SPRAY PARTICLE ANALYZATION OF NOZZLE TIPS WITH HERBICIDES AND ADJUVANTS.

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Most spray nozzle tips used in the application of pesticides produce a distribution of droplet sizes. Droplet size refers to the diameter of an individual spray droplet. The nozzle tip spray pattern is made of numerous spray droplets of varying sizes.

Spray nozzle classification by droplet spectrum in the US was developed and approved by the American Society of Agricultural Engineers (ASAE) in August of 1999. This standard, S-572, defines droplet spectrum categories for the classification of spray nozzles relative to specified reference fan nozzles discharging spray into static air so no stream of air enhances atomization. This provides a means for relative nozzle comparisons based only on droplet size. Other drift and application efficacy factors - droplet discharge trajectory, height, velocity, air bubble inclusion, droplet evaporation and impaction on target – are not addressed. The standard is based on spraying water through the reference nozzles and the nozzles to be classified. Spray liquid properties may affect droplet sizes and should be considered by the end user. Flow rate and operating pressure are specified for each reference nozzle, as droplet size spectra from pressure atomizers are affected by flow rate and pressure.

Particle size is affected by nozzle tip size and design, herbicide and adjuvants. The percent of the spray volume 210 microns (μm) and less is a useful statistic when comparing particle size distributions. Small droplets produce most spray particle drift. With the 11002XR nozzle tip at 15, 30, 45 and 60 psi, the 210 μm and less percentage is 30, 52, 62, and 72 respectively with water as the carrier. Adding 2% ammonium sulfate did not change the values. Adding a glyphosate at a rate of 0.75 lb ae/a at a carrier volume of 10 gpa increased the percentages 7 to 10%. Adding Adjuvant A decreases the volume of 210 μm and less by 26 to 53%. These percentages stayed nearly the same with Adjuvant A plus ammonium sulfate plus a glyphosate. This combination did affect the amount of small droplets when nozzle size was increased. With water only, the 11002XR nozzle at 15 psi produced 30% of the spray volume in 210 μm and less, while the 11008XR nozzle produced 11% under the same conditions. With Adjuvant A plus ammonium sulfate plus a glyphosate, the 11002XR at 15 psi produced 17% of the spray volume in 210 μm and less, while the larger 11008XR nozzle produced 28%.

Increasing the size of the air induction nozzle did not reduce the percentage of the spray volume 210 μm and less. With the 11002AI, 3% of the volume was of this droplet size, while the 11008AI produced 8%. These measurements were taken at 30 psi.

The previous comparisons were not based on replicated trials, but on single observations. Additional research with spray particle size and distribution is needed. The results will aid in managing drift and improving efficacy.

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