Aerial Application Methods for Increasing Spray Deposition on Wheat Heads

Prepared for Presentation at

2005 ASABE/NAAA Technical Session

by

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Background

- Research initiated in response to national need on part of U.S. Wheat and Barley Scab Initiative (USWBSI) for control of Fusarium Head Blight
  - 2 years of funded research
  - 3rd year unfunded follow-up effort
- Year 1:
  - Rotary atomizers vs. conventional hydraulic nozzles.
- Year 2:
  - Conventional hydraulic nozzles (CP-03s) at 3 rates (2, 5, 10 gpa) and 2 droplet sizes (175 and 350 µm)

Previous Years' Results: Summary

- Year 1 (College Station, TX)
  - Maximum deposition
    - Rotary atomizers at 5 gpa and 240 µm
  - 2nd Maximum deposition
    - CP-03s at 2 & 10 gpa and 250 µm
  - Multi-directional spraying did not result in total coverage (upwind and downwind sides)
- Year 2 (North Dakota and Minnesota)
  - Maximum deposition
    - 2 & 5 gpa and 350 µm
  - No efficacy data of significance as a results of minimal Fusarium outbreak in fields of interest

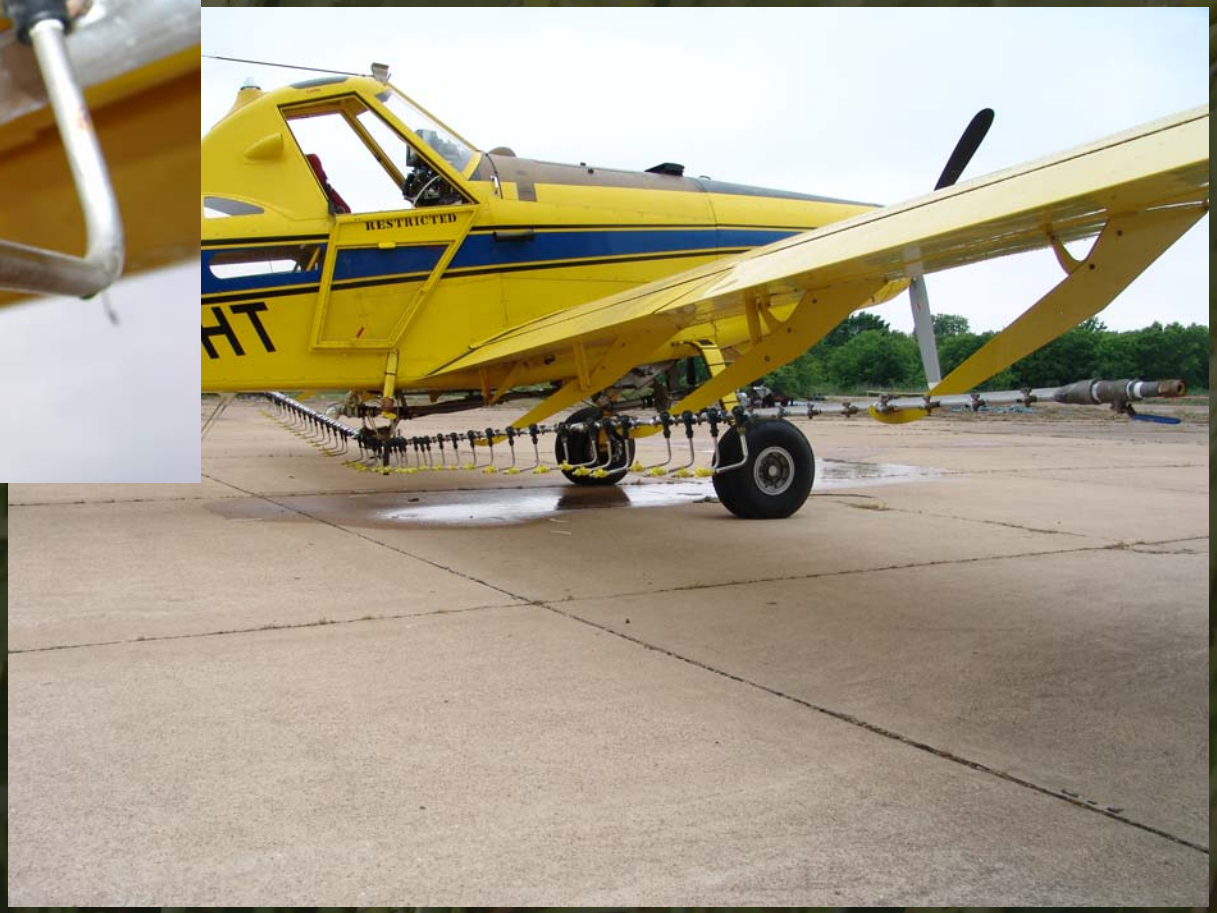
2005 Study Treatments

- ASC Rotary Atomizers (RA)
  - 2 gpa and 175 µm
- Spectrum Electrostatics (ES)
  - 1 gpa and 150 µm
- CP-03 nozzles
  - 2 gpa and 175 µm (LVF)
  - 5 gpa and 175 µm (HVF)
  - 2 gpa and 350 µm (LMD)
  - 5 gpa and 350 µm (HMD)

Wheat Study Booms
Rotary Atomizers

Wheat Study Booms
Spectrum Electrostatics

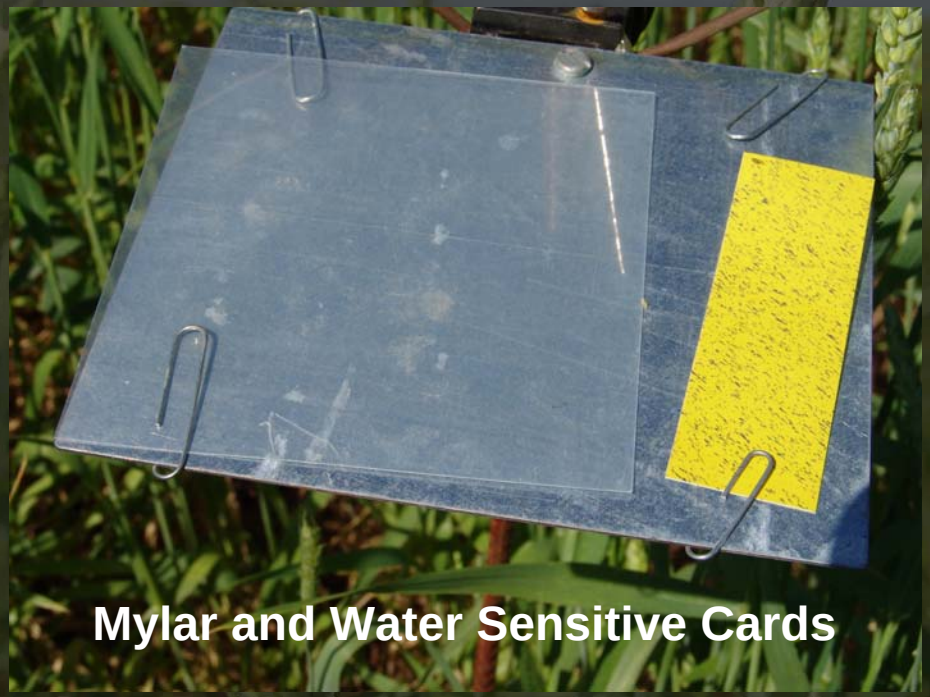
Wheat Study Booms
CP Nozzles



Field Study

- Wheat field near College Station, TX
  - Each of the 6 treatments replicated 3 times
  - Plots were 5 swaths wide and approx. 1250’ long (~ 4 acres)
- Spray solution of water, surfactant Triton X-100, and fluorescent tracer
- Samples collected
  - Wheat heads
  - Mylar cards
  - Water sensitive paper
  - Wheat heads for fluorescent photographs

Wheat Study Samples



Mylar and Water Sensitive Cards

Wheat Heads

Results

- Water Sensitive Cards
  - All measured droplet sizes smaller than targeted
    - Expected
- Mylar Samplers (standard sampler for comparisons with previous studies)
  - Greatest deposition from MEDIUM spray treatments followed by VERY FINE spray treatments followed by Rotary Atomizers then by Electrostatics
    - Expected
      - Larger droplets more efficiently collected on flat surface than smaller droplets

LMD HMD LVF HVF RA ES

Results

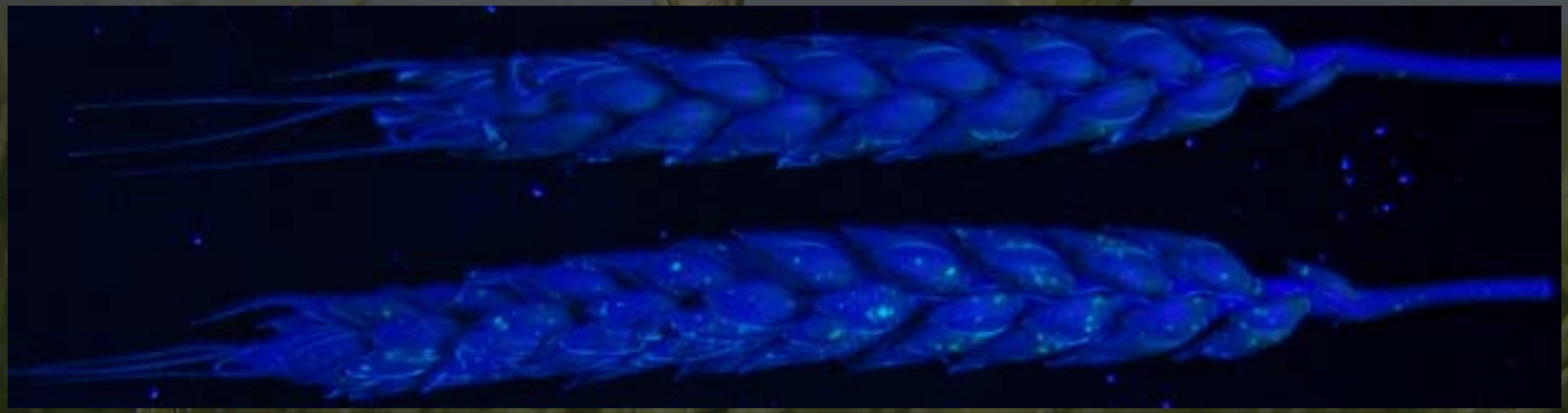
- Wheat Heads
  - Greatest deposition from CP-03 at 2 gpa and 350 µm (LMD) followed by Electrostatics.
    - Greatest deposition from CP-03 at 2 gpa and 350 µm mirrors results from 2004 work.
  - Rotary Atomizers provided minimum deposition on wheat heads.

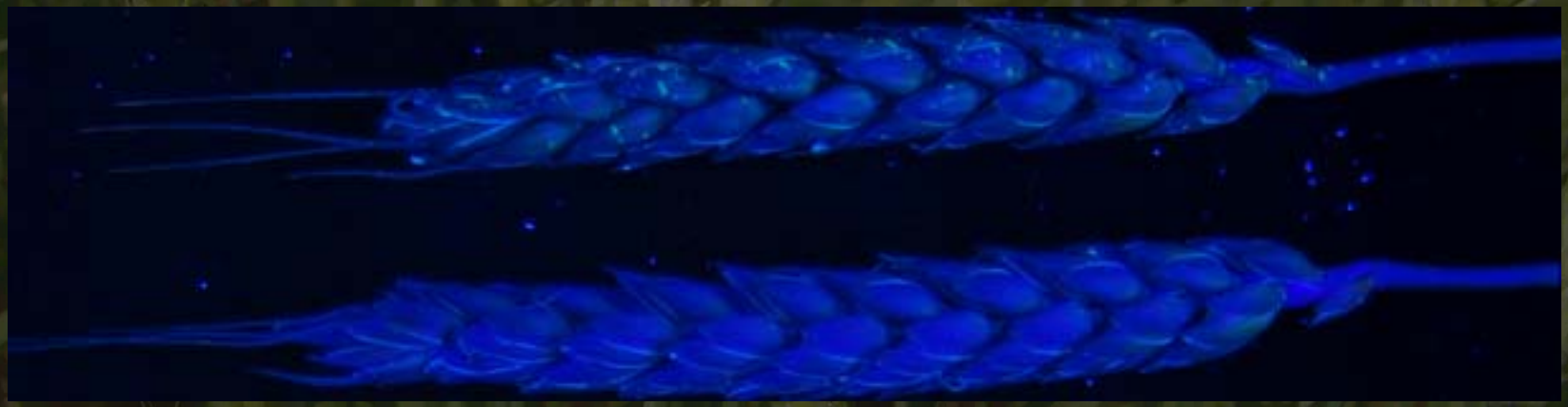
LMD ES LVF HVF HMD RA

Fluorescent Photography

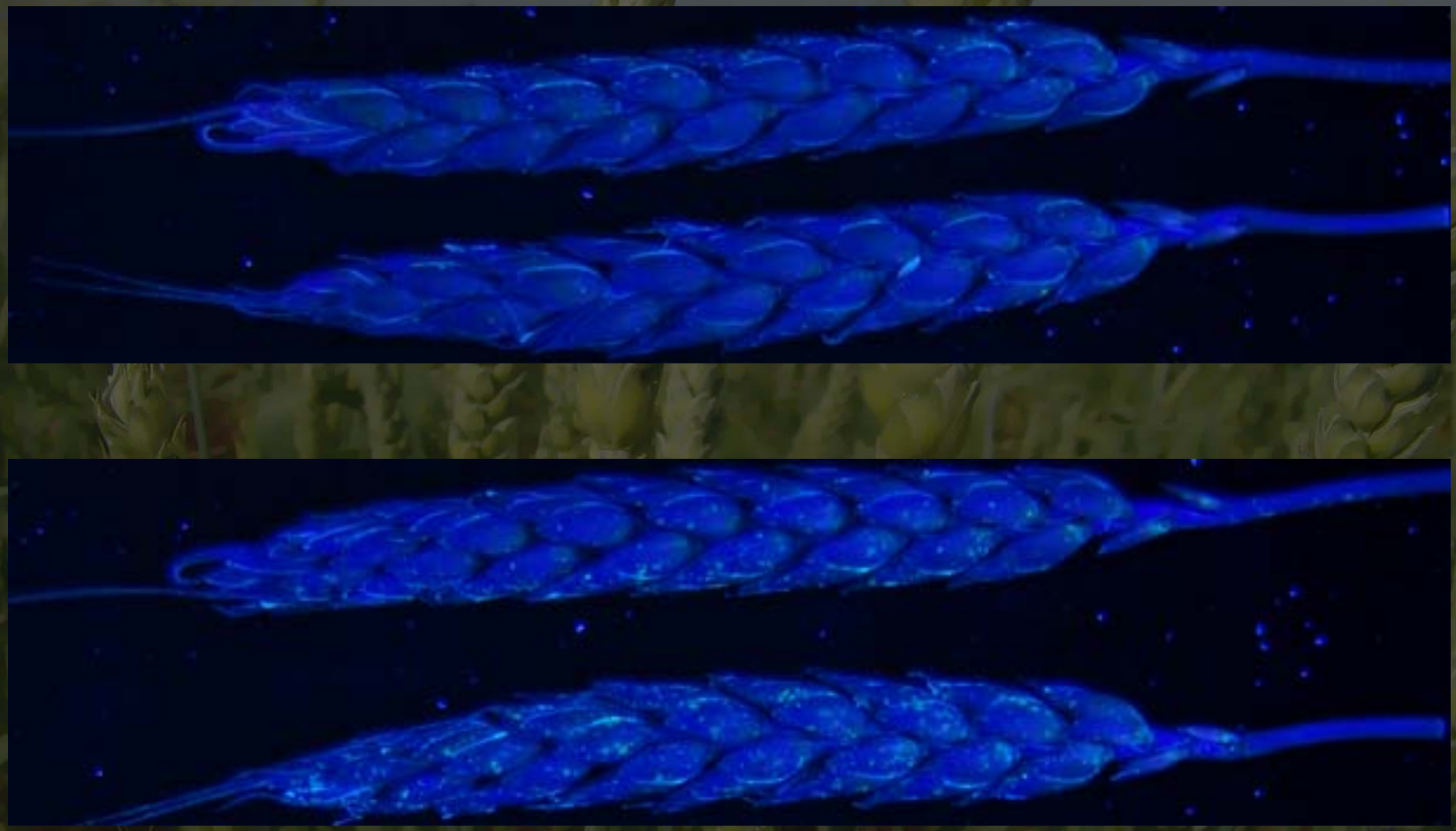
- Taken from randomly selected wheat heads within each treatment plot
- Used for a visual assessment of deposition
- Photo taken from 2 opposing sides (A & B)

Rotary Atomizers

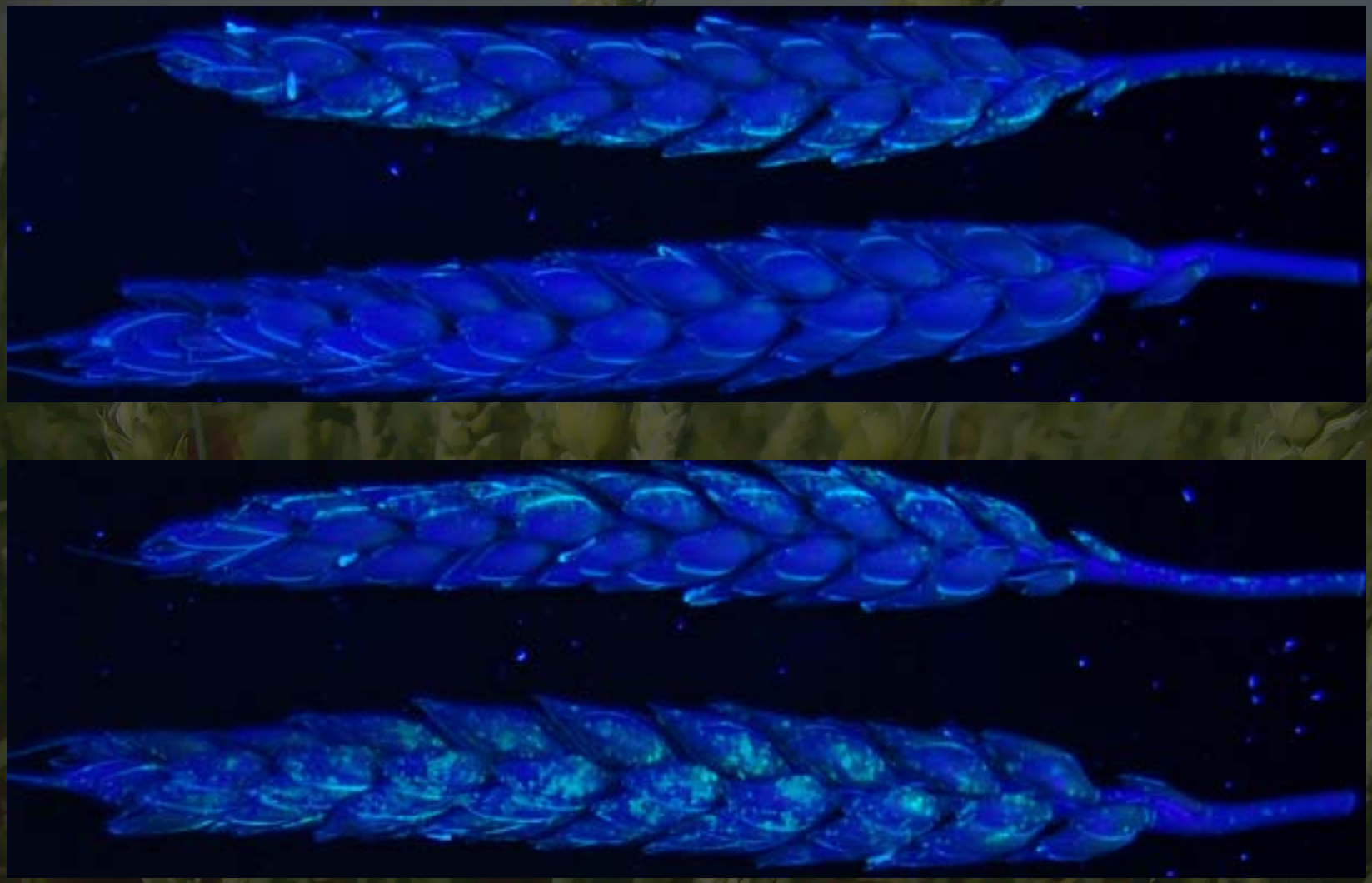




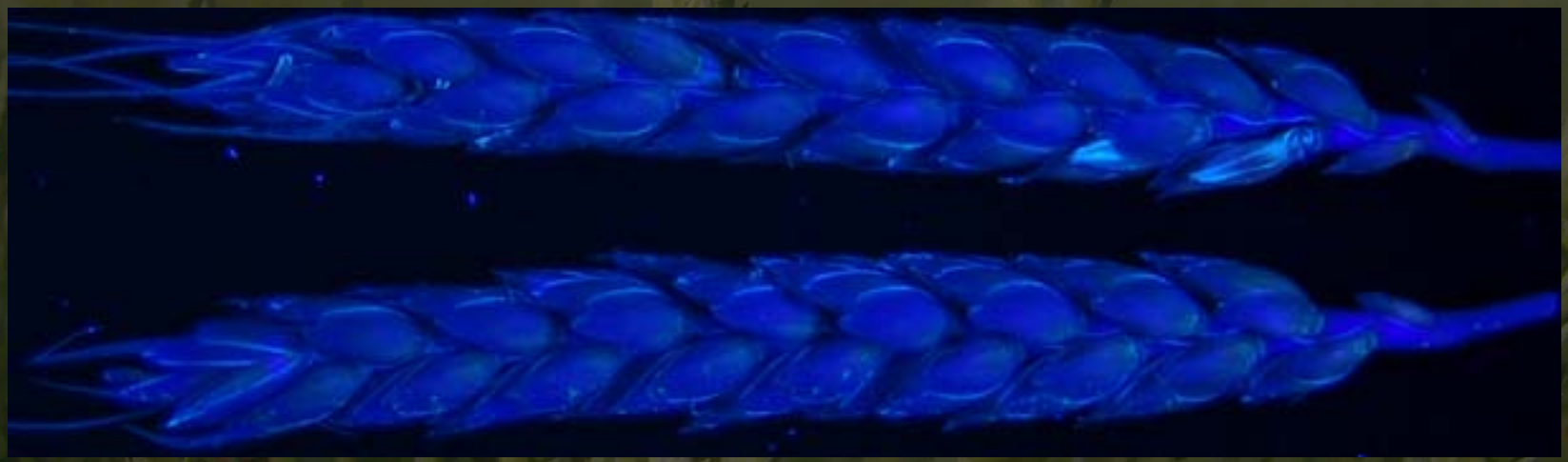
Electrostatics

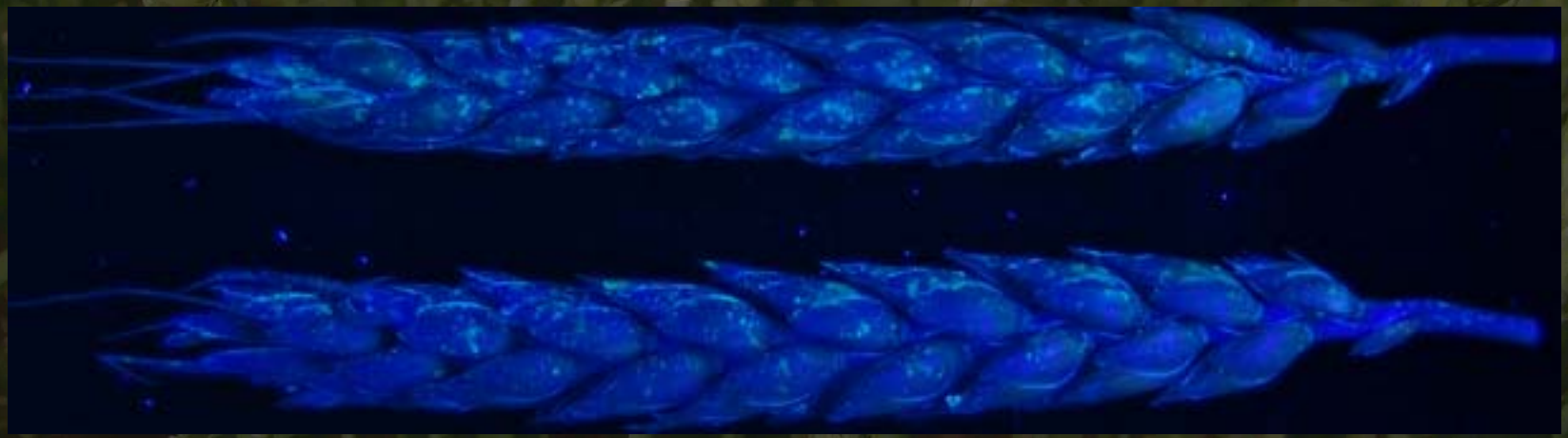


CP-03 at 2 gpa and 175 µm

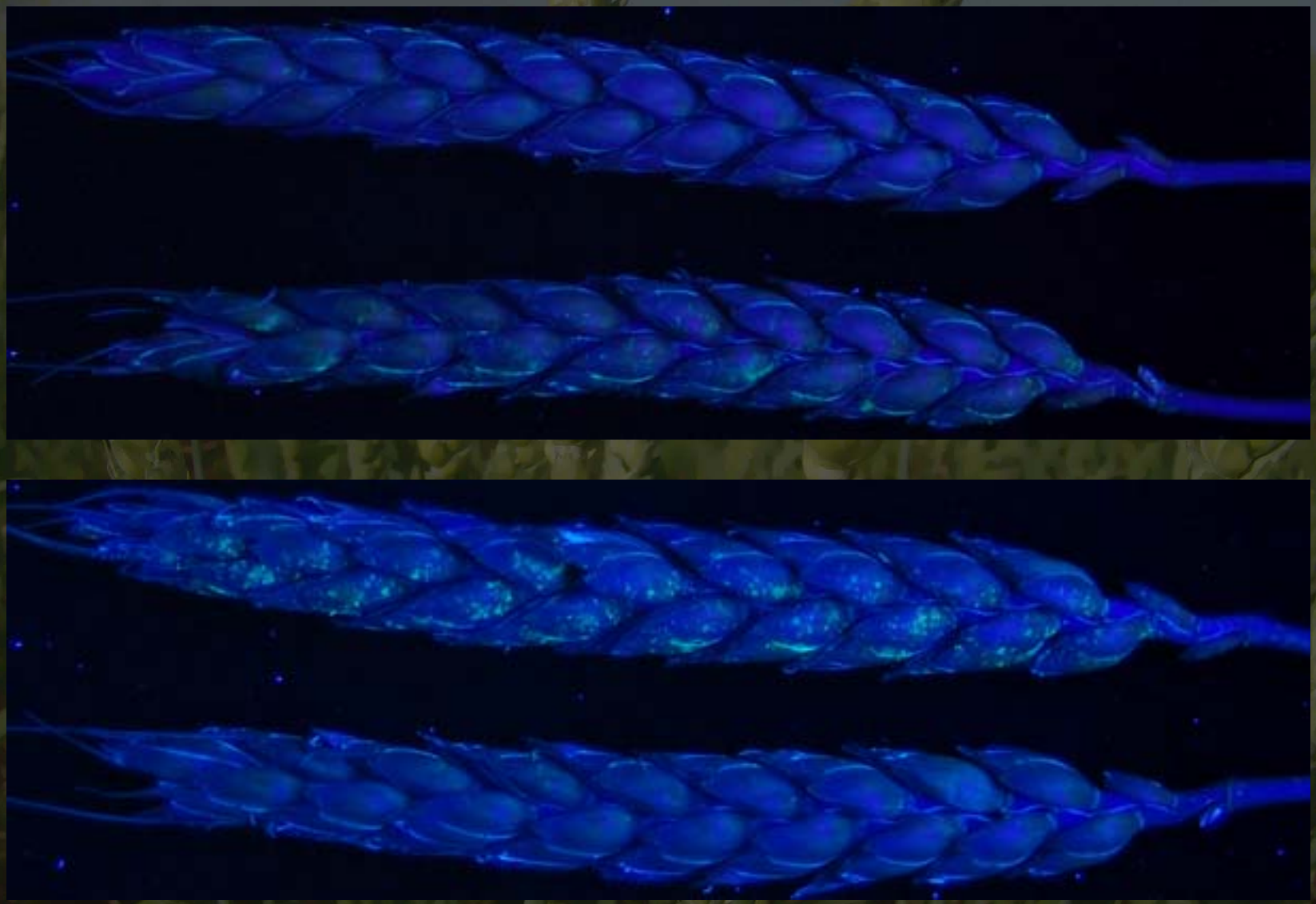


CP-03 at 5 gpa and 175 µm

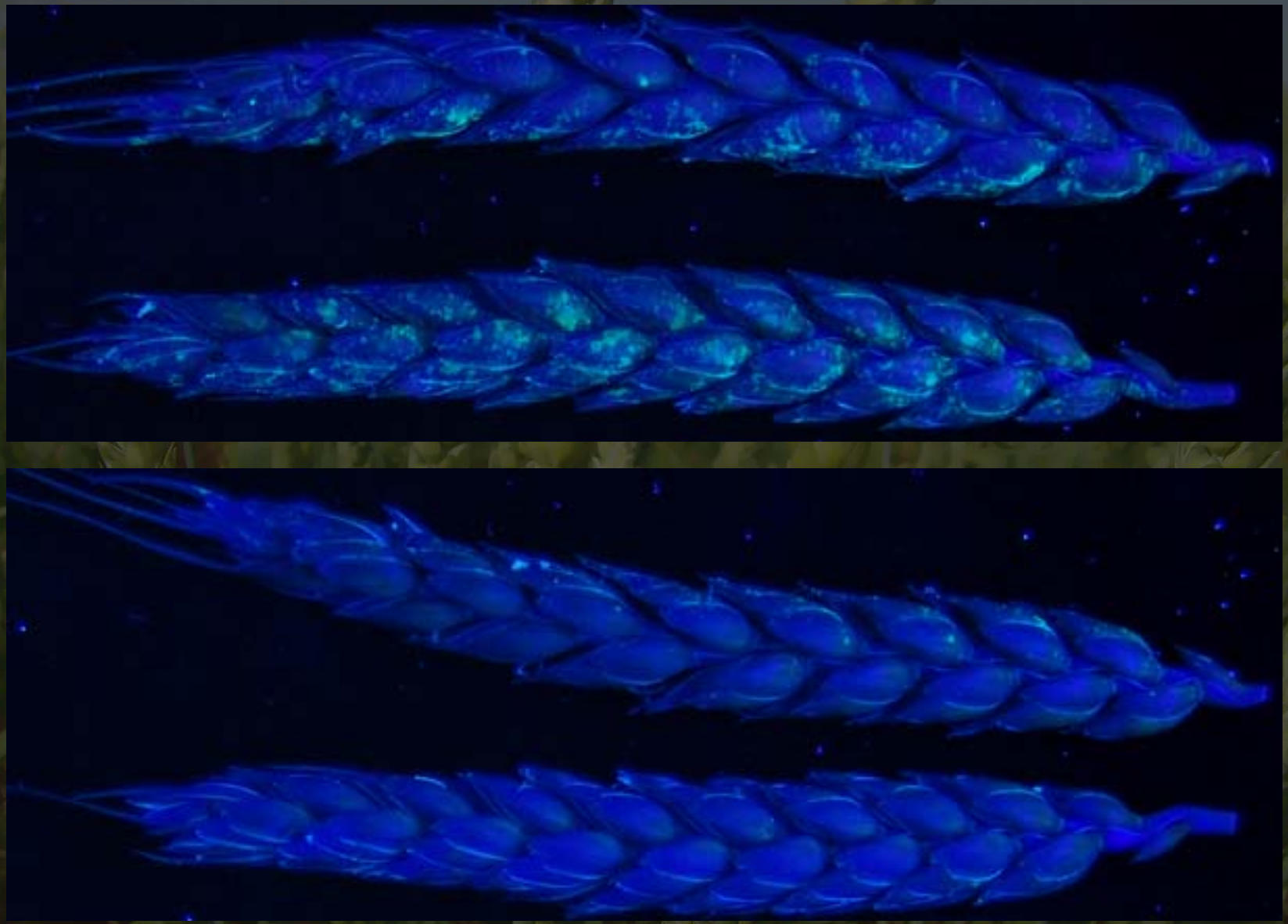




CP-03 at 2 gpa and 350 µm



CP-03 at 5 gpa and 350 µm



Fluorescent Photography

- Spray only deposited on one side of wheat head (agrees with 2003 study)
  - Side facing into wind
  - Multi-pass spraying does not help (2003 study)
- Increased coverage amounts do not necessarily correlate to increased amount of active ingredient on target
  - Higher spray rate somewhat increased or equaled coverage as compared to low spray rates, but greater concentration of dye in low rate spray resulted in greater dye deposition per area amounts
- Large variability in spray deposition from wheat head to wheat within same treatment plot
- All of this information could be beneficial is a dose response is known for a particular product

Conclusions

- Highest deposition amounts on wheat heads
  - CP-03 at 2 gpa and 350 µm (Same as 2004 study)
  - Electrostatics at 1 gpa and 150 µm
    - Lower spray rates mean greater efficiency
- Target dependent
  - Other in-house studies on different targets using same treatment set-ups yielded different optimal treatments
  - This study did not look at efficacy
    - Optimal coverage and deposition amounts may vary between different products and targeted pests.

Thank you

- On behalf of College Station USDA-ARS Aerial Application Research Group
  - THANK YOU for your continued support
  - Feel free to contact us