Making Effective Spray Applications

Scouting and Spray Evaluation Workshop

23 August 2011

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Bio. & Ag. Engineering

UC-Davis

“Application is a necessary evil..”

-Mr. Jim Coburn
Western Farm Service

Feb 2008

Tools for higher quality applications:

⇒ **Proper nozzles**
- Droplet size management

⇒ **Adjuvants**
- Reduce liquid rates
- Small droplet deposition with larger droplets

⇒ **Air carrier spraying**
- Small droplet transport
- Canopy penetration

Past 10 years: Spray drift has been foremost concern with spraying

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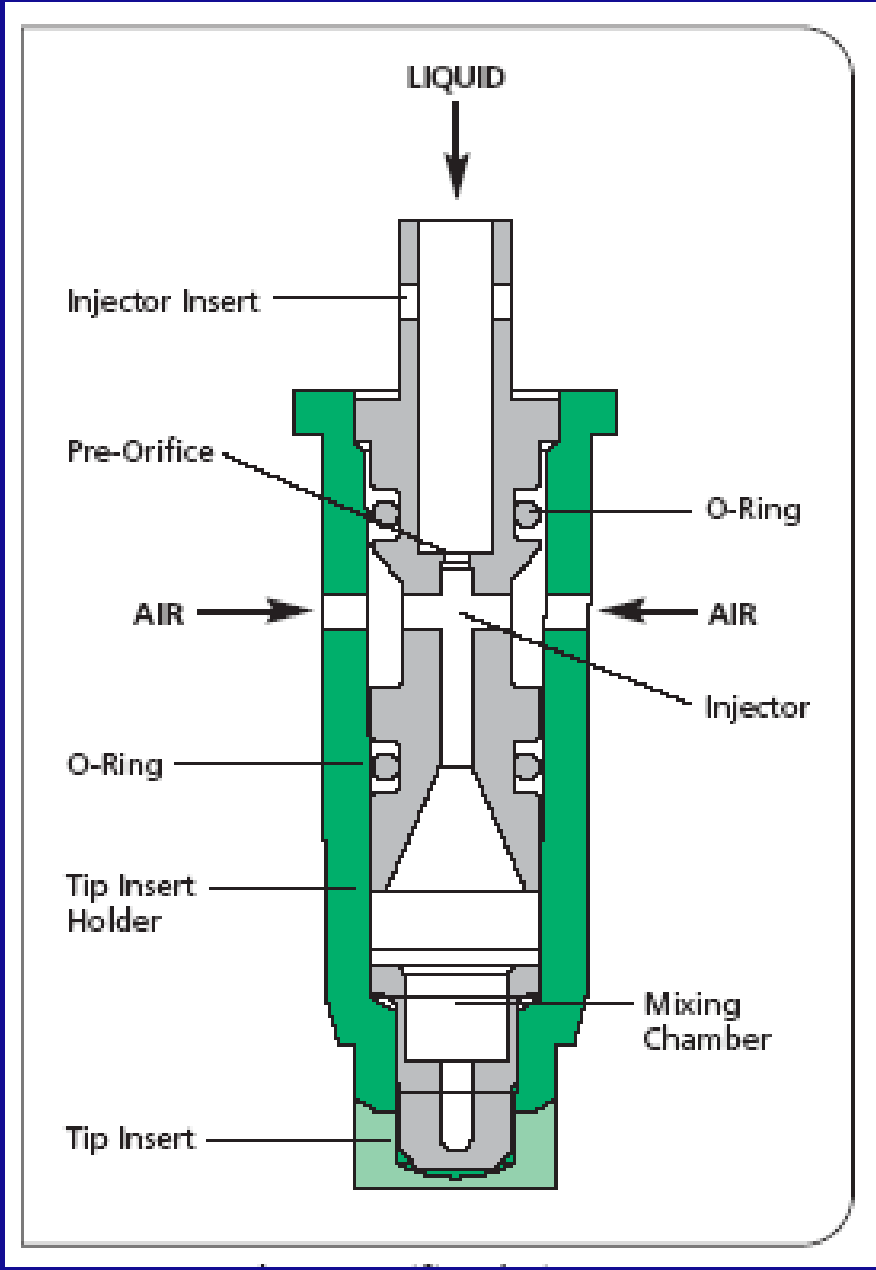
Nozzle Technology

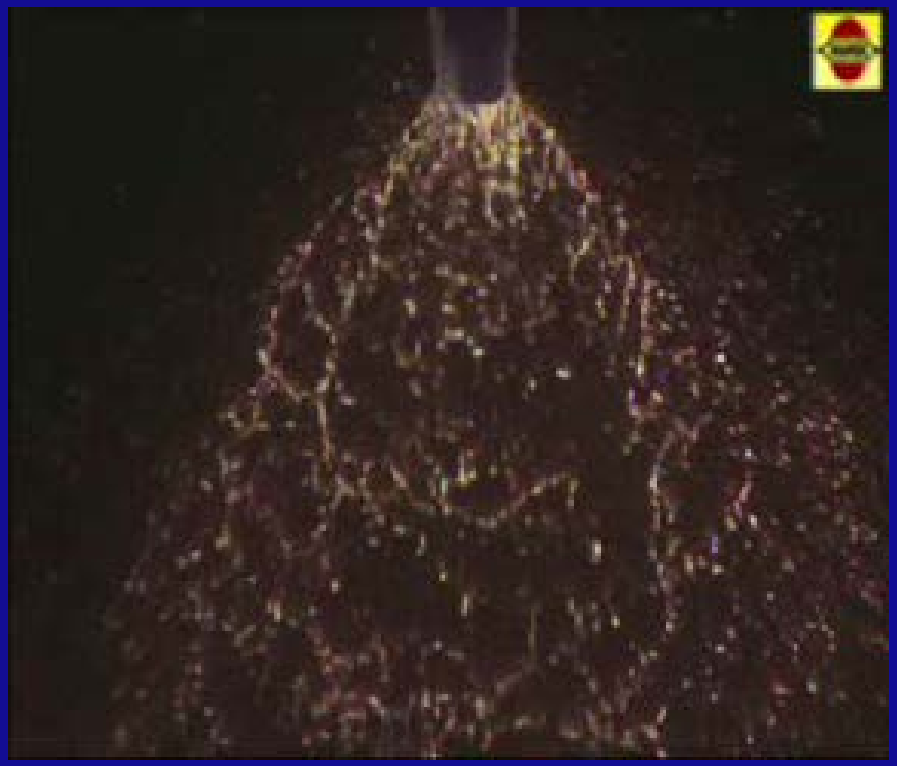
- Trend toward larger droplets
- Using air induction
- Manipulating droplet velocities

Air induction nozzle

- A passive air flow
- Reduces small droplets
- Can create bubbles in droplets



Flat fan v. Air induction



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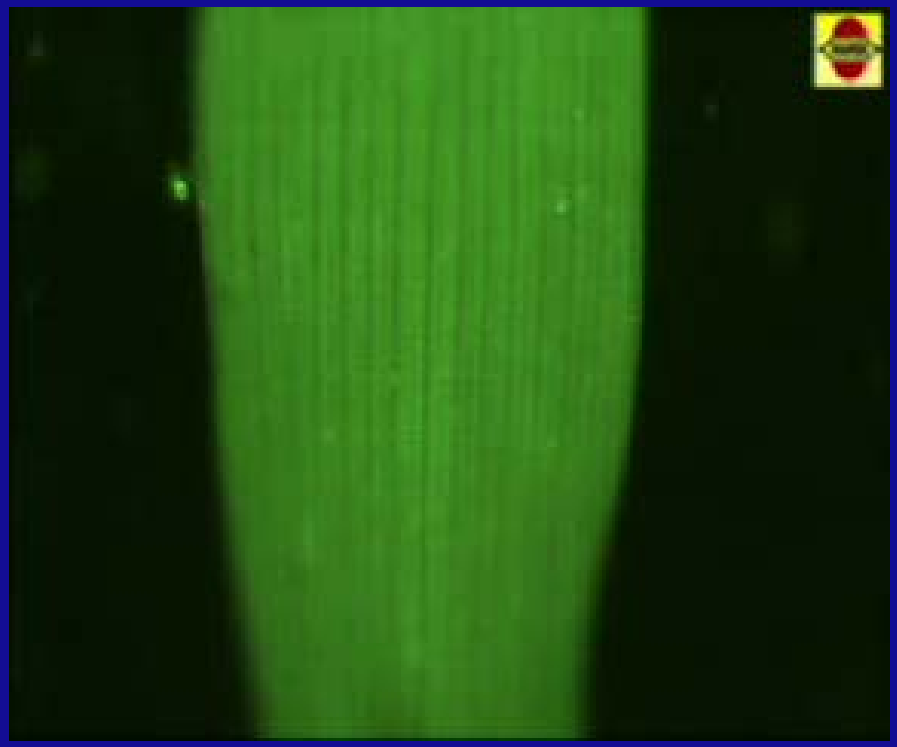

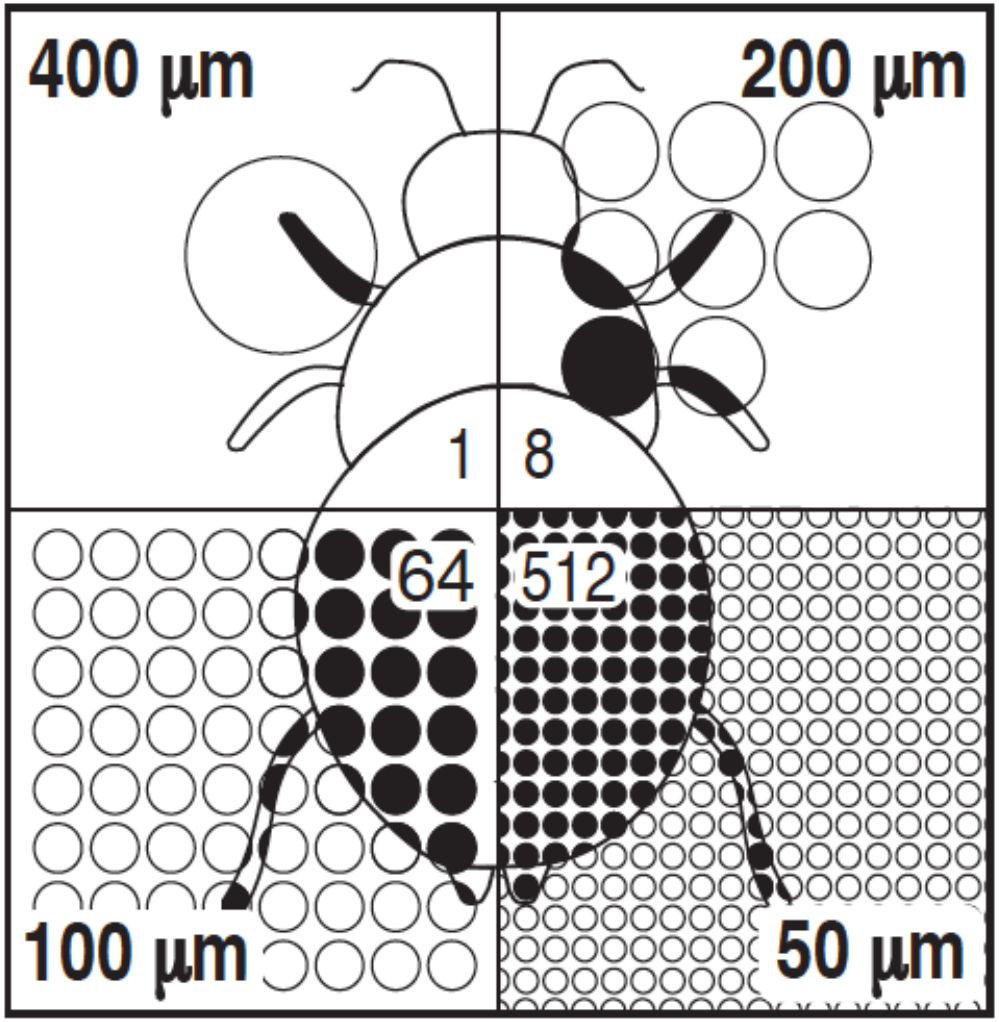

Halving one 400 mm drop produces 8 drops of 200 µm. With these smaller drops, it is possible to cover about twice the area.

Droplet size information

Turbo TeeJet® (TT)

	PSI										
	15	20	25	30	35	40	50	60	70	80	90
TT11001	C	M	M	M	M	M	F	F	F	F	F
TT110015	C	C	M	M	M	M	M	M	F	F	F
TT11002	C	C	C	M	M	M	M	M	M	M	F
TT11003	VC	VC	C	C	C	C	M	M	M	M	M
TT11004	XC	VC	VC	C	C	C	C	C	M	M	M
TT11005	XC	VC	VC	VC	VC	C	C	C	C	M	M
TT11006	XC	XC	VC	VC	VC	C	C	C	C	C	M
TT11008	XC	XC	VC	VC	VC	VC	C	C	C	C	M

TeeJet catalog or www.teejet.com

Droplet size information

Turbo TeeJet® Induction (TTI)

	PSI											
	15	20	25	30	35	40	50	60	70	80	90	100
TTI110015	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC
TTI11002	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC
TTI110025	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC
TTI11003	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC
TTI11004	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC
TTI11005	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC
TTI11006	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC	XC

TeeJet catalog or www.teejet.com

Droplet size information

TwinJet® (TJ)

	PSI				
	30	35	40	50	60
TJ60-6501	F	VF	VF	VF	VF
TJ60-650134	F	F	F	VF	VF
TJ60-6502	F	F	F	F	F
TJ60-6503	M	F	F	F	F
TJ60-6504	M	M	M	M	F
TJ60-6506	M	M	M	M	M
TJ60-6508	C	C	C	M	M
TJ60-8001	VF	VF	VF	VF	VF
TJ60-8002	F	F	F	F	F
TJ60-8003	F	F	F	F	F
TJ60-8004	M	M	F	F	F
TJ60-8005	M	M	M	F	F
TJ60-8006	M	M	M	M	M
TJ60-8008	C	M	M	M	M
TJ60-8010	C	C	C	M	M
TJ60-11002	F	VF	VF	VF	VF
TJ60-11003	F	F	F	F	F
TJ60-11004	F	F	F	F	F
TJ60-11005	M	M	M	F	F
TJ60-11006	M	M	M	F	F
TJ60-11008	M	M	M	M	M
TJ60-11010	M	M	M	M	M

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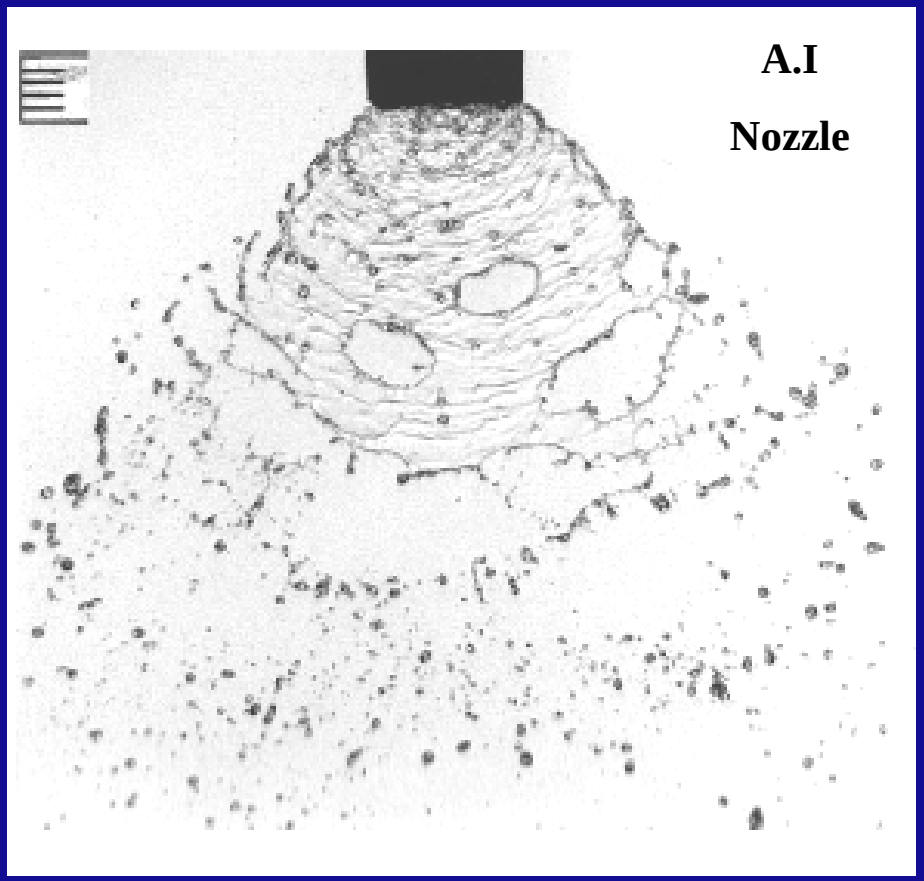
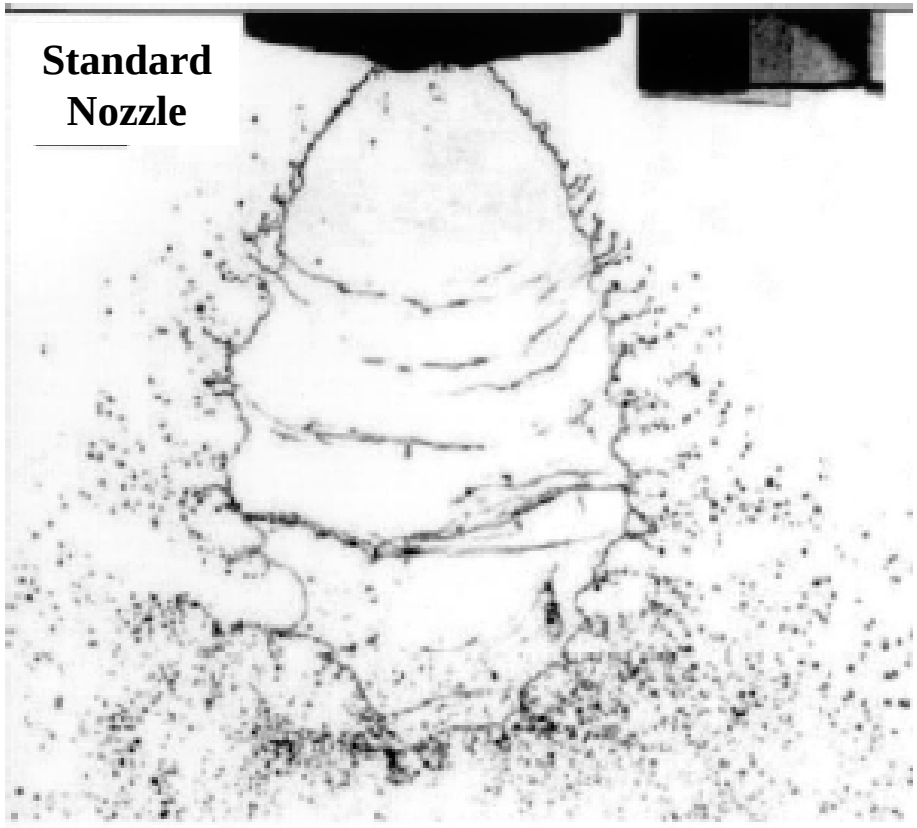
Air induction nozzle

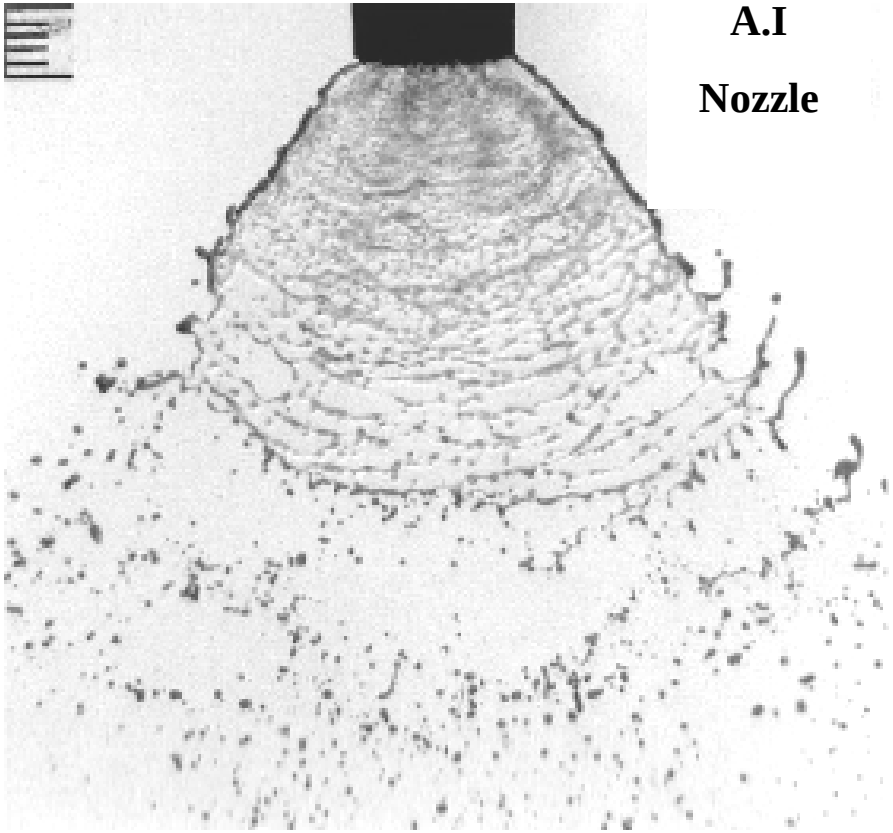
water



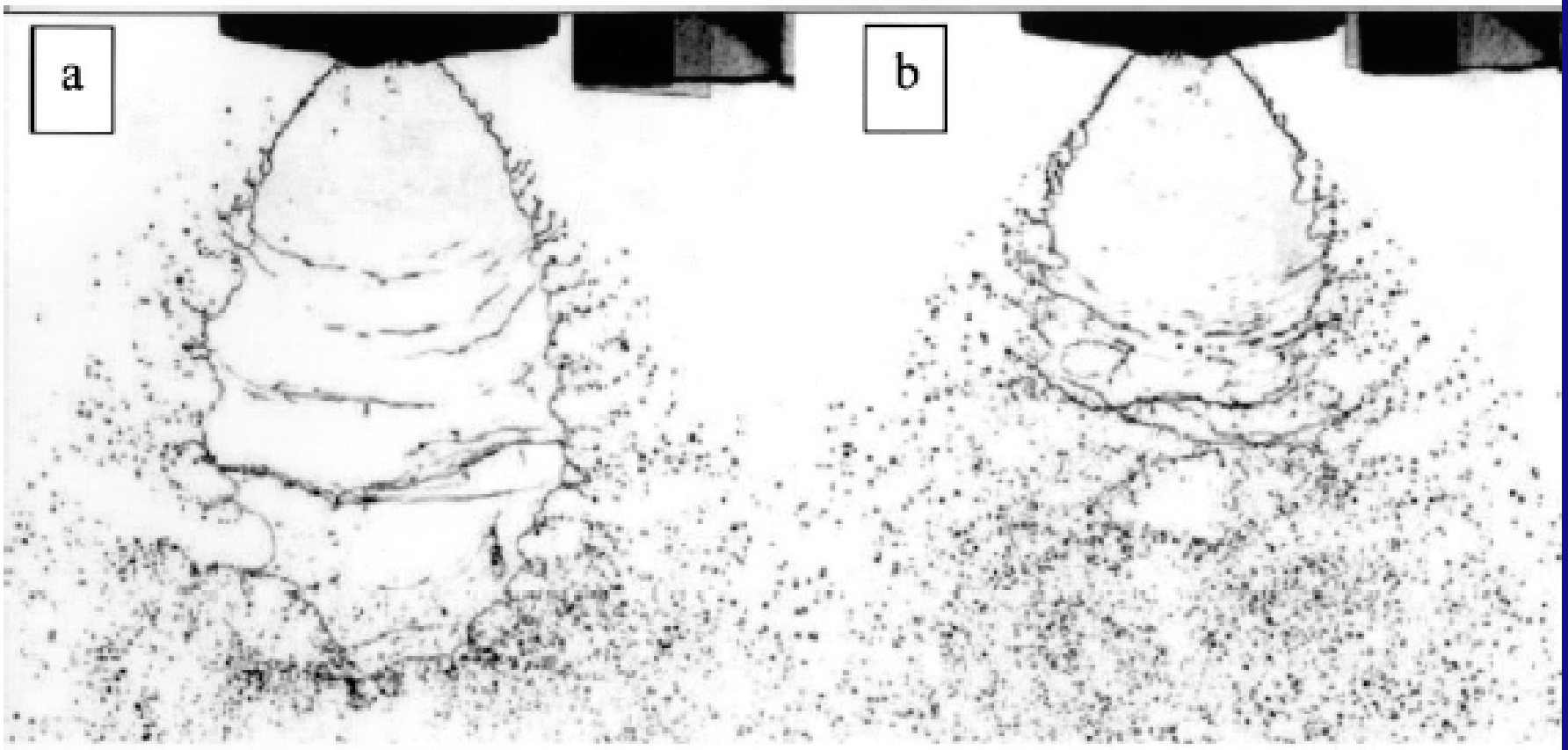
Air induction nozzle

water + 0.5% surfactant

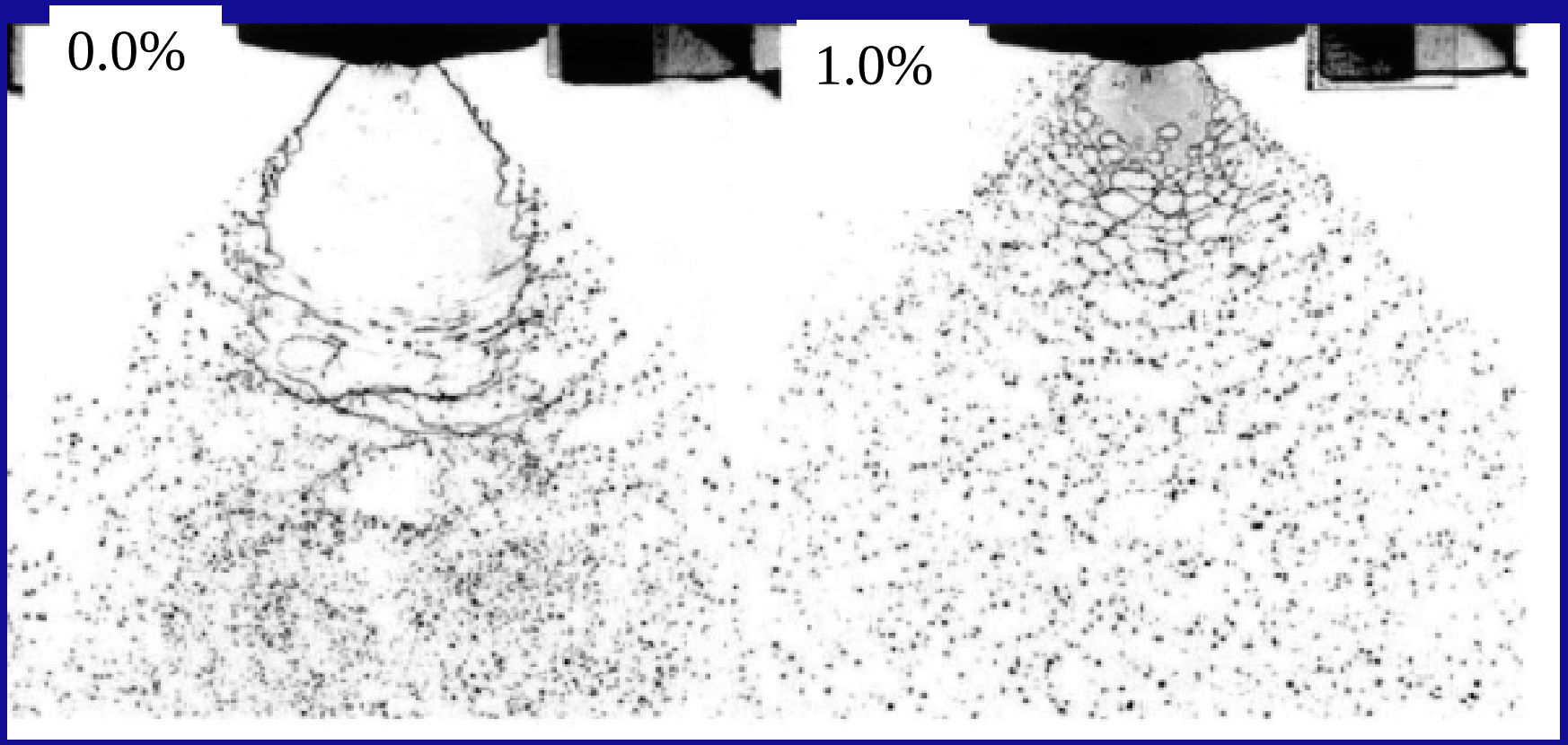




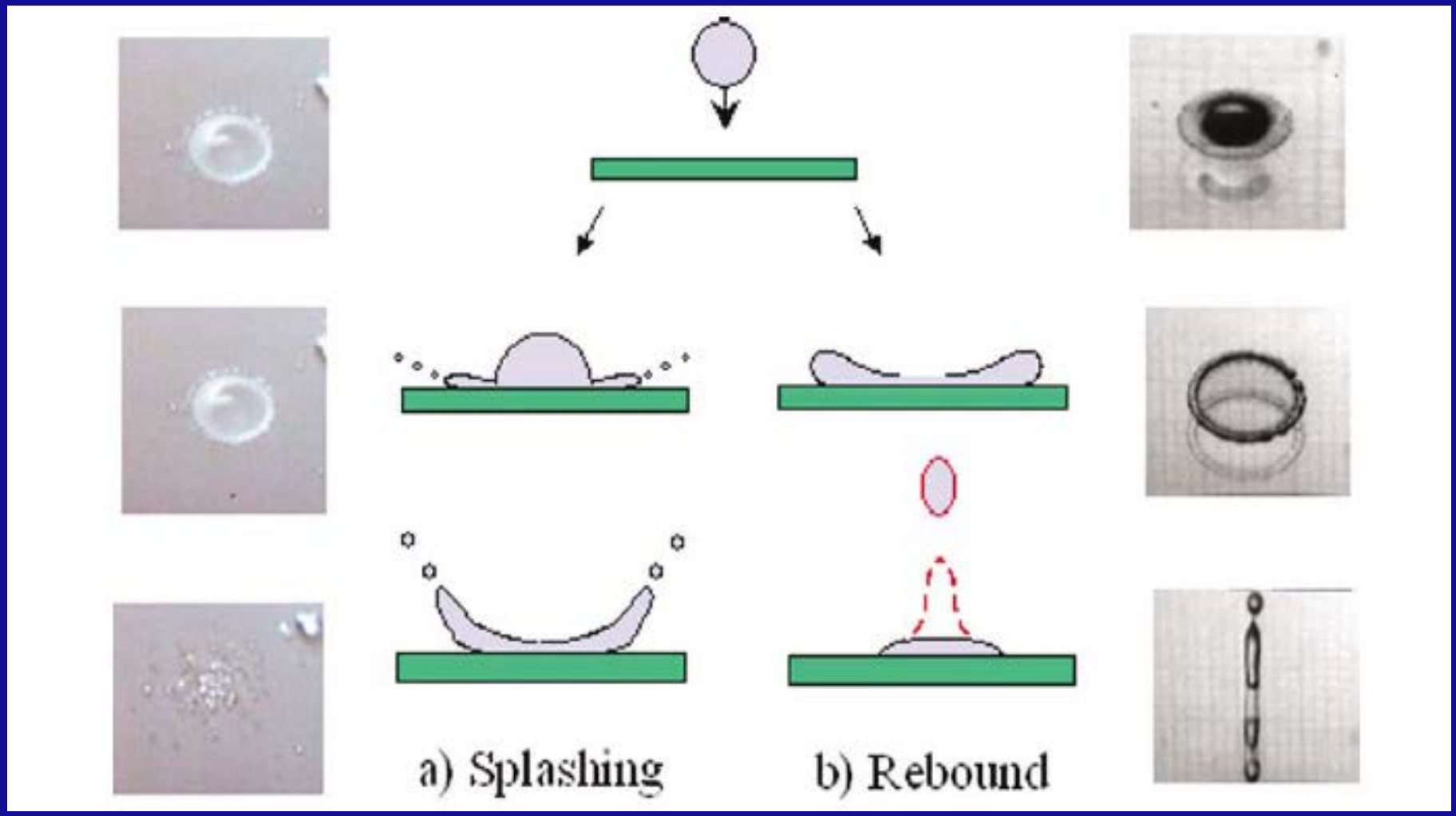
Effects of changing surface tension of spray mix



Effects of changing surface tension and viscosity of spray mix



Droplet deposition



Bergeron, 2003

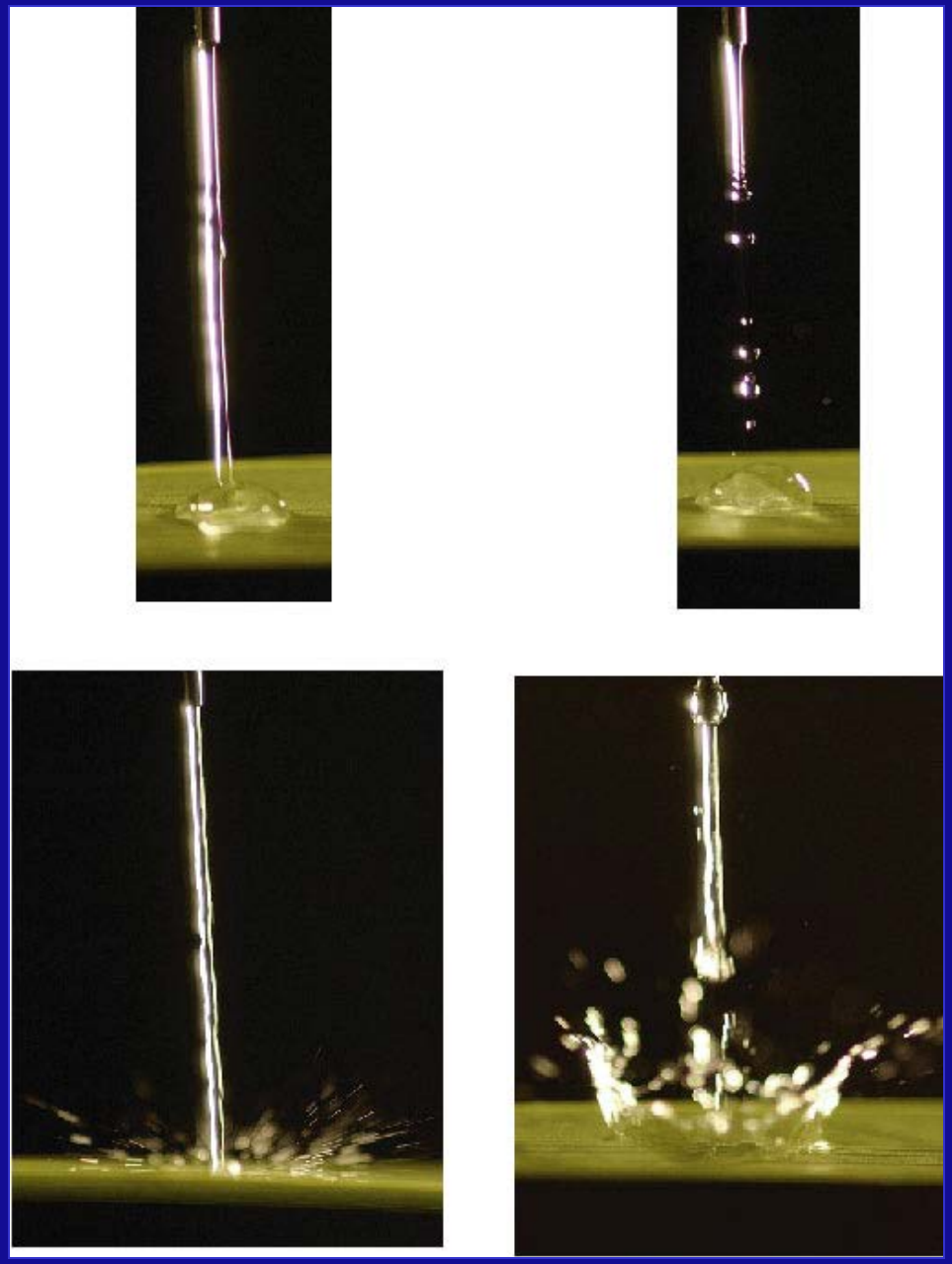
Water

0.508 mm orifice

5 cm distance

70 kPa

100 ms pulse



Poor spread

Water + surfactant

0.508 mm orifice

5 cm distance

70 kPa

100 ms pulse

Splash

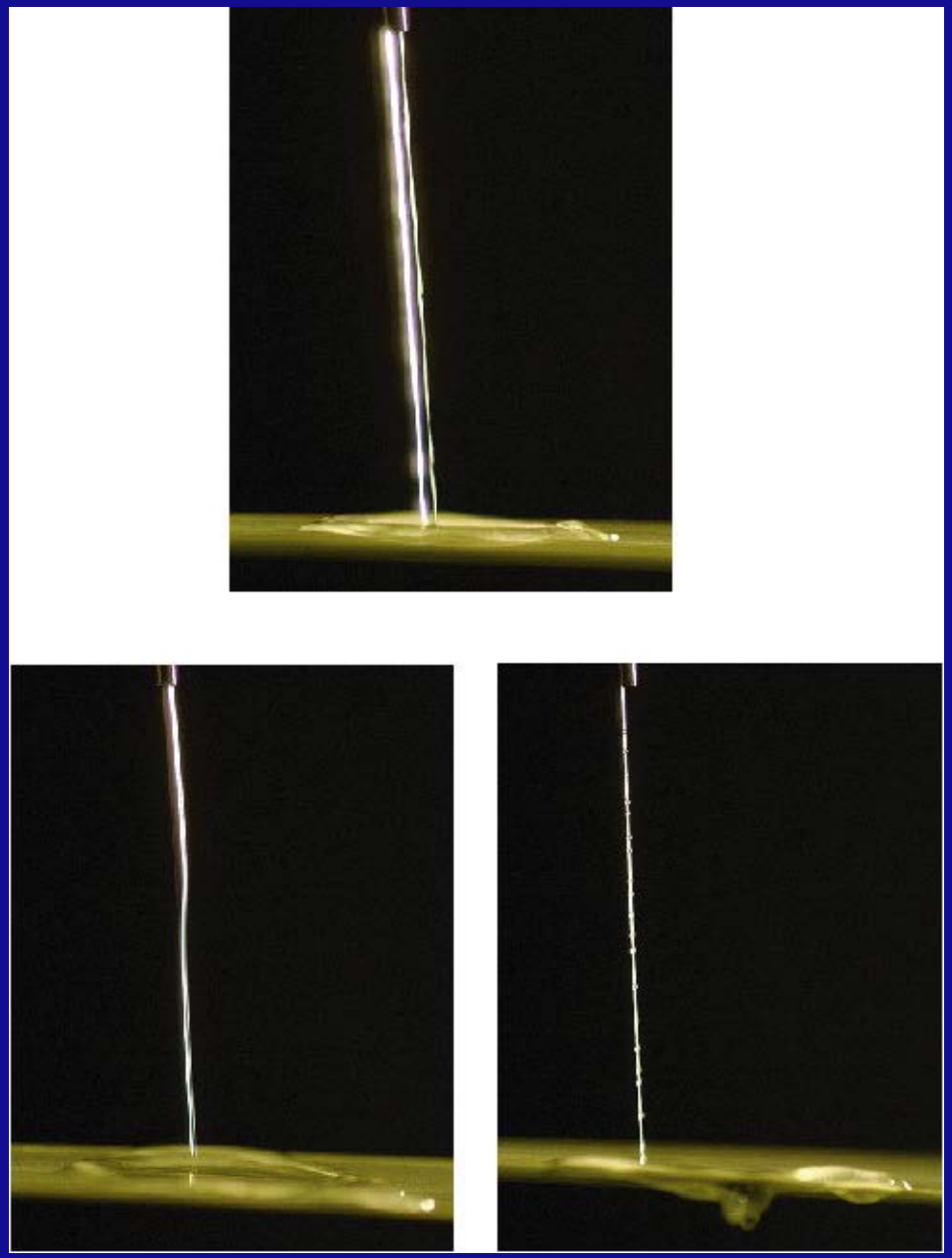
Water + surfactant
+ polymer

0.508 mm orifice

5 cm distance

70 kPa

100 ms pulse



Good spread

Splash inhibited

Avocado

Angle = 45°

Fall Distance = 39 inches

Drop Size = 700 µm

Upper Surface

Lower Surface

Adjuvant effects on deposition

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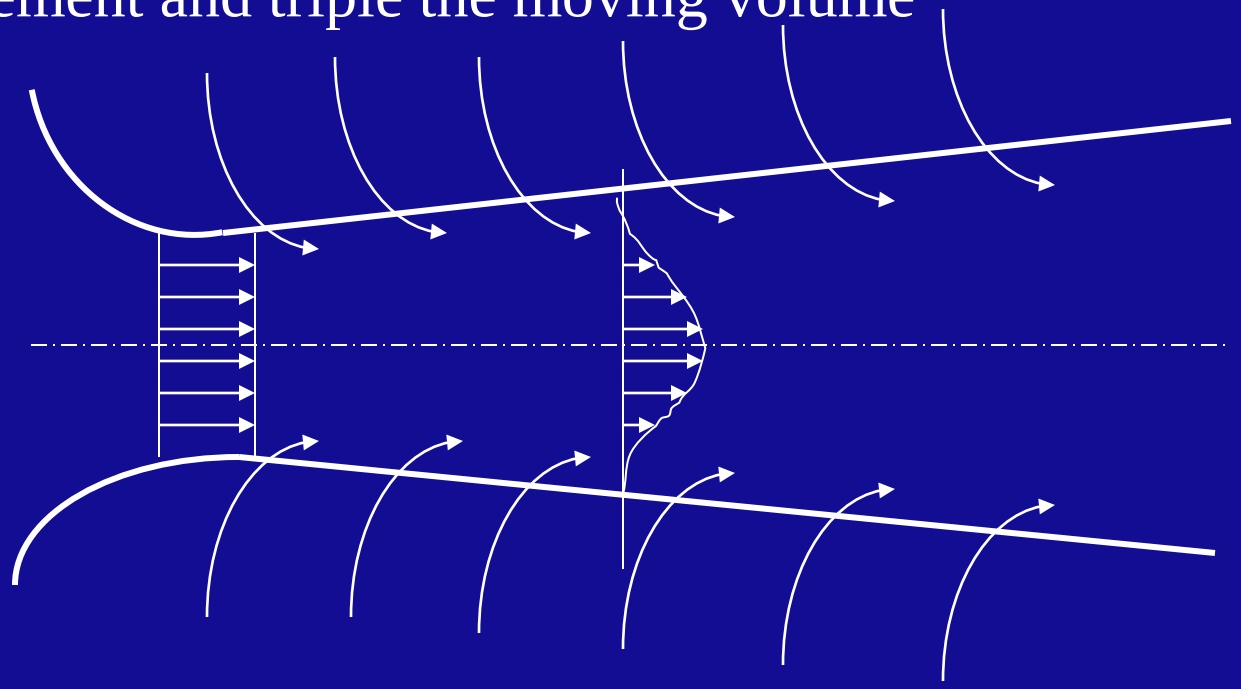
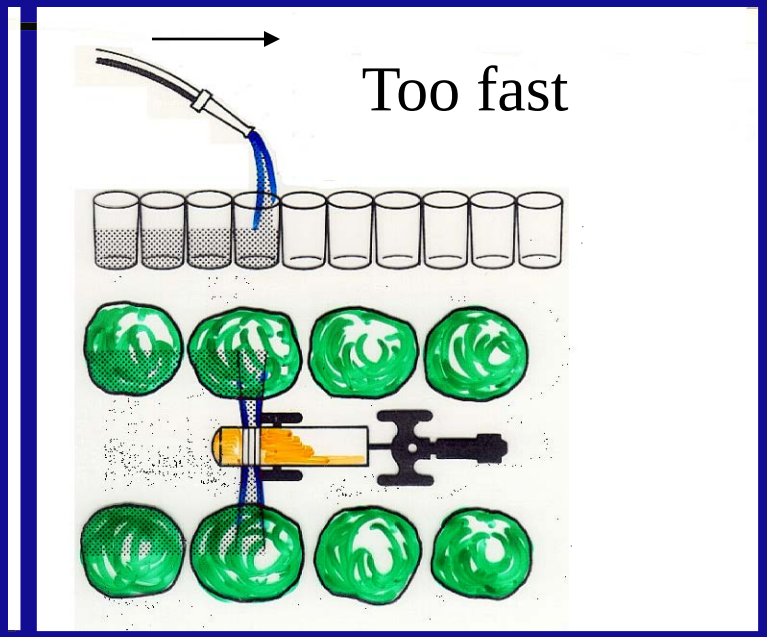
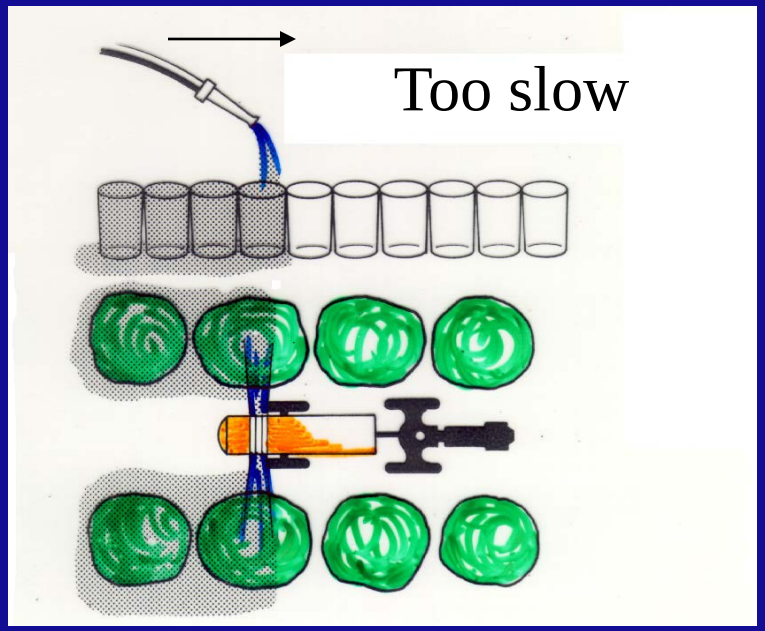
Air movement

- We want to fill the target canopy with spray laden air
- In normal density canopy the blower air will induce air movement and triple the moving volume





Not enough air.



Too much air.

Rule of thumb:

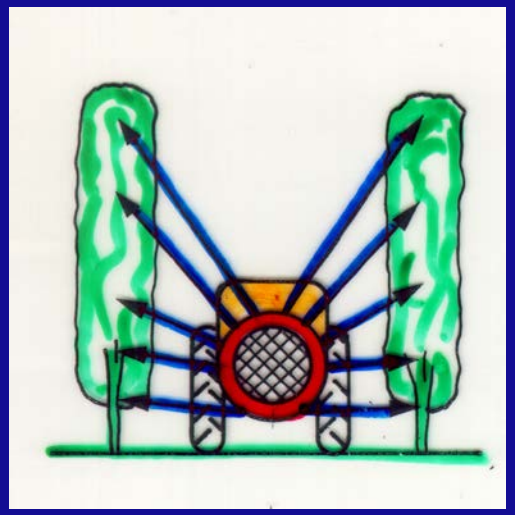
At the optimum combination of air volume and speed the spray will only occasionally penetrate through the row

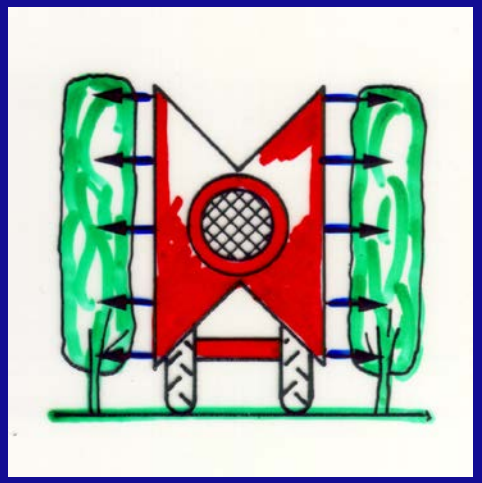
Adjusting driving speed and air to canopy volume

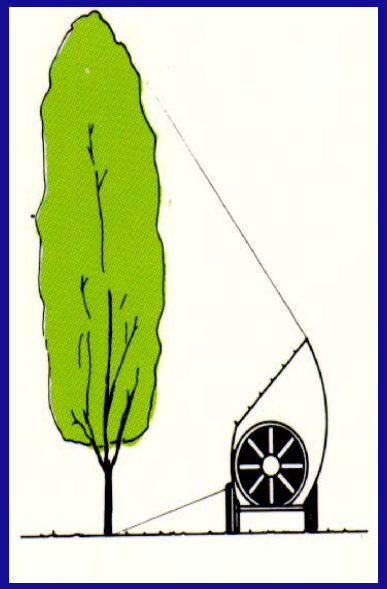
- Theoretical maximum driving speed:

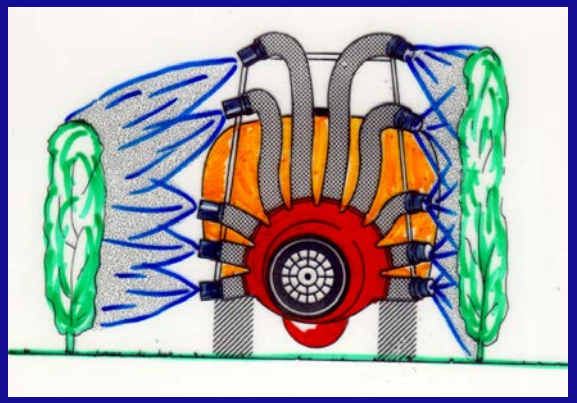
  -the fan should provide enough air to fill the target canopy will droplet loaded air:

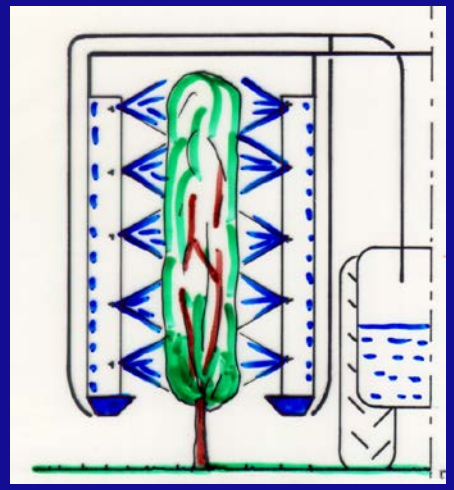
AIR CARRIER SPRAYER CONFIGURTIONS





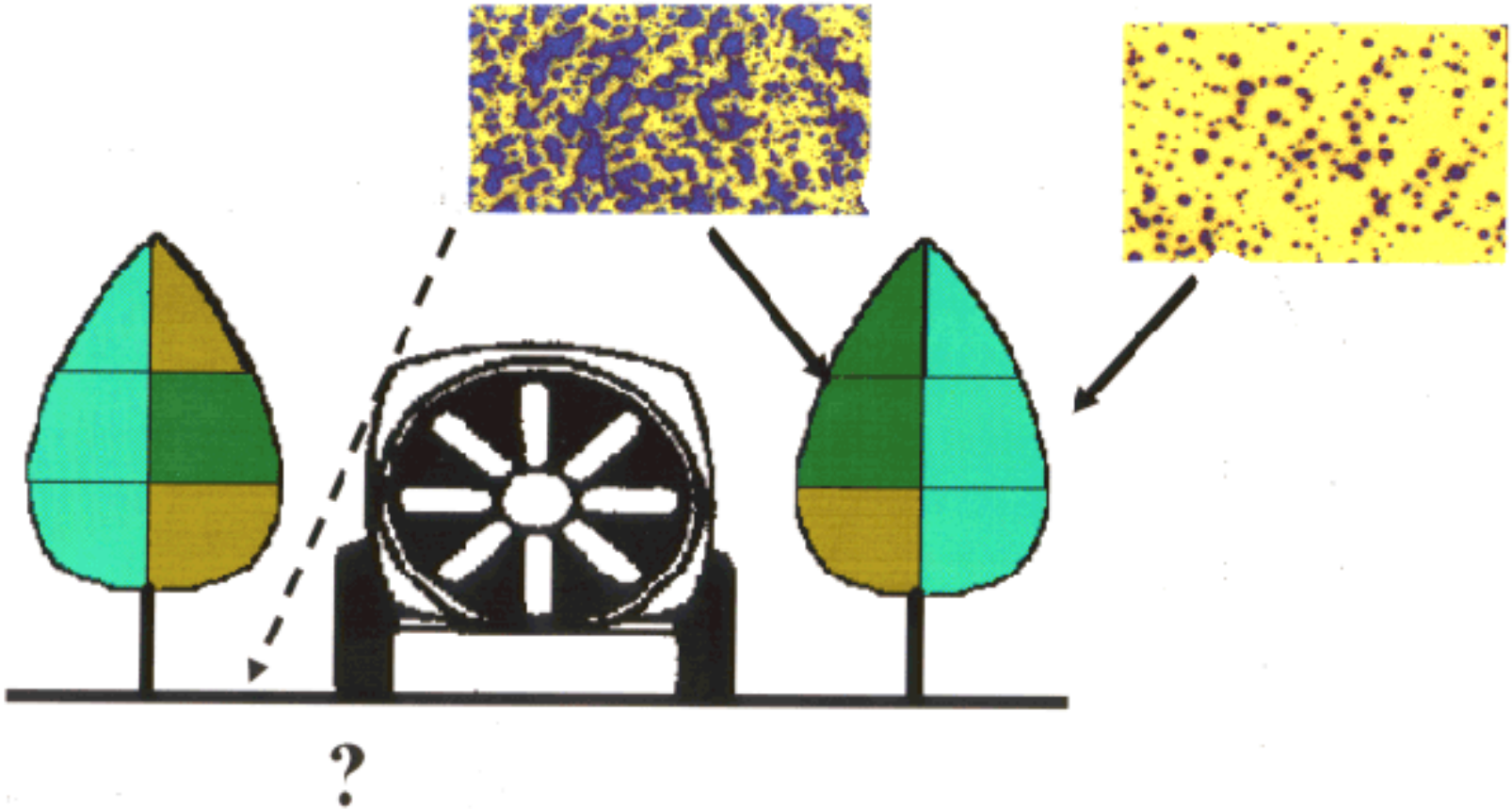






Testing your set-up

Water sensitive paper



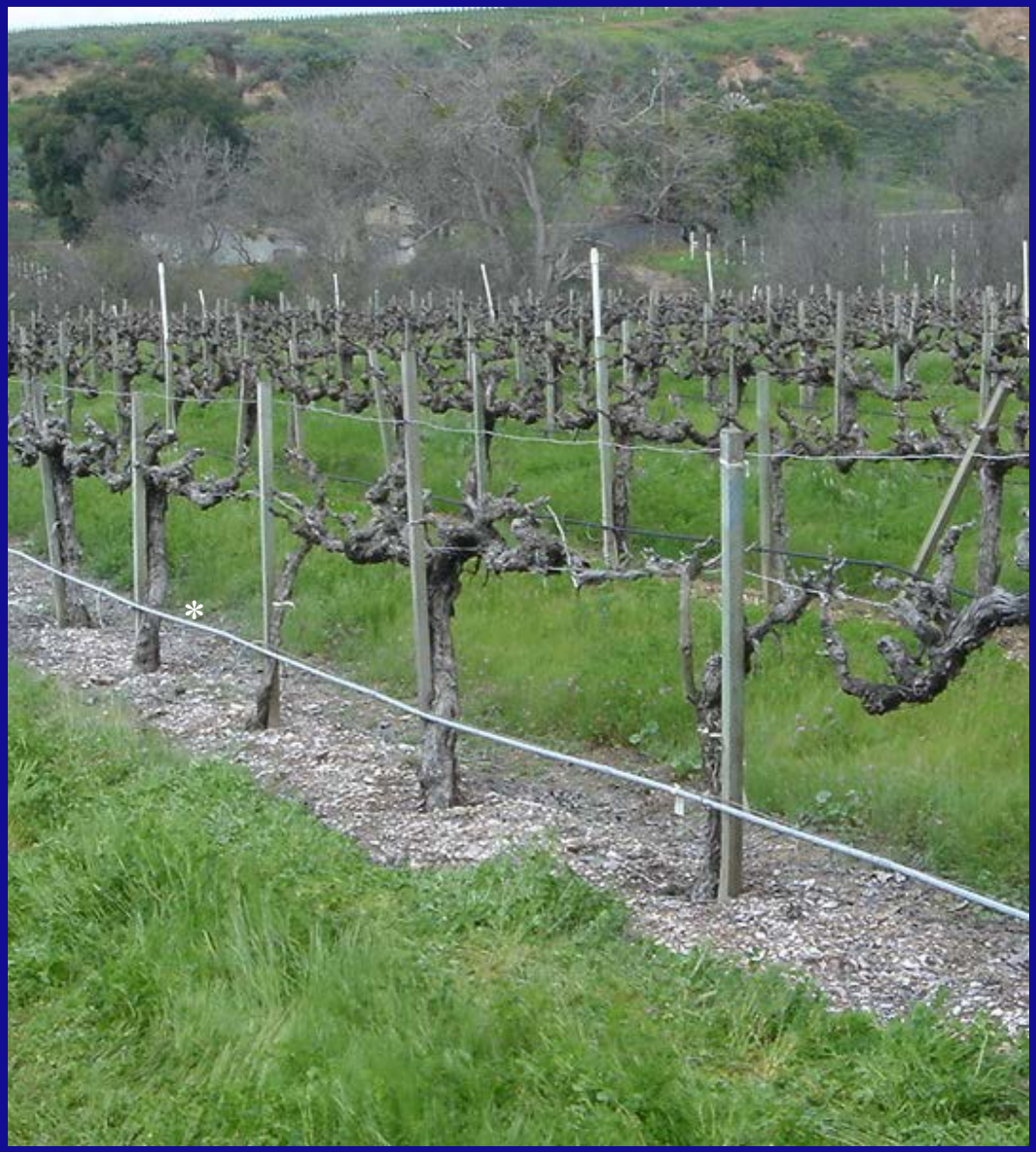
UV tracers – a number of products are available

Tracer with UV-light

Good tracer and registered for use, OMRI* listed:

Surround™

A kaolin clay



* Organic Materials Research Institute

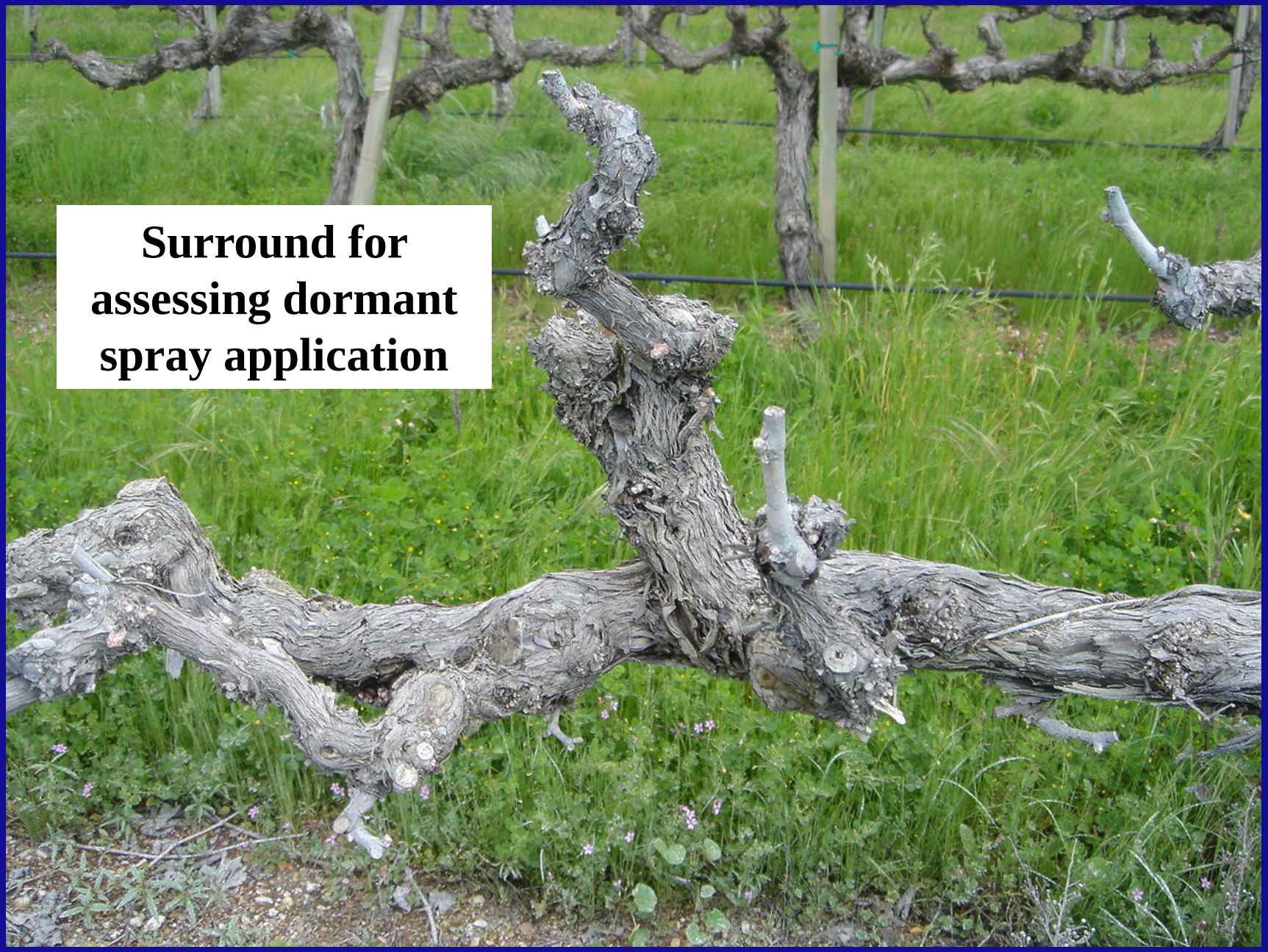
40 gal/acre no surfactant

40 gal/acre with surfactant

20 gal/acre no surfactant

20 gal /acre no surfactant

20 gal /acre with surfactant


Surround for assessing dormant spray application

Clay material shows runoff and overspray

Or … use drip line woven into canopy to show spray patterns…

UCDAVIS
University of California, Davis