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Assessing Spray Droplet Spectra to Develop Spray Technologies for Precision Pesticide Applications

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Abstract

Precision pesticide application is a crucial challenge for modern agriculture, with the need to ensure optimal coverage while minimizing spray particle drift. Droplet size is a key factor in achieving successful pesticide applications. However, the current practice of nozzle selection for effective pesticide applications relies primarily on droplet size based on the Volume Median Diameter (VMD), which does not account for the droplet size variability present within a spray. To address this issue, a study was conducted to evaluate spray droplet spectra and quantify droplet size variability within a spray for six different droplet sizes commonly used for agricultural pesticide applications. Applications were performed with water at the rate of 15 gallons per acre, and each droplet size was replicated three times. The aim was to determine how droplet spectra affect spray drift and coverage. The analysis of the droplet spectra showed significant droplet size variability within a spray for each target droplet size, indicating the potential for spray drift and reduced coverage when using nozzles selected based on the VMD droplet size classification. The majority of the spray droplets within each droplet spectra were smaller or larger than the target droplet size, with the exception of ultra-coarse droplets. The study emphasizes the importance of accounting for droplet size variability in spray applications to enhance pesticide application efficacy and minimize environmental impact. Analyzing spray droplet spectra can assist in developing new techniques and technologies that can effectively reduce spray particle drift and improve coverage, thereby ensuring precise and safe pesticide applications.

Keywords: (Droplet size variability, Volume Median Diameter (VMD), Nozzle selection, Spray coverage, Spray drift)