

# Calibrating your Sprayer

Wine Grape Integrated Pest Management  
Workshop

March 19, 2013

Why do I have disease and pest problems  
in my vineyard?



A complex problem

Need to place the proper amount of pesticide on the target

How do you adjust the amount of spray reaching the target?

1. Tractor speed
2. Output of sprayer

# Tractor Speed

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Double your speed and half the spray reaches a given area

Lower speeds increase uniformity in spray deposition

speed usually 3 – 4 mph

# What is your forward speed?

Do not rely on the tractor speedometer



# Determining speed of tractor

1. set up a measured course – at least 100 feet
2. timing course should be similar to vineyard same slope, terrain, etc.
3. attach sprayer and have half filled with water run sprayer while on course
4. measure in seconds how long it takes to travel course run the course more than once
5. use an accurate stopwatch – check at [www.time.gov](http://www.time.gov)
6. tractor must be up to speed at start of course
7. record gear and tractor pto rpm use tachometer to measure pto rpm
8. can use a GPS unit to determine speed

# Determining speed of tractor

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Calculate speed

$$\text{Speed (mph)} = \text{distance (feet)} \times 60 / \text{time (sec)} \times 88$$

# Sprayer Output

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Modify sprayer output with

- nozzles
- pressure



# Nozzles

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Size of orifice helps determine flow rate

Determines shape of spray pattern

Forms the spray droplets – partly responsible for size

# Nozzles

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Many types and construction materials

Materials

Plastic, brass, stainless steel, ceramic

Types

Solid cone

Hollow cone

Air induction

Air shear

Rotary

Electrostatic

# Pressure

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- Higher pressure increases output of sprayer  
increase pressure 4 times – flow rate doubles
- Higher pressure decreases droplet size
- Higher pressure increases nozzle tip wear
- Higher pressure might increase spray angle  
depends on type
- Reducing pto rpm will reduce pressure
- Need accurate gauge on sprayer

# Calculating Sprayer Output

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- Gallons/minute GPM
- Recommended application volume gallons/acre from pesticide label GPA
- Speed of tractor miles/hour MPH
- Row width in feet W





$$\text{GPM} = \text{GPA} \times \text{MPH} \times W / 495$$

Divide GPM by the number of nozzles

Determine pressure required to deliver GPM per nozzle  
use nozzle chart

# Nozzle Chart

## Hollow Cone Type Spray Tips

			GPM												
			10 PSI	20 PSI	30 PSI	40 PSI	60 PSI	80 PSI	100 PSI	150 PSI	200 PSI	300 PSI	20 PSI	40 PSI	80 PSI
D1	DC13	.031"	—	—	.059	.066	.078	.088	.097	.115	.128	.152	—	51°	62°
D1.5	DC13	.036"	—	.057	.067	.075	.088	.098	.110	.127	.142	.167	38°	55°	66°
D2	DC13	.041"	—	.064	.075	.08	.10	.11	.12	.14	.16	.18	49°	67°	72°
D3	DC13	.047"	—	.071	.08	.09	.11	.12	.13	.16	.18	.20	53°	70°	75°
D4	DC13	.063"	.070	.09	.11	.12	.14	.16	.17	.20	.23	.27	69°	79°	83°
D1	DC23	.031"	—	—	.064	.072	.080	.096	.107	.124	.139	.164	—	47°	58°
D1.5	DC23	.036"	—	.064	.076	.086	.103	.117	.130	.155	.175	.210	34°	51°	62°
D2	DC23	.041"	—	.078	.092	.10	.13	.14	.16	.19	.21	.25	51°	63°	70°
D3	DC23	.047"	.065	.087	.10	.12	.14	.16	.18	.21	.24	.28	58°	69°	75°
D4	DC23	.063"	.082	.113	.14	.15	.19	.21	.23	.28	.32	.38	68°	82°	87°
D5	DC23	.078"	.095	.13	.16	.18	.22	.25	.28	.34	.38	.46	79°	89°	94°
D6	DC23	.094"	.112	.15	.19	.21	.26	.29	.32	.39	.45	.54	84°	93°	98°
D1	DC25	.031"	—	—	.088	.101	.122	.138	.156	.185	.210	.255	—	27°	43°
D1.5	DC25	.036"	—	—	.118	.135	.162	.185	.205	.245	.280	.33	—	38°	49°
D2	DC25	.041"	—	.12	.14	.16	.19	.22	.25	.29	.34	.41	39°	51°	58°
D3	DC25	.047"	.10	.14	.17	.19	.23	.26	.29	.35	.40	.48	52°	61°	67°
D4	DC25	.063"	.15	.21	.25	.29	.35	.40	.45	.54	.62	.75	67°	74°	80°
D5	DC25	.078"	.18	.25	.30	.35	.42	.48	.54	.65	.75	.90	73°	79°	84°
D6	DC25	.094"	.23	.32	.39	.44	.54	.62	.70	.85	.97	1.19	79°	85°	89°

# Set the Pressure

- Sprayer should be half filled with water
- Make sure all nozzle discs are the same
- Operate sprayer and set desired pressure
- Use same pto rpm for all tests - use tachometer
- CHECK FOR LEAKS

# Measuring Sprayer Output



# Measuring Sprayer Output

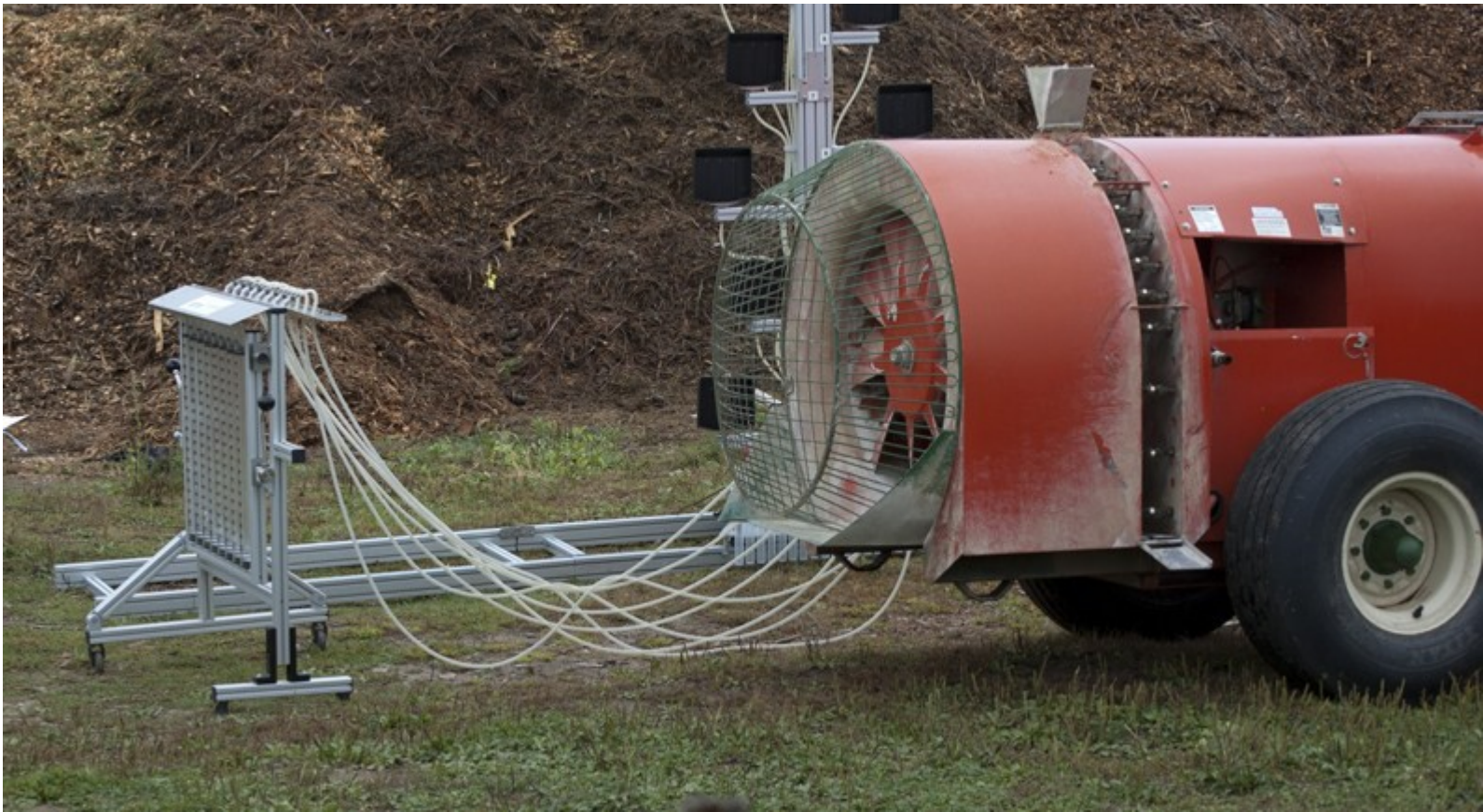
- Connect hoses or containers to nozzles
- Operate tractor at same rpm used for tractor speed
- Collect water output of each nozzle for 1 minute
- Every nozzle should be close to desired GPM
- If not reset pressure and test again
- If GPM is + or – 10% off average – replace nozzle
- If 2 nozzles or more are off – replace all nozzles tips



# Measuring Sprayer Output

Penn State Pesticide Education program has purchased a tester to measure sprayer output

Cost to grower is \$50 for first sprayer & \$30 for each additional sprayer



# Positioning Nozzles

Use a patternator

