Preliminary Evaluations of Low Volume Headline Application Technology

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BASF Corporation

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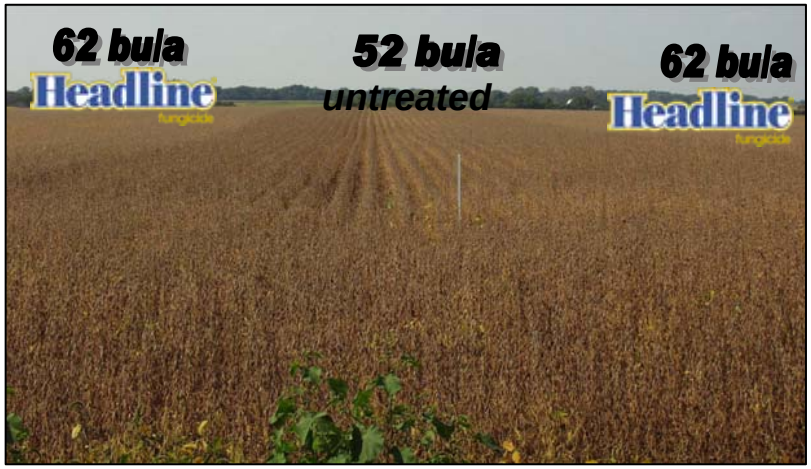
Headline® Fungicide
Disease Control, Plant Health, Yield



Syngenta Quilt

NC + 4250R
Quilt Yield
218 bu/A

Headline® fungicide

NC + 4250R
Headline Yield
237 bu/A

Zoss Farms
Lowpoint, IL

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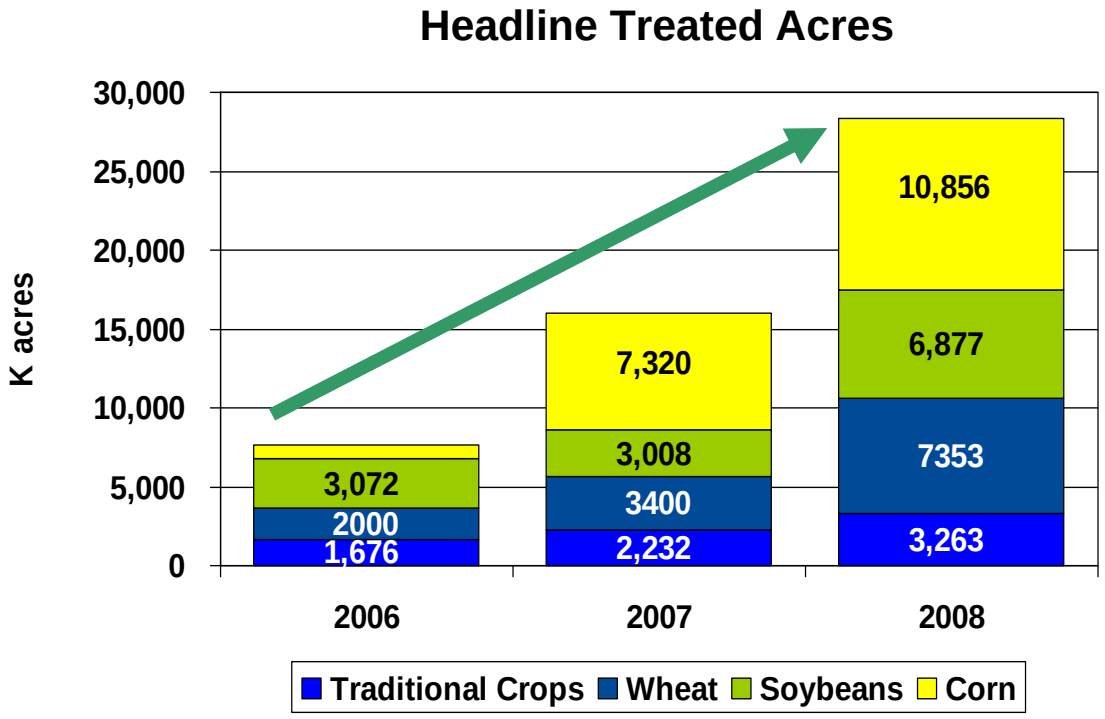
Continued Success with Headline in 2008



- **Significant growth in all markets**
- **Another season of substantial yield increases**
- **Further establishment of Headline as the Leader in Disease Control and Plant Health**

Headline® fungicide

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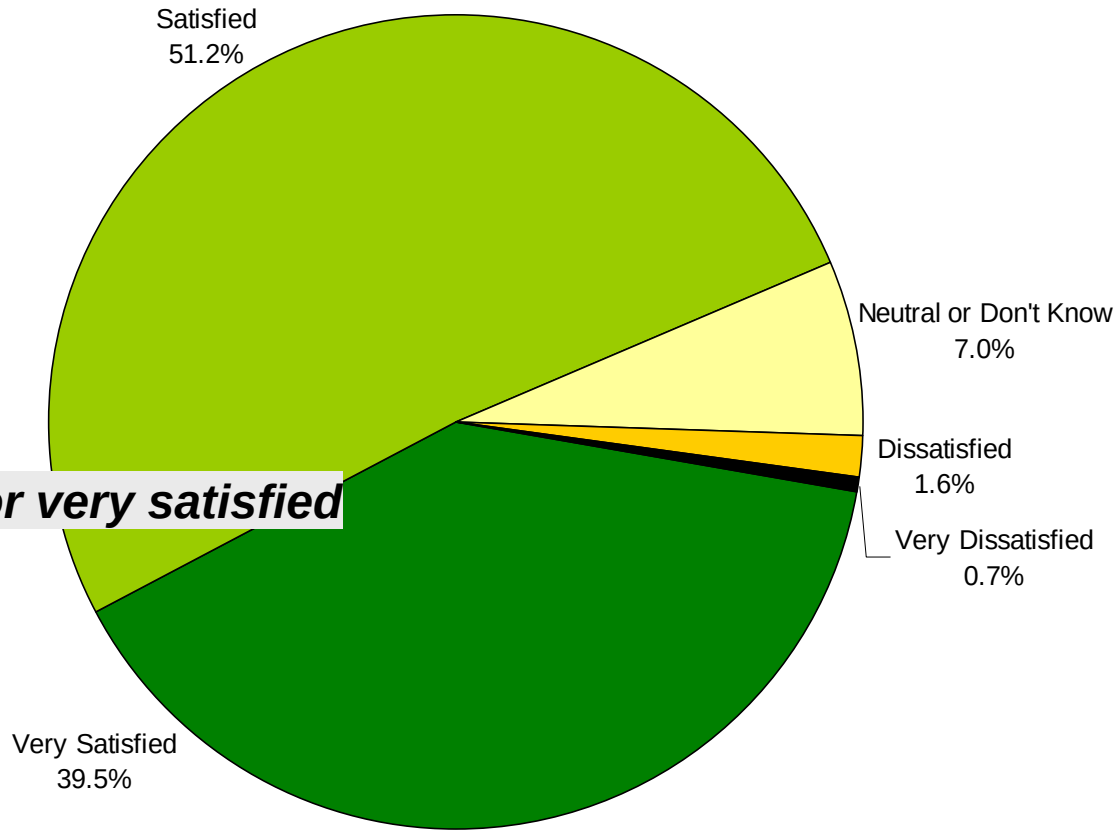
Satisfaction with Aerial Applicators



91% satisfied or very satisfied

n = 441

Source: 2008 Stratus Agrimarketing

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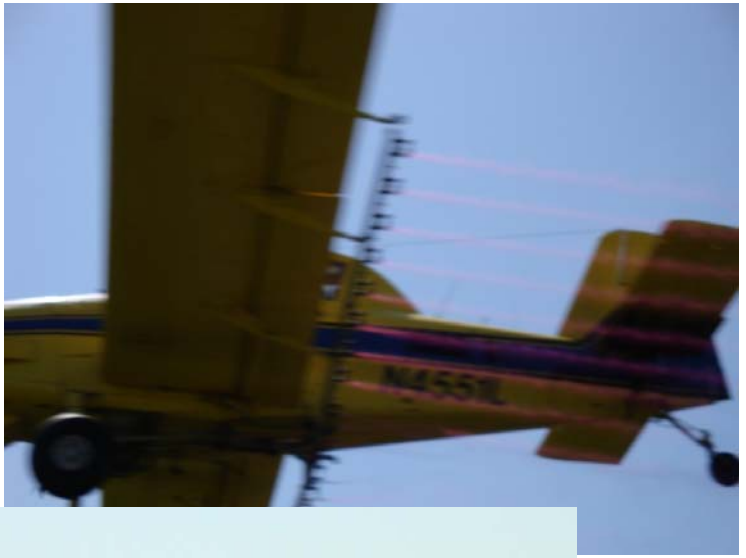
Application Technology Goals

- **Stewardship of BASF Plant Health products**
  - **Minimize off-target**
  - **Maximize efficacy**
- **Help our customers be more successful**
  - **Greater efficiency**
    - **Time**
    - **Fuel**
    - **Wear and tear**
  - **More acres**
  - **Satisfied growers**



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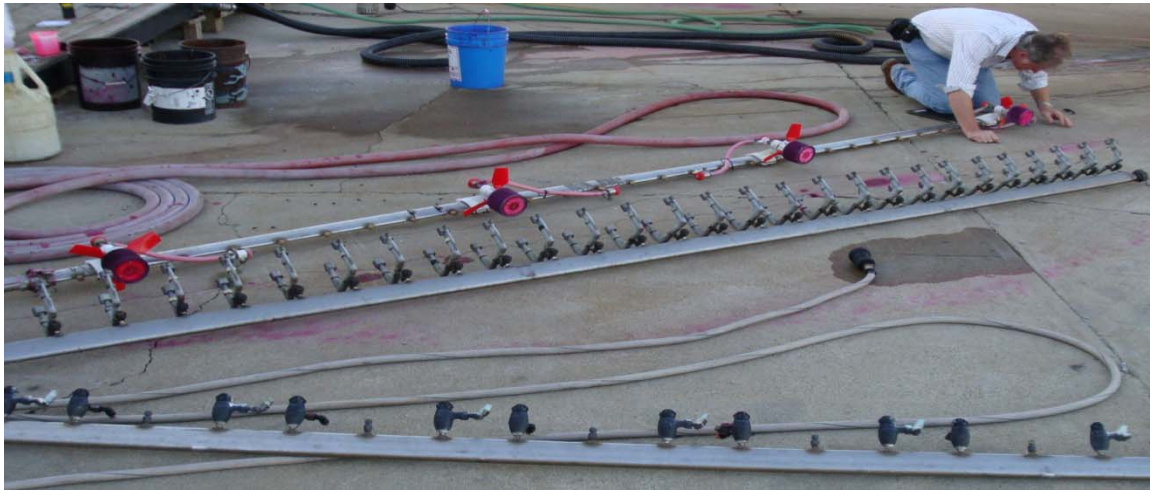
Materials and Methods

- 3 Application Methodologies
  - Conventional nozzles (C)
  - Rotary Atomizers (RA)
  - Electrostatic (ES) where possible
- 2 volumes
  - 2 gpa
  - 1 gpa
- 8 locations
- 3 crops
  - Corn
  - Wheat
  - Soybeans
- Headline at 6 oz/Acre w/ Superb HC at 2 pints/100 gal

Headline® fungicide

Headline at 1 gpa is not labeled; required studies not yet submitted to EPA.



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Materials and Methods

- Evaluations
  - Spray droplet collection using water sensitive cards
  - Spray deposition
    - Quantified using Stainmaster 1.0.9
  - Spray drift
  - Efficacy, yield as possible

- Study “Director” Alan McCracken
  - Calibration
  - Organization
  - Reduce variability

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Results - General

- Deposition/Coverage
  - All systems provided adequate coverage at 1 gpa *with proper calibration and system set-up*
  - Optimum coverage was dependent on uniform droplet size
- Droplet size
  - Droplet size in the range of 100 to 300 *μ* was achieved with each system
  - Larger and less uniform droplet size was more likely at 2 gpa
- Spray drift
  - Drift was adequately controlled at 1 gpa and equal to 2 gpa conventional applications
    - Reducing droplet of < 100 *μ* was key to drift management

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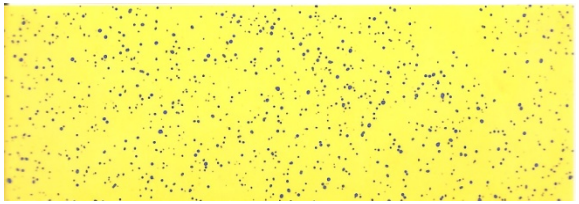
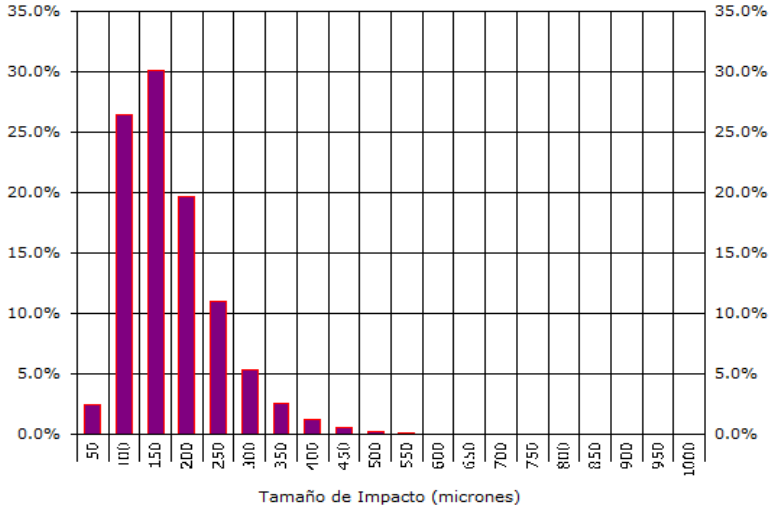
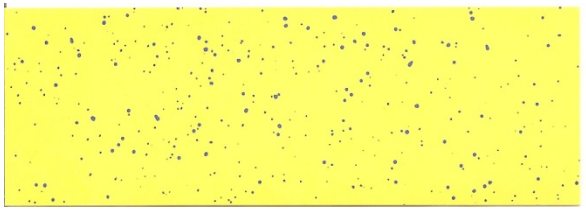
Research Results: Reed Aviation, LA

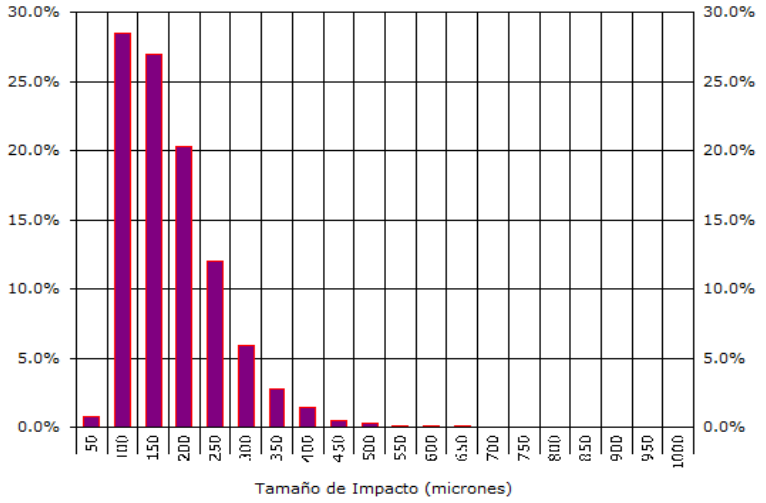
"C" droplet distribution (NMD) 1 gpa





"C" droplet distribution (NMD) 2 gpa





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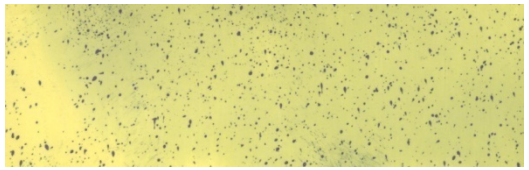
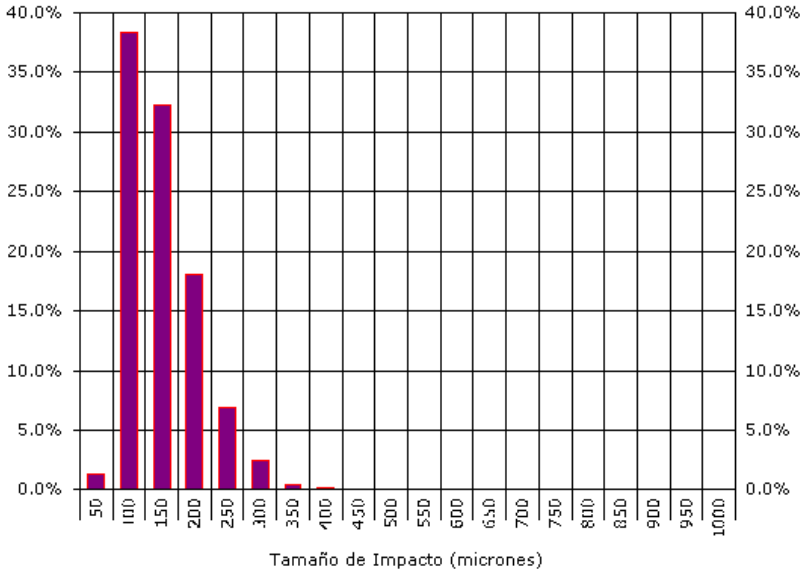
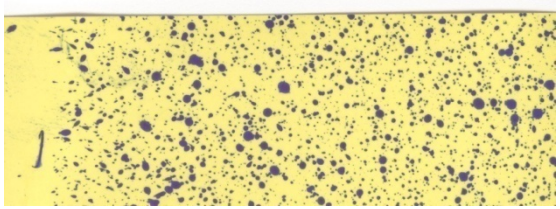
Research Results: Max Birney, KS

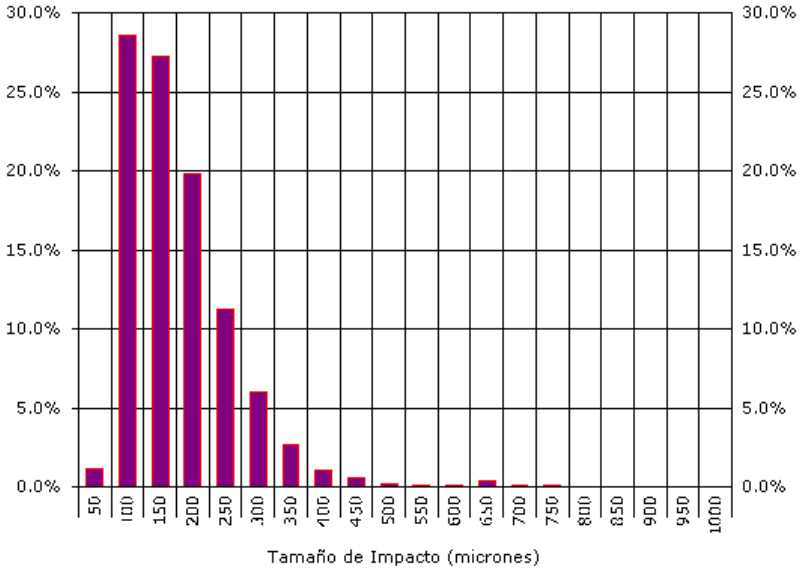
RA droplet distribution (NMD) 1 gpa





"C"droplet distribution (NMD) 1 gpa





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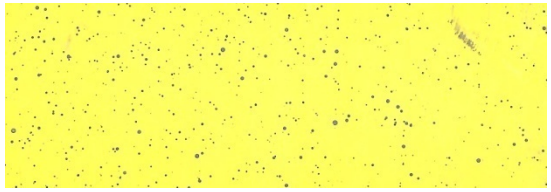
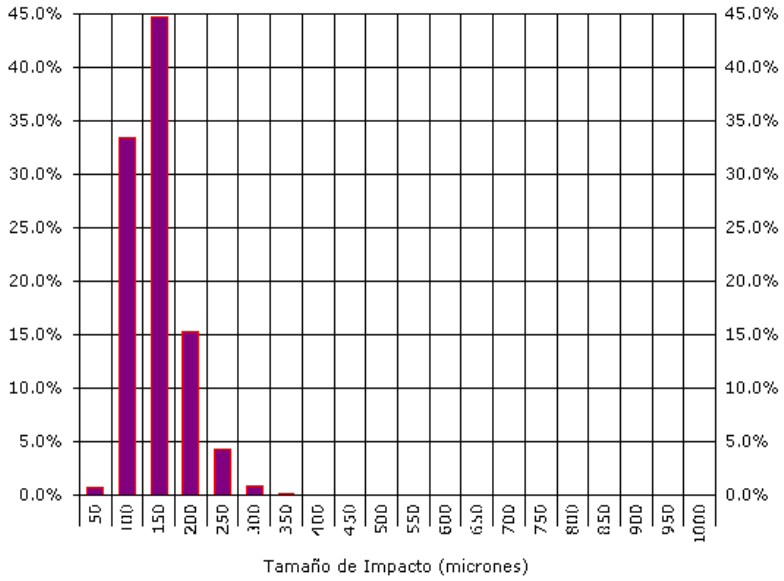
Research Results: Wakarusa, IN

(ES) droplet distribution (NMD) 1 gpa





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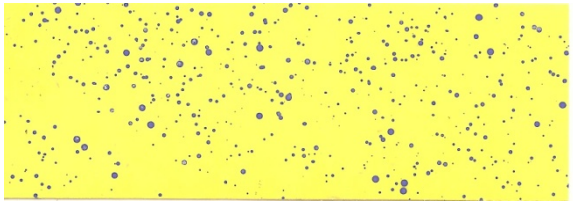

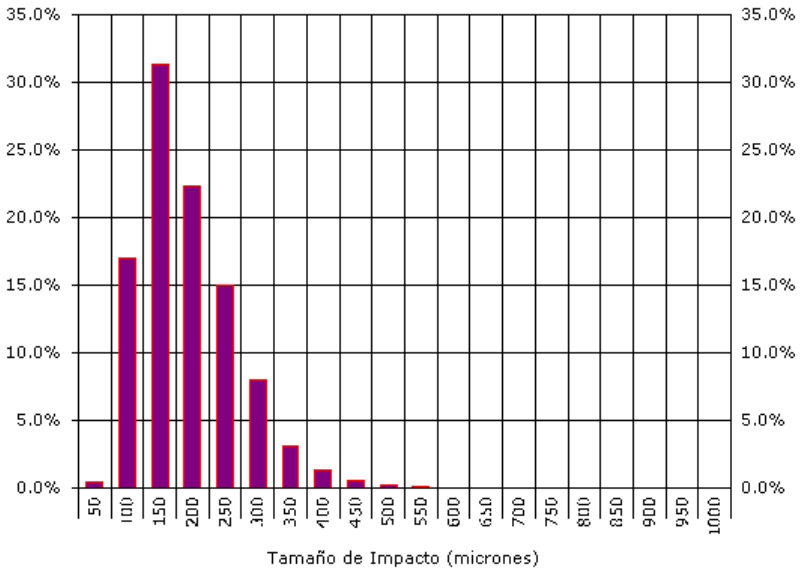

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Research Results: Yield

- Wheat in Kansas
  - No differences among application, volume types
- Soybeans in Mississippi
  - 10 bu/A increase with Headline
    - – No differences among application volume, type
- Corn in Mississippi
  - 40 to 55 bu/A increase with Headline compared to untreated
- Corn in Illinois
  - 50 bu/A yield increase with Headline
    - – No differences among application volume, type

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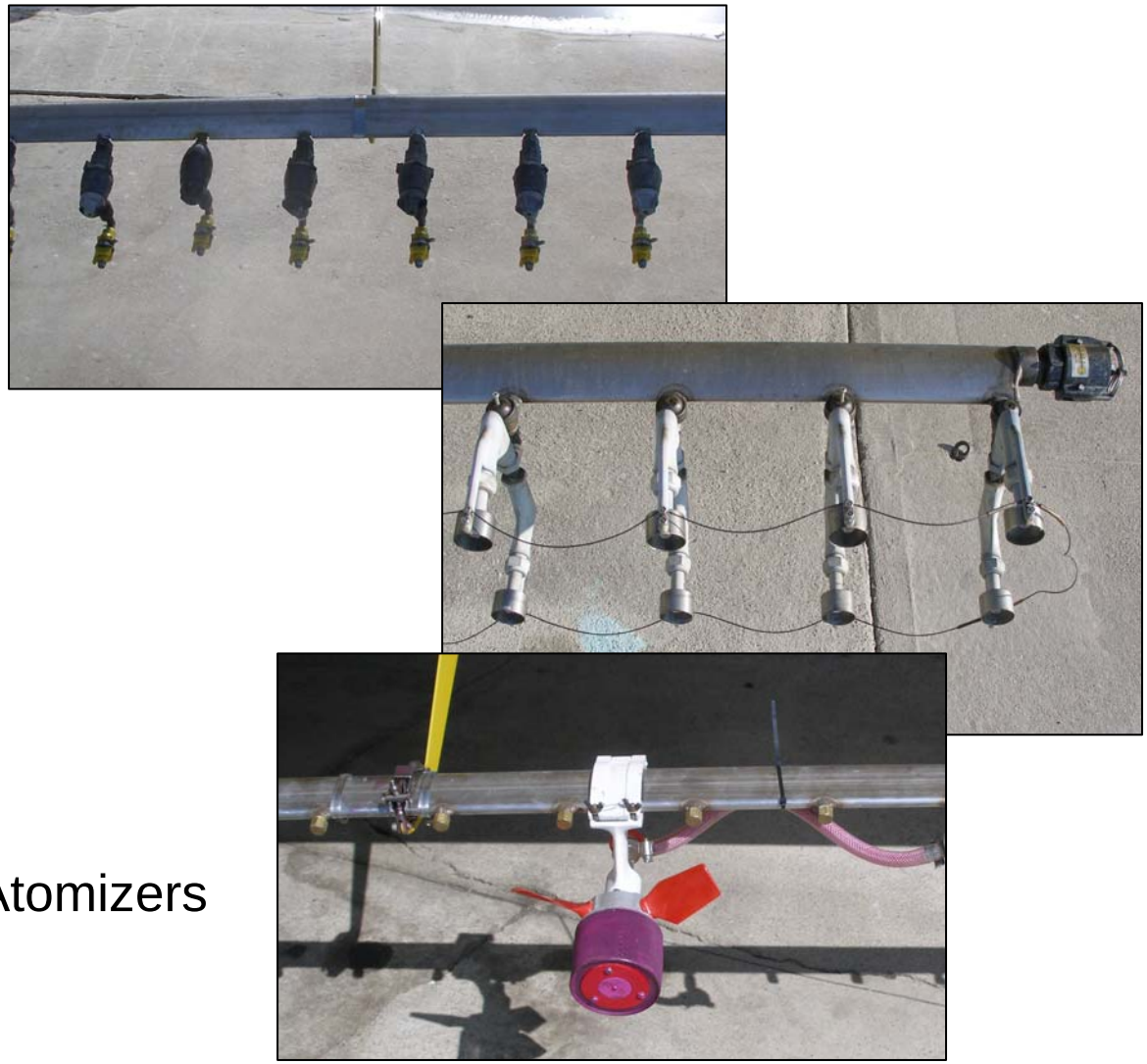
Discussion
Optimizing Aerial Application

- Calibration
  - Nozzles
    - Number
    - Angle & deflection
    - Wear
  - Screens
  - Pressure
  - Leaks
  - Swath width
- Electrostatic and Rotary Atomizers
  - Each has a place



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Discussion
Optimizing Aerial Application

- Fly-ins
  - More of them with greater intensity
    - Smaller groups
    - More passes
    - Greater level of education and stewardship
  - Example: Nebraska Aviation Trades Association
    - Largest number of aircraft participated in 2008 Operation Safe than any other year

(Alan Corr, NATA Operation Safe coordinator)

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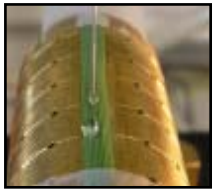
Future Research: Delivery Optimization

Equilibrium surface tension (EST)

Information on wettability of spray fluids

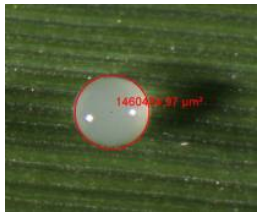
Dynamic surface tension (DST)

Explains how quickly spray droplets increase surface area



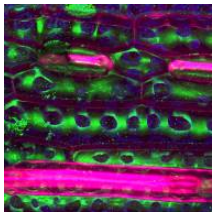
Contact angle (CA)

Information of how a droplet wets the plant surface



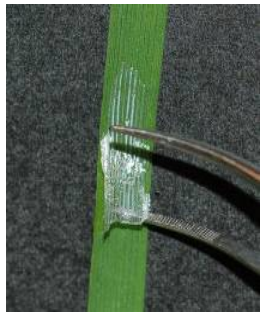
Microscopy – Spreading / Deposit

Microscopic measurement of the dried droplet area in relation to applied droplet and characterisation of deposit



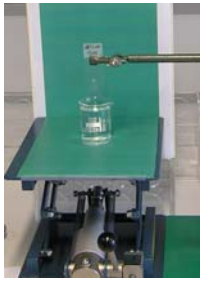
Confocal Fluorescence Microscopy

Influence of adjuvants on uptake of fluorescent substances.



Uptake measurement

Cellulose Acetate in combination with LC-MS-MS



Rain-Fastness

Model system in the lab for screening

Rheology (viscosity properties)

Viscosity measurement of formulations and spray solutions

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