

THE AFFECT OF PULSE WIDTH MODULATION NOZZLE CONTROL 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 using Pulse Width Modulation (PWM) and a common flat-fan style nozzle. The PWM system utilizes a computer controlled modulation valve to manage application volume independent of droplet size and pressure. The experiment included comparisons of three different orifice sizes of the turbo flat-fan (TT) at two operating pressures, 173 and 345 kPa. All treatments were conducted at 8 km/h and at a spray volume of 94 L/ha. The nozzle angle and orifice sizes used were 11002, 11004, and 11006. The applications were made with a tractor-mounted 3-point sprayer equipped with a 6-nozzle PWM boom. Nozzles were spaced at 51 cm and located 51 cm above the target. Glyphosate at 0.42 kg ae/ha and paraquat at 0.63 kg ai/ha were used to compare efficacy on common velvetleaf, sorghum and corn. Sublethal herbicide rates were used to accentuate efficacy differences. The experiment had a randomized complete block design in a split plot arrangement with herbicide as the main plot and spray tip by pressure as the subplot. Efficacy ratings for 27 days after treatment (DAT) are reported. Droplet size characteristics are given for each treatment based on Spraying Systems charts which reflect ASAE Standard S-572 - *Spray Nozzle Classification by Droplet Spectra*. The TT 11002 was classified as a coarse droplet at 173 kPa and a medium droplet at 345 kPa. Both the 11004 and 11006 were classified as very coarse and coarse at the same pressures respectively.

Efficacy ratings show that significant differences and interactions were found among herbicide, nozzle, and pressure variables. At 27 DAT species control varied between glyphosate and paraquat as would be expected. Glyphosate provided better control for all three species with significant differences measured for sorghum and corn. A significant interaction was measured for nozzle, pressure, and chemical in sorghum. In general, the 11004 orifice had better control when compared to the 11002 and 11006 orifices. The differences were more pronounced with paraquat than glyphosate.

Significant differences in control occurred among orifice size and pressure comparisons for all species. For both corn and sorghum, the better control occurred at the higher pressure through all three orifice sizes. Differences were greater for the 11002 and were less for the larger orifice 11006. For velvetleaf, the 11002 was significantly better for control at the higher pressure. That was reversed for the 11004 and 11006, but the differences were not significant.

As evidenced in this study, several significant differences were found among treatments. The main finding and trend was that the percent control was better for the higher pressure treatments at the smaller orifice size. This trend was not found with velvetleaf. There was also a significant difference in performance between glyphosate and paraquat for sorghum and corn with glyphosate having better control. That significance was not present for velvetleaf. The tip, pressure, and chemical interaction is also significant for sorghum with glyphosate again showing better control when compared to paraquat and slightly better for control at the higher pressure. The pressure differences were more pronounced with paraquat with higher pressure significantly different in all comparisons.

When the nozzle and pressure treatments are assigned a classification based on ASAE S-572, except for two treatments with velvetleaf, all smaller droplet categories had better control.