## EFFECT OF NOZZLE TYPE ON GLYPHOSATE APPLICATIONS E.J. Jones and G.D. Wills Delta Research and Extension Center J.E. Hanks USDA, ARS Application Production and Technology Research Unit Stoneville, MS

## Abstract

Laboratory studies were conducted to determine the spray patterns and droplet sizes produced with combinations of glyphosate applied at 0.4 lb ai in 10 gallons per acre as Rodeo® which has no surfactant and as Roundup Ultra Max® which has a proprietary surfactant with each of two deposition aids, 1) HM 9752, a proprietary blend of polymeric viscosity modifiers and ammonium sulfate at 9 lb/100 gal, and 2) HM 9950, a proprietary blend of ammonium polyacrylates, hydroxy carboxylates, sulfates, and polymeric deposition aids at 1.0% v/v. Applications were made with the TeeJet Extended Range 110015VS and the TeeJet Air Induction 110015VS spray nozzle.

A previous field study has shown that the deposition aids either had no effect or increased the efficacy of glyphosate. Where increased efficacy occurred, the percent increase was greater with the Rodeo than with the Roundup Ultra Max formulation.

Spray patterns were determined at spray pressures of 41 to 44 psi the same as when applied at the rate of 10 gallons per acre in the field applications. Spray nozzles were positioned at 13 inches above a slanted sheet of corrugated metal with troughs spaced 2.5 inches apart. The spray mixtures were applied in 600-ml volumes and collected from each trough in 100-ml graduated cylinders. The average milliliter volumes of three replications as collected at each position from left to right, were reversed, added together, and averaged again to show a symmetrical pattern for each mixture.

The width of the spray patterns using both the Extended Range and the Air Induction nozzles was similar for Rodeo and Roundup Ultra Max. With the Extended Range nozzle, the spray width with each formulation alone was approximately 50 inches. The spray widths with the addition of HM 9950 at 1% and HM 9752 at 9 lb/100 gal were 35 to 40 inches. The spray width for the Air Induction nozzle with each Rodeo and Roundup Ultra Max alone was approximately 40 inches. The addition of HM 9950 at 1% and HM 9752 at 9 lb/100 gal were 35 to 40 inches. The addition of HM 9950 and HM 9752 reduced the spray widths to 15 and 20 inches with Roundup Ultra Max and Rodeo, respectively.

Previous research has shown that drift of herbicide spray decreases as spray droplet size increases. Spray droplet size was determined using an Insite Measurement Systems Laser Particle Size Analyzer to measure the droplet size for each combination of glyphosate formulation and deposition aid. Droplet size was determined both as the average droplet size designated as the volume median diameter (Dv.5) in microns and as the percentage of the spray volume in fine droplets less than 144 microns (<144 $\mu$ ) in diameter. Application was made using two nozzle types, the TeeJet Extended Range 110015VS nozzle at 30, 40, 50, and 60 psi and the TeeJet Air Induction 110015VS nozzle at 40, 50, 60 and 70 psi.

The average droplet size decreased and the percent volume of fine droplets increased for each spray mixture as the spray pressure was increased for each nozzle type. When using the TeeJet Extended Range 110015VS spray nozzle, glyphosate as both Rodeo and Roundup Ultra Max alone resulted in 47 to 62% and 50 to 64% volume of fine spray droplets and 117 to 151 and 114 to 145 microns average droplet size, respectively. The addition of HM 9752 reduced the percent volume of fine droplets to 26 to 39% and to 24 to 35% and increased the average droplet sizes to 180 to 245 and to 200 to 253 microns with Rodeo and Roundup Ultra Max, respectively. The addition of HM 9950 reduced the percent volume of fine droplets to 22 to 36% and to 9 to 31% and increased the average droplet sizes to 193 to 256 and to 234 to 488 microns with Rodeo and Roundup Ultra Max, respectively.

When using the Air Induction 110015VS spray nozzle, glyphosate as both Rodeo and Roundup Ultra Max alone resulted in 7 to 10% and to 3 to 6% volume of fine spray droplets and 423 to 502 and to 414 to 513 microns average droplet size, respectively. The addition of HM 9752 reduced the percent volume of fine droplets to 2 to 4% and increased the average droplet size to 563 to 717 and to 583 to 636 microns with Rodeo and Roundup Ultra Max, respectively. The addition of HM 9750 reduced the percent volume of fine droplets to 2 to 4% and increased the average droplet size to 563 to 717 and to 583 to 636 microns with Rodeo and Roundup Ultra Max, respectively. The addition of HM 9950 reduced the percent volume of fine droplets to 2 to 4% and increased the average droplet size to 546 to 670 and to 640 to 664 microns with each glyphosate formulation.