Spray Performance Evaluation of DJI Agras T30 UAS Sprayer at Different Application Parameters

Coleman Byers
College of Engineering
University of Georgia

UNIVERSITY OF GEORGIA
College of Engineering

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Introduction

- Unmanned Aerial Vehicle (UAV) applications have been increasing rapidly in agriculture
- Multiple UAV platforms are available commercially today for pesticides application
- Increased capabilities in newer models – swath, speed, droplet size etc.

UAS Sprayers

- Limited information is available on selection of parameters for effective pesticide applications (e.g. speed, height, nozzle type)
- Assessing application performance of these platforms is important to inform best management practices and effective technology utilization

Objective

Evaluate the influence of varying application parameters *(spray height, nozzle type, and flight speed)* on spray deposition and uniformity for a DJI T30 UAV sprayer.

Methods and Materials

- **Location**:
  - Tifton, GA (UGA Lang Farm)
- **UAV Sprayer**:
  - T30, SZ DJI Technology Co., (Shenzhen, China)
  - D-RTK 2 High Precision GNSS Mobile Station, SZ DJI Technology Co., (Shenzhen, China)

Study Treatments

- Three Heights (swath):

  1.5, 2.3 and 3.0 m

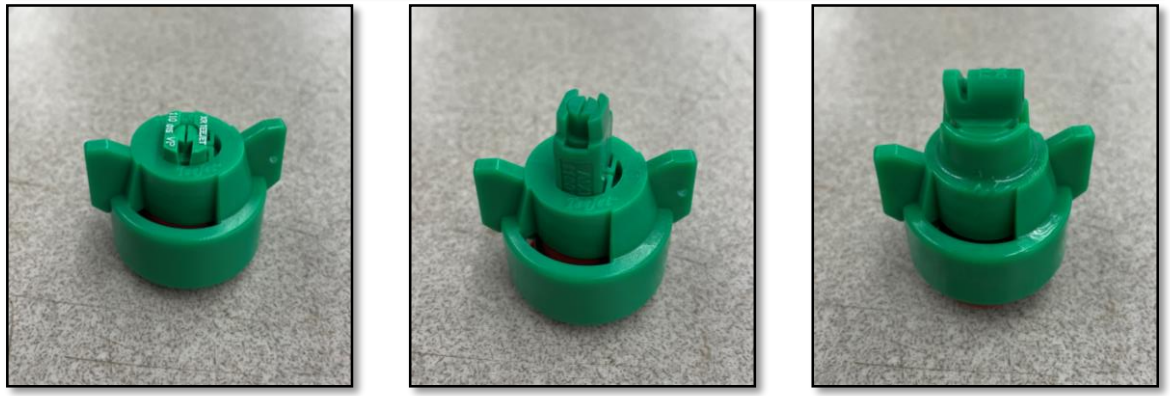
- Three Nozzles (droplet sizes):

  XR (M), AIXR (VC) and TTI (UC)

- Three speeds:

  4.5, 5.6, and 6.7 m s^{-1}

- All applications made using a spray volume of 18.7 L ha^{-1} (2 GPA) as a single pass



Data Collection

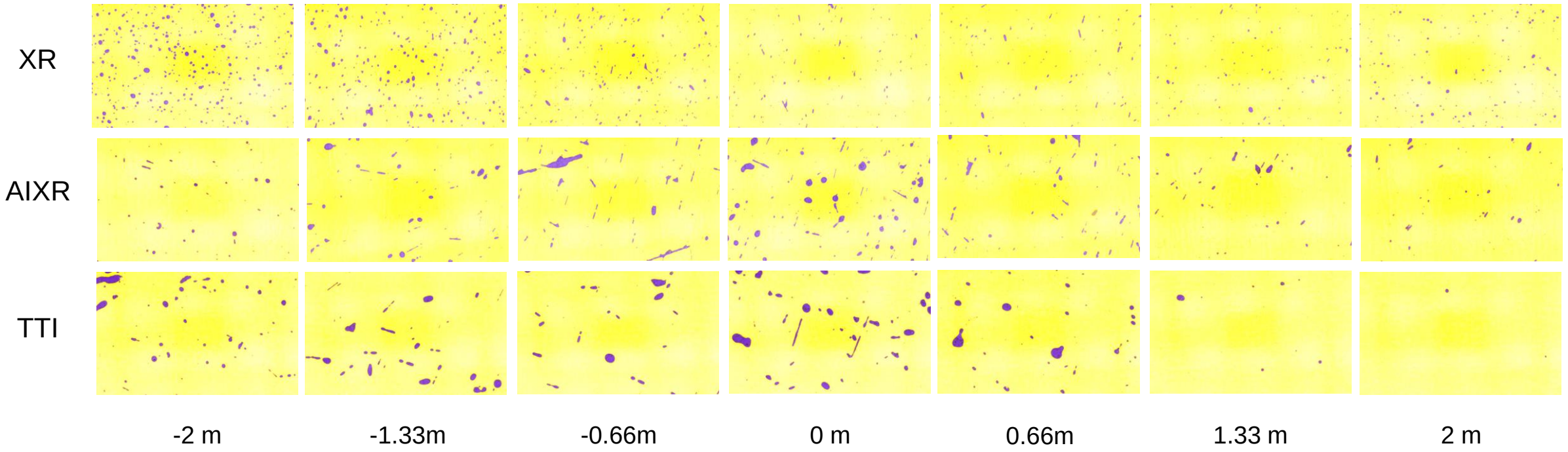
- Water sensitive paper (WSP) placed at 0.3 m increments across the swath
- Each pass represented a single replication of the selected treatment combination (i.e. speed x height x nozzle type)
- Each treatment was replicated three times
- Meteorological data collected using Davis Instruments 6250 (wind speed, temperature and humidity)

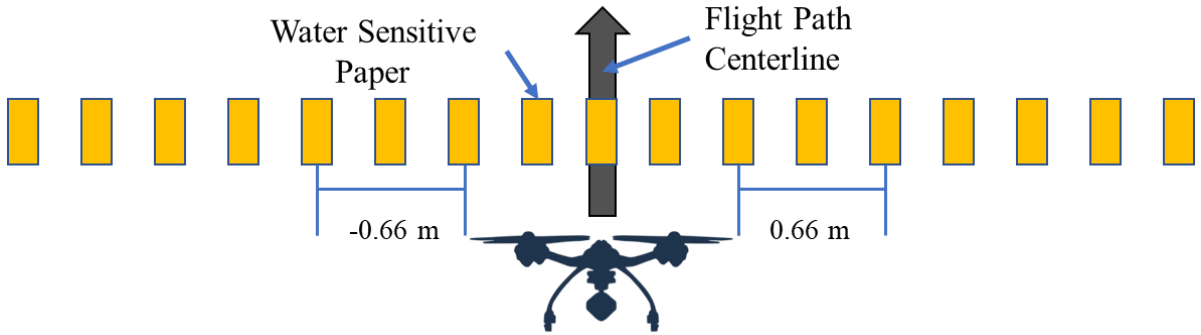
Data Analysis

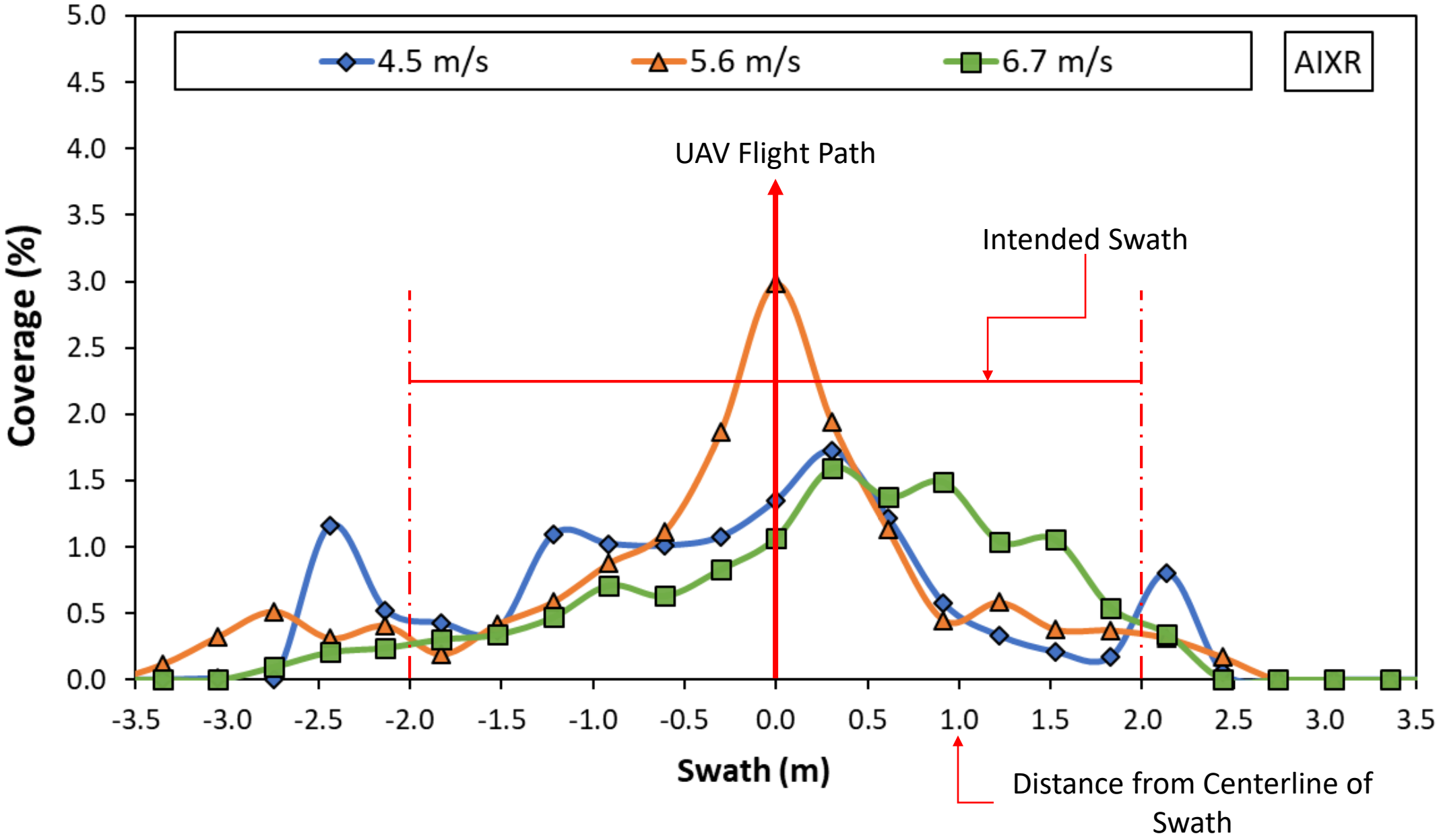
- WSP collected after each pass and analyzed using the SprayX Dropscope instrument
- Spray coverage value by location for each pass was extracted from raw data
- Coverage values were averaged across the swath based on their location for all three replications
- Mean coverage and CV (%) computed for each treatment

Results

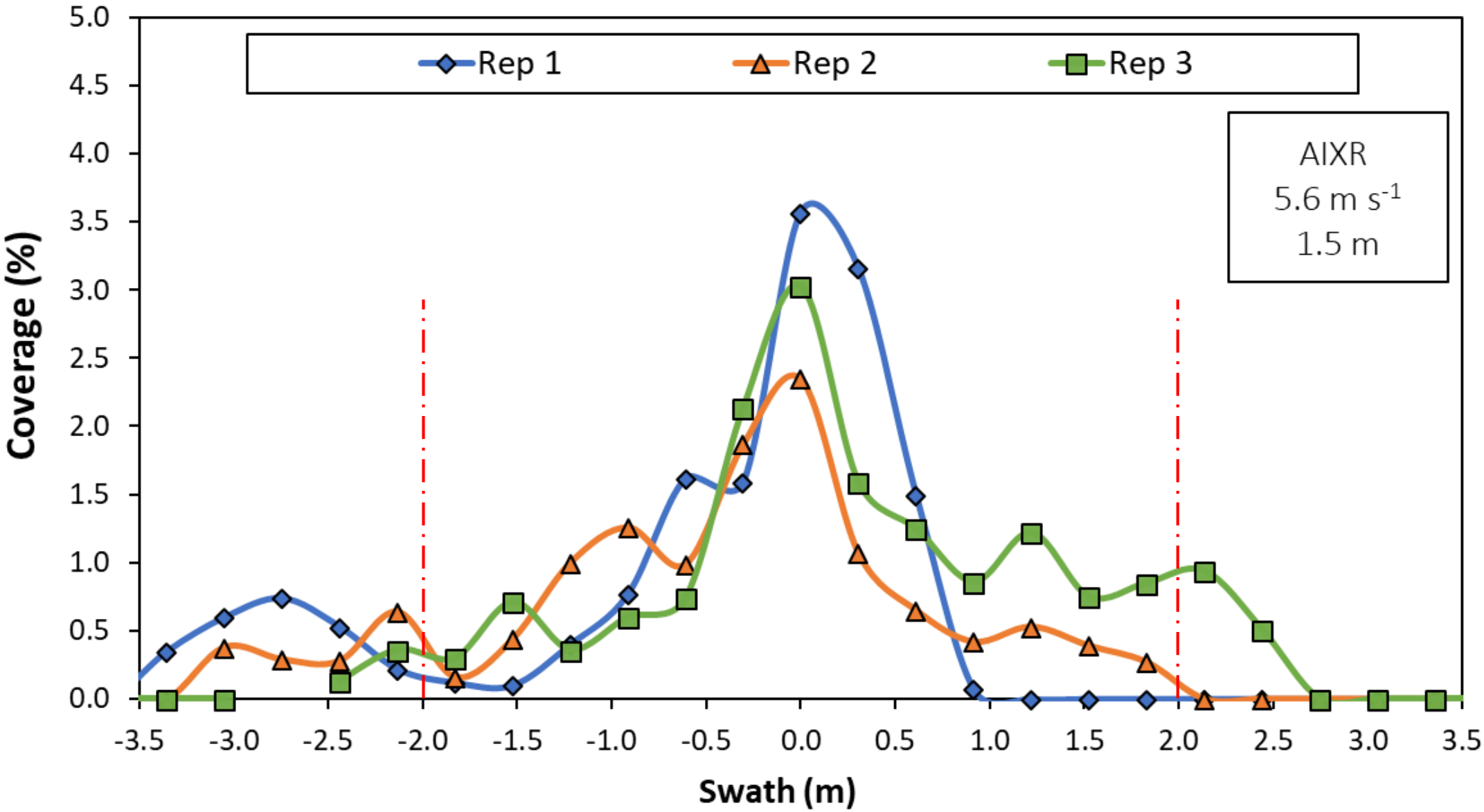
Spray Height = 2.3 m





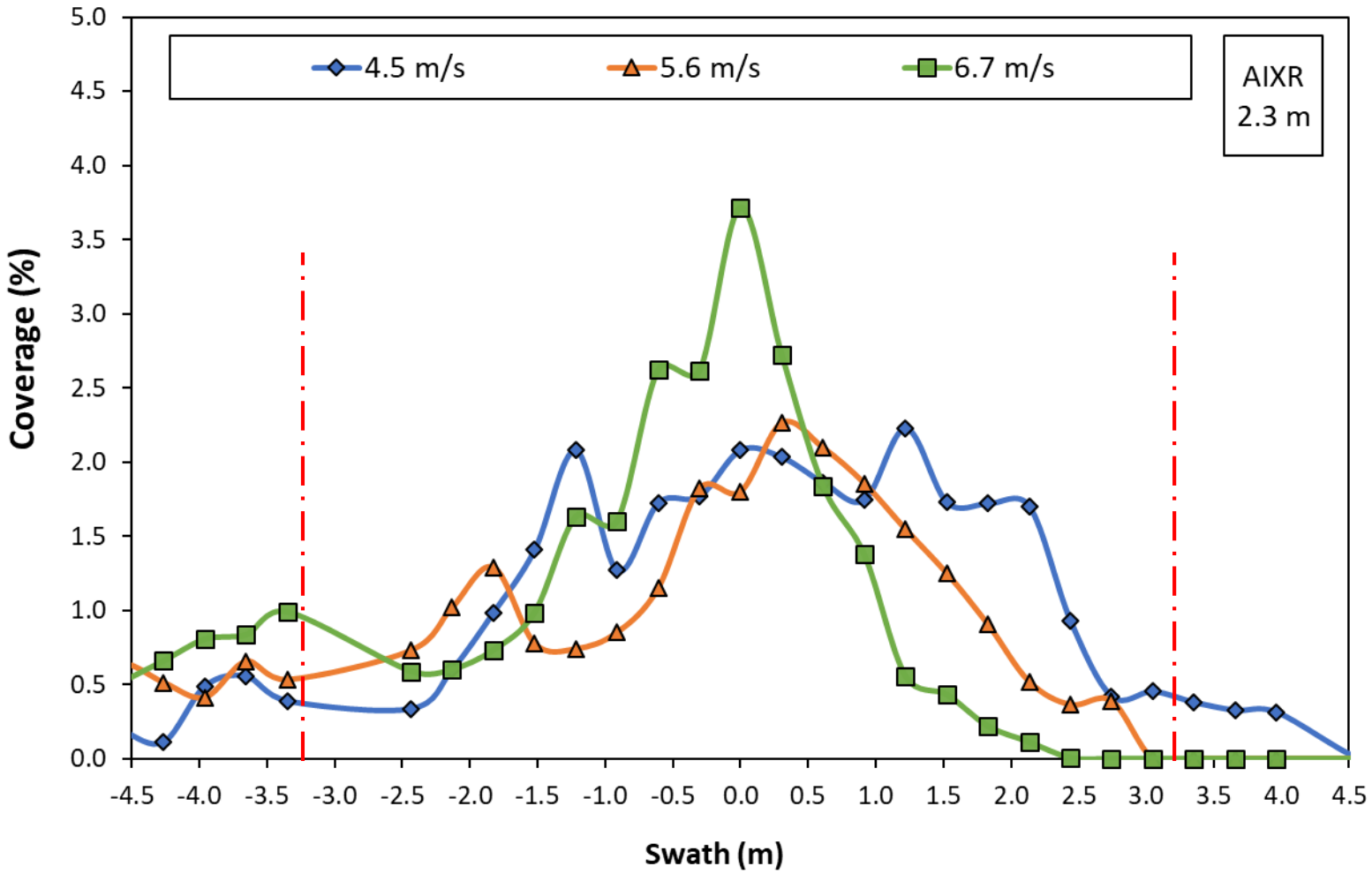

4.5 m/s
5.6 m/s
6.7 m/s
AIXR
UAV Flight Path
Intended Swath
Coverage (%)
Swath (m)
Distance from Centerline of Swath
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-3.5
-3.0
-2.5
-2.0
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5

Nozzle – AIXR, Flight Speed – 5.6 m/s, Height – 1.5 m



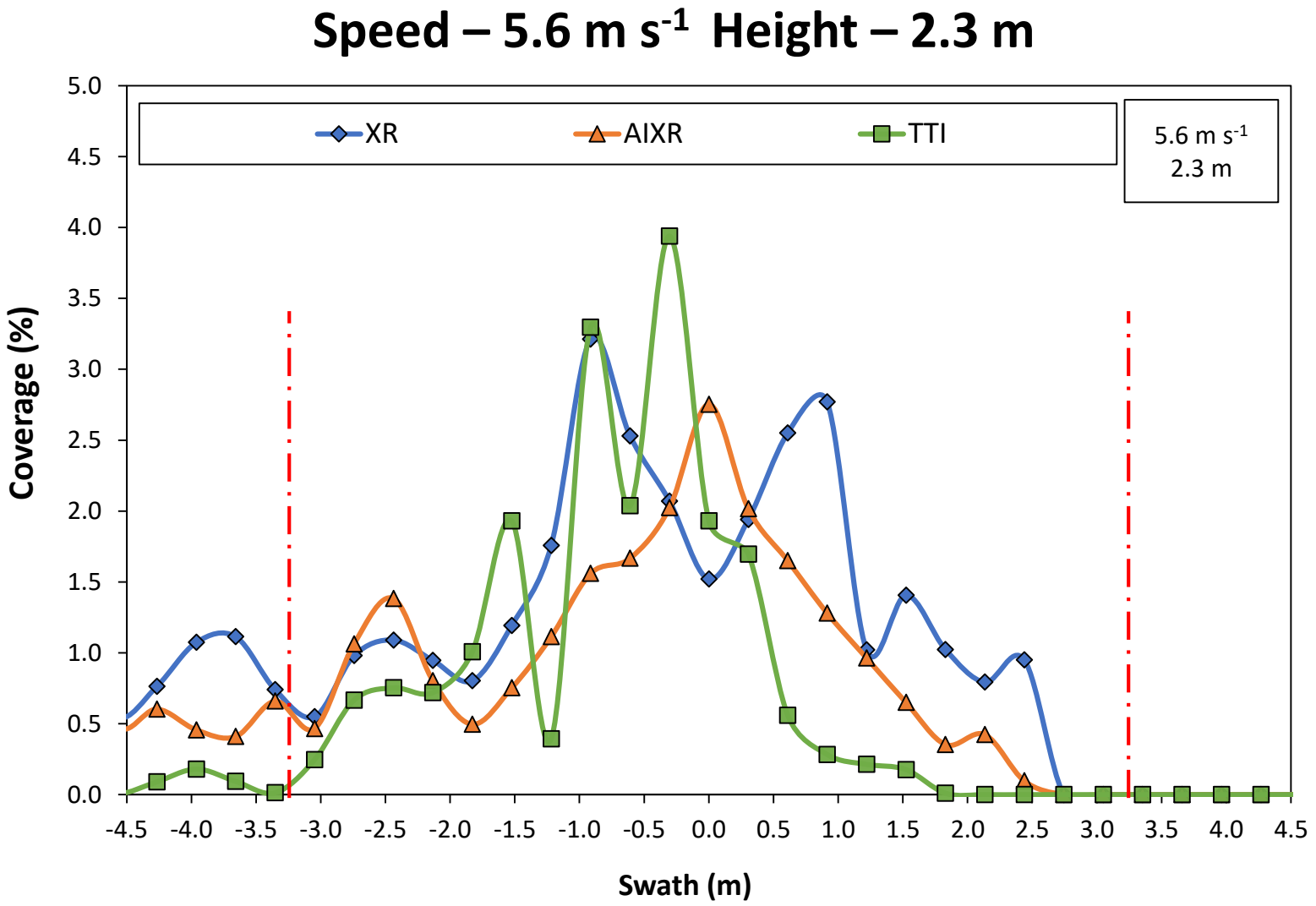
Effect of Flight Speed

Nozzle – AIXR, Flight Height – 2.3 m



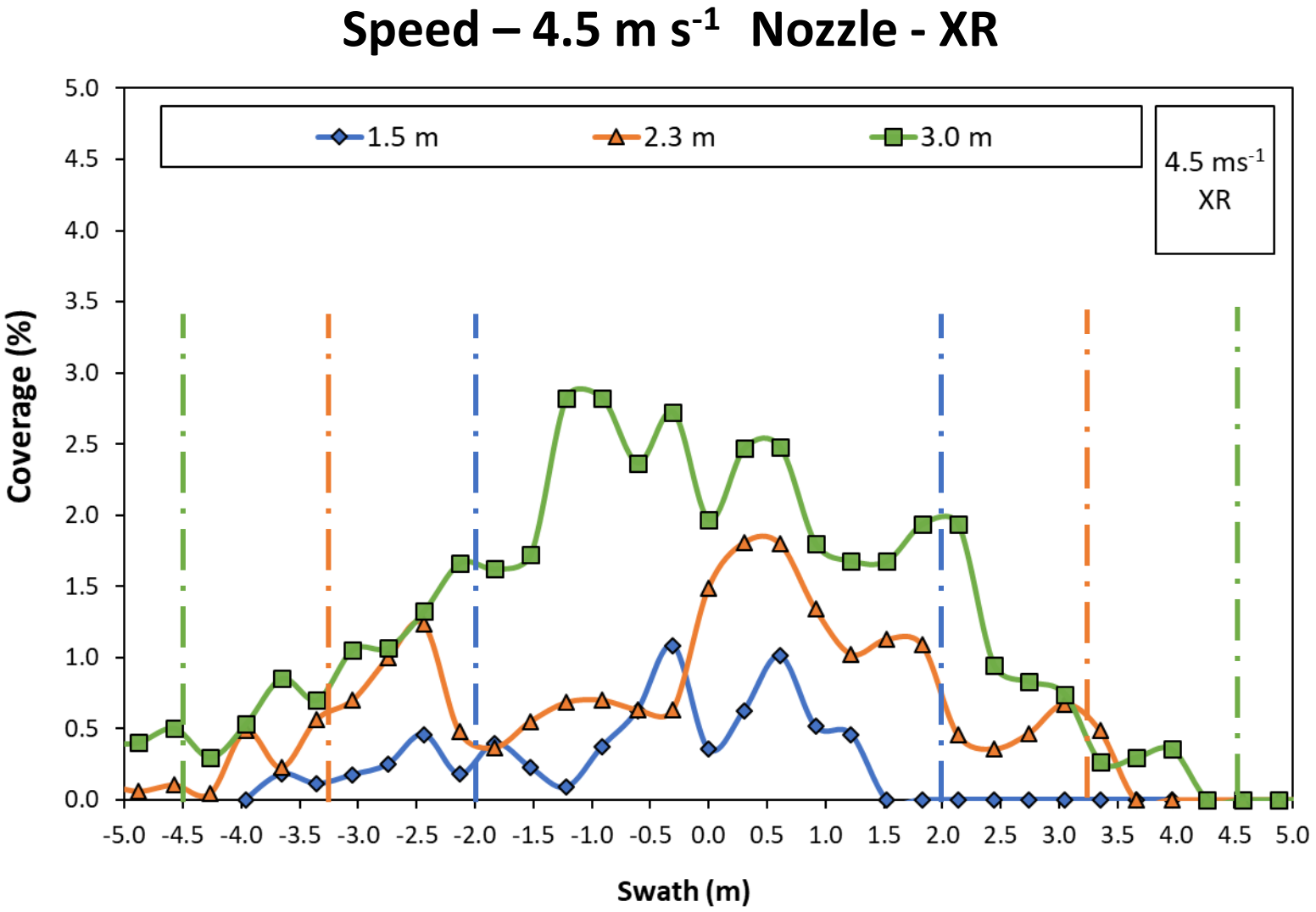
Speed	Mean Coverage (%)	CV (%)
4.5 m/s	1.33	50.22
5.6 m/s	1.04	63.31
6.7 m/s	1.11	96.88

Effect of Nozzle Selection



Nozzle	Mean Coverage (%)	CV (%)
XR	1.421	57.782
AIXR	1.043	63.313
TTI	0.946	118.828

Effect of Application Height



Height	Mean Coverage (%)	CV (%)
1.5	0.828	83.116
2.3	0.881	50.997
3	1.428	57.399

Conclusions

- Less than 5% coverage across all tested treatments.
- AIXR and TTI have (on average) higher coverage values but also a larger CV as compared to XR nozzles.
- Increase in height (swath) tended to cause an increase in coverage across the swath due to more nozzles coming on to maintain the target application rate.
- Flight speed had little effect on total coverage across all tested speeds, with the T30 maintaining a coverage near 1% on average at 2 GPA.
- Further research – Need to investigate performance of other newer models and compare performances to determine best application practices.

Thanks!

Cole Byers

Coleman.Byers@uga.edu

Graduate Research Assistant
College of Engineering
University of Georgia
Tifton, GA

Twitter: @ENGRTechCole
https://agtechdata.uga.edu/