NOZZLE TYPE AND CARRIER VOLUME INFLUENCE ON DEFOLIATION

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Abstract

The release of new herbicide traits and products for cotton in 2017 came with multiple restrictions on application procedures and methods. Among those nozzle restrictions are key, as only nozzles that produce very coarse or larger droplets will be approved for use. This has raised concerns over how this impacts other areas of crop management when sprayers are in use and whether producers will switch out nozzles between applications or if the nozzles approved for auxin herbicides will be utilized for all applications, regardless of the application purpose. This is especially true for defoliation where getting adequate plant coverage is a priority. Coverage is typically accomplished through high carrier volume and medium to fine droplet sizes. Coverage may be sacrificed with coarse droplets, leading to inadequate defoliation which could necessitate additional applications or increase the potential for quality losses. Speed is also an issue as producers would ideally like to cover as many acres as possible, and with increased ground speeds the gallons per acre (GPA) of harvest aids is reduced. Previous work has shown that defoliation success and regrowth inhibition is optimized with increases in carrier volumes (15 gallons per acre compared to 5 or 10 gallons per acre), while nozzles that produce smaller droplet sizes (fine or medium) result in more effective defoliation (Siebert et al., 2006). The nozzle restrictions associated with the new herbicide technologies require a nozzle that produces coarser droplets than the nozzle evaluated in the study by Siebert et al., 2006. The objective of the current study was to investigate the relationship between carrier volume and droplet size for harvest aid applications, and resulting impacts on defoliation and fiber quality. Three nozzle types were evaluated; TXR hollow cone (HC) which produces fine droplets, Turbo TeeJet (TTI) which produces medium droplets, and Turbo TeeJet Induction (TTI) which produces extremely or ultra-coarse droplets (TeeJet Technologies, Wheaton, IL). The TTI nozzles are among some of the only nozzles labeled so far for use in applying the new auxin herbicide products. Harvest aids were applied across all nozzles at four carrier volumes; 5, 10, 15, and 20 GPA. There were six locations in 2016 spanning the Cotton Belt, including Safford, AZ, New Deal, TX, Snook, TX, Portageville, MO, Starkville, MS, and Jackson, TN. At every location the same rates of three harvest aid products were applied; tribufos at 8 oz per acre, ethephon at 24 oz per acre, and thidiazuron at 2 oz per acre. Harvest aid ratings were conducted at 7, 14, and 21 days after application (DAA) and included defoliation, desiccation, open boll, and regrowth percentages. Seed cotton harvested from the New Deal, Portageville, Starkville, and Jackson locations was ginned at the University of Tennessee Cotton MicroGin in Jackson, TN and classed by the USDA Classing Office in Memphis, TN.

There were two cases in which a significant interaction between carrier volume and nozzle type was present, and both occurred for regrowth at 7 DAA at the Starkville and Snook locations. Lower regrowth control in the TTI nozzle at 5 GPA was the general trend at both locations. Nozzle selection produced differences in defoliation, with the TTI nozzle resulting in decreased defoliation compared to the HC at 7 DAA in Jackson and 14 DAA at Snook and Starkville. A similar trend was observed in regrowth at 14 DAA in Snook and Starkville, with the HC nozzle resulting in greater regrowth inhibition than the TTI. The nozzle effects on both defoliation and regrowth likely reflect the reduction in plant coverage as a result of the large droplets produced by the TTI nozzles as compared to the HC nozzles. Lower

carrier volumes resulted in reduced defoliation in New Deal and Jackson across all three rating dates. In Jackson, defoliation was reduced in the 5 GPA treatment compared to 15 and 20 GPA at all three dates, and was lower than 10 GPA at 14 DAA. In New Deal, there was no difference between 15 and 20 GPA season long, and no difference between 10 and 15 at 7 and 14 DAA. Defoliation was lower in the 5 GPA compared to 15 and 20 GPA at all three dates. The only fiber quality parameter that was impacted in this study across the four locations that were ginned and classed in the same location was HVI trash at the Portageville location. While both the main effects of nozzle and carrier volume resulted in differences in trash, differences were approximately 0.1%, thus not realistically significant in regards to reductions in fiber quality or potential discounts.

In summary, there was no significant effect of the different combinations of nozzle type or carrier volume on fiber quality despite multiple cases of differences in the amount of green leaves defoliated and regrowth inhibition. Environmental conditions also have a significant impact on harvest aid efficacy, so it is likely that the ideal or unfavorable conditions that were present at many locations played a larger role than the application methods on defoliation success. This still doesn't explain the lack of differences in fiber quality in relation to the obvious visual differences between treatments, so further work will need to be done to better understand the impacts of carrier volume and nozzles on potential fiber quality concerns and visual evidence of differences.

References

Siebert, J.D., A.M. Stewart, D.K. Miller, and C.C. Craig. 2006. Effect of carrier volume and nozzle type on cotton harvest-aid efficacy. Journal of Cotton Science 10: 89-96.