

EVALUTATION OF NEW VENTURI NOZZLE DESIGNS FOR IMPROVING HERBICIDE EFFICACY. Robert E. Wolf and Dallas E. Peterson, Associate Professor and Extension Specialist, Biological and Agricultural Engineering, and Professor, Department of Agronomy, Kansas State University, Manhattan, KS 66506.

Field studies were conducted in 2008 and 2009 to evaluate herbicide efficacy comparing multiple nozzle types designed to reduce drift while maintaining adequate efficacy. The experiment included comparisons of a chamber style nozzle, the turbo flat-fan from Spraying Systems (TT); three older venturi styles, the AirMix from Greenleaf (AM), the Ultra LoDrift from Hypro (ULD), and the Air Induction from TeeJet (AI); two new venturi style nozzles, the Air Induction Extended Range from TeeJet (AIXR) and the Guardian Air from Hypro (GA); a new design chamber nozzle, the Turbo Twin flat-fan from TeeJet (TTJ60), and a new venturi design from Greenleaf, a TurboDrop High Speed Twin Fan (TD HS TF). In 2009, another new nozzle design was added, the air induction twin flat-fan from Lechler (IDK-T). Orifice sizes and operating pressures (.03 at 193 kPa, .025 at 276 kPa and .02 at 483 kPa) for each nozzle treatment were selected to deliver a spray volume of 70 L/ha at 16 km/h. The orifice sizes were TT110025, AM110025, TTJ60110025, GA110025, AIXR110025, AIC11002, ULD12002, TDHSTF11002, and IDK-T12003. Applications were made with a tractor-mounted 3-point sprayer equipped with four nozzles spaced at 51 cm and located 51 cm above the target. For both years, glyphosate at 0.42 kg ae/ha and paraquat at 0.42 kg ai/ha were used to compare efficacy. In 2008 the species used for the comparisons were velvetleaf, common sunflower, sorghum, and corn. In 2009, velvetleaf, ivyleaf morning-glory, sorghum, and corn were used for the comparisons. N PAK ammonium sulfate at 5% v/v was added to the glyphosate treatments and nonionic surfactant at 0.5% v/v was added to the paraquat treatments. Both years the treatments were replicated three times and efficacy was evaluated at 7, 14, and 28 days after treatment with 28 DAT reported.

Species control varied between glyphosate and paraquat for both years. When averaged across nozzle type and species in 2008; glyphosate had 96.2% control and paraquat had 80.2% control, compared to 83.4% and 69.2% in 2009 respectively. Within the compared species, glyphosate had very few differences in control among nozzle types for either year. Range of control averaged across nozzle type by species was 99.8% for corn, 99.6% for sorg, 98.4% for cosf, and 86.8% for vele in 2008. In 2009, the same averages were 98.2% for sorg, 89.4% for corn, 81.1% for vele, and 64.7% for ilmg. With paraquat, in both years mixed results with some differences were found across all nozzle types and species. Range of control in 2008 averaged across nozzle type by species was 93% for cosf, 83.5% for corn, 73.3% for vele, and 71.0% for sorg. Control in 2009 ranged from 85% for vele, 84% for ilmg, 69.2% for corn, and 38.4% for sorg. In 2009, for the paraquat treatments, the broadleaf species control was much better than the grass species control.

For both years there were no significant differences found for each species among nozzle types when averaged across glyphosate and paraquat. In 2008, the average control across nozzle type was 96% for cosf, 92% for corn, 85% for sorg, and 80% for vele. In 2009, average control across nozzle type was 83% for vele, 79% for corn, 74% for ilmg, and 69% for sorg.

In summary, for the glyphosate treatments across all species tested and nozzle types, though only slight differences were found, the AIXR (85.5%) and TT (85.3%) exhibited the best control. When comparing similar nozzle designs, the twin-fan IDK-T (84.3%) performed better than the twin-fan TTJ60 and TDHSTF (both 82%). Within the new venturi designs, the AIXR (85.5%)

outperformed the AM (83%) and GA (83.3%). For the old style venturi designs, the AIC and ULD performed the same (82.5%).

For the paraquat treatments across all species and nozzle types, the twin-fan TTJ60 had the best control (73.8%), the IDK-T, also a twin-fan, was next with 72%. The AIC was third (70.3%), followed by the AIXR (69.8%) and the AM (69.0%). The TDHSTF (67.8%), ULD (67.5%), TT (66.3%), and the GA (66.3%) had the lowest control with paraquat. When comparing similar designs, with the twin-fan designs, the TTJ60 and IDK-T outperformed the TDHSTF. The single outlet TT was outperformed by the double outlet TTJ60 (73.8 – 66.3%). With the new style venturi designs, the AIXR and AM performed better than the GA. For the old style venturi designs, the AIC performed better than the ULD.