Spray Tips for Aiding Herbicide Performance

58th Annual Lodi Grape Day

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What can we do to aid herbicide performance?

(assuming we're using the proper herbicide(s), rates, additives, and spray timing for the weeds being treated)

- ✓ Spray nozzle choice (drift/efficacy)
- ✓ Spray technique (applicator/conditions)

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Tall weeds = erratic or poor control = high spray height
= increased drift = increased plant injury = complaints
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Treat within a couple weeks of each weed flush if possible

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✓ Spray nozzle choice

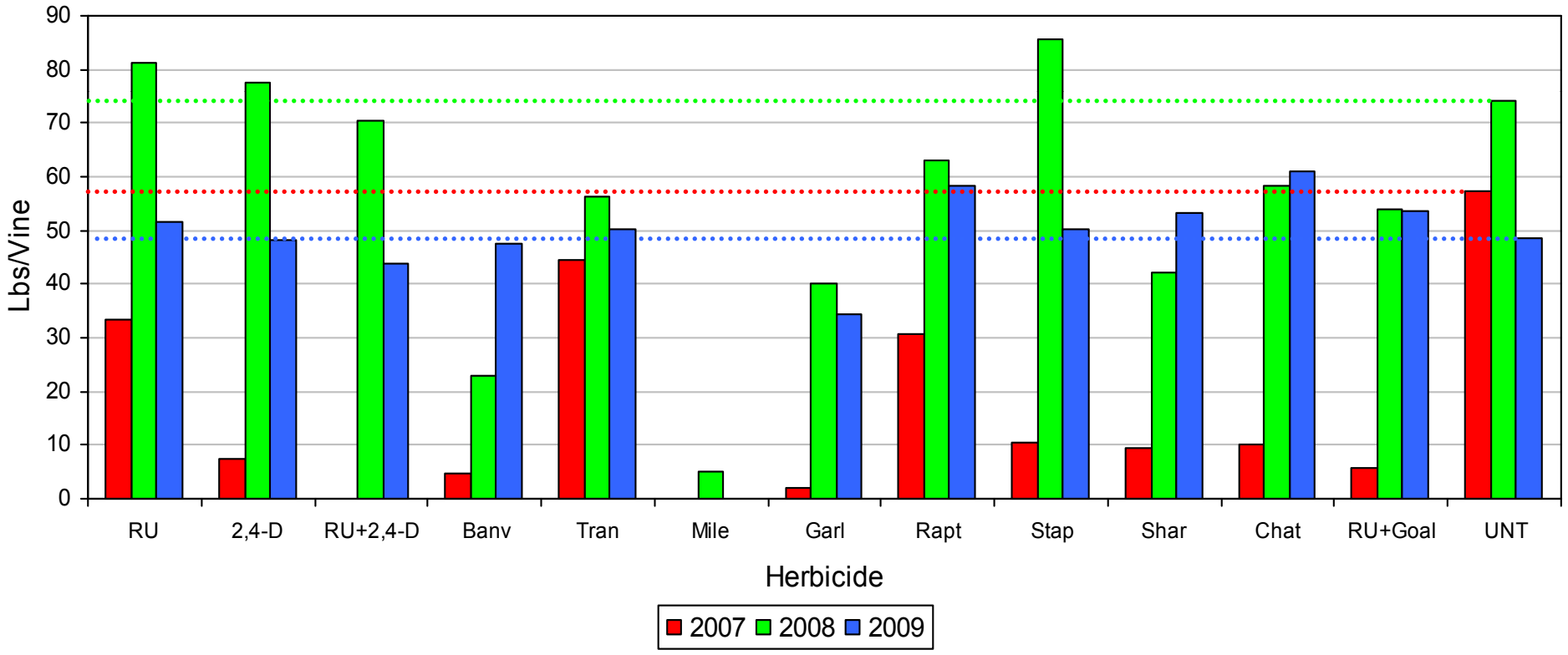
Spray nozzles are the least expensive part of any spray job, but often the most overlooked!

Nozzles have been engineered to produce spray droplets of a given size for a given pattern.

Nozzle choice

- Directly affects:
  - spray droplet size
  - spray drift potential
  - uniformity and coverage
- Which impacts:
  - weed control
  - economics
  - environmental quality

Postemergent Herbicide Drift and Grape Yield (treated at 4" shoots) KAC



Droplet size classification
(droplets <~200 microns drift more)

Spray droplet diameter (μm)	Spray droplet category	Example
10	---	Dry fog
<145	Very fine	Wet fog
145-225	Fine	Fine mist/drizzle
226-325	Medium	Very fine rain
326-400	Coarse	Fine rain
401-500	Very coarse	Light rain
>500	Extremely coarse	Medium rain
1000	---	Heavy rain

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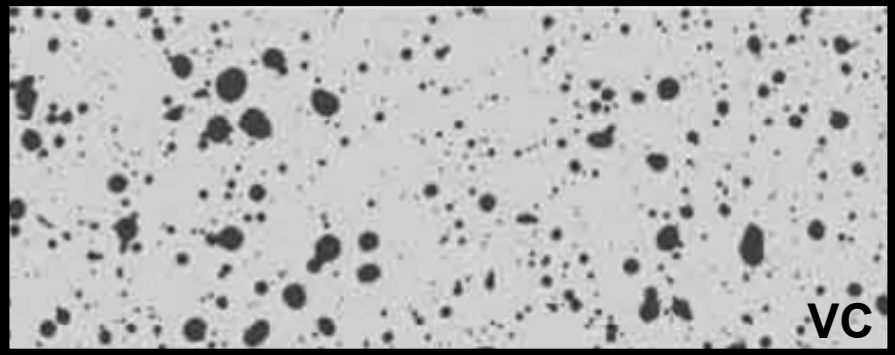
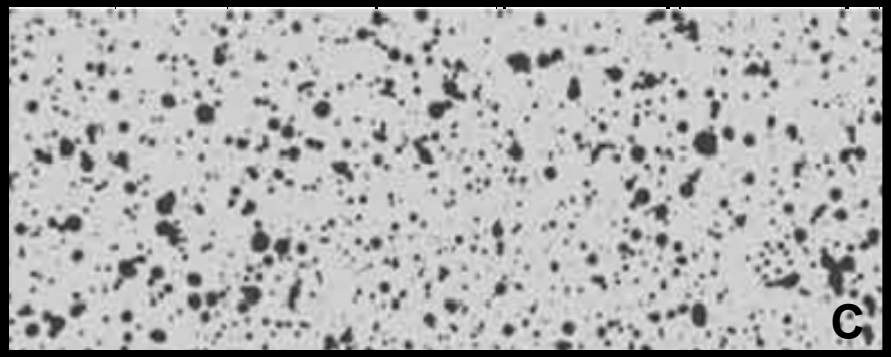
Droplets <~200 μm drift more

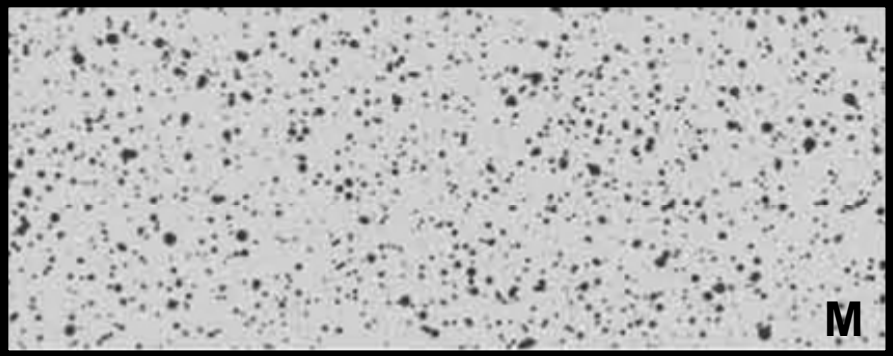
410 microns



340 microns



235 microns



Less Drift

Better coverage, but more drift

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Use an 03 or larger size nozzle to get the carrier and herbicide to the weeds

8001 at 30 psi at 5 mph

Fine droplets (~175 µm)

8004 at 30 psi at 5 mph

Medium droplets (~250 µm)

Spray nozzle choices for herbicide application, drift management, and herbicide performance.

Table 1. Spray nozzle description, operating pressure, droplet size, drift, and general herbicide use patterns

Spray Nozzle Description	PSI range	Droplet size	Drift management	Preemergents	Systemics	Contacts
Extended Range (XR) flat fan	15 – 60	F-C (15 psi) VF-M (50 psi)	Good (15-20 psi)	Good	Very Good (15-30 psi)	Good (>40 psi)
Off-Center	30 – 60	M-VC	Good (>size 06)	Very good**	Good**	Poor
Turbo TeeJet	15 – 90	M-XC	Very good (<30 psi)	Good	Excellent (<30 psi)	Good
Drift Guard TeeJet	30 – 60	F-C	Good	Good	Good	Poor
Air Induction	30 – 100	C-XC	Excellent	Very good	Excellent	Good
Air Induction XR	15 – 90	M-XC	Excellent	Very good	Excellent	Good
Turbo TeeJet Induction	15 – 100	XC	Excellent	Excellent	Excellent	Poor
TwinJet	30 – 60	F-M	Poor	Poor	Good	Excellent
Drift Guard TwinJet	30 – 60	F-C	Very good	Very good	Excellent	Very good
Turbo TwinJet	20 - 90	M-XC	Excellent (<30 psi)	Very good (<30 psi)	Excellent (<30 psi)	Very good (>30 psi)

VF (very fine), F (fine), M (medium), C (coarse), XC (extra coarse)

Nozzle tip wear: nozzle tip wear depends primarily on tip material:
(wears quickly) brass > polyacetyl > stainless > ceramic > carbide (little to no wear).

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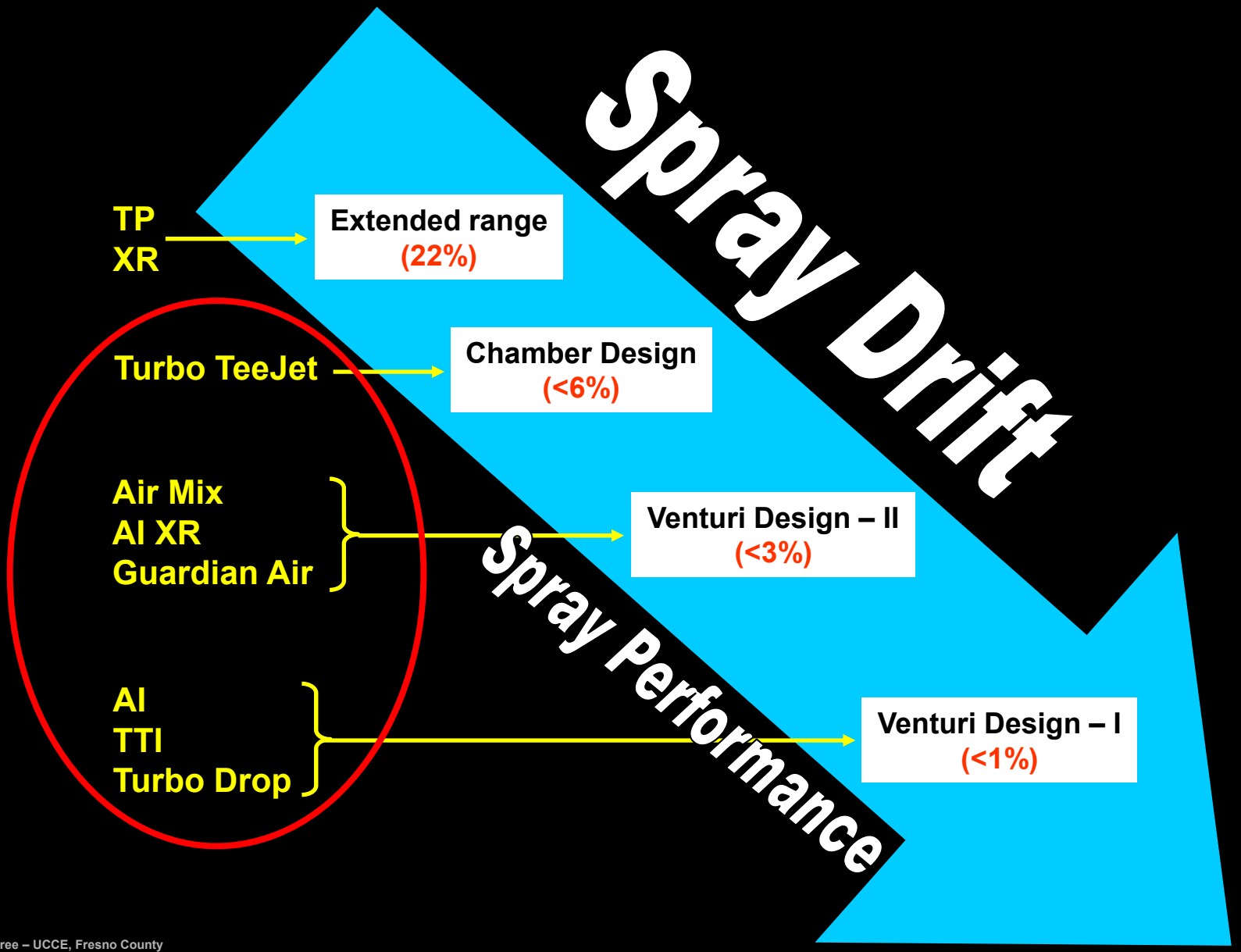
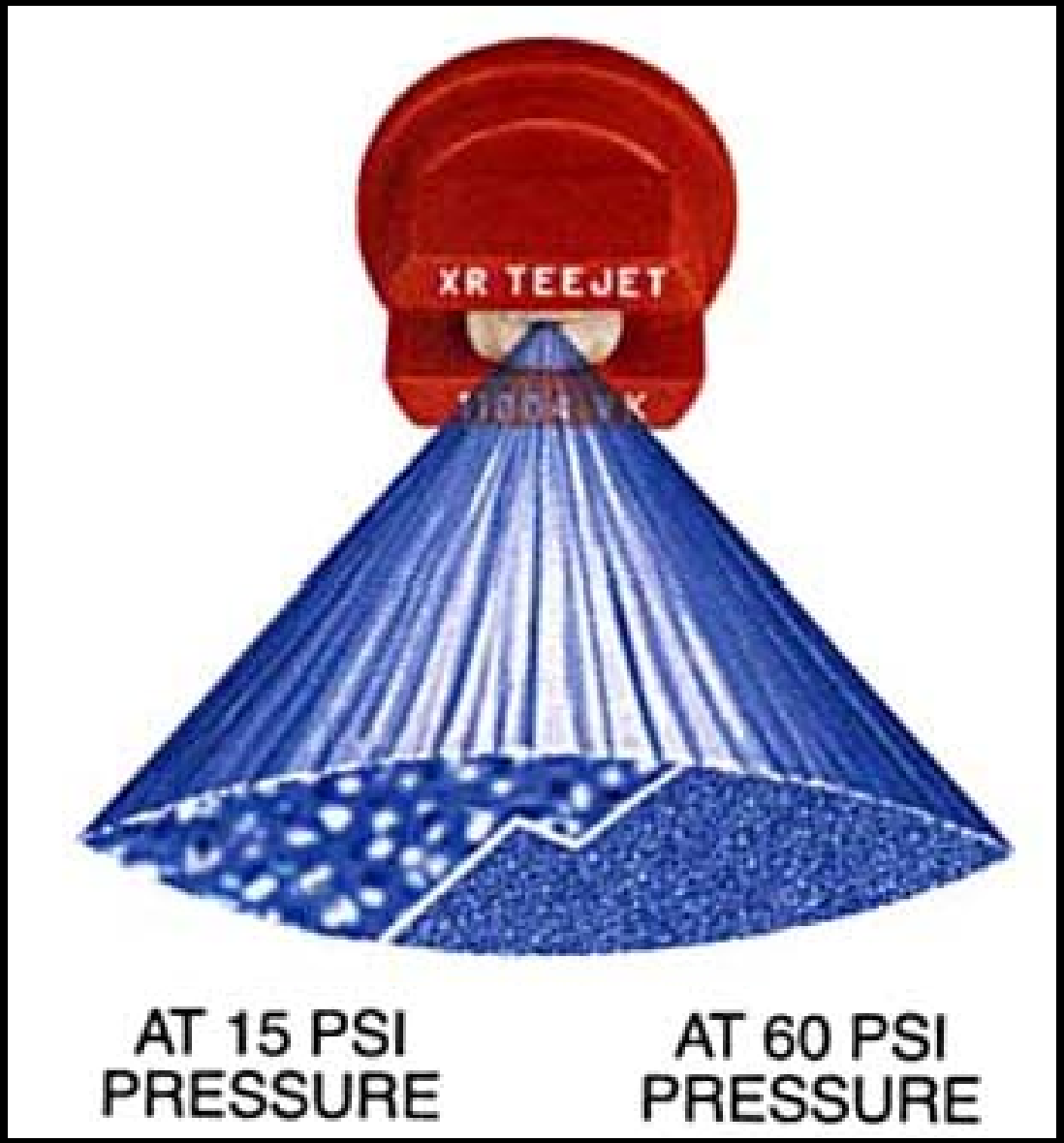
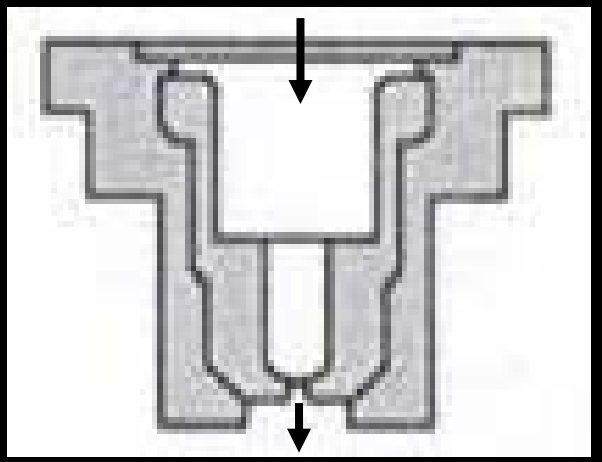
Spray nozzles, drift, and performance

Dr. Kassim Al-Khatib, Kansas State University



Extended Range (XR) Flat Fan





PSI: 15 - 60
C – F (400-145)

Drift rating:
Good (15 - 20 psi)

XR11004VS

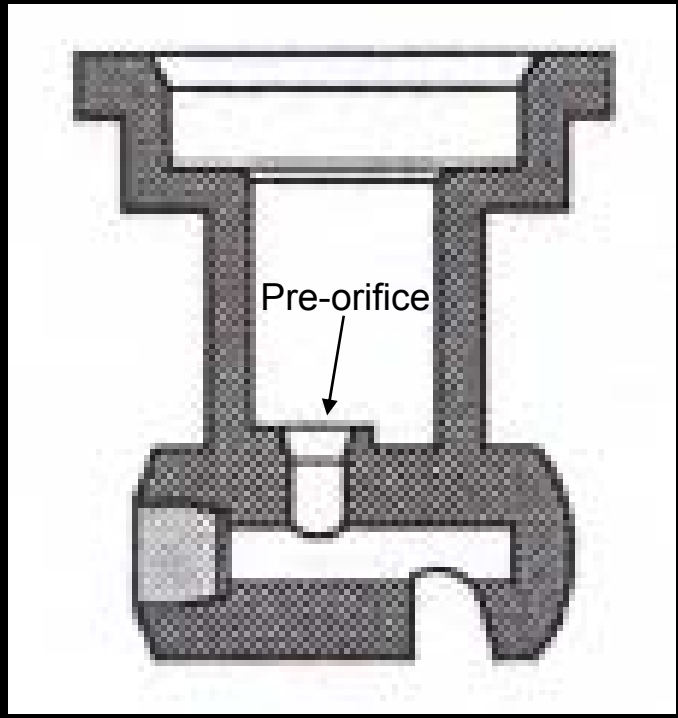
20 psi, wind 5 mph

Medium droplets (~225 µm)
(PRE or Systemics)

40 psi, wind 5 mph

Fine droplets (~150 µm)
(Contacts)

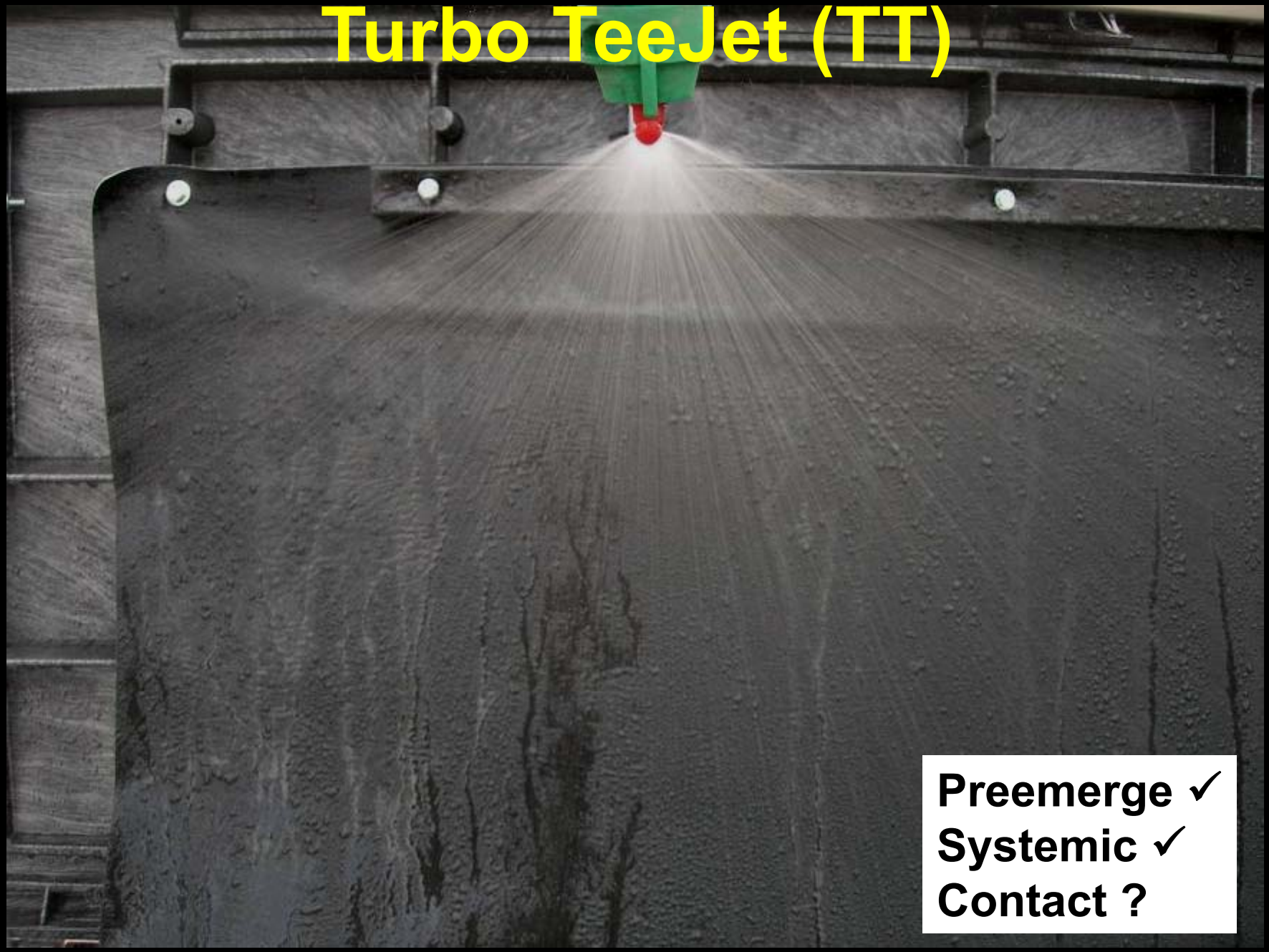
Turbo TeeJet (TT)



PSI: 30 - 90
VC – M (500-225)

Drift rating:
Very good

Turbo TeeJet (TT)



Preemerge ✓
Systemic ✓
Contact ?

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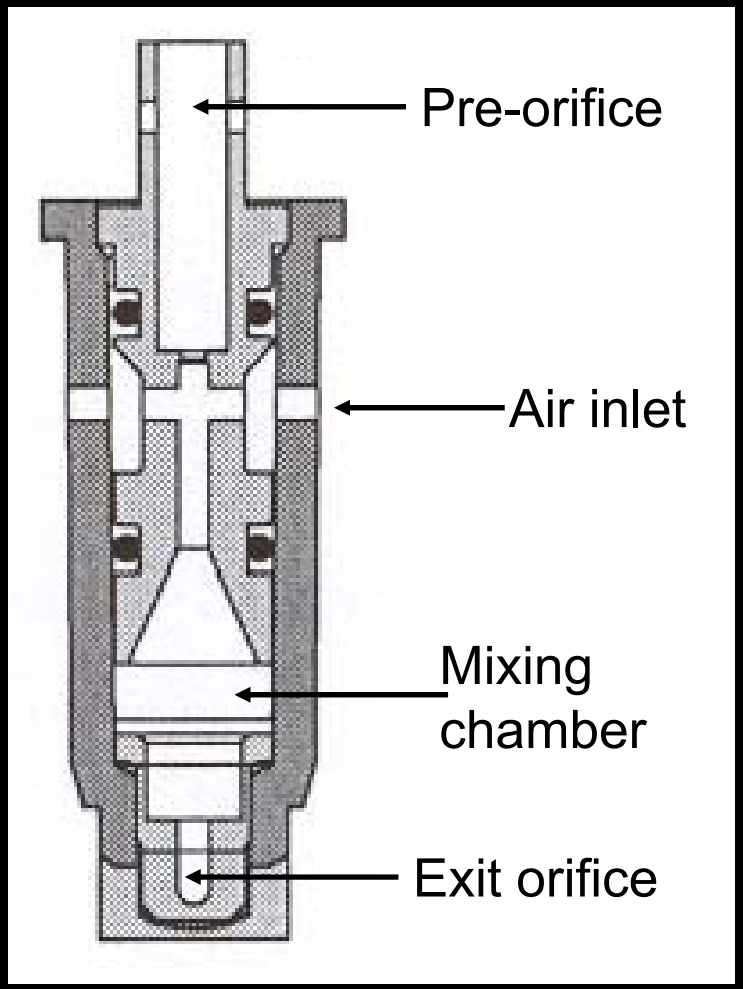
Air Induction (AI)



PSI: 30 - 100
XC – C (500-325)

Drift rating: Excellent

Preemerge ✓
Systemic ✓
Contact

Air Induction (AI)

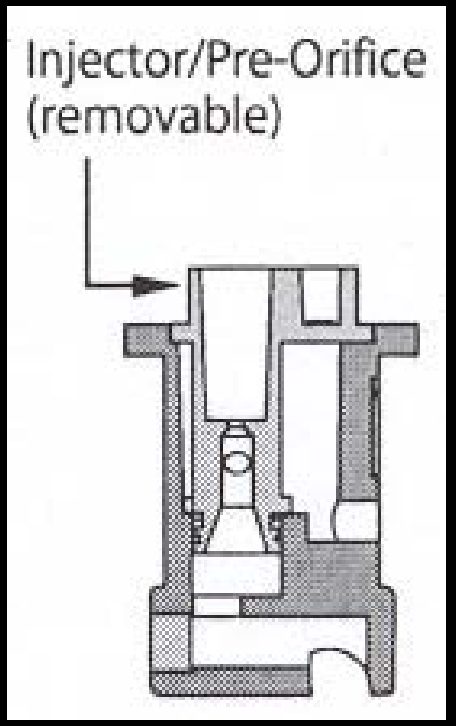
30 psi, wind 6 mph

Extremely coarse (~500 µm)

60 psi, wind 6 mph

Very coarse (~400 µm)

Turbo TeeJet Induction (TTI)



PSI: 15 - 100
Drops: XC (>500)

Drift rating:
Excellent

Preemerge ?
Systemic ✓
Contact

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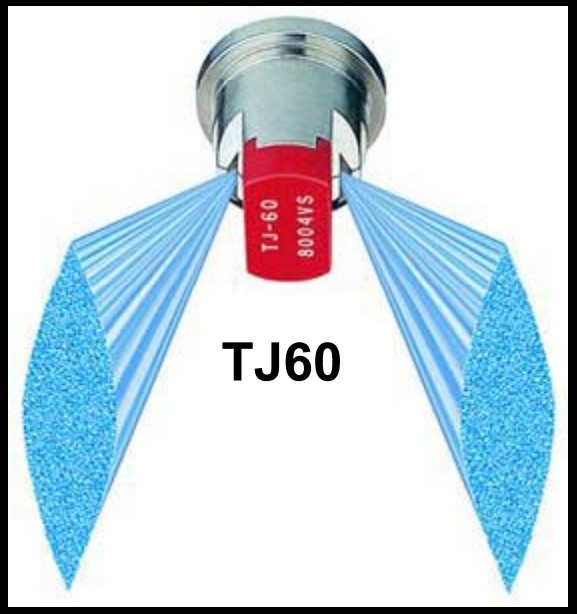
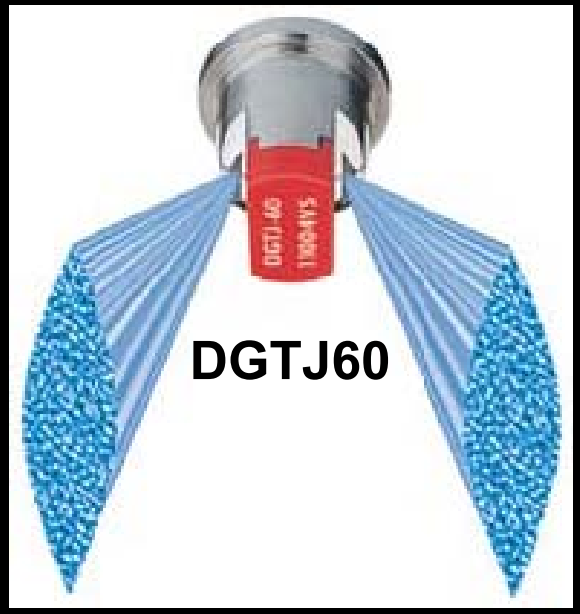
TwinJet nozzles



PSI: 30 - 60
M – VF (325-<150)

Drift rating:
Poor



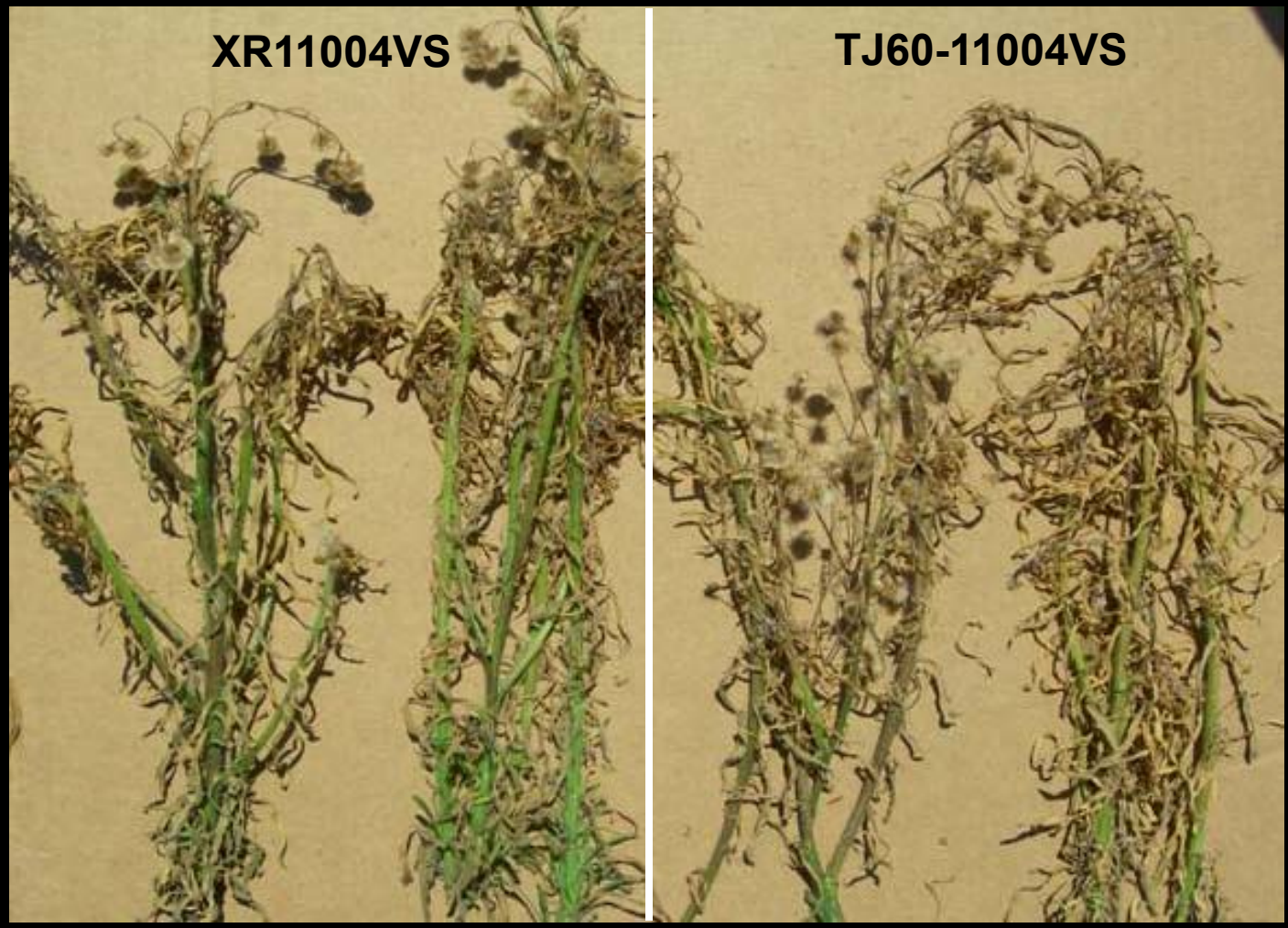
PSI: 30 - 60
C – F (400-150)

Drift rating:
Very good (03-08)

PSI: 20 - 90
XC – M (500-225)

Drift rating:
Excellent (<30 psi)
Very good (>30)

Spray nozzle trial in grapes 2006 (15 DAT)



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Spray nozzle trial 2008 (30 DAT)

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✓ Spray technique

The applicator

Spray conditions

Applicator care, attitude, and skill

Some of the costs associated with a poor spray job:

- Poor or spotty weed control
- Spray drift (crop and non-target damage)
- Waste of time, effort, product, and money
- Illegal residues (fines and lawsuits)

The applicator's goal should be to…

- deliver the carrier (and herbicide) to the target area accurately, uniformly, and efficiently as possible.

  - to kill the weeds

  - to reduce off-target movement

Spray height
Spray angle
Nozzle spacing
Travel speed
Spray pressure

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Keep an eye out to make sure nozzles are working consistently.

Warn nozzle example:

Herbicide cost is $20/A; 160 acres treated; 1 of 4 is over by 5-10%, then…

5% over = $0.25/A = $40/160 acres

10% over = $0.50/A = $80/160 acres

General factors that influence spray drift and herbicide performance

Factor	More Drift	Less Drift
Spray droplet size	Smaller	Larger
Wind speed (3-7 mph)	Higher	Lower
Air temperature	Higher	Lower
Relative humidity	Lower	Higher
Air stability	Stable	Mixing
Herbicide volatility	Volatile	Non-volatile
Nozzle orifice size	Smaller	Larger
Nozzle type	Produce fine droplets	Produce coarse droplets
Spray pressure	Higher	Lower
Spray release height	Higher	Lower
Travel speed	>6 mph	<6 mph

Summary – to aid herbicide performance

- **Herbicide timing:**
  - preemergent (time close to rainfall, watch the foot traffic)
  - postemergent (small weeds shortly after emergence)

- **Spray nozzle selection:**
  - use size >03 (larger droplets and less plug-ups)
  - reduce drift to improve delivery to target (>200 µm)
  - balance of drop size, pressure and speed with herbicide

- **Spray technique:**
  - applicator care, attitude, and skill
  - spray conditions (environment and delivery)

Thanks for your attention!

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