THE EFFECT OF NOZZLE TYPE IN COMBINATION WITH ELECTROSTATICS ON GLYPHOSATE AND PARAQUAT EFFICACY. Robert E. Wolf and Dallas E. Peterson, Extension Specialist, Biological and Agricultural Engineering, and Professor, Department of Agronomy, Kansas State University, Manhattan, KS 66506.

This study was designed to measure herbicide efficacy and droplet characteristics using the Energized Spray Process (ESP) and three common flat-fan spray nozzles. The ESP system utilizes contact charging of the spray liquid prior to atomization at the nozzles. The charge creates a high-intensity electrostatic field between the nozzle and plant. The experiment included comparisons of the extended range (XR), turbo (TT), and venturi (AI) flat-fans with and without the electrostatic charge. All treatments were conducted at 207 kPa, 16 km/h, and at a spray volume of 47 L/ha. The nozzle angle and orifice size used in all treatments was 11002. The applications were made with a Spra-Coupe 3640 equipped with an ESP boom spanning 18.6m. Nozzles were spaced at 51 cm and located 51 cm above the target. The three nozzle types were evenly split in groups across the boom (left 1/3 were XR, middle 1/3 were TT, and right 1/3 were AI) for all treatments. Glyphosate at 0.31 kg ae/ha and paraquat at 0.0.63 kg ai/ha were used to compare efficacy on common sunflower, sorghum and corn. Sublethal herbicide rates were used to accentuate any efficacy differences. The study had a randomized complete block design in a split-split plot arrangement with herbicide as the main plot, electrical charge as the subplot, and spray tip as the sub-subplot. In addition to efficacy ratings at 7, 14, and 21 days after treatment (DAT), kromekote papers were placed under the spray boom to collect droplet spectra data. Five kromekote papers per treatment over one replication were summarized. DropletScan software was used to analyze the papers.

Efficacy ratings at 21 DAT show that very few significant differences were found among herbicide, nozzle, and electrostatic charge variables. No significant differences in control occurred among the interaction of nozzle, chemical, and electrostatic charge for all three species. Only minor differences in control occurred among spray nozzles. The AI tip showed the best control with glyphosate for all species. The XR had nearly the same control as the AI with the TT somewhat less. With paraquat, the TT was slightly better followed by the AI and the XR was lowest. However, in all cases the differences were small and not significant.

Significant differences in control were shown with the electrostatic charge and chemical interaction on corn at 21 DAT. For both glyphosate and paraquat the control was higher without the electric charge, although the difference was significant for glyphosate, but not for paraquat.. Control was significantly higher without electrical charge than with charge for all three species at both 14 and 21 DAT, (except for cosf at 14 DAT).

The droplet statistic volume median diameter (VMD) averaged across all treatments show differences as expected for nozzle types with the XR at 303 microns, TT at 363 microns, and AI at 543 microns. When classified according to the ASAE S-572, the XR and TT are medium sized drops and the AI drops are very coarse. Percent area coverage exhibited very little differences among the three nozzle types (XR=8.7%, TT=8.0%, and AI=8.8%).

As evidenced in this study, very few significant differences were found among treatments. The main finding and trend was that the percent control was better without the electrostatic charge with significant differences reported for all three species at 21 DAT. It was also interesting to note that the AI nozzle performed well in percent control compared to the other nozzle types and the XR and TT had less control than might have been expected. Even though the droplet spectra were different for each the percent area coverage for each was nearly the same.