

Training Module: Choosing Spray Nozzles

Objective: To be able to recognize the difference between nozzles, choose the best one for the intended job, and be able to clean nozzles properly and safely.

Trainer's Note: Spray nozzles are important part of reducing spray drift. Choosing the correct nozzle for the job and taking proper care of them are an essential part of spraying safety. Have nozzles at the training session compare the differences and practice cleaning.

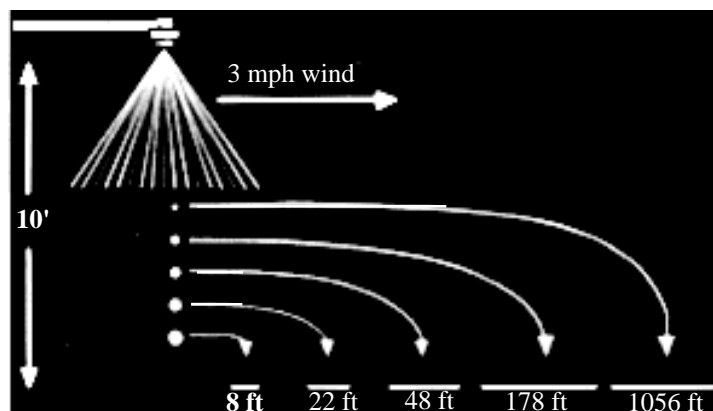
Background

Nozzles regulate the spray flow, droplet size and spray pattern. Proper selection and operation of spray nozzles are important steps in precise application. Choosing the correct nozzle is critical for safe spray application. By using the proper nozzle for the job, less spray will drift to unintended areas. Such as other crops, backyards, or animal pastures.

Flow regulation affects the application rate. Nozzle opening size and spray pressure are key features affecting the flow rate through nozzles. These factors can be varied by selecting a different nozzle size or adjusting the pressure.

Droplet size varies due to pressure, climatic conditions (such as: temperature, humidity, wind speed, and direction) and nozzle size. The size may be affected by the spray angle and the spray pattern shape (nozzle design). In a conventional system, droplet size can be decreased by increasing the pressure at the nozzle. Droplet size can also be decreased by increasing the spray angle of the tip.

Weather has a strong influence on spray drift. Both wind direction and velocity can cause spray to drift away from its intended target. The larger the droplet, the faster it falls toward its target, and the less likely it is to drift. However, high winds can cause large droplets to drift off target. **As shown in the figure, smaller droplets drift longer distances.**



Nozzle Spray Patterns

There are three basic types of nozzle spray patterns: flat-spray, hollow-cone and full-cone patterns. The characteristics of each spray pattern favor certain chemical applications.

Flat-spray nozzles spray droplets from a flat-spray tip, forming a fanshaped pattern as they leave the nozzle opening.

- The edges of the pattern have a lower spray volume, so patterns of adjacent nozzles must overlap to obtain uniform coverage along the spray boom.
- Wider-angle nozzles produce smaller droplets, but they can be spaced farther apart on the spray boom or operated closer to the target.
- Narrow-angle spray tips produce a more penetrating spray and are less likely to become clogged.
- Flat-spray tip characteristics make them ideal for broadcast applications of herbicides when uniformity is critical.

Wide-angle full-cone nozzles produce large droplets that are distributed uniformly in a full-cone pattern.

- The uniform spray pattern is maintained over a pressure range of 10 to 40 psi.
- Droplets are larger than with other tip styles of equal capacity at similar pressures.
- It is good for soil-applied and systemic herbicides.
- Maximum drift control at pressures of 15 to 20 psi is achieved.

Hollow-cone nozzles produce a spray pattern with the liquid concentrated on the outside of a conical pattern.

- The typical spray distribution is saddle-shaped with less liquid in the center of the distribution, tapering off rapidly at the edges.
- It is not well-suited for broadcast applications because proper overlap is difficult to achieve.
- Generally produces the smallest droplets.
- Best used for applying insecticides, fungicides or growth regulators where penetration and coverage are critical.
- Spray drift can be high because of the many small droplets produced at the normal operating pressure of 40 psi and above.

Cleaning Nozzles

- Use water that looks clean enough to drink when cleaning the sprayer. Foreign materials found in the water can wear out nozzles.
- Observe the output pattern of nozzles periodically. Streaks in the pattern indicate that foreign materials are inside the nozzles.
- Remove and clean nozzles, using a soft brush for the tip and screen and strong detergent solution or kerosene.
- Cleaning with a pin, a knife or any other metallic object can completely change the spray pattern capacity of the tip.
- Use a wooden toothpick to unclog nozzle tips.



Spraying Tips to Reduce Drift:

- Follow label recommendations to avoid drift with highly volatile pesticides.
- Use nozzles that produce coarser droplets when applying pesticides on targets that do not require small, uniformly distributed droplets.
- Keep spray volume up, and use nozzles with larger orifices.
- Use nozzles with narrower spray-fan angles.
- Avoid spraying on extremely hot and dry days.
- Do not spray when wind speeds are higher than 5 miles per hour.
- Avoid spraying near sensitive crops that are downwind. Leave a buffer strip of 50 to 100 feet, and spray the strip later when the wind shifts.

Important Note:

It is critical that the proper personal protective equipment (PPE) is worn when working with any type of pesticide, herbicide, or spray. Consult the label for appropriate PPE. (Refer to the modules: Reading Pesticide Labels and Pesticide Protective Equipment).

Review the Following Points

- Nozzles regulate spray flow, droplet size and spray pattern.
- Nozzle opening size and spray pressure are important aspects of the flow rate through the nozzles.
- Droplet size varies due to pressure, climatic conditions and nozzle size.
- There are three basic spray pattern shapes: flat-spray, hollow-cone and full-cone.

True or False Answer Key

1. T, 2. F, 3. T, 4. F, 5. T

Choosing Spray Nozzles Quiz

True or False

Name _____

- | | | |
|--|---|---|
| 1. There are three basic nozzle spray patterns, flat-spray, hollow-cone and full-cone patterns. | T | F |
| 2. Flow regulation has nothing to do with the application rate. | T | F |
| 3. Hollow-cone nozzles can result in high spray drift because of the many small droplets produced. | T | F |
| 4. Nozzles should be cleaned with a regular detergent and a pin or knife. | T | F |
| 5. Streaks in the nozzle's output pattern means that foreign materials are inside the nozzle. | T | F |