Calibrating Sprayers for Effective Weed Control

Richard Smith, Vegetable Crop and Weed Science Farm Advisor, Monterey County

Component of Spray Equipment

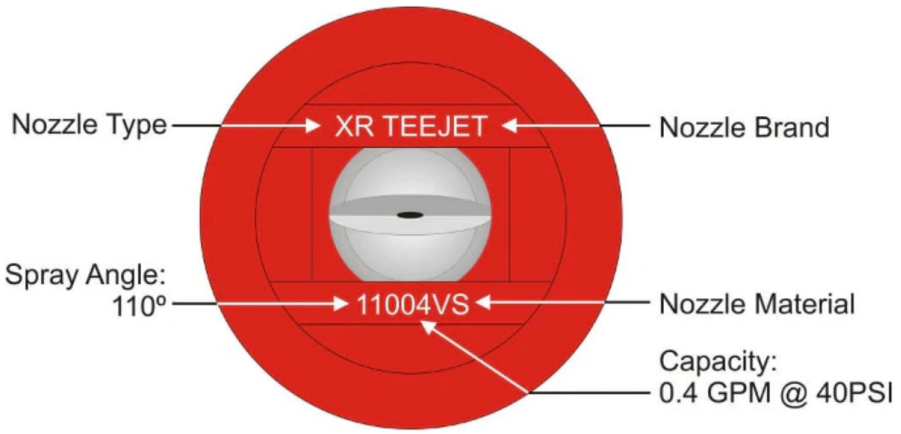
- Tank – various sizes
- Pump – different types
- Filter – typically 50-100 mesh
- Nozzles – flat fan, cone, flood
- Regulator – to adjust and maintain pressure

Pumps

- Several types (diaphragm, roller, centrifugal, piston)
- They need to provide even pressure and volume
- They tend to wear over time and lose original specs

Nozzles

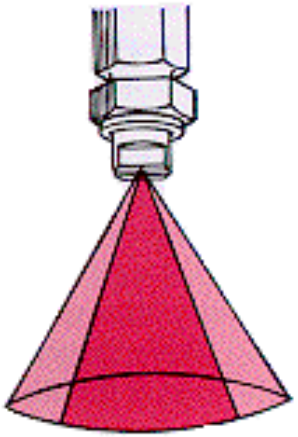
- **Flat fan and floods – used for herbicides**
- **Sizes -**



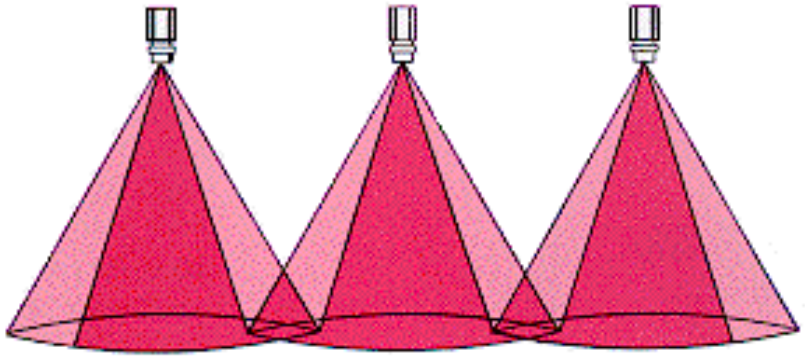
Tip Size	Colour	Flow Rate	
		US gpm @ 40 psi	L/min @ 3 bar
01	Orange	0.10	0.4
015	Green	0.15	0.6
02	Yellow	0.20	0.8
025	Lilac	0.25	1.0
03	Blue	0.30	1.2
035	Brown Red	0.35	1.4
04	Red	0.40	1.6
05	Brown	0.50	2.0
06	Gray	0.60	2.4
08	White	0.80	3.2

Flat Fan Nozzles

- **Broadcast**
- **Tapered edges**
- **Must overlap**

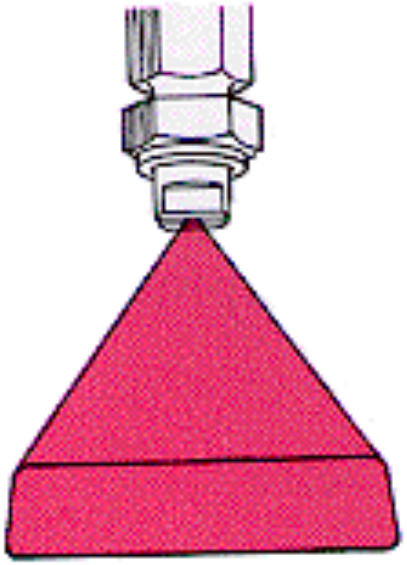


Flat
Fan
Spray



Flat fan nozzle set-up with proper pattern overlap

Even Flat Fan Example 8002E



Drift

- Factors affecting drift
  - Spray pressure; spray angle; nozzle type; orifice size
  - All these affect droplet size which can increase the tendency of a material to drift
- To minimize drift
  - Minimize pressure
  - Use nozzles with larger orifice
  - Special nozzles to reduce small droplets (e.g. air induction)
  - Spray additives

To Increase the Rate

- Slower travel speed
- Larger nozzles
- Increase pressure
- Decrease nozzle spacing

To Decrease the Rate

- Faster travel speed
- Smaller orifices
- Decrease pressure
- Increase nozzle spacing

Boom vs Hand-Held

- **Boom application**

- **Hand-held sprayer**

To Calibrate a Boom Sprayer Step 1

- **Determine the average speed of the tractor/ATV**
  - **Be sure to be going at the normal speed for the terrain that you are going to treat**
  - **Measure the time it takes (in seconds) to drive a set distance (i.e. 200 feet)**
    - **Do not depend on the speedometer (too inaccurate) – use your cell phone**
  - **Repeat the measurement three times and take the average of the times**
  - **This gives you feet/minute**

To Calibrate a Boom Sprayer Step 2

- **Measure the width of the spray pattern for the boom at the height that you will use for the application**
  - **Go to a dry spot and with just water in the tank**
  - **Start the sprayer at the pressure you will use for the application**
  - **measure the width in feet of the spray pattern**

To Calibrate a Boom Sprayer Step 3

- **Measure the volume of output by each nozzle and the total amount put out by the boom**
  a. **Using pure water, measure the output of each nozzle into a measuring cup for 1 minute to get gallon/minute/nozzle**
  b. **Add up the output of all the nozzles and convert to gallons**
  c. **Calculate the output of the boom in gallons per minute (GPM)**

To Calibrate a Boom Sprayer Step 4

- **Calculate the area per minute covered by the sprayer**
  - **Multiply the boom width by the speed (feet per minute covered by the sprayer in step 1) to get square feet per minute**
  - **Divide feet per minute by 43,560 to get acres/minute**

To Calibrate a Boom Sprayer Step 5

- **Calculate the output of the sprayer in gallons per acre**
  - **Divide gallons/minute (step 3) by acres per minute (step 4) to get gallons/acre**

To Calibrate a Boom Sprayer Step 6

- Calculate the number of acres that a tank load can cover
  - Divide gallons/acre by the gallon capacity of the tank

To Calibrate a Boom Sprayer Step 7

- **Calculate how much material to add to the tank**
  - **Multiply the gallon capacity of the tank by the label rate**
  - **Example: 4.0 ounces/A Transline times 10 gallons in the tank = 40 ounces/tank load**

Hand-Held Applications

- Hand-held spray equipment is commonly used to spot treat infested areas in a pasture
- Most applications are based on a percent concentration of herbicide rather than a specific rate of application (i.e. material/acre)

Hand-Held Applications

- An evaluation of application rates by experienced applicators indicated that there is wide variability of application rates
- A good way to calibrate a hand-held application is using the 128th acre calibration method

128^{th} Acre Calibration Method

- 128^{th} of an acre is equal to an area 18.5 x 18.5 feet
- Time how long it takes to spray this area
- Measure the amount of water in ounces that your sprayer puts out in this amount of time

128^{th} Acre Calibration Method

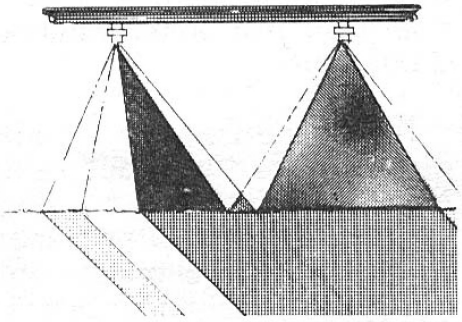
- The number of ounces sprayed on 128^{th} of an acre is equal to <u>gallons per acre</u>
- This information can be used to adjust the amount of liquid you are applying or to apply a specific rate per acre

Maintenance

- It is critical to maintain nozzle and pump screens to maintain flow rate and pressure

Maintenance

- **It is critical to maintain nozzles to maintain an even application pattern**



Worn or plugged nozzles cause poor application.

Calibrating a Sprayer

- Boom sprayer hand out on Devii's website that walks you through the steps we just discussed
- 128th acre procedure. On YouTube the University of Arkansas has a nice explanation of the proceedure

Other Application Strategies

- Basal bark
- Cut Surface
  - Tree injection
  - Hack and squirt
  - Stump treatment
- Rope wick

- Labels have specific details on these application techniques such as rate and application technique (e.g. spray to runoff, etc)