Spray Performance Assessment of a DJI Agras T30 Spray Drone to Optimize Application Efficiency

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Introduction

- The application of pesticides using unmanned aerial vehicles (spray drones) is gaining interest rapidly in the United States.
- Limited research is available on the application performance of spray drones.
- DJI Agras T30 is currently one of the most commonly used spray drones for pesticide applications in crops.
- Assessing the spray performance of commercially available spray drones is important to inform best management practices for pesticide applications and for effective technology utilization.

Objective

Evaluate the influence of spray height, ground speed, and nozzle type on spray deposition and uniformity for a DJI Agras T30 spray drone.

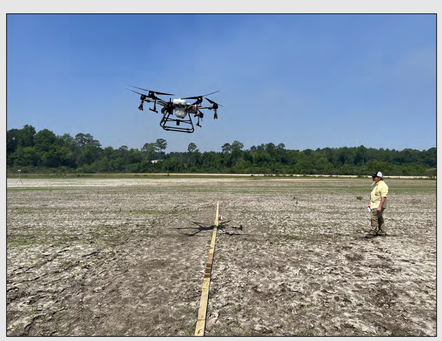
Methods

Spray Drone System:

- DJI Agras T30 agricultural spray drone
- DJI D-RTK 2 high precision GNSS mobile station

Treatments:

- Target spray volume: 18.7 L ha^{-1}
- Three nozzles to obtain different droplet sizes:
  - *XR (Fine-Medium)*
  - *AIXR (Coarse-Very Coarse)*
  - *TTI (Extremely Coarse-Ultra Coarse)*
- Three heights to attain different spray swaths:
  - *1.5, 3.0, 4.5 m*
- Three flight speeds:
  - *4.5, 5.6, 6.7 m s^{-1}*
- The study treatments were implemented as a factorial arrangement with each treatment replicated three times.



Data Collection and Analysis:

- Spray deposition/coverage was collected utilizing Syngenta water sensitive paper (WSP) placed in 0.33 m increments across the swath for each treatment combination.
- WSP was analyzed utilizing the DropScope 2.4.1. Coverage values were then averaged across each replication and graphed.

Results

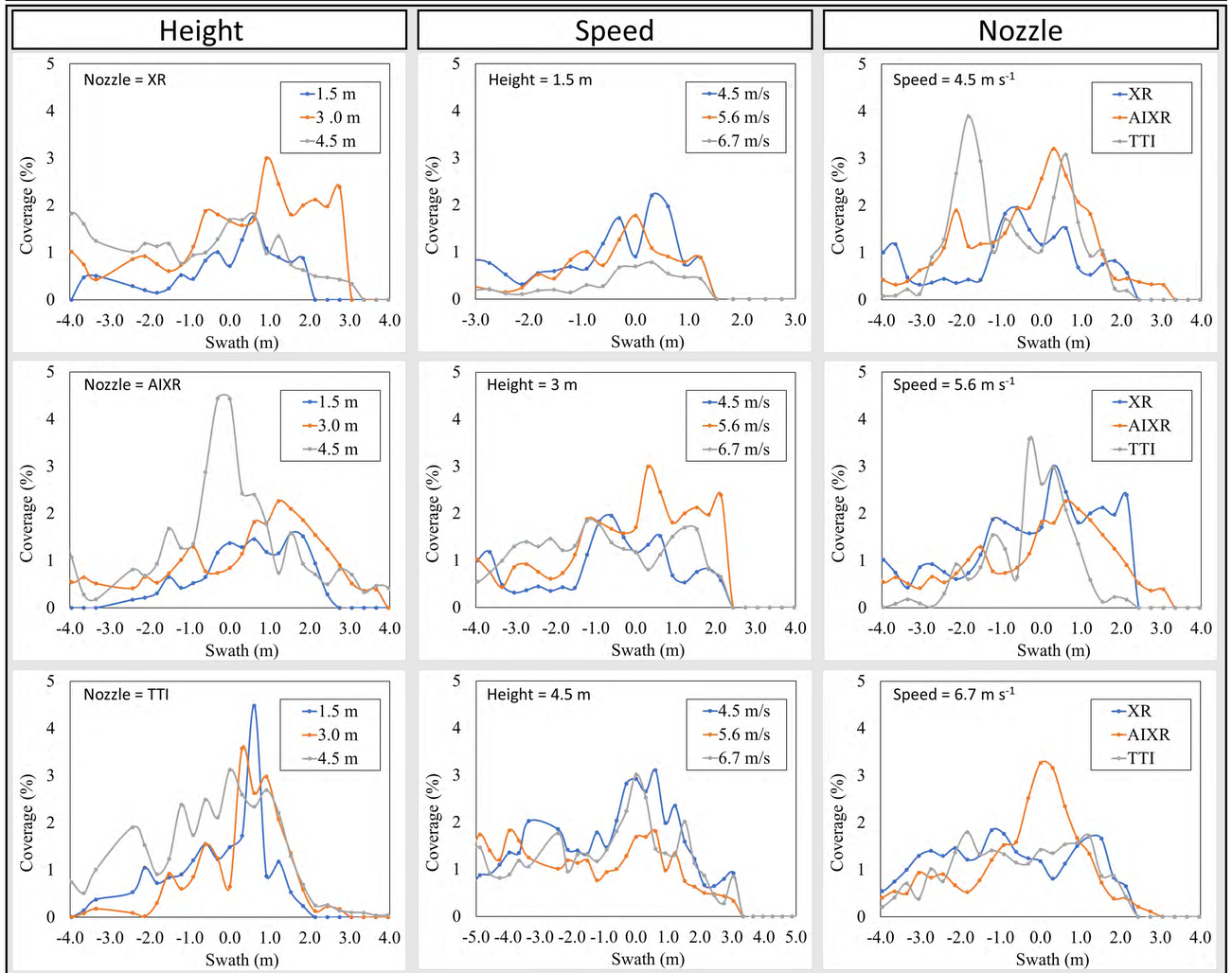


Figure 1: Total spray coverage grouped by tested application parameters. For the height column, speed is fixed at 5.6 m s^{-1} for all graphs. For the speed column, the nozzle is fixed as XR for all graphs. For the nozzle column, height is fixed at 3 m for all graphs.

Conclusions

- Spray coverage was consistently under 5% for all tested parameter combinations.
- Spray coverage was similar across all the flight speeds regardless of the height.
- An increase in height resulted in greater variability in coverage across the swath.
- The XR and AIXR nozzles exhibited more uniform coverage compared to the TTI nozzles.
- Future research will evaluate spray drift at varying application parameters tested in this study.

Acknowledgements

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