

26<sup>th</sup> Symposium on Pesticide Formulations and Delivery Systems: Reassessing Pesticide Technologies,  
October 18-20, 2005, Dallas, Texas, USA

## Wind Tunnel Evaluation of Drift Reduction Potential with Air Induction Nozzles, Low Pressure Conventional Nozzles and Drift Retardants

H. Guler<sup>1</sup> H. Zhu<sup>2</sup> H. E. Ozkan<sup>3</sup> R.C. Derksen<sup>2</sup> C.R. Krause<sup>2</sup>

<sup>1</sup> Department of Food, Agricultural and Biological Engineering, OARDC/The Ohio State University, Wooster, Ohio, USA

<sup>2</sup> USDA/ARS Application Technology Research Unit, Wooster, Ohio, USA

<sup>3</sup> Department of Food, Agricultural and Biological Engineering, The Ohio State University, Columbus, Ohio, USA

Although considerable research has been done on effectiveness of low-drift nozzles and drift retardants for many years, answers to some questions are still unclear to applicators when selecting effective techniques to reduce spray drift. The objective of this research was to evaluate spray drift reduction potential with drift retardants, air induction nozzles and conventional nozzles with reduced pressure.

Wind tunnel experiments were conducted to assess spray deposits on the wind tunnel floor beyond 0.4 m downwind distance from the nozzles, and airborne deposits at 2.1 m downwind from the spray discharge point with air velocity ranging from 0 to 5 m/s. Various sizes of air induction nozzles with open and sealed air intake holes, conventional flat fan nozzles, and conventional hollow cone nozzles with and without three different types of drift retardants were used in the tests. During the tests, the operating pressure for air induction nozzles with open and sealed air holes and conventional flat fan nozzles was adjusted to produce equal flow rates. The orifice size of the conventional flat fan nozzles was close to the orifice size of air induction nozzles. Droplet sizes from the nozzles and drift retardants were measured with the Oxford laser imaging system.

At 1650 kPa pressure and 4.65 L/m flow rate, the volume median diameter of droplets from the hollow cone nozzle discharging spray mixtures containing water only, polyvinyl, xanthan and polyacrylamide drift retardants was 201, 222, 239 and 210  $\mu\text{m}$  respectively. At 2.5 m/s wind velocity, polyacrylamide drift retardant produced the highest airborne deposit among the three drift retardants, followed by polyvinyl, and then xanthan. At the same operating pressure, air induction nozzles with sealed air intake holes had higher flow rate than those with open holes because of the energy loss by venturi effect. For the same flow rate of 4.65 L/min with large orifice size, the volume median diameter of droplets from the air induction nozzle with open air holes, air induction nozzle with sealed holes, and conventional flat fan nozzle was 403, 511, and 420  $\mu\text{m}$ , respectively. For the same flow rate of 0.93 L/min with small orifice size, the volume median diameter of droplets from the air induction nozzle with open air holes, air induction nozzle with sealed holes, and conventional flat fan nozzle was 263, 254, and 254  $\mu\text{m}$ , respectively. There was no significant difference in both ground and airborne deposits for the air induction nozzles with open and sealed air intake holes and conventional flat fan nozzles when their discharge flow rates were equal. Therefore, conventional flat fan nozzles when operated at low pressure could achieve the equal effectiveness in drift reduction potential as the air induction nozzles.