

Nozzle and equipment considerations for improved coverage in the soybean canopy: A summary of the work done in Ohio

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Effects of air-assisted and conventional spray delivery systems on management of Asian Soybean Rust

Objective:

- Evaluate the efficacy and deposition efficiency of various fungicide application methods to protect against infection that could result in soybean crop yield loss.



Measures of sprayer performance

- Spray coverage
 - Spray deposit
- } See poster
- ✓ Lower canopy: 12 inches above ground
 - ✓ Middle canopy: 24 inches above ground
 - ✓ Fluorescent tracer (Brilliant Sulfaflavine)
 - ✓ Metal deposition targets
 - ✓ Water sensitive paper coverage targets
 - ✓ 15 ft x 150 ft plots
 - ✓ R5 stage treatment



Measures of sprayer performance

- Fungicide spray retention on foliage
 - Sampled several plants from each spray plot
 - ✓ Removed bottom of each plant
 - ✓ Divided plant into upper and lower zones
 - ✓ Removed top 4-6" of each plant
 - ✓ Separated leaves from stems
 - Headline (A.I.: Pyraclostrobin) residue analysis
 - ✓ Buffered QuEChERS method for extraction of pesticide
 - ✓ LC/MS analysis of prepared sample



2005 Asian Soybean Rust Field Trials: Treatments

Treatment		Pressure (psi)	Speed (mph)	Flow (gpm)	Spray Quality
Sprayer	Nozzle				
Jacto air-assist sprayer	Jacto JA3	154	7	0.35	fine
Boom sprayer	XR8004	31	7	0.35	medium
Boom sprayer	XR8002	42	4	0.20	fine
Boom sprayer	XR8005	20	7	0.35	coarse
Boom sprayer	Turbo Dual QJ90- TT11002	31	7	0.35	medium
Boom sprayer	TJ60-8004	31	7	0.35	medium
Boom sprayer	TX-18	54	7	0.35	medium
Boom sprayer with canopy opener	XR8004	31	7	0.35	medium

Application rate for all treatments: 15 gpa



2005 Sprayer Treatments

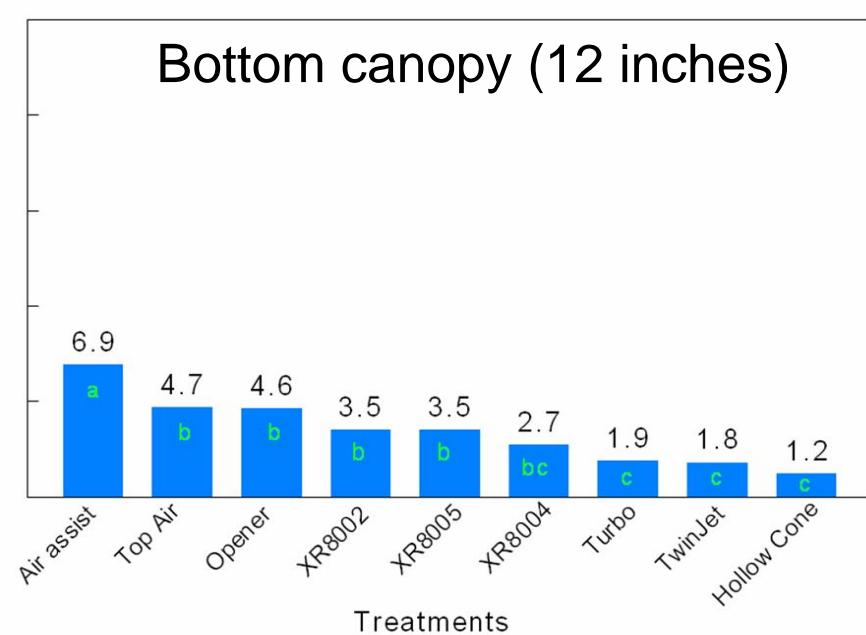
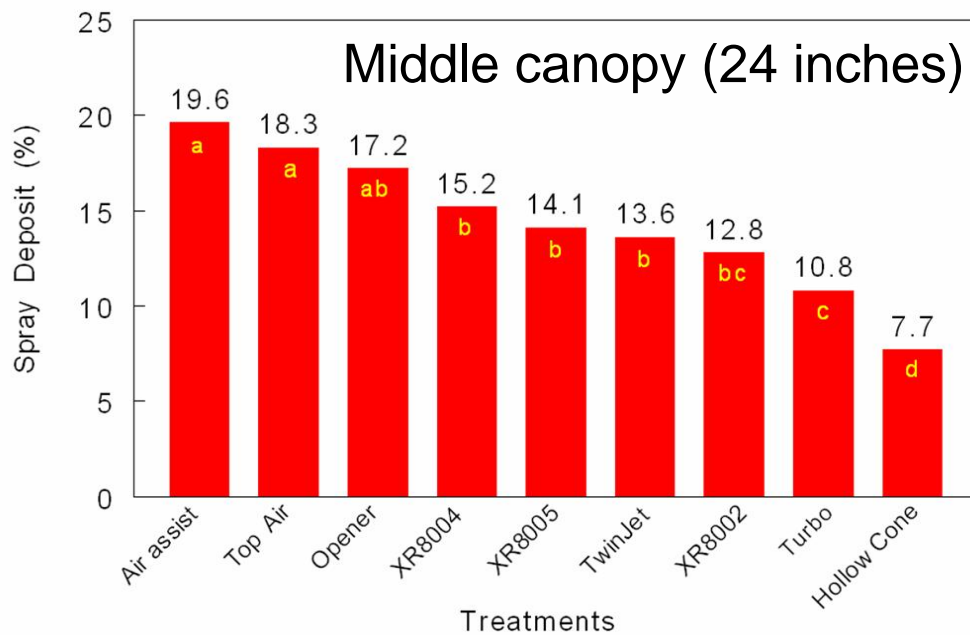
Jacto air-assist, JA3

Canopy opener, flat fan

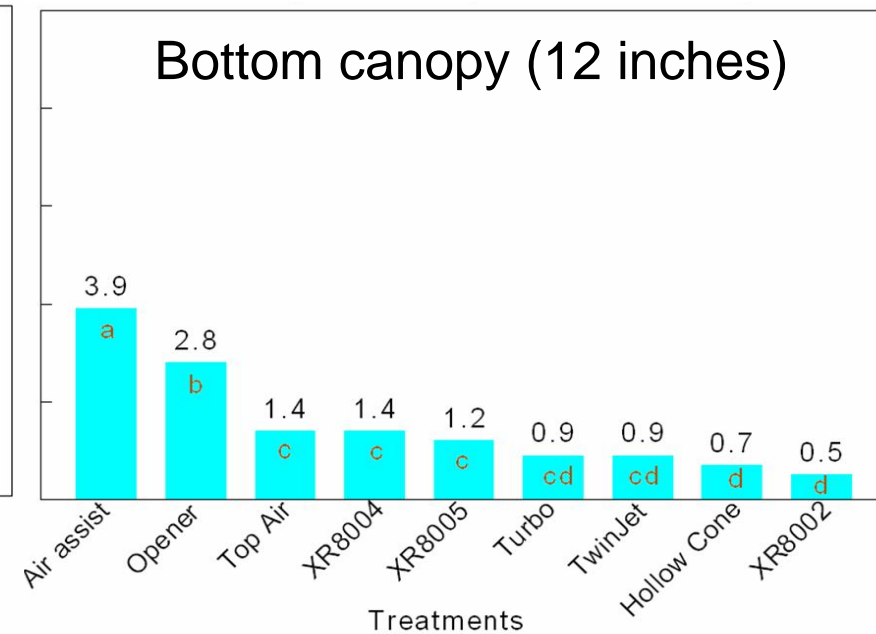
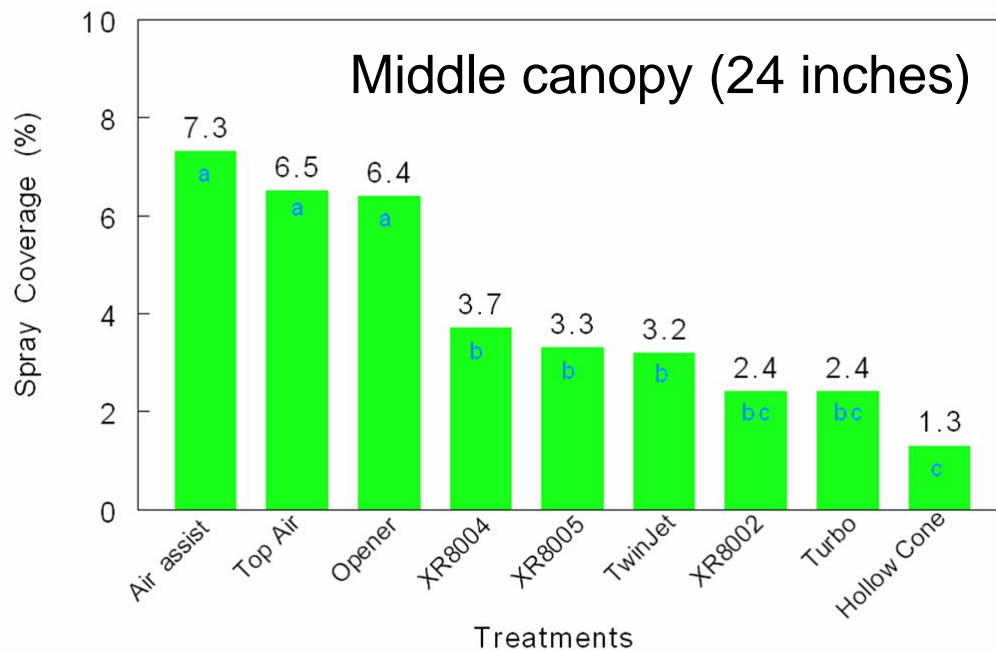
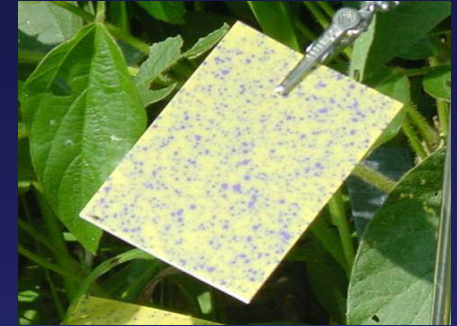


**Conventional
broadcast, flat fan**

Percent Spray Volume deposited on artificial targets

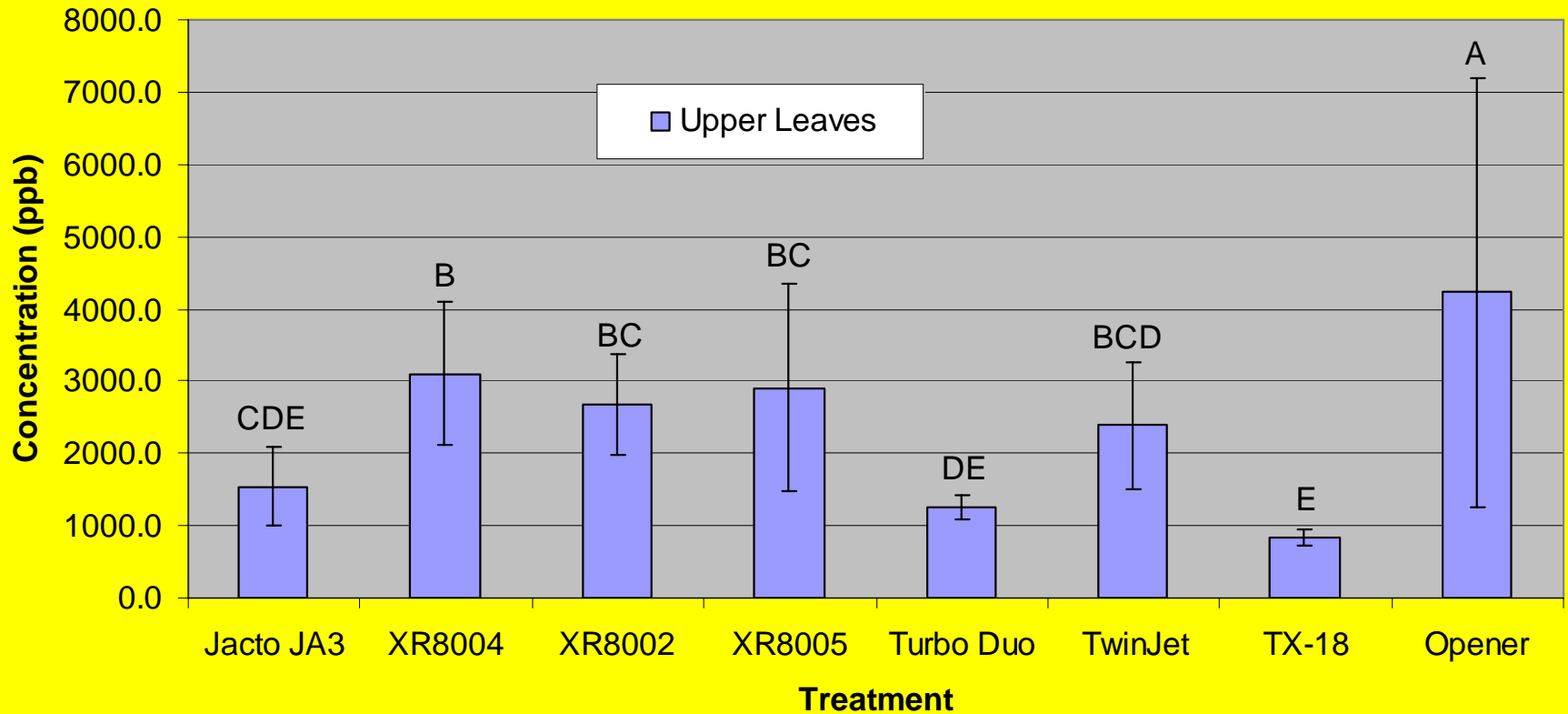


Percent Spray Coverage on WSP targets

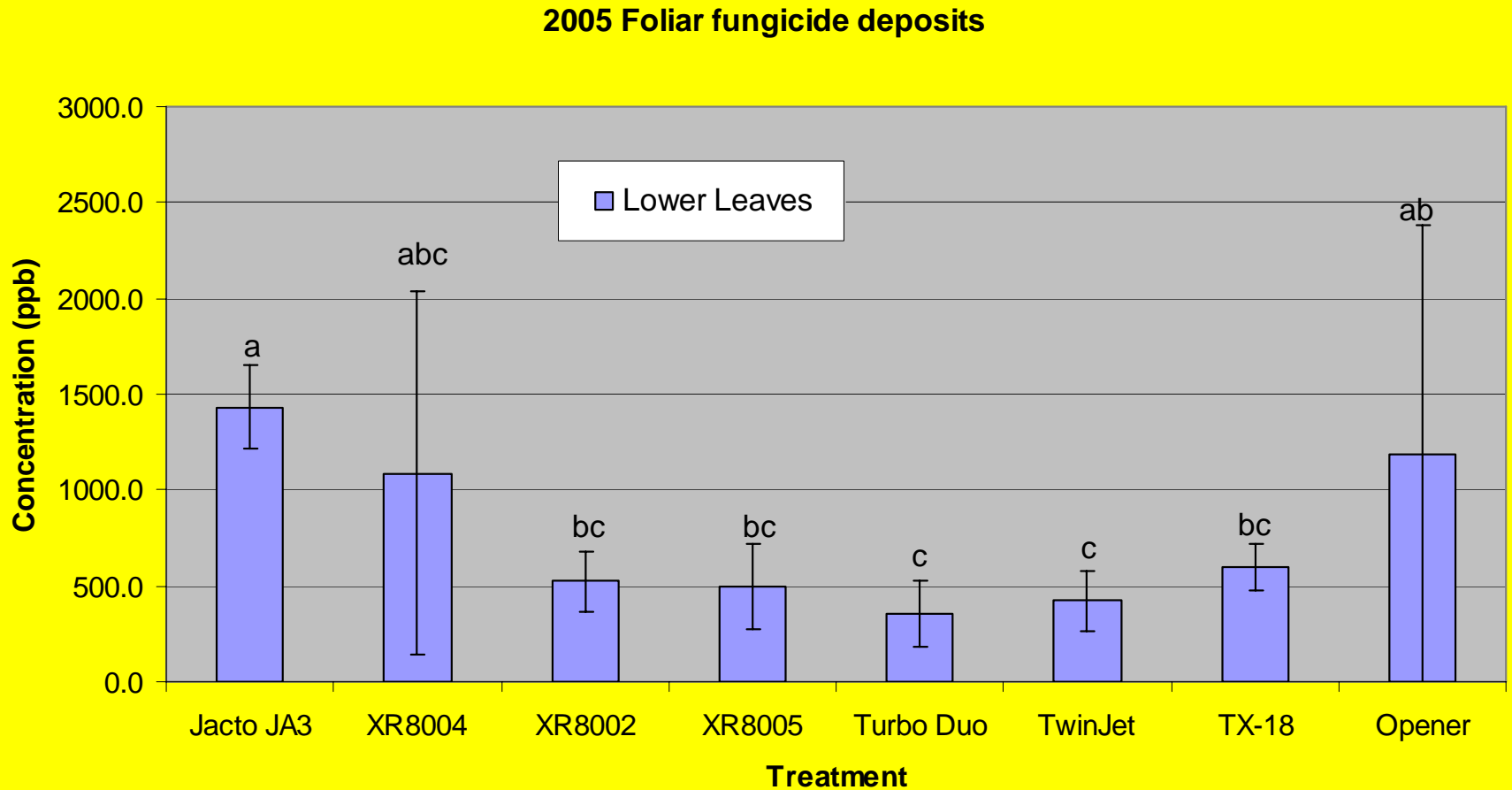


Results: 2005 Foliar deposits

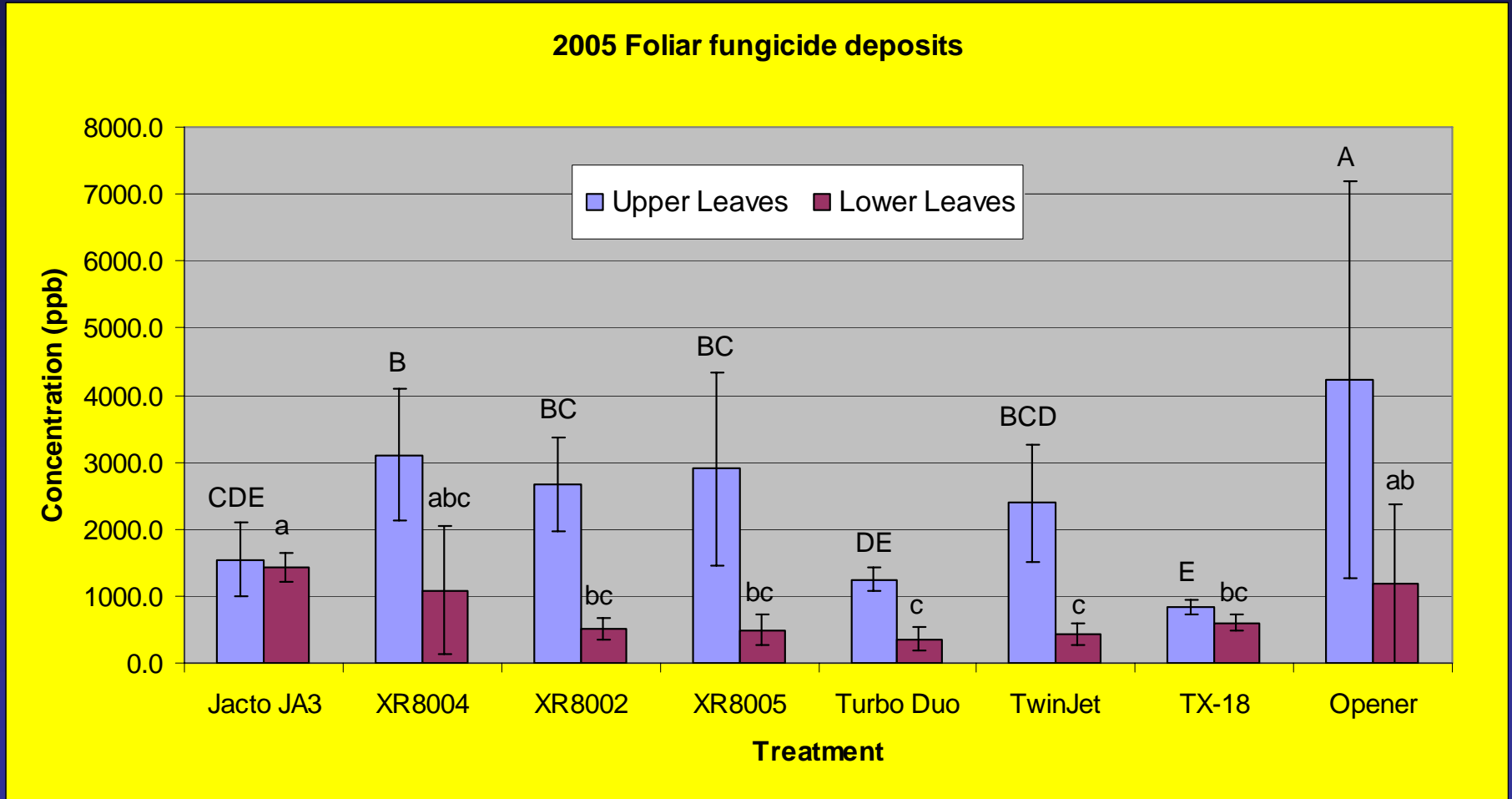
2005 Foliar fungicide deposits



Results: 2005 Foliar deposits



Results: 2005 Foliar deposits



2006 Asian Soybean Rust Field Trials: Treatments

Treatment		Pressure (psi)	Flow (gpm)	Rate (gpa)	Spray Quality
Sprayer	Nozzle				
Boom sprayer	XR8004	34	0.35	15	medium
Boom sprayer	XR8004	59	0.47	20	medium
Boom sprayer	TTJ60-11003	57	0.35	15	medium
Jacto air-assist sprayer	AXI11002	48	0.24	10	Medium
Jacto air-assist sprayer	AXI11002	118	0.35	15	medium
Jacto air-assist sprayer	Jacto JA3	151	0.35	15	fine

Travel speed for all treatments: 7 mph



2006 Sprayer Treatments

**Jacto air-assist,
flat fan AIX11002**



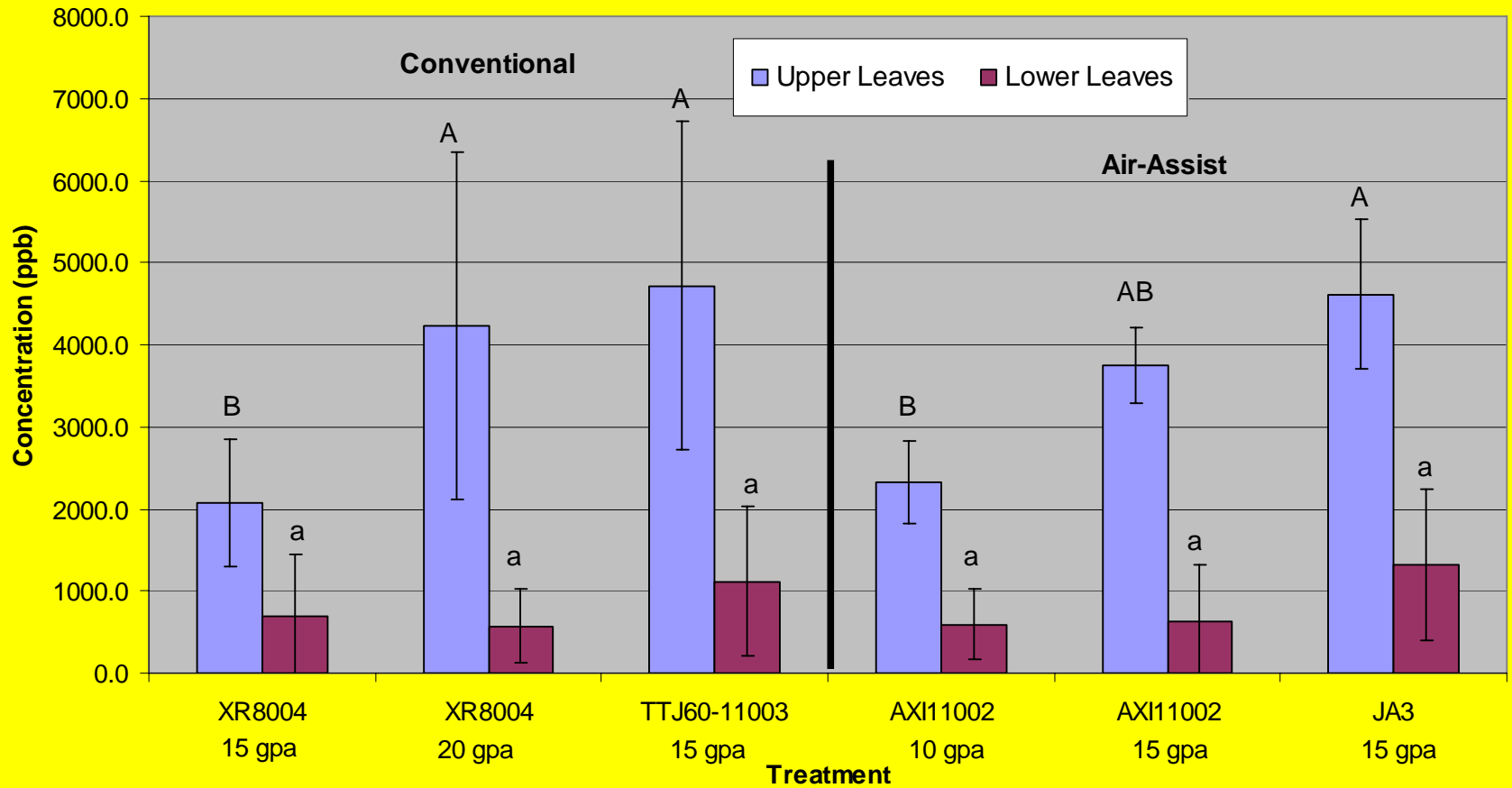
**Conventional broadcast,
TTJ60-11003**



Jacto air-assist, JA3

Results: 2006 Foliar deposits

2006 Foliar Fungicide Deposits by Sprayer Type

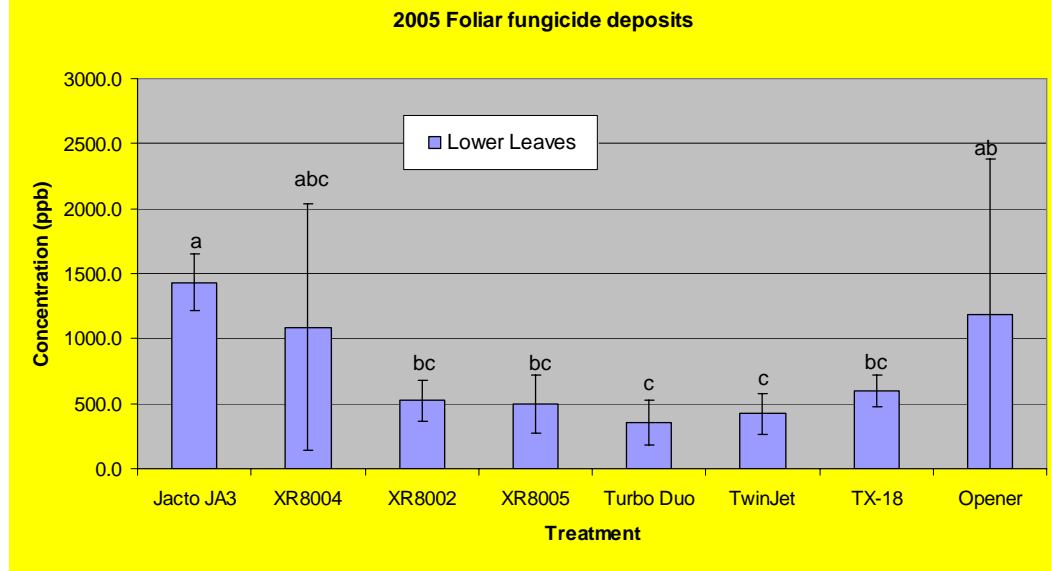
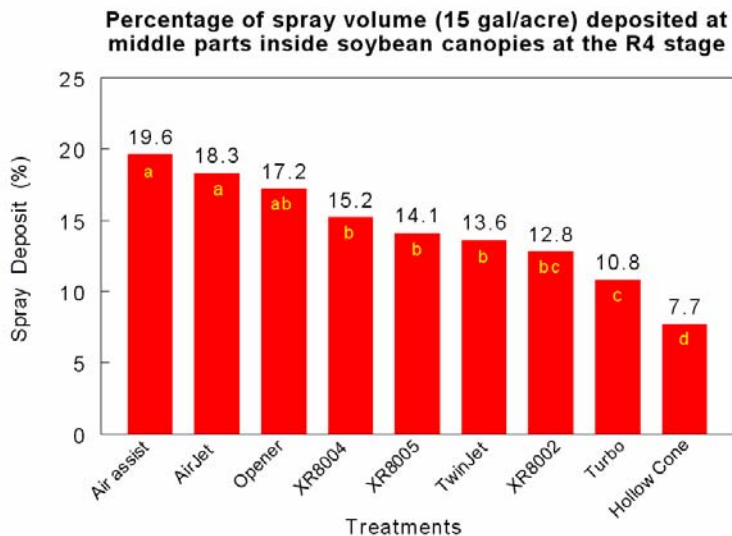


2005 & 2006 Comparisons

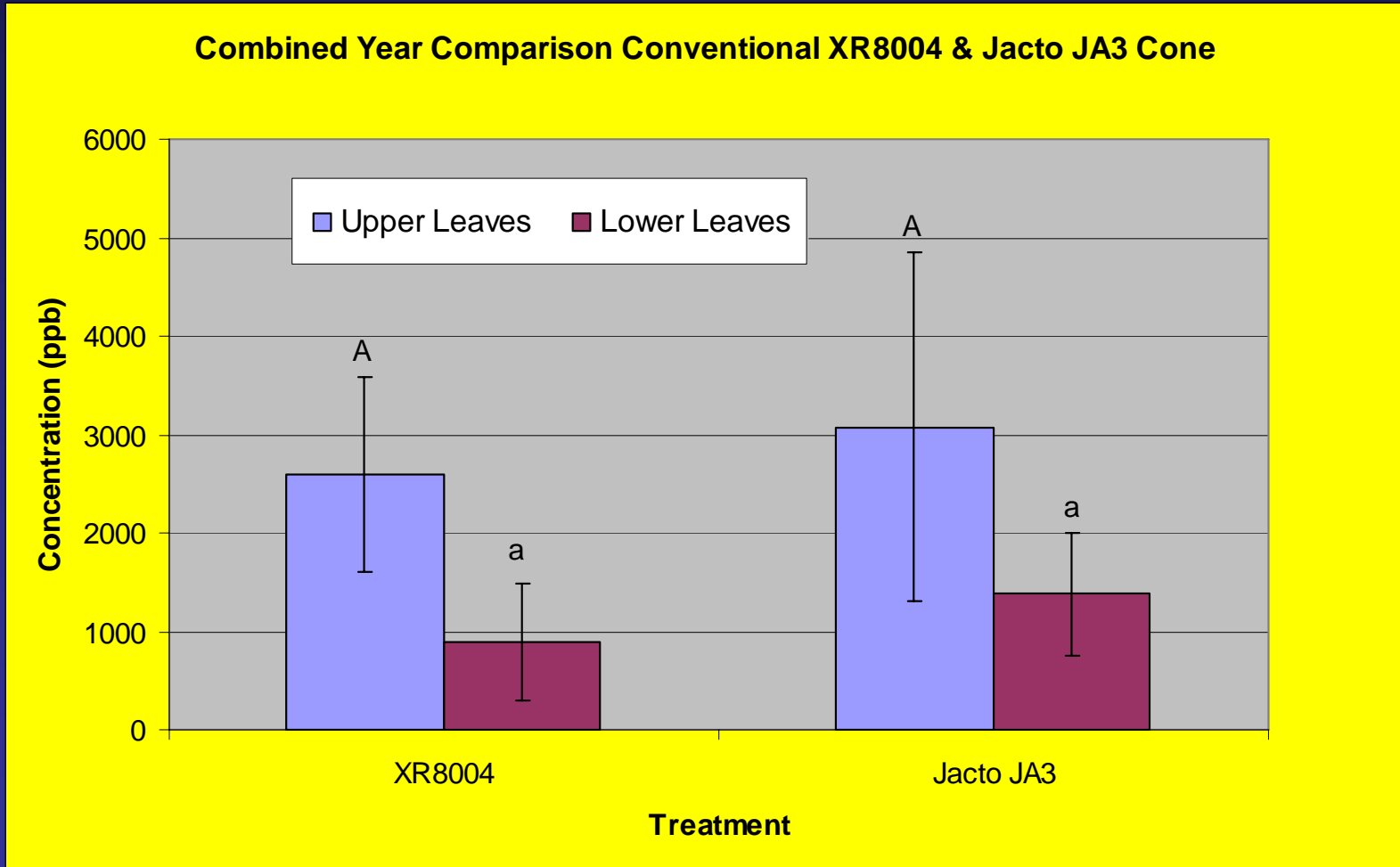
- Seed
 - 2005: Seed Consultants SC9284 (210,000 seeds/acre)
 - 2006: Pioneer 92B38 (200,000 seeds/acre)
- Canopy taller in 2005 than 2006
 - 44 inches vs. 41 inches
 - Larger area sampled for Upper/Lower canopy in 2005
 - More of the plant closer to nozzles was removed in 2005 compared to 2006
 - Spray more directed at Upper canopy area in 2006 than 2005
- Canopy more dense in 2005 than 2006
 - LAI: 6.4 vs. 3.4

Fungicide Residue and Artificial Tracer Comparisons

- Target area
 - Artificial tracer targets stationary
 - Larger foliar area sampled for fungicide residue
 - Middle tracer target (24 inches) may be better comparison with leaves from lower canopy
 - Trends for flat fan nozzle similar



2005 & 2006 Comparisons: Foliar deposits



Summary & Conclusions:

- Canopy differences affect deposition
 - Higher deposits found in shorter/less dense canopy
 - Coverage higher in shorter/less dense canopy
 - In taller/more dense canopy, single flat fan delivery treats lower canopy area better than dual-fan or cone nozzles
- ‘Medium’ quality sprays are recommended for conventional, broadcast applications

Summary & Conclusions:

- Based on all measures of performance, air-assisted delivery provides better canopy penetration
- Cone and flat fan nozzles performed similarly in air-assisted applications
- Bending over the top of the canopy helps improve spray penetration
- Unable to detect Headline on stems