Assessing Fungicide Deposition into Peanut Canopies at Different Carrier Volumes and Droplet Sizes

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Introduction

- Effective management of diseases and pests in peanut requires adequate spray deposition and penetration into the canopies.
- Besides being timely and choice of a good fungicide program, proper selection of application variables including carrier volume and droplet size is considered important for attaining good spray deposition within the peanut canopies.
- No recent studies have been conducted to investigate on the effect of carrier volume and droplet size on fungicide spray penetration and efficacy since the last study by Zhu et al. in 2004.
- Better understanding of the impact of carrier volume and droplet size on fungicide spray penetration into the peanut canopies can help inform proper selection of spray parameters to maximize efficiency of fungicide application in peanut.

Hypotheses

Both carrier volume and droplet size will impact spray deposition into the peanut canopies. Higher volume and smaller droplets will exhibit greater deposition within the canopies.

Objective

To assess the influence of carrier volume and droplet size on spray deposition at different positions within the peanut canopies during fungicide applications

Material and Methods

Application Equipment:

- 6-row UTV boom sprayer equipped with rate control and individual nozzle control and boom sections were configured to cover four peanut rows (12 ft)
- Sprayer calibrated at 7 mph and 30 psi to deliver the target carrier volumes and droplet sizes

Treatments:

- ***Three Carrier Volumes*** :10, 15 and 20 gallons per acre (GPA) (by varying nozzle size)
- ***Three Droplet Sizes***: Medium (M), Very Coarse (VC) and Ultra-Coarse (UC) droplet sizes (ASABE S572.3, 2020) using TeeJet® XRC, AIXR and TTI nozzles, respectively.

Experimental Design: Randomized complete block design (RCBD) with each treatment replicated three (2021) or four (2022) times.

Fungicide Applications & Data Collection:

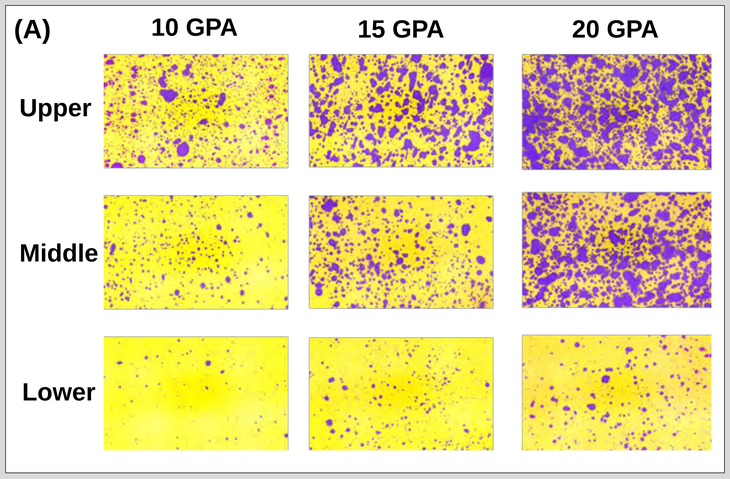
- Chlorothalonil @ 16 oz/ac and Tebuconazole @ 7.2 oz/ac at 30, 45, 60, 75, 90, 105 and 120 days after planting (DAP); Spray deposition data collected at 45, 60, 90 and 120 DAP
- Water sensitive paper (WSP) were placed at three different positions in the peanut canopies (upper, middle and lower), and scanned using Dropscope (Spray X software)
- Analysis of variance (ANOVA) and multiple pairwise comparisons using student t-test (α = 0.05) were conducted using JMP® Pro 16.0 (SAS, Cary, NC)

Arrangement of WSP in upper, middle and lower position of canopies

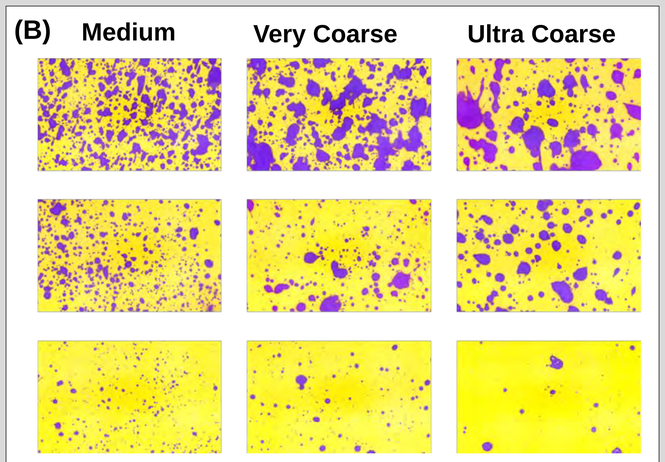
Dropscope Instrument

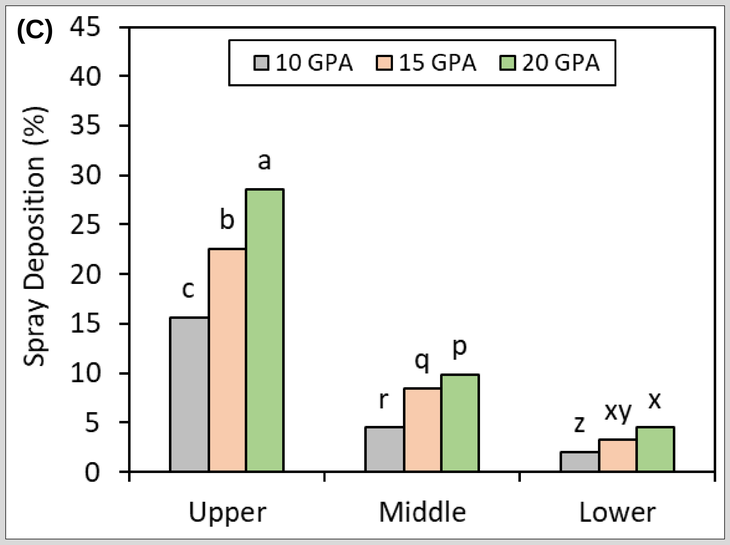
Results

Carrier Volume



Droplet Size





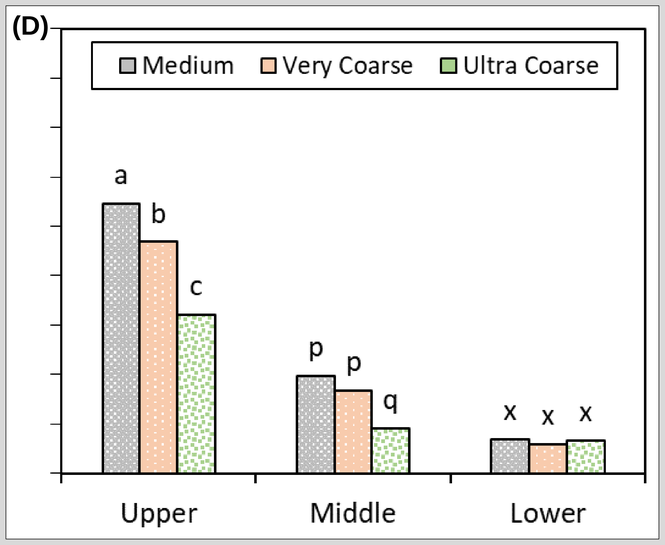


Figure 1. Water sensitive paper illustrating the effect of (A) carrier volume and (B) droplet size on spray deposition at upper, middle and lower positions in the peanut canopies. Graphs in (C) and (D) shows the effect of carrier volume and droplet size, respectively on spray deposition (%) at the upper, middle and lower positions in the peanut canopies. Data was pooled across all fungicide application periods. Bars sharing the same letters within the peanut canopy position are not significantly different (p>0.05).

Conclusions

- Both carrier volume and droplet size had a significant effect on spray deposition within the peanut canopies.
- Spray deposition was reduced from the upper to lower position of the canopies for all levels of carrier volume and droplet sizes used during fungicide applications in this study.
- Higher Carrier volume (20 GPA) provided the greatest deposition across all positions of peanut canopies followed by the 15 GPA and 10 GPA.
- Droplet size effect was observed up to middle canopies only where M droplets exhibited the highest deposition followed by the VC and UC spray droplets.

Future Research

Evaluating the influence of application timing along with spray parameters on fungicide deposition within the peanut canopies, especially in the fields with moderate to high disease pressure.

References

ASABE/ANSI. S572.3. (2020). Spray Nozzle Classification by Droplet Spectra.

Zhu H, Dorner J, Rowland D, Derksen R, Ozkan H (2004) Spray penetration into peanut canopies with hydraulic nozzle tips. Biosyst Eng 87:275-283.