MISSISSIPPI SOYBEAN PROMOTION BOARD
PROJECT NO. 45-2018
2018 ANNUAL REPORT

Title: Herbicide Efficacy and Economic Return as Affected by Precision Agriculture Technology

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OBJECTIVES

We have a student that will be joining this project full time for the upcoming year!

Objective 1. To compare weed control, application efficiency, and economic returns on the WeedSeeker, WeedIt, and See & Spray sprayers.

John Deere / Blue River Technology has not been able to provide a See & Spray system at this point in time. It appears that they are focusing on cotton because of the lower plant density of the crop. We will proceed with the WeedSeeker/WeedIt system.

Objective 2. To compare the efficiency of the Capstan Aim and ExactApply pulse width modulation spray system as a function of weed control and droplet size to a standard nozzle.

John Deere has still been unable to provide a research-sized sprayer to do a direct comparison between the two PWM systems. We are investigating the possibility of securing the new TeeJet PWM system and to compare both systems to a conventional sprayer. Additionally, we have modified a track sprayer with w PWM system so we can provide comparison treatments in the greenhouse.

Objective 3. To compare drift from a Capstan Aim, and ExactApply pulse width modulation spray system operating within a given droplet size distribution

This objective yielded the greatest value for this project. Since the last quarter we have validated the spray quality in the wind tunnel facilities in Nebraska with Dr. Kruger. We are in the final stages of preparation of a manuscript on this objective and it should be submitted by first quarter of the upcoming year. Below is an abstract describing the results as presented at the annual meeting of the Southern Weed Science Society and the Weed Science Society of America.

Previous research has suggested that a proportional carrier volume with a herbicide solution concentration similar to the concentration of a full-labeled rate better represents plant response to sublethal herbicide rates in simulated drift studies. However, due to soybean's extremely high sensitivity to dicamba, achieving a proportional carrier volume to doses that cause low levels of injury or yield is almost impossible with standard equipment. Therefore, field experiments were conducted across three sites in Mississippi in 2018 to evaluate the effect of carrier volume and spray quality on non-dicamba-resistant soybean response to a sublethal dicamba dose under field conditions.

Dicamba plus glyphosate were applied at 1% of the standard use-rate to soybean at the R1 growth stage with a pulse-width-modulation (PWM) sprayer calibrated to deliver 140, 105, 70, 35, 14, and 7 L/ha (LPH) using either Fine or Coarse spray qualities. Significant effects of spray quality were not detected for soybean injury or plant height evaluations; however, carrier volume profoundly affected these parameters. Soybean injury 3 days after treatment (DAT) from carrier volumes of 70 to 140 LPH ranged from 6 to 16%; however, treatments applied at 7 or 14 LPH resulted in 49 and 42% injury, respectively. By 28 DAT, soybean injury ranged from 38 to 56%, with higher injury resulting from reduced carrier volumes. Soybean height 28 DAT was similar amongst carrier volumes of 35 to 140 LPH (39 to 42% reduction); however, when carrier volume was reduced to 14 or 7 LPH, soybean height was reduced 46 and 51%, respectively.

Both the main effects of spray quality and carrier volume influenced soybean grain yield. Averaged across carrier volumes, Fine and Coarse spray qualities resulted in 30 and 26% yield loss, respectively. Likewise, yield loss ranged from 41 to 14% and increased as carrier volume decreased. Consequently, these data indicate that carrier volume can severely influence results in studies investigating sublethal dose exposure to soybean. These data demonstrate that with some active ingredients, a rate titration applied at the same delivery volume may not be the same as what may happen with true OTM such as particle drift. That is not to say that existing studies are not valid, but instead that they may be more reflective of effects from contaminated spray equipment than from particle drift.