicide mode of action chemistries called for more coverage

Materials and Methods

The variety used across all of the locations was Phytogen 333, which is considered by DowDupont to be a hairy variety, and is adapted across the Cotton Belt. The locations included in this study are as follows Lubbock, TX, College Station, TX; Jackson, TN; Starkville, MS; Brewton, AL; Raleigh, NC; and Solomon, AZ. Samples were ginned at the West TN Research Center Micro-Gin in Jackson, TN.

Table 1: Weather data for each location.

Location	Date of Application	Avg Temp's 7DAA	RFA 7DAA	Avg Temp's 14DAA	RFA 14DAA	Avg Temp's 21DAA	RFA 21DAA
College Station, TX	8/23/2017	79 °F	18.23 in	80 °F	18.25 in	78 °F	18.25 in
Raleigh, NC	9/5/2017	67 °F	1.22 in	70 °F	1.22 in	72 °F	1.22 in
Brewton, AL	9/19/2017	78 °F	0.23 in	77 °F	0.25 in	77 °F	3.11 in
Jackson, TN	9/23/2017	61 °F	0.08 in	60 °F	0.36 in	57 °F	1.98 in
Starkville, MS	9/28/2017	65 °F	0.28 in	64 °F	0.29 in	63 °F	0.29 in
Safford, AZ	10/2/2017	74 °F	0.00 in	73 °F	0.00 in	73 °F	0.00 in
Lubbock, TX	10/11/2017	65 °F	0.00 in	63 °F	0.01 in	60 °F	0.08 in

RFA= Rainfall Accumulation

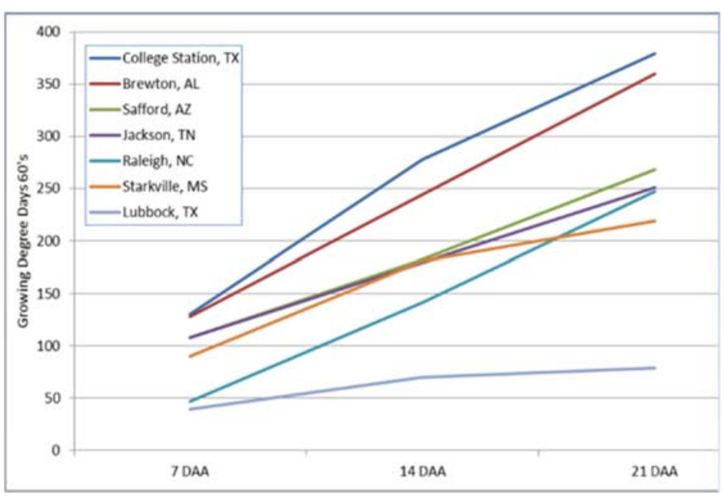

Figure 1: Growing Degree Days Accumulation across locations after Harvest aid application.

All of the treatments used the same consistent products of 8 fl. oz. Folex® (Tribufos), 24 fl. oz. Superboll® (Ethephon), and 2 fl. oz. Freefall® (Thidiazuron). The nozzle, spray volume pressure and speed by each of the treatments is as follows:

1. Untreated Control
2. TXR80053VK 5 GPA; 40 psi @ 3 mph (Very Fine)
3. TT11001 5 GPA; 30 psi @ 5 mph (Medium)
4. TTI110015 5 GPA; 15 psi @ 5 mph (Ultra Course)
5. TXR8001VK 10 GPA; 40 psi @ 3 mph (Fine)
6. TT110015 10 GPA; 45 psi @ 5 mph (Medium)
7. TTI110015 10 GPA; 15 psi @ 3 mph (Ultra Course)
8. TXR80015VK 15 GPA; 40 psi @ 3 mph (Fine)
9. TT110015 15 GPA; 40 psi @ 3 mph (Medium)
10. TTI110015 15 GPA; 40 psi @ 3 mph (Ultra Course)
11. TXR8002VK 20 GPA; 40 psi @ 3 mph (Fine)
12. TT11002 20 GPA; 40 psi @ 3 mph (Medium)
13. TTI11002 20 GPA; 40 psi @ 3 mph (Ultra Course)

Data was received from each state Cotton Extension Specialist then aggregated into a single MS Excel worksheet to be analyzed in SAS Jmp. Variables were compared using Tukey-Kramer HSD Compare Means at a p-value of .05. The 7DAA from the College Station and the fiber quality values from AZ were not used in the results.

Results and Discussion

Percent defoliation showed no statistical difference between treatments, only between treatments and the check. For the percentage of open bolls (Figure 2), 7 days after application (DAA) there were no significant differences between treatments.

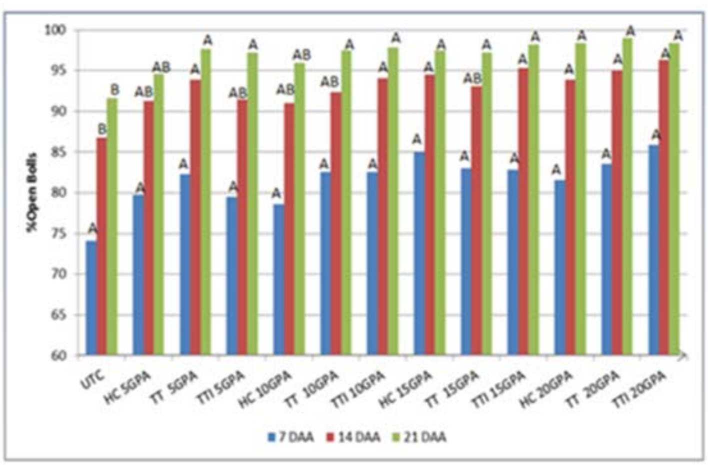

Figure 2: Percentage Open Bolls by Treatment 7, 14, and 21 DAA

After 14 days there was the biggest division between treatments of Turbo Teejet at 5 and 20 GPA, Turbo Teejet Induction at 10, 15, and 20 GPA, and Hollow cone 15 and 20 GPA and the untreated controls. Twenty one days after application only hollow cone at 5 and 10 GPA were statistically the same as the untreated checks.

Percentage desiccation (Figure 3) showed the most statistical differences between treatments at 7 and 14 DAA but none at 21 DAA ratings. At the 7 DAA ratings, treatments of hollow cone at 10 and 20 GPA, Turbo Teejet at 15 and

20 GPA were statistically different. For the 14 DAA ratings, only the Turbo Teejet induction at 5 and 10 and the Hollow Cone at 10 GPA were significant.

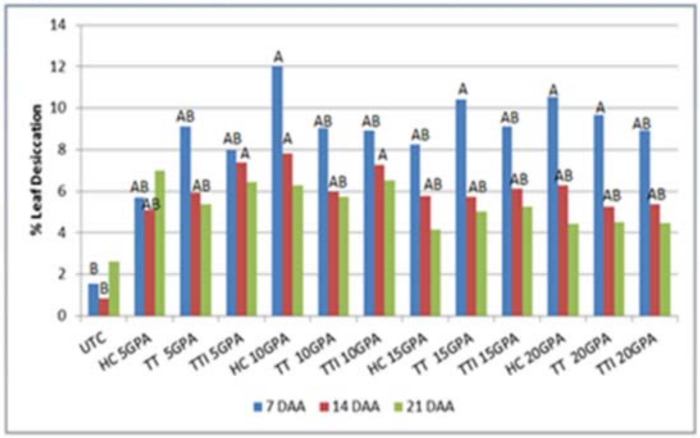

Figure 3: Percentage Leaf Desiccation by Treatment 7, 14 and 21 DAA.

The terminal regrowth ratings were not statistically different amongst the treatments; however, all treatments were considerably lower than the untreated checks. The basal regrowth percentage ratings were insignificant for the 14 and 21 DAA ratings but were statistically different for the 7 DAA as all of the treatments except Turbo Teejet and Turbo Teejet Induction at 5 GPA and Turbo Teejet Induction at 10 GPA were statistically different.

Grades from the USDA Classification Office were not statistically different from one another. There were some slight patterns as the higher GPAs offered lower yellowness values and Turbo Teejet nozzles offered overall better reflectance values (Figure 4).

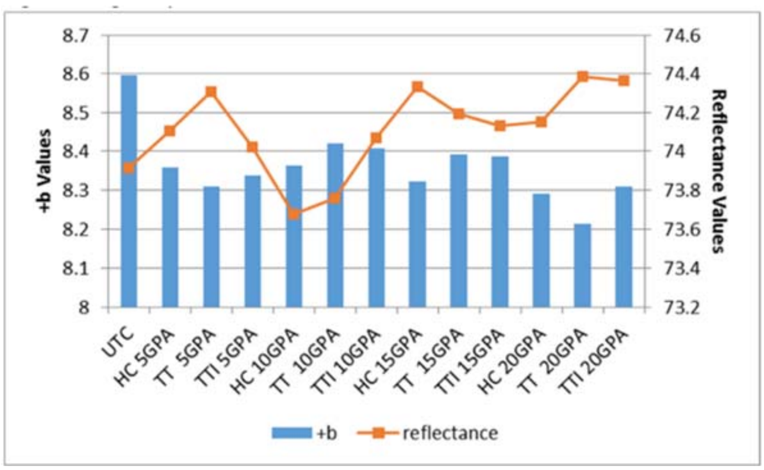

Figure 4: Reflectance and Yellowness Grades by Treatment.

Summary

As previously researched, timeliness is the greatest factor to regrowth along with environmental factors. No consistently significant correlations were observed between fiber quality and water volume and deposition. Where differences were observed (14 DAA), higher water volumes had greater impact on boll opening than nozzle type. Higher GPA or tip type had minimal impact on terminal regrowth. Basal Regrowth showed separation at the 7DAA rating but not after. Leaf desiccation was influence by tip type and water volumes more than any other measurement

Turbo Teejet, regardless of water volume, increased reflectance. Leaf grade is inconsistent in respect to water volume and nozzle type as shown in Figure 5.

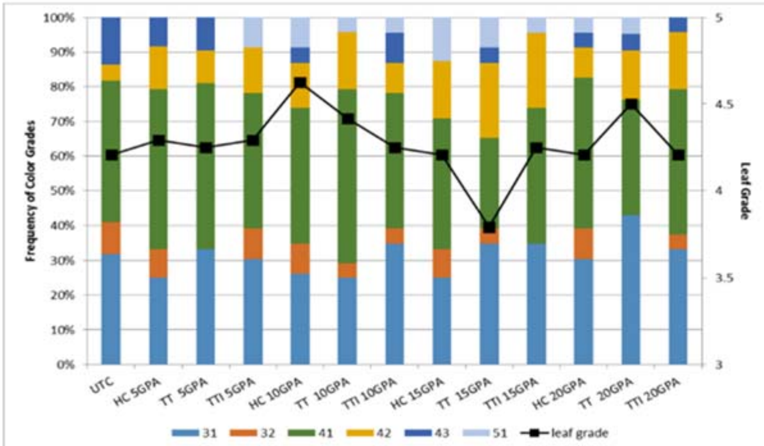

Figure 5: Frequent Table of Color grades and Average Leaf Grades by Treatment.

Acknowledgements

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