ElectroStatics-Progress Report

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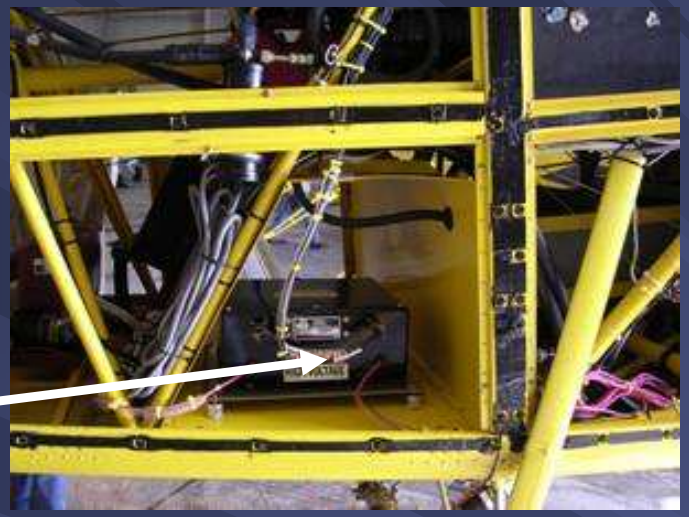
Why should ES be seriously studied by Aerial Applicators?

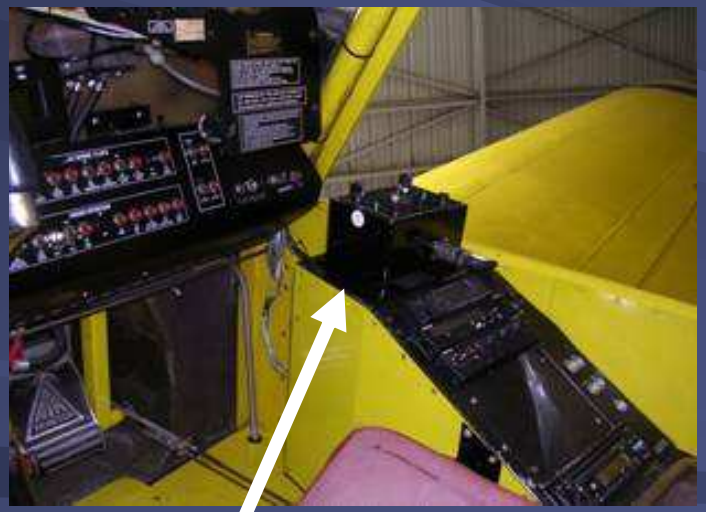
- US farmers (our customers) in 2006 will be faced with projected rising inputs of 13 % for fertilizer and up to 50% for fuel. Meanwhile commodity prices are far below actual production costs.
- Aerial Applicators fixed costs have doubled since 1990 also.
- Ag aircraft burn more fuel per acre than ground applicators.
- If ElectroStatics is proven effective-aerial applicators can help their customers by reducing application fees as well as improving pesticide efficiency.
- With ag aircraft more productive-more CPP's sold.

- WIN-WIN-WIN

Typical Installation



Power Supply



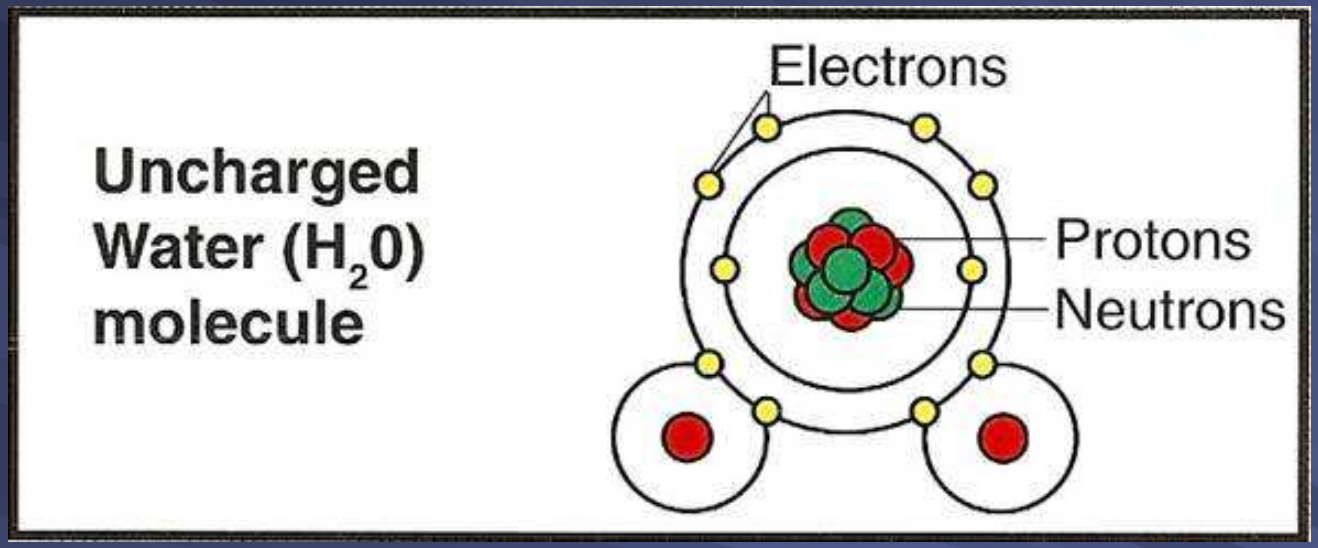
Control Panel

Volt/Amp Meter

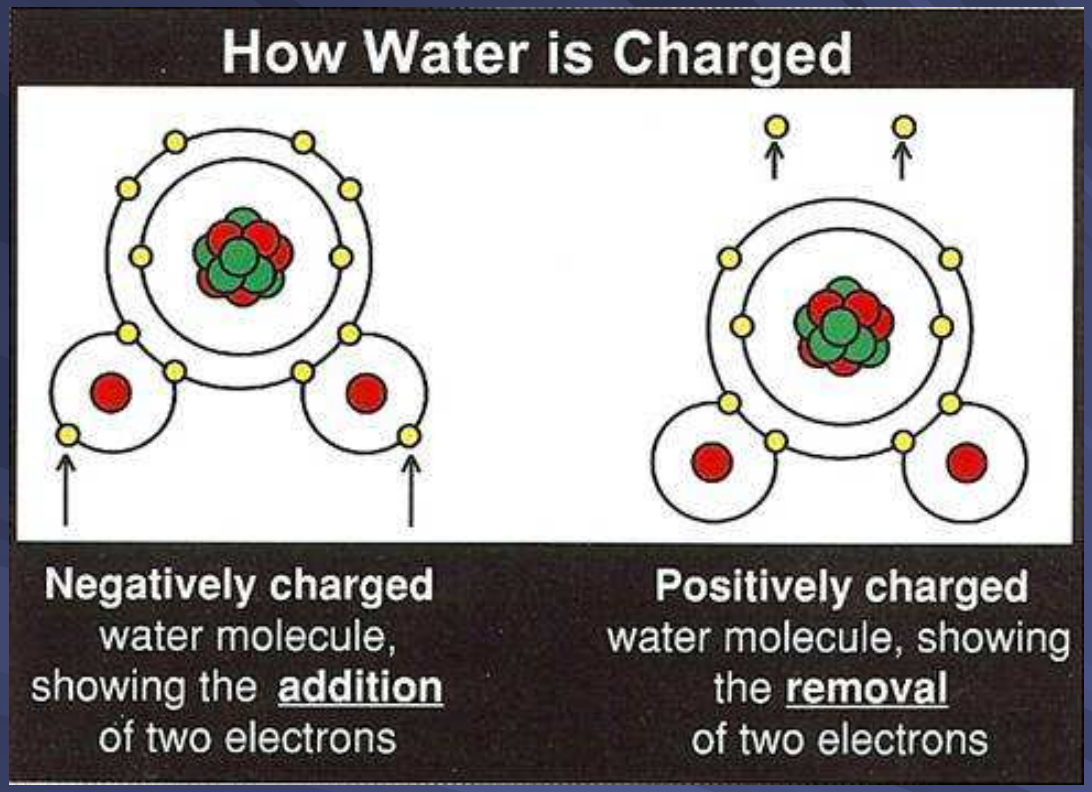
Installed System

SPRAY BOOM ATTACHED
TO AN AT-602

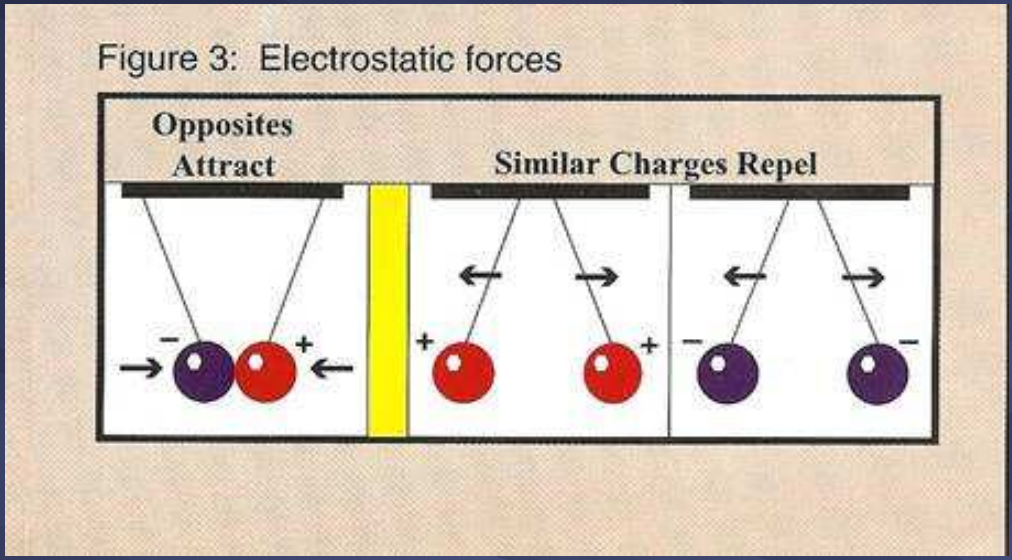
How ES Works



A typical uncharged water droplet with the oxygen molecule covalently bonded to the hydrogen molecule.



Approximately 8000 volts is applied to the stainless steel ring (see photo) inducing an electric field in the region where the droplet is formed. Resulting in a positive charged droplet on the left wing and a negative charged droplet on the right wing.



Since the droplets on each wing have similar charges they are repelled from each other. This effect is especially noticeable when the spray droplets land on the leaf surface of a plant. The repelling effect of like charges causes the spray droplets to spread out surrounding the plant forcing more uniform coverage. One benefit is that since opposites attract the spray coverage under the center of the center of the aircraft is filled in resulting in a very uniform pattern.

Electrostatics spray is applied at 150 microns

While conventional sprays are between 250-350 microns

Droplet Size	Number
150 microns	2,141,866,848
300 microns	267,733,356

There are 8 times more droplets in a gallon of water of 150 micron droplets when compared to 300 micron droplets.

Coverage vs. Droplet Size?

- How much coverage is necessary for control?
- How much of the plant needs to be covered with the pesticide to effect control?
- What is more important small number of large drops (250-300 micron) on a plant, or a large number of small drops (150 micron)?

Date Mailed: July 31, 2005

AgAirupdate

Volume 23 Number 8 August 2005

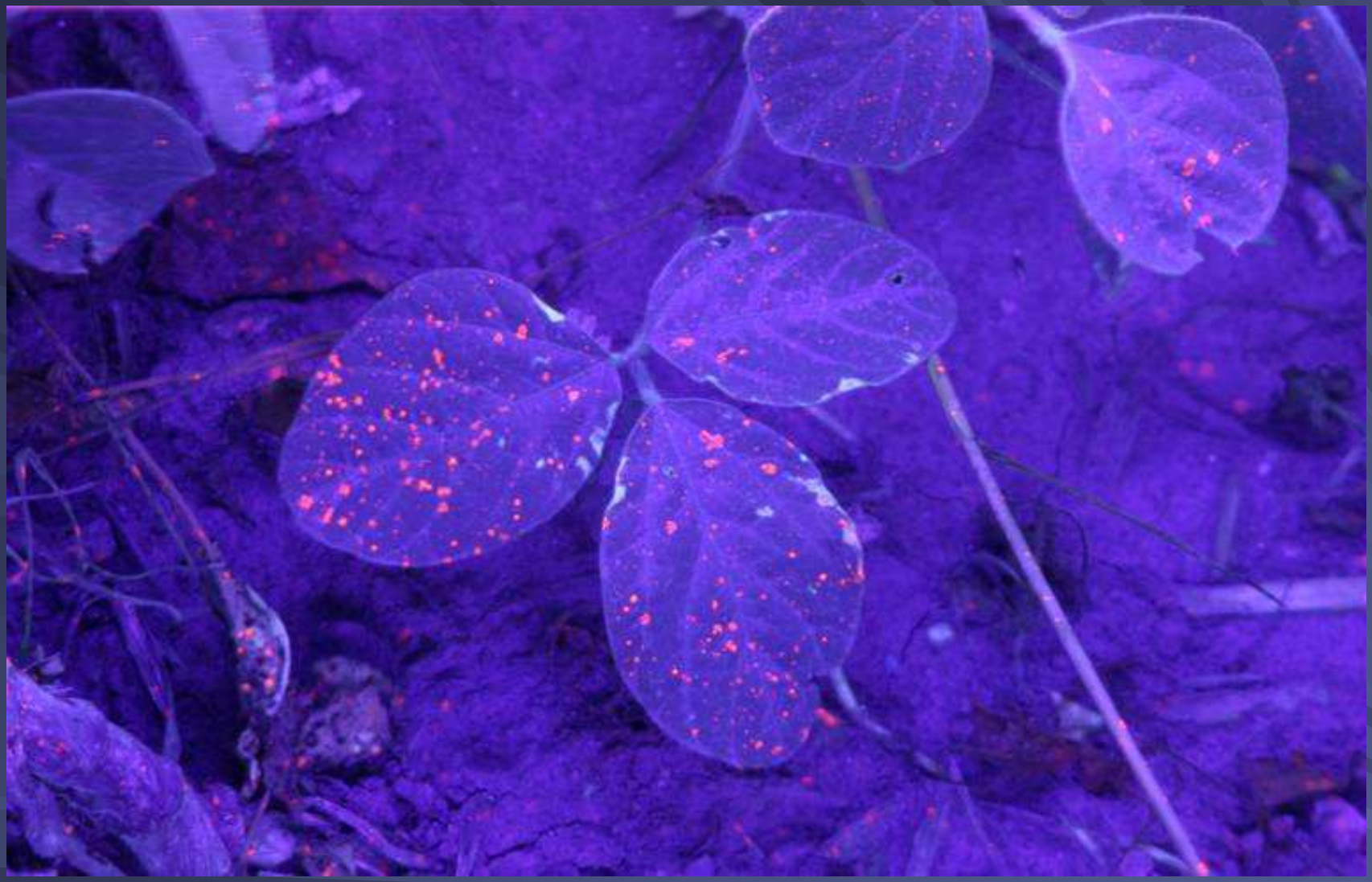
AG AVIATION'S NEWSPAPER

Spectrum ES system proves itself in Indiana

David Ely of AgriLite Services in Wakarusa, Indiana makes a pass over soybeans during an evaluation of the Spectrum Electrostatic spray system. Purdue University scientist, Syngenta and Pioneer Seed Company representatives are on-hand to review results. Read the whole story on page 8.

- Air Tractor adopts Lean Manufacturing
- Operators participate in "On Condition Maintenance"
- Need a new loading facility?
- Smart Drop Technology

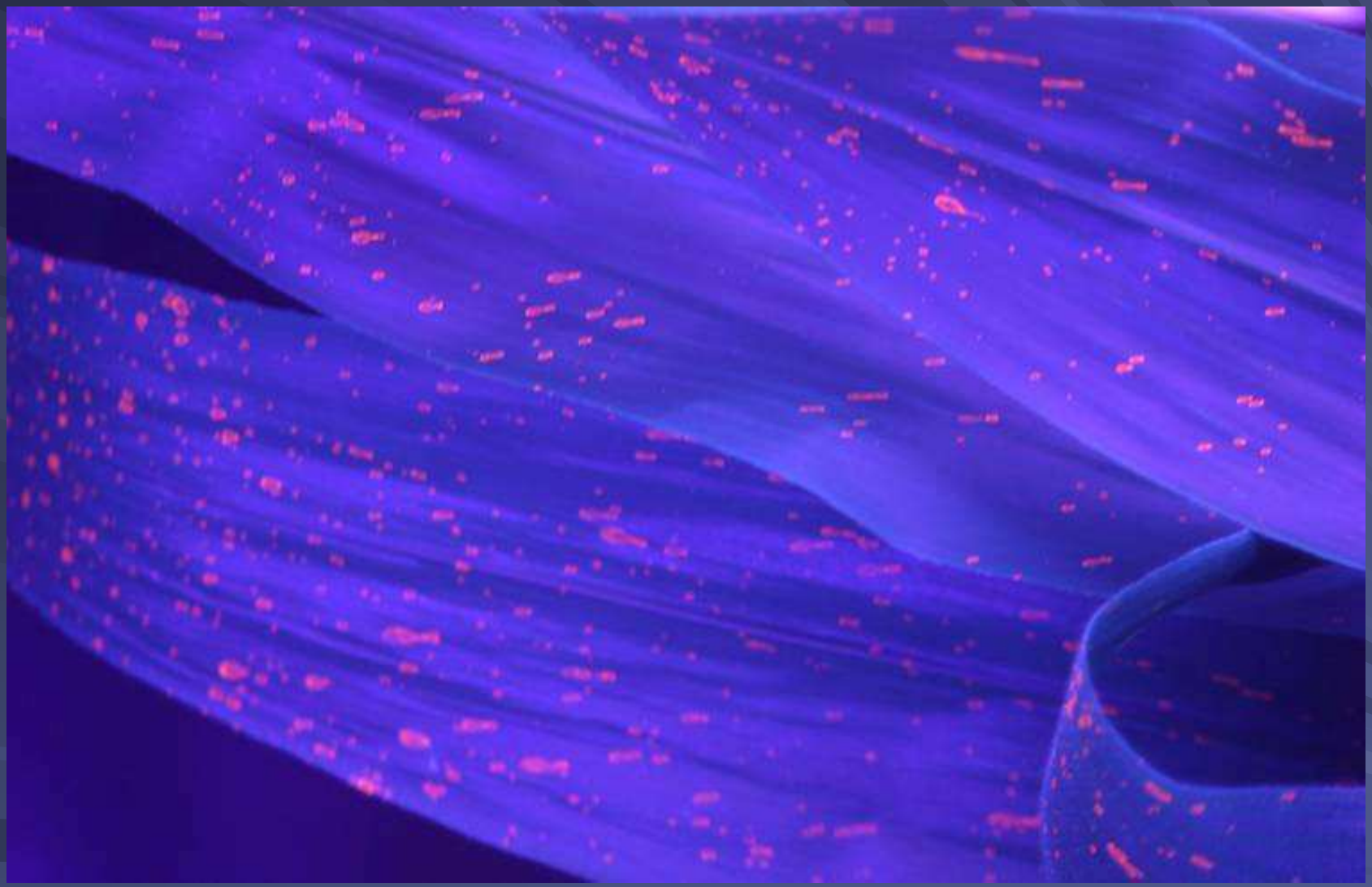
5 GPA(AIR-CONV.) FLAT FAN **-Soybeans**



On the following 3 slides of conventional 2 & 5 gallon air applications note the droplet size, spacing, coverage, canopy penetration and under leaf coverage.

2 GPA(AIR CONV.) FLAT FAN- ***Soybeans***

5 GPA (AIR CONV.) FLAT FAN-***Corn***



2 GPA (AIR CONV.) FLAT FAN-***Corn***

Ground Applications-what really happens.

SOURCE: THE FURROW FEB. 2005

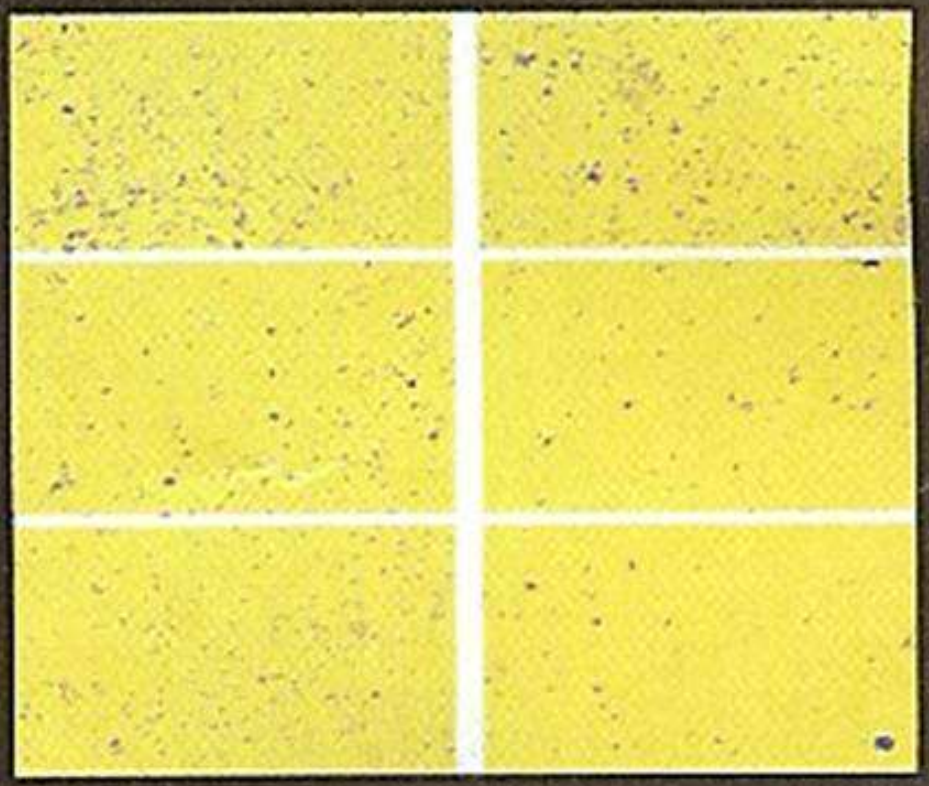
Spray Coverage

Upper Canopy

Mid Canopy

Lower Canopy

10 mph 63 psi



Research conducted by John Deere using two different nozzles at two different settings in late-season soybeans shows a tremendous difference in the amount of lower-canopy spray coverage necessary to treat Asian Soybean Rust.

SOURCE: THE FURROW FEB. 2005

20 GPA TWIN TEE JET FLAT FANS–*Ground Application*.

The high volume spray covers the exposed top leaves of the canopy, then congeals to a droplet and falls to the ground. Almost no coverage on plant underneath the canopy and on the underside of the leaf.

20 GPA TWIN TEE JET FLAT FANS–*Ground Application*.

Additional photo of ground application showing little penetration below the canopy.

ES(1 GPA-AIR) ***Soybeans***

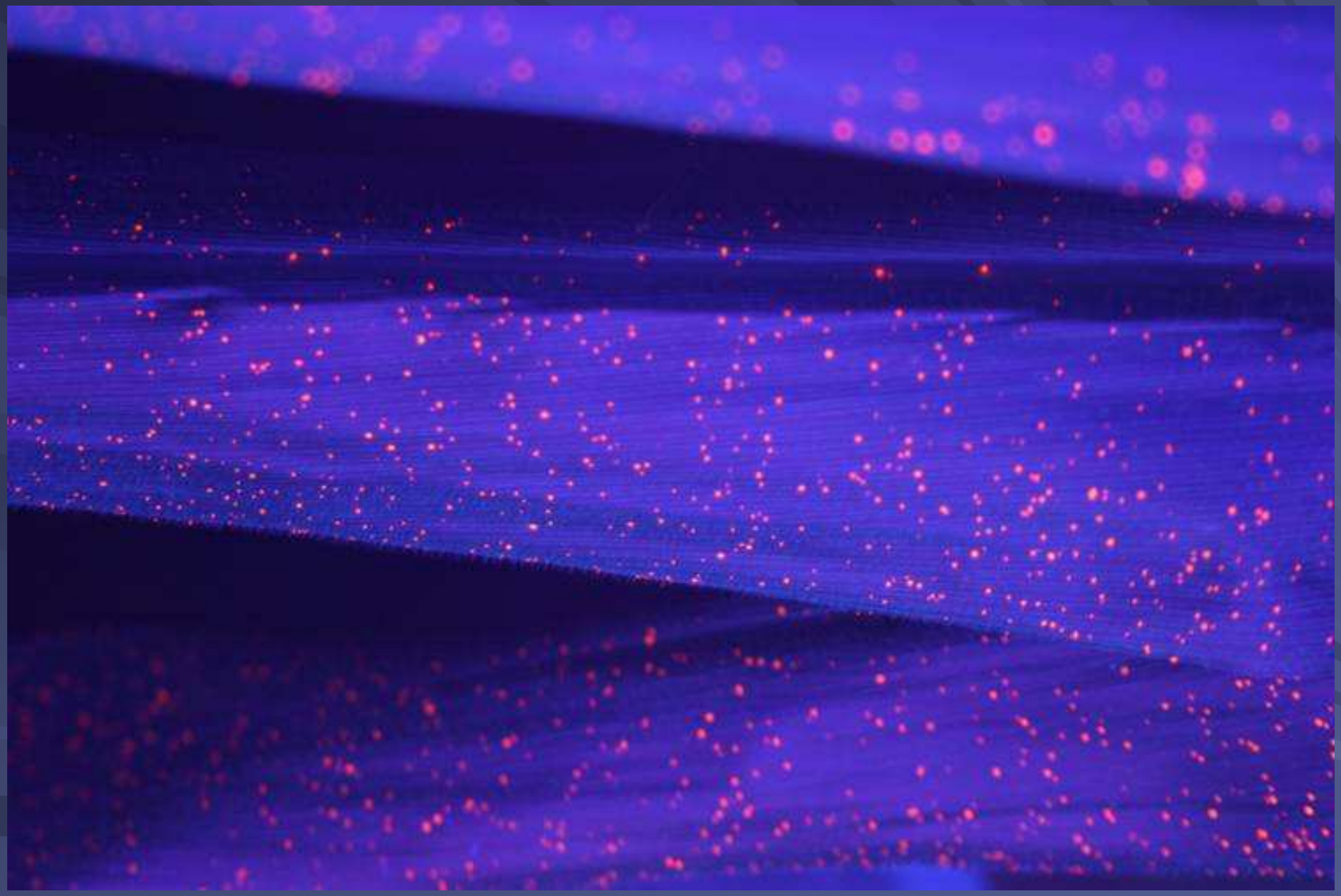
On the following 6 slides of ElectroStatic applications note the more uniform coverage with penetration below the canopy and on underside of the leaves.

ES (1 GPA-AIR) ***Soybeans***

ES (1 GPA-AIR) ***Corn***

ES (1 GPA-AIR) ***Corn***

ES (1 GPA-AIR) ***Corn***



ES (1 GPA-AIR) VS. 5 GPA-*Corn*

ELECTROSTATICS

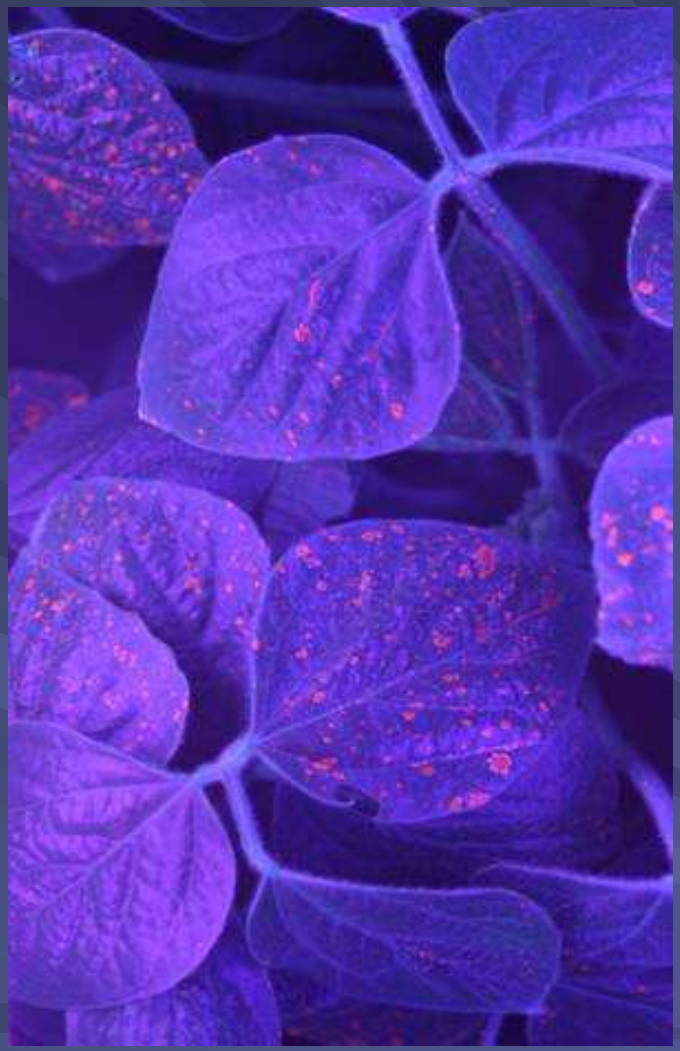
1 GPA

CONVENTIONAL

5 GPA

ES (1 GPA-AIR) VS. 5 GPA-*Soybeans*

ELECTROSTATICS
1 GPA

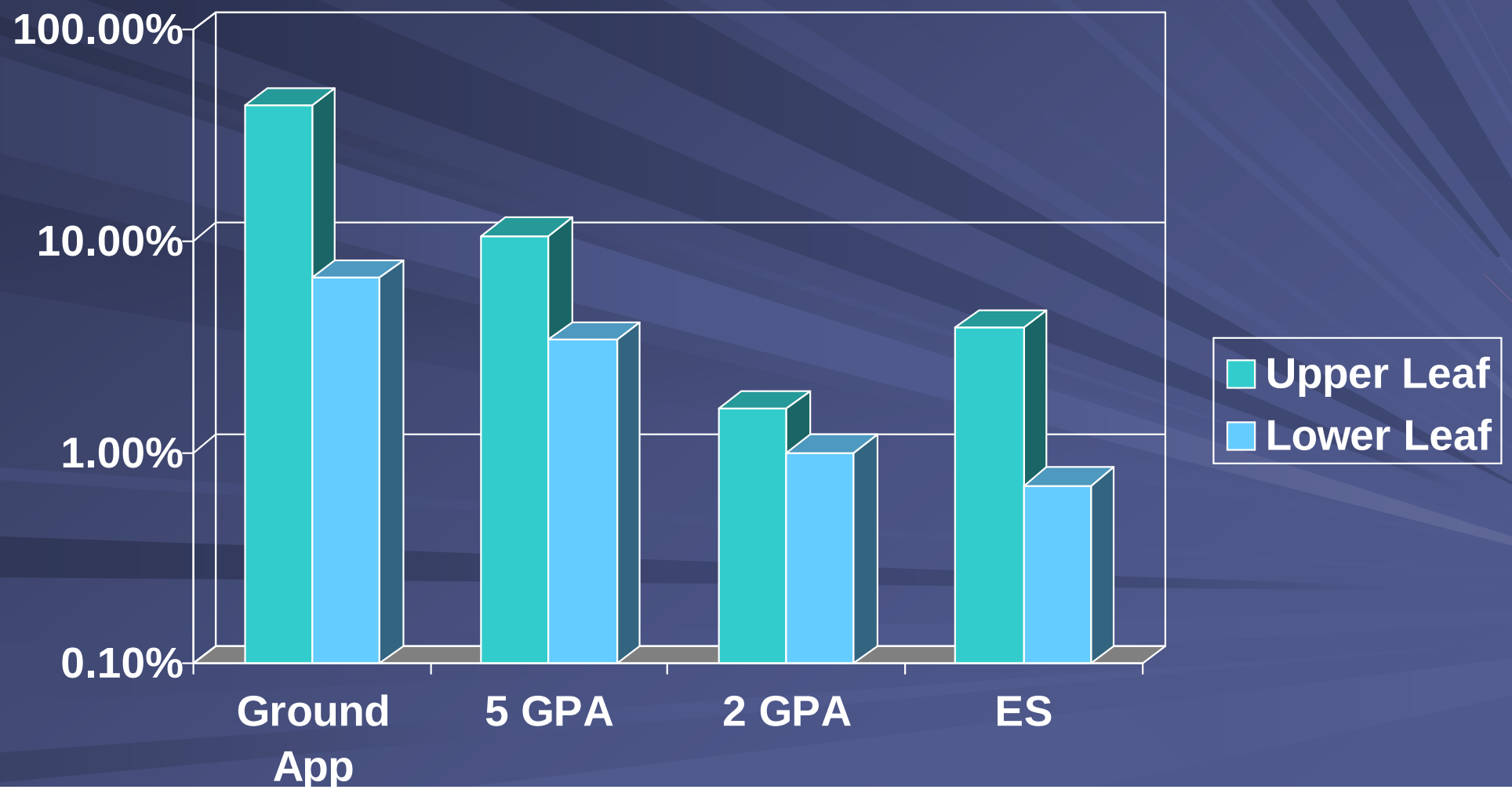


CONVENTIONAL
5 GPA

SOYBEAN SPRAY COVERAGE DATA

From Dr. Shawn Conley, Purdue University.

Note: Data is for upper leaf surface only. No account was make for under leaf coverage from aircraft applications.



RESEARCH NEEDED FOR 2006

- Correlation between spray density and optimum control
- Fungicide studies (reducing 5 gpa applications to 1 gpa ES)
- CPP–which ones are effective with ES and which are not

CREDITS

- MINN. DEPT OF AG.- DR. KEN OSTLIE
- PURDUE UNIV.-SHAWN CONLEY & GREG SHANNER
- SPECTRUM ELECTROSTATICS
- ED NEWBERG, MN
- TIM STIER, MN
- SPECK THORNTON, TX
- GERT BADENHORST, SWAZILAND
- ALAN PAULSON, BRAZIL
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