The great sprayer nozzle debate of 2006

PART DEUX

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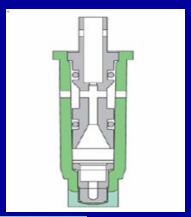
Droplet size categories

American Society of Agricultural Engineers

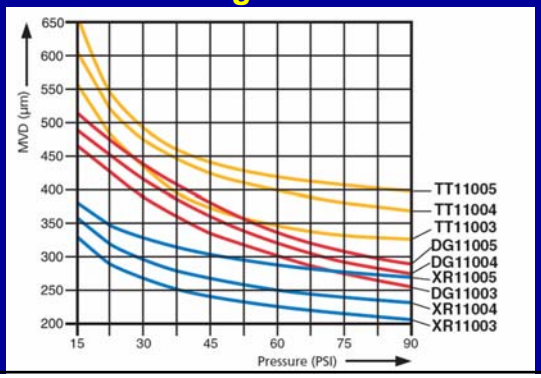
Category	Symbol	Color Code	Volume mean diameter (microns)
Very fine	VF		<150
Fine	F		150-250
Medium	M		250-350
Coarse	C		350-425
Very Coarse	VC		425-500
Extremely coarse	XC		>500

Turbo TeeJet | Extended Range | Air Induction



Page 160 – 161 Droplet Size

Pressure and Droplet Size Page 163



Effect of spray droplet size on drift potential and foliar coverage. Data reprinted from Iowa State University Extension publication, B.A. Pringnist and M. Hanna, 2000.

Droplet diameter (microns*)	Seconds to evaporate	Drift distance**	Coverage (droplets/in^2)
20	0.3	37 ft	
50	1.8	6 ft	197,000
100	7.0	1.6 ft	24,000
150	16.0	10 in	
200	29.0	7 in	3,000

*1 micron = 1/25,000 inch
**from 12 inch fall, with 1 mph wind

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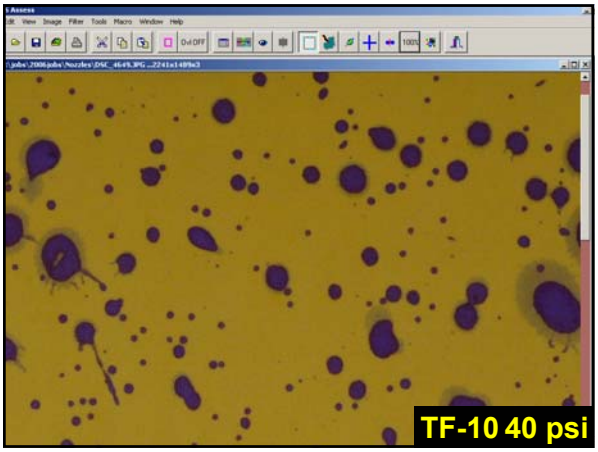
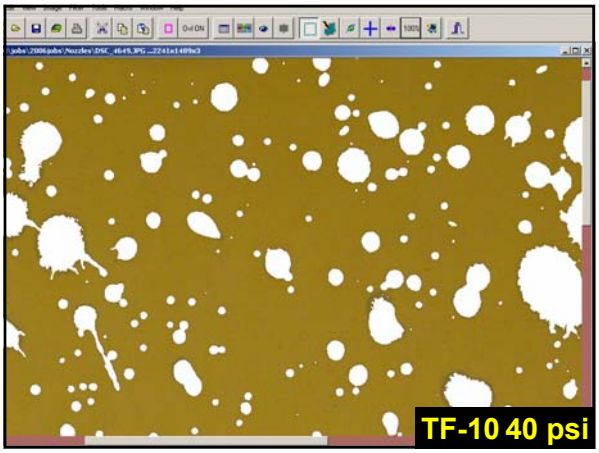
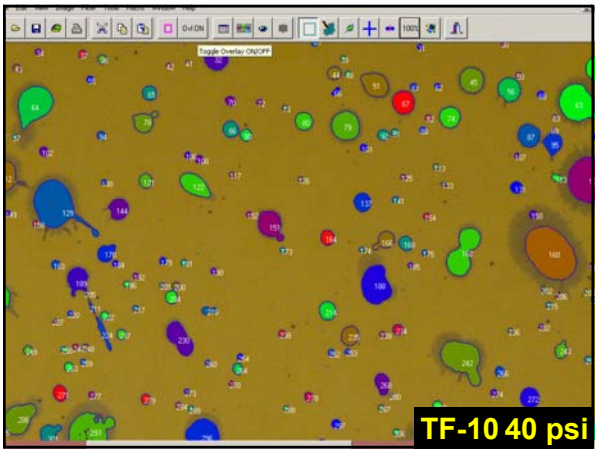
American Society of Agricultural Engineers

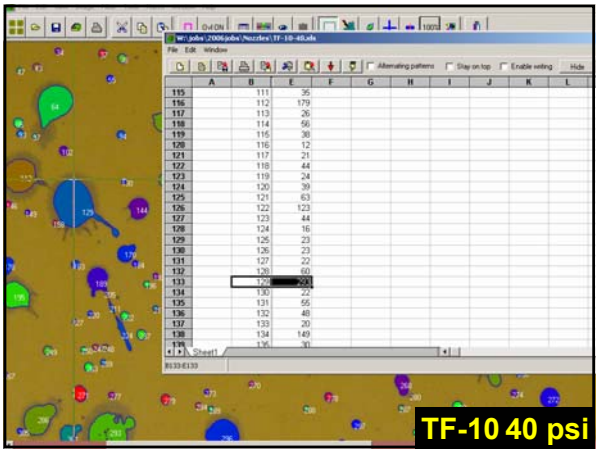
Splat Testing

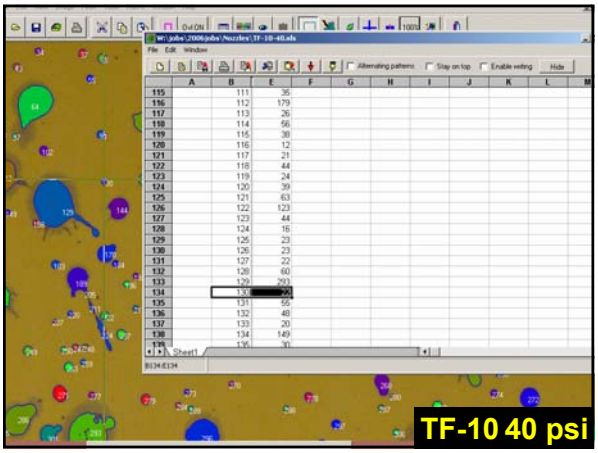
- Evaluation of droplet size distribution using water sensitive paper
- Splat refers to the water spread pattern when a droplet impacts a surface
- Digital photographs are analyzed using image analysis software

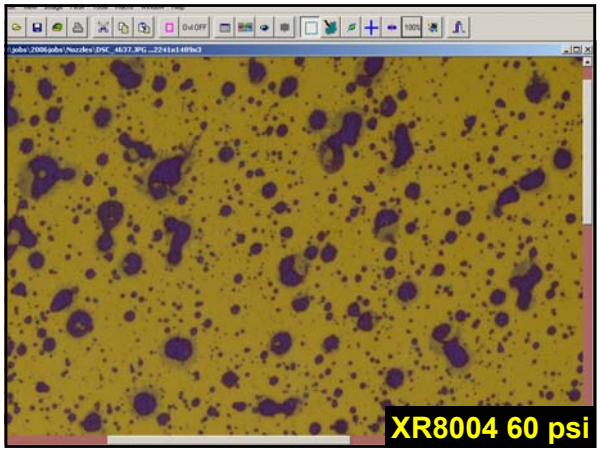


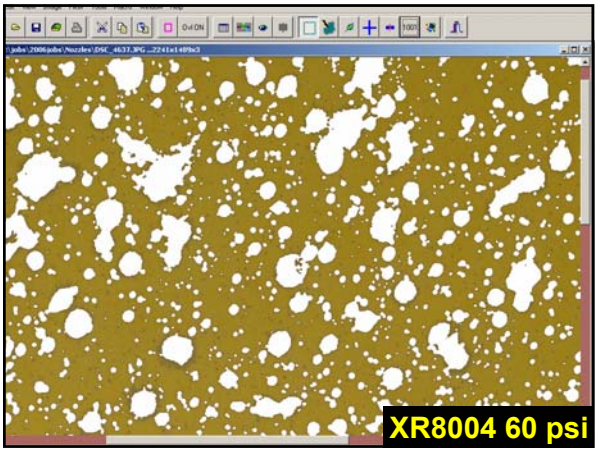









XR8004 60 psi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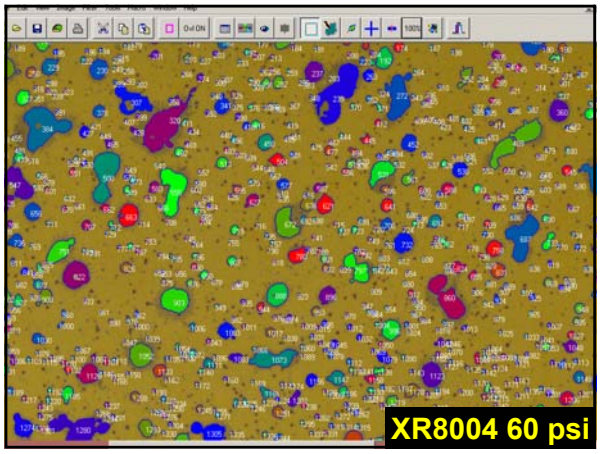
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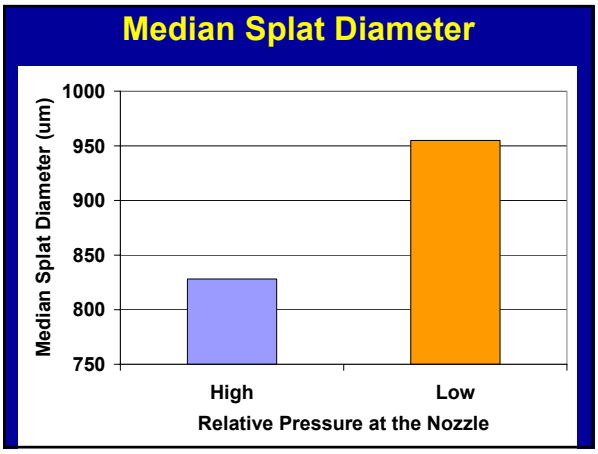
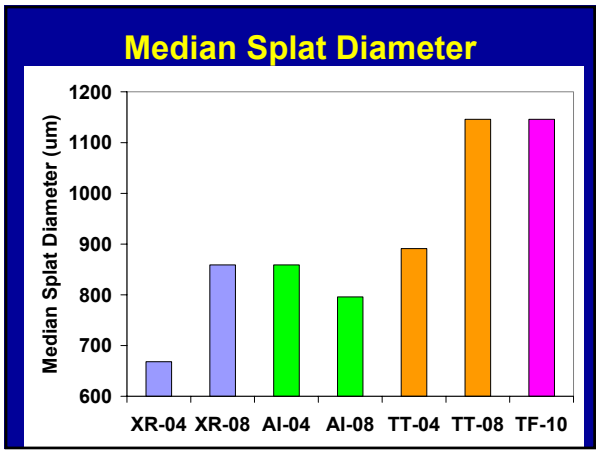
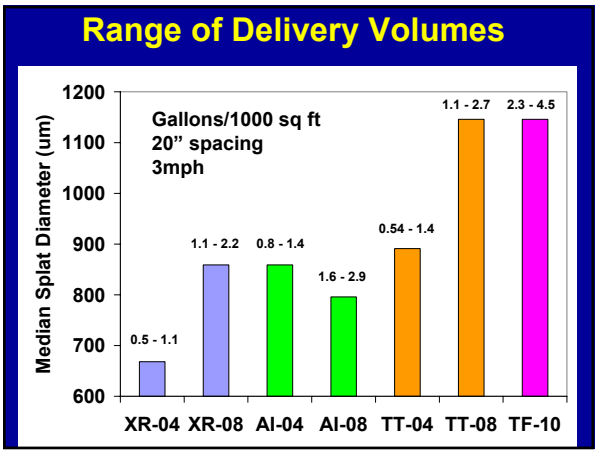

Median Splat Diameter
Median Splat Diameter (um)
1000
950
900
850
800
750
High
Low
Relative Pressure at the Nozzle

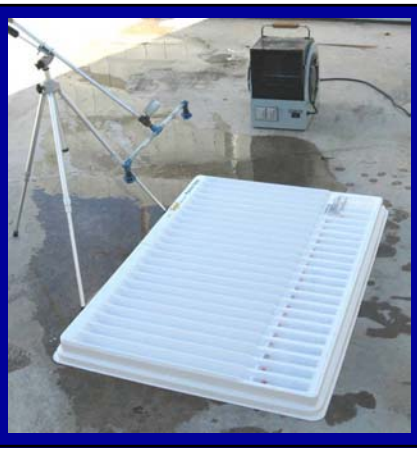

Median Splat Diameter
Median Splat Diameter (um)
1200
1100
1000
900
800
700
600
XR-04
XR-08
AI-04
AI-08
TT-04
TT-08
TF-10

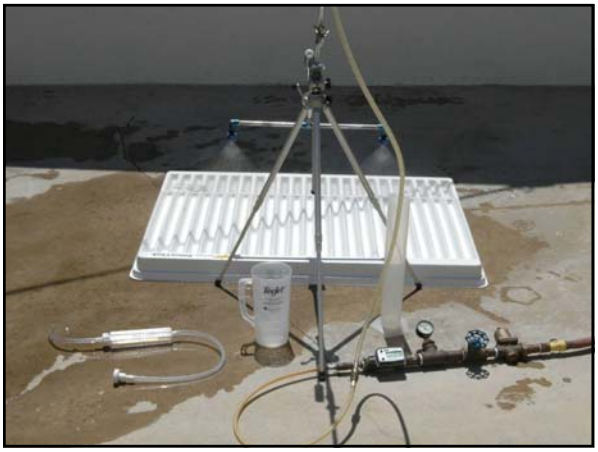

Range of Delivery Volumes
Median Splat Diameter (um)
Gallons/1000 sq ft
20” spacing
3mph
0.5 - 1.1
1.1 - 2.2
0.8 - 1.4
1.6 - 2.9
0.54 - 1.4
1.1 - 2.7
2.3 - 4.5
XR-04
XR-08
AI-04
AI-08
TT-04
TT-08
TF-10

Drift Testing

Drift Testing Setup

- Flow controlled by throttling valve
- Output set to approximately 1 liter per test application
- Low wind speed was between 4 and 6 mph
- High wind speed was between 7 – 9 mph
- 20” nozzle spacing, 17 inch nozzle height



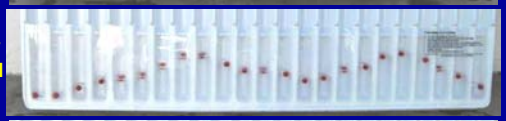


XR8004VS Coarse

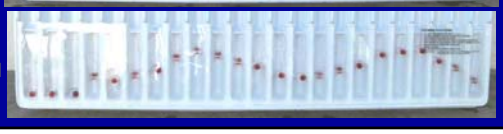
15 psi 0.19 gpm 0.32 gal/M @ 4 mph

No wind

Low wind



High wind



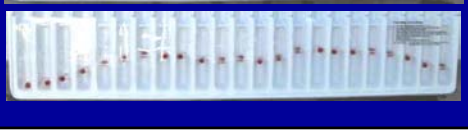
XR8004VS Medium

60 psi 0.48 gpm 0.81 gal/M @ 4mph

No wind

Low wind

High wind



TT11004 Very Coarse

20 psi 0.27 gpm 0.46 gal/M @ 4mph

No wind

Low wind

High wind

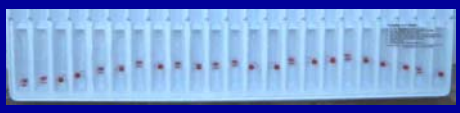
TT11004 Medium

70 psi 0.54 gpm 0.91 gal/M @ 4mph

No wind

Low wind

High wind



AI11004 Extremely Coarse

40 psi 0.42 gpm 0.71 gal/M @ 4mph

No wind

Low wind

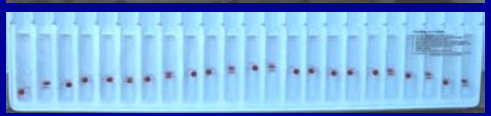
High wind

AI11004 Very Coarse

60 psi 0.51 gpm 0.87 gal/M @ 4mph

No wind

Low wind



High wind

Selecting Nozzles

Sprayer must be able to sense and maintain pressure at the boom or flow rate in addition to maintaining constant speed

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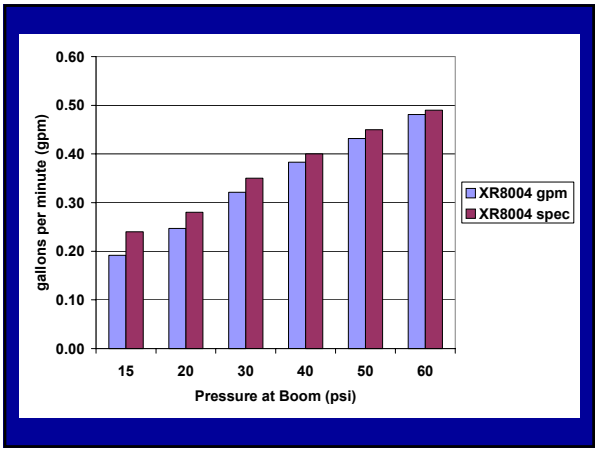
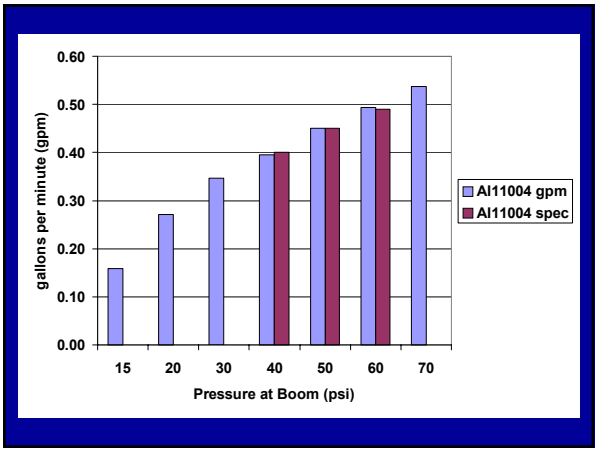
$$\text{gpm} = \frac{\text{mph x nozzle spacing inches x gal/1000 sq ft}}{136}$$

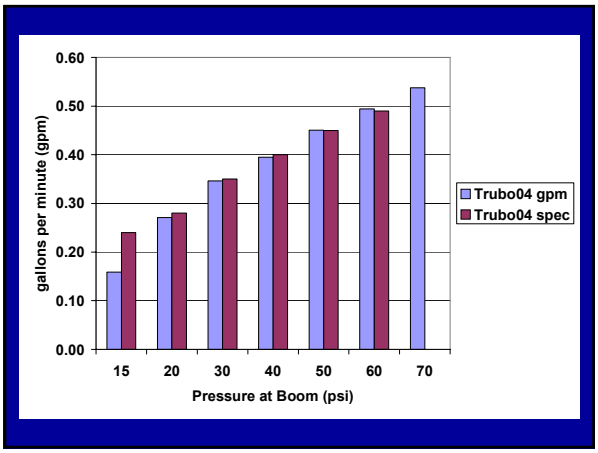
$$\text{gpm} = \frac{\text{mph x nozzle spacing inches x gpa}}{5940}$$

$$\text{gal/1000 sq ft} = \frac{136 \text{ x gpm}}{\text{mph x nozzle spacing inches}}$$

$$\text{gpa} = \frac{5950 \text{ x gpm per nozzle}}{\text{mph x nozzle spacing inches}}$$







Nozzle Specifications
Pages 9 - 12

$$gpm = \frac{2\ gal/1000\ sq\ ft \times 4\ mph \times 20\ inches}{136}$$

$$gpm = 1.18$$

- **Turbo Teejet TT11008 @ 90 psi (page 9)**
- **AI Teejet AI11008 @ 90 psi (page 12)**
- **XR8010 @ 60 psi or XR8015 @ about 28 psi (page 10)**
- **Need pump with at least 15 gpm capacity 12 nozzles 20" spacing**
- **Luckily, fairways are not treated at 2 gpa in the West**

$$gpm = \frac{1\ gal/1000\ sq\ ft \times 4\ mph \times 20\ inches}{136}$$

$$gpm = 0.59$$

- **XR8008 @ 20 psi (page 10)**
- **Turbo Teejet TT11006 @ 40 psi (page 9)**
- **AI Teejet AI11006 @ 40 psi (page 12)**
- **Need pump with at least 8 gpm capacity 12 nozzles 20" spacing**

$$gpm = \frac{1.0 \text{ gal/1000 sq ft x 3 mph x 20 inches}}{136}$$

$$gpm = 0.44$$

- **XR8004 @ 50 psi (page 10)**
- **XR8005 @ 30 psi**
- **XR8006 @ 20 psi**
- **Turbo Teejet TT11004 @ 50 psi (page 9)**
- **AI Teejet AI11004 @ 50 psi (page 12)**
- **Need pump with 9 gpm capacity**
  24 nozzles on 10" spacing

$$gpm = \frac{2 \text{ gal/1000 sq ft x 3 mph x 20 inches}}{136}$$

$$gpm = 0.88$$

- **XR8008 @ 50 psi (page 10)**
- **Turbo Teejet TT11006 @ 90 psi or 08 @ 50 psi (page 9)**
- **AI Teejet AI11006 @ 90 psi or 08 @ 50 psi (page 12)**
- **Need pump with at least 11 gpm capacity**
  12 nozzles 20" spacing

$$gpm = \frac{2 \text{ gal/1000 sq ft x 3 mph x 10 inches}}{136}$$

$$gpm = 0.44$$

- **XR8004 @ 50 psi (page 10)**
- **XR8005 @ 30 psi**
- **XR8006 @ 20 psi**
- **Turbo Teejet TT11004 @ 50 psi (page 9)**
- **AI Teejet AI11004 @ 50 psi (page 12)**
- **Tight nozzle spacing, more flexibility**
- **Need pump with 11 gpm capacity**
  24 nozzles on 10" spacing

$$gpm = \frac{4 \text{ gal/1000 sq ft x 3 mph x 10 inches}}{136}$$

$$gpm = 0.88$$

- **XR8008 @ 50 psi (page 10)**
- **Turbo Teejet TT11006 @ 90 psi or 08 @ 50 psi (page 9)**
- **AI Teejet AI11006 @ 90 psi or 08 @ 50 psi (page 12)**
- **More options with 10" spacing**
- **Need pump with at least 21 gpm capacity**
  24 nozzles 10" spacing

Any Questions?