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Spray Drift Potential Increases during Warm Weather Applications

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Abstract
Recent rains over much of the state are encouraging crop and weed growth and pesticide applications will be a primary focus as soon as fields are suitable. In a May 15, 2009 ICM News article, management factors to reduce drift potential were reviewed, with special focus on the effect of droplet size and wind speed on physical spray drift. As daily high temperatures increase into the upper 70 to 80s degrees F range, mid-day relative humidity frequently drops below 50 percent. This article takes a look at the effect of temperature and humidity on pesticide drift.

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By Mark Hanna, Department of Agriculture and Biosystems Engineering and Kristine Schaefer, Pest Management and the Environment

Recent rains over much of the state are encouraging crop and weed growth and pesticide applications will be a primary focus as soon as fields are suitable. In a May 15, 2009 ICM News article, management factors to reduce drift potential were reviewed, with special focus on the effect of droplet size and wind speed on physical spray drift. As daily high temperatures increase into the upper 70 to 80s degrees F range, mid-day relative humidity frequently drops below 50 percent. This article takes a look at the effect of temperature and humidity on pesticide drift.

Temperature and humidity affect the evaporation of liquid droplets. The higher the temperature and lower the humidity, the faster evaporation occurs. As a result of evaporation, spray droplet size decreases. The smaller droplets are then more susceptible to moving off target with prevailing winds as they become entrained in ambient air currents (Figure 1).

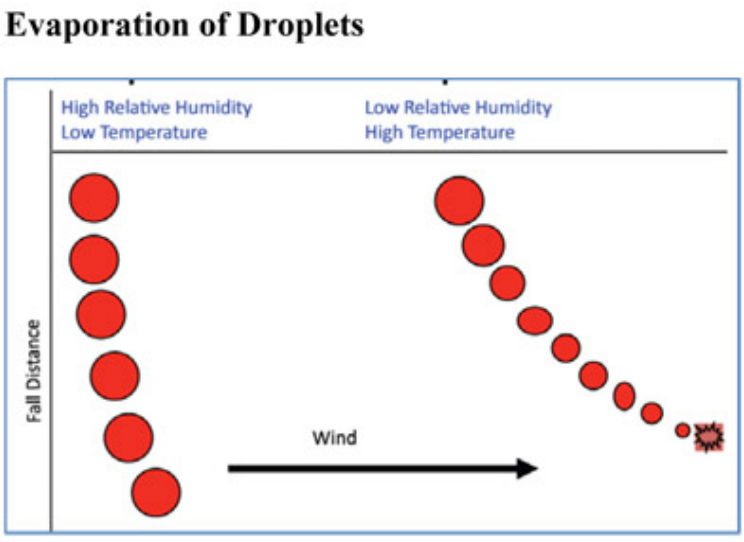

Figure 1. Effect of temperature and relative humidity on droplet size and movement.

The adverse effects of high temperature, low relative humidity and increasing wind speeds on the distance liquid spray solutions drift are illustrated below (Figure 2). Values in the figure are an indication of what might be expected when using a number four tip at 40 psi with a sensitive target 30 feet downwind. Such conditions can be common for a mid-season insecticide or fungicide application using a medium spray droplet quality.

At 50 degree temperatures with 80 percent relative humidity and an average wind speed of 10 miles per hour, about 1percent of spray volume will drift 30 feet away from the nozzle. If the temperature increased to 86 degrees with a lower relative humidity of 40 percent, and the wind speed remains unchanged, twice as much material, about 2 percent will drift 30 feet away from the nozzle. With average wind speeds increased to 15 miles per hour under the 86 degree temperatures, 40 percent relative humidity conditions, the amount of spray drift moving 30 feet away from the nozzle is nearly quadrupled to 3.5 percent.

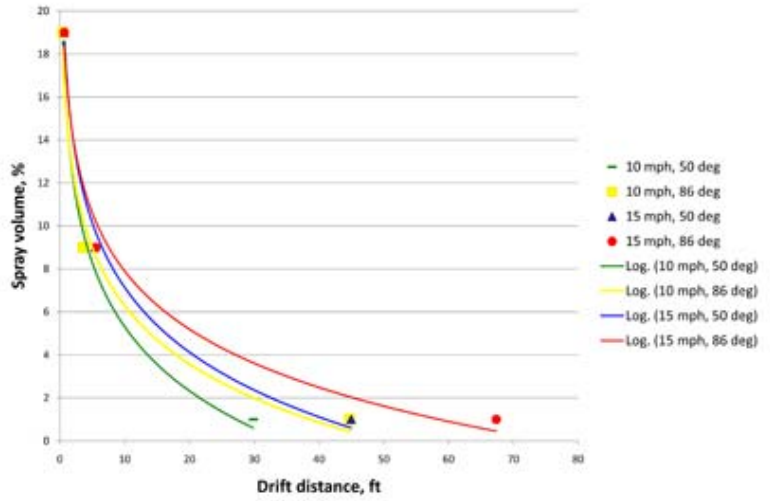

Figure 2. Effects of crosswind speed and air conditions (80 percent r.h. at 50 degrees; 40 percent r.h. at 86 degrees) on drift distance for percentage of spray volume exiting an 8004 flat-fan nozzle at 40 psi.

In addition to making nozzle size and type, boom height, sprayer pressure and speed adjustments, drift retardant additives may also be considered. The addition of deposition aids or drift reducing adjuvants to a spray application can help in some situations to reduce off site movement and help to deposit and retain more of the pesticide product on target. There are many drift reducing products available. Some are formulated with AMS and other surfactants. Careful considerations of the pesticide products being applied, the label requirements in terms of additives, the composition and qualities of the drift retardant product, and the type of nozzles and sprayer setup are important before selecting and using a drift retardant.

Mark Hanna is an extension agricultural engineer in agricultural and biosystems engineering with responsibilities in field machinery. Hanna can be reached at hmhanna@iastate.edu or (515) 294-0468. Kristine Schaefer is a program specialist in the Department of Entomology serving on the Pesticide Management and the Environment team. Schaefer can be reached by email at schaefer@iastate.edu or by phone at (515) 294-4286.