

# The great sprayer nozzle debate of 2006

## PART DEUX

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www.paceturf.org

# Droplet size categories

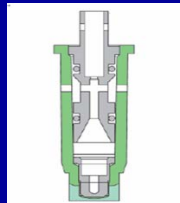
American Society of Agricultural Engineers

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

Turbo TeeJet

Extended Range

Air Induction

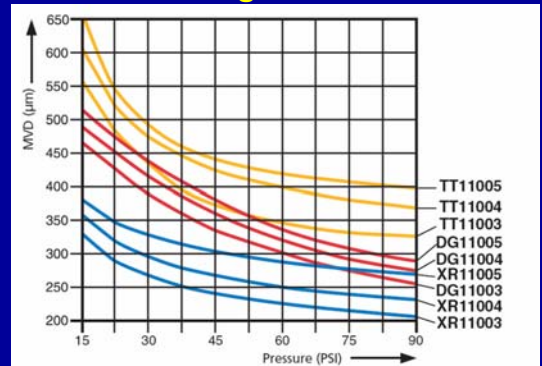


Page 160 – 161 Droplet Size



# Pressure and Droplet Size

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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 <sup>2</sup> ) |
|-----------------------------|----------------------|------------------|--------------------------------------|
| 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

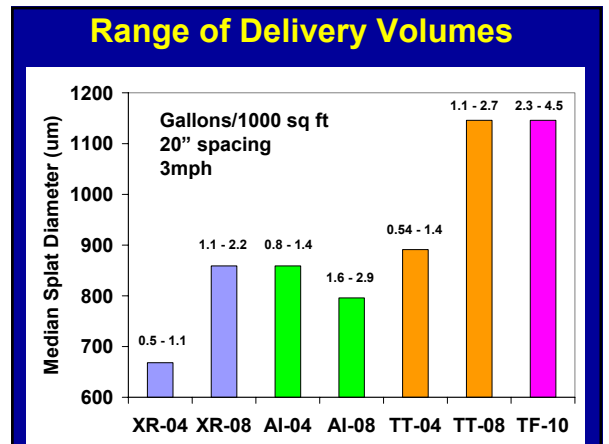
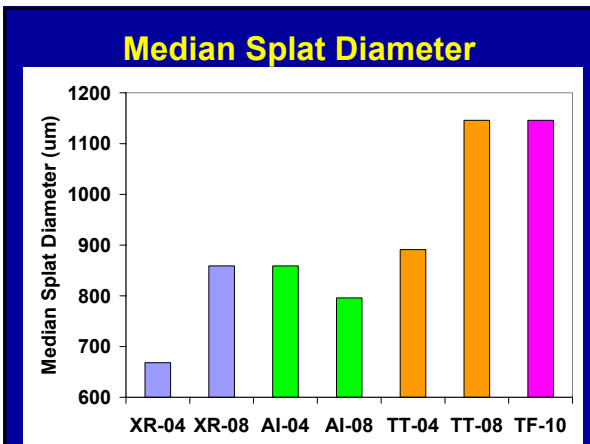
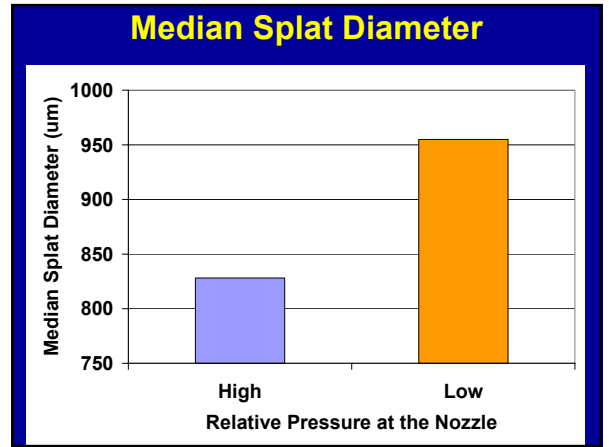
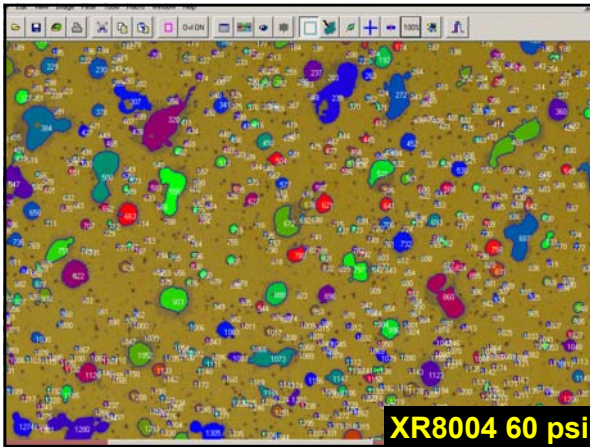
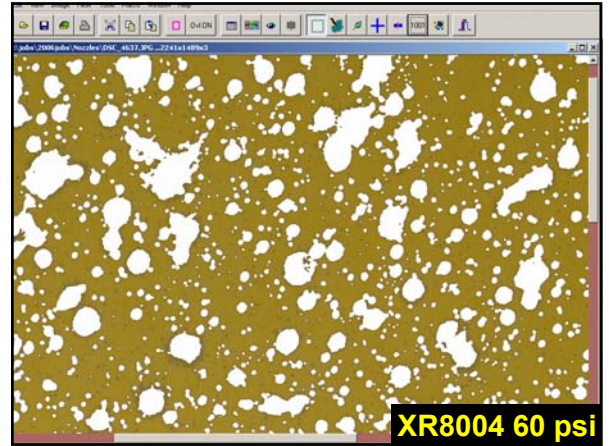
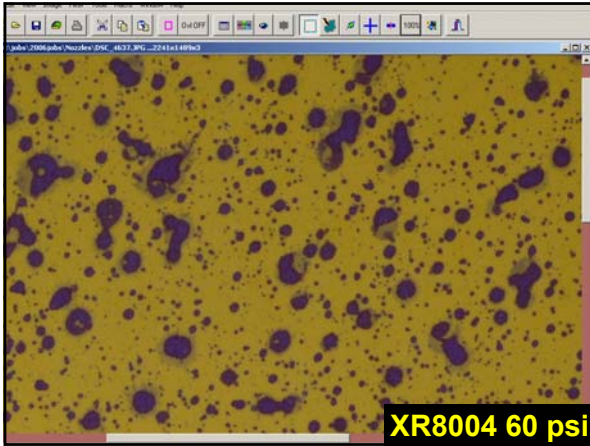
\*\*from 12 inch fall, with 1 mph wind

# Droplet size categories

| Category           | Symbol    | Color Code    | Volume mean diameter (microns) |
|--------------------|-----------|---------------|--------------------------------|
| Very fine          | VF        | Red           | <150                           |
| Fine               | F         | Orange        | 150-250                        |
| <b>Medium</b>      | <b>M</b>  | <b>Yellow</b> | <b>250-350</b>                 |
| <b>Coarse</b>      | <b>C</b>  | <b>Cyan</b>   | <b>350-425</b>                 |
| <b>Very Coarse</b> | <b>VC</b> | <b>Green</b>  | <b>425-500</b>                 |
| Extremely coarse   | XC        |               | >500                           |

American Society of Agricultural Engineers

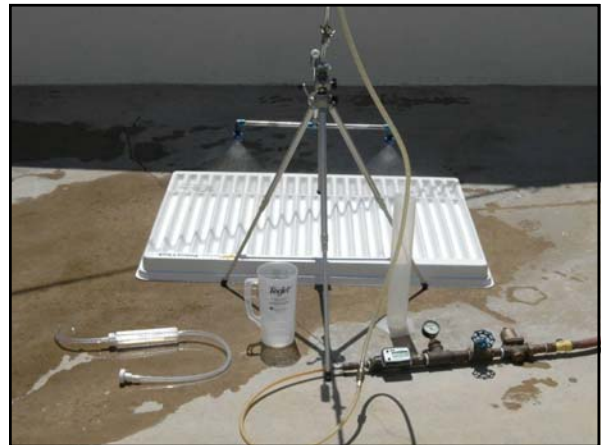




## Drift Testing

## Drift Testing Setup

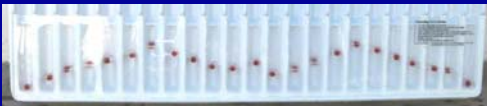
- Flow controlled by throttling valve
- Output set to approximately 1 liter per test application
- Low wind speed was between 4 and 6 mph
- High wind speed was between 7 – 9 mph
- 20" nozzle spacing, 17 inch nozzle height



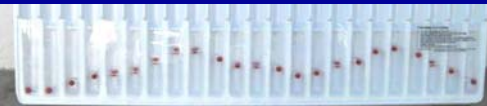
## XR8004VS Coarse

15 psi 0.19 gpm 0.32 gal/M @ 4 mph

No  
wind



Low  
wind



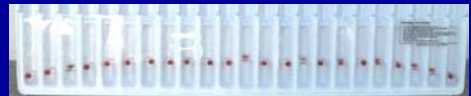
High  
wind



## XR8004VS Medium

60 psi 0.48 gpm 0.81 gal/M @ 4mph

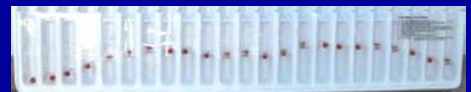
No  
wind



Low  
wind



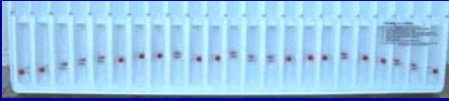
High  
wind



## TT11004 Very Coarse

20 psi 0.27 gpm 0.46 gal/M @ 4mph

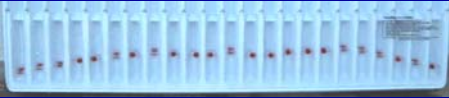
No  
wind



Low  
wind



High  
wind



## TT11004 Medium

70 psi 0.54 gpm 0.91 gal/M @ 4mph

No  
wind



Low  
wind



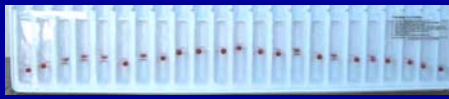
High  
wind



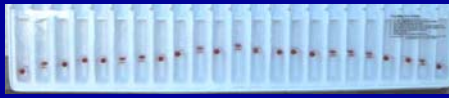
## AI11004 Extremely Coarse

40 psi 0.42 gpm 0.71 gal/M @ 4mph

No  
wind



Low  
wind



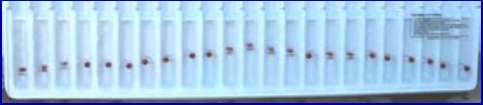
High  
wind



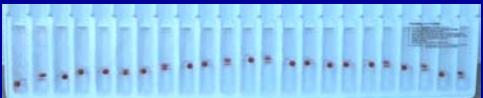
## AI11004 Very Coarse

60 psi 0.51 gpm 0.87 gal/M @ 4mph

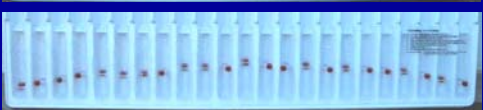
No  
wind



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**

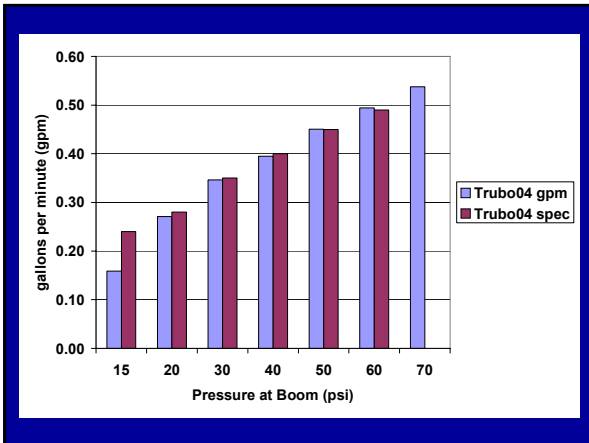
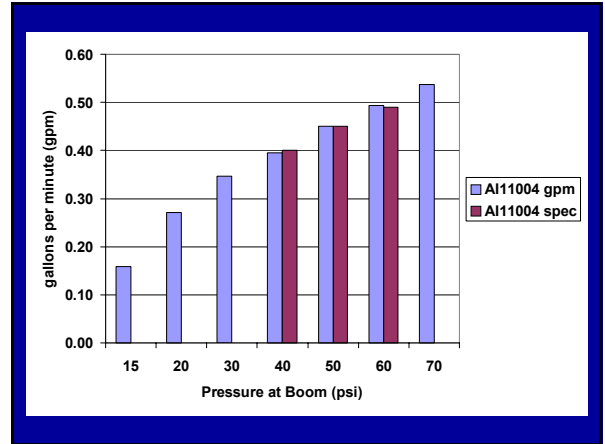
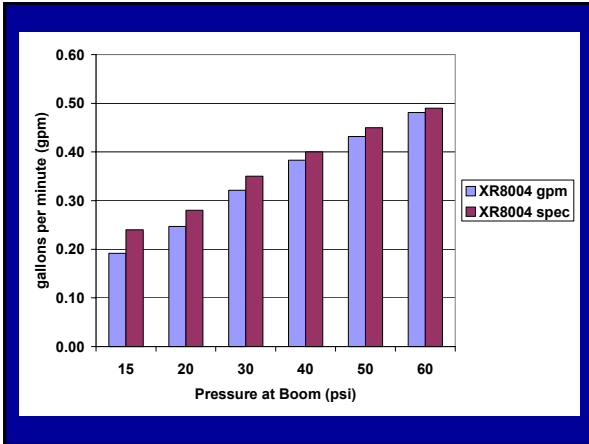
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$$\text{gpm} = \frac{\text{mph} \times \text{nozzle spacing inches} \times \text{gal/1000 sq ft}}{136}$$

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

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

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



## Nozzle Specifications Pages 9 - 12

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

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

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

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

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

$$\text{gpm} = 0.44$$

- 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

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

$$\text{gpm} = 0.88$$

- 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

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

$$\text{gpm} = 0.44$$

- 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

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

$$\text{gpm} = 0.88$$

- 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?**