Choosing drift-reducing NOZZLES

Vern Hofman,
Extension ag engineer,
North Dakota State University

Jim Wilson,
Extension pesticide education coordinator,
South Dakota State University

"What nozzle should I use?" That's as hard a question as "What tractor should I buy?" You wouldn't buy a 300 hp tractor to mow your ditches. The answer to either question depends upon your needs.

Some of the many nozzles on the market can reduce pesticide drift. Would these be right for you?

Whether a particular low-drift nozzle fits your program depends upon your spraying needs and how you currently operate. Larger droplets reduce drift potential, but they may also reduce the effectiveness of the pesticide application. One nozzle will seldom be the best choice for all situations.

Consider your priorities before making your nozzle choices. Nozzles are relatively inexpensive, but they can be the most important sprayer component you buy.

Should you be concerned about spray drift?

- Are you, or your neighbors, planting a greater diversity of drift-susceptible crops?
- Are you using more highly active or nonselective herbicides?
- Are you planting more herbicide-resistant crops?
- Are you able to make applications at the right crop growth stage or do you need a wider window in which to spray?
- Are there sensitive areas (shelterbelts, neighboring fields, rural homes) close by that you should protect from drift?
- Are you concerned about the effect of pesticide drift on the environment?
- Are you trying to avoid future drift problems?

These concerns have made drift management everybody's business. Adopting drift management strategies is a timely and appropriate move for all pesticide applicators.

Whatever nozzle you choose, the chemical label is still the law and must be followed. If a pesticide label states that the pesticide should not be applied above a specific wind velocity and you go ahead, even with low-drift nozzle technology you will be breaking the law. Be aware also that drift-reducing nozzles do not eliminate all drift, they only reduce it. Spraying when susceptible plants are downwind may still cause damage.

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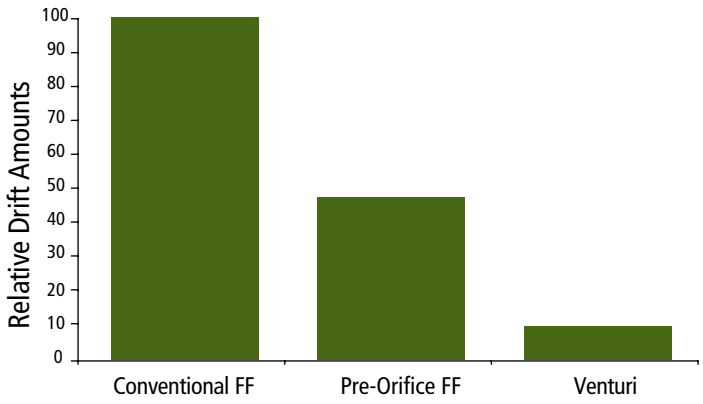

Figure 1. Drift comparison. (Wolf)

Figure 2. Conventionalflat fan spray tips at 40 psi. (Wolf)

Figure 3. Air induction nozzles at 70 psi. (Wolf)

This publication summarizes some characteristics of low-drift nozzle technology and shows the nozzle with a picture of the spray deposit it produces. The deposits were made using water volumes of approximately 8 gal/acre for all nozzles at their standard or optimum pressures.

Figure 1 shows a comparison of relative drift produced from the standard flat fan, the pre-orifice flat fan, and the venturi nozzle. The venturi nozzles show a 90% or more reduction in drift as compared to the flat fan at standard pressures. Figures 2 and 3 indicate the visual difference in drift between a commonly used flat fan nozzle and the newer drift-reducing venturi nozzle.

Research with spray shields has also shown excellent drift reduction. Using venturi nozzles with spray shields will reduce the drift potential even more but still will not reduce it to zero. You still must use care when spraying upwind of a susceptible crop.

Low-drift nozzles

Low-drift nozzles are designed to produce larger spray droplets with fewer driftable fines. The bigger droplets are produced in a pressure-reducing chamber inside the nozzle and, with some nozzles, by the incorporation of air into the spray droplets. These nozzles are excellent at reducing drift, but they do not eliminate all drift. Caution must still be used when susceptible crops are downwind.

When drift is reduced, spray coverage may be reduced or may stay about the same as with finer droplets. Spray coverage is usually less because fewer large droplets will be deposited on the plant. There will be larger spaces between the spray droplets even when the same application rate is used.

Systemic pesticides are generally recommended for use with low-drift nozzles. Pesticides that move within the plant usually do not need to cover the entire plant compared to a contact pesticide. Low-drift nozzles may only provide moderate or poor control with contact-type pesticides and are usually not recommended for these uses. Consult the pesticide label for specific restrictions.

Costs

Nozzle prices vary widely. Nozzle tips made from stainless steel or ceramic will usually cost more than plastic tips but generally last longer and may be worth the extra expense. Newer designs in

Table 1. Nozzle selection guidelines.

Conditions when coarser sprays could be considered:	Conditions when finer sprays could be considered:
(larger orifice / lower pressure conventional nozzles or drift reduction nozzle technology)	(smaller orifice / higher pressure conventional nozzles)
Non-selective herbicides	Insecticides/fungicides, contact herbicides
Easy-to-wet broadleaf weeds (pigweed, smartweed, thistles, etc.)	Difficult-to-wet broadleaf weeds / grassy weeds (lambsquarters, kochia / wild oat, foxtail etc.)
Cereal canopy penetration	Open broadleaf canopy penetration
Outside rounds and windy conditions	Favorable weather conditions
Adjacent sensitive crops or non-target areas	

Table 2. Nozzle droplet size classification (microns).

Droplet size	Very fine	Fine	Medium	Coarse	Very coarse	Extremely coarse
Dv 0.5*	less than 182	183-280	281-429	430-531	532-655	greater than 655
% of spray volume under 141 microns**	57	20-57	6-20	3-6	Less than 3	--
Color code	Red	Orange	Yellow	Blue	Green	White

* ASAE standard S-572 and Kirk, USDA–Southern Plains Ag Research Center
** BCPC (British Crop Protection Council) estimate

nozzles incorporating air induction technology will also cost more than standard flat fan nozzles, but again the extra cost may be worth the extra expense if they prevent drift injury. A drift problem can cost thousands of dollars, so a few extra dollars for a set of nozzles may be a good investment.

After you decide on a nozzle, be sure to check with several suppliers, since there may be considerable difference in price.

Drift management strategies

The most important factor in reducing drift is the size of the droplets produced by the nozzle.

For conventional flat fan nozzles, the best approach to reducing fine droplets is to increase the nozzle orifice size and to drop the spray boom pressure.

Consider using a 110° nozzle. This will allow you to lower your boom height and give the wind less opportunity to catch the spray. Booms should be set as low as possible above the target, based on nozzle discharge angle and nozzle spacing, while maintaining uniform coverage. Check with your nozzle manufacturer to match proper boom height and overlap.

Droplet size classification

Droplet size classification is new; manufacturers are beginning to list ASAE (American Society of Ag Engineers) categories that range from very fine to extremely coarse. This standard is based upon the average size droplet, known as the volume mean diameter (VMD), measured in microns, that is produced at a particular operating pressure. One micron is 1/1000 millimeter, or approximately 1/25,000 inch.

The volume median diameter (VMD) is a droplet size diameter which indicates that half of the spray volume is in droplets smaller than this number and half of the spray volume is in droplets larger than this size. It is also often indicated by Dv0.5.

Two other values are also important. They are the 10% volume and 90% volume droplet size and are indicated by Dv0.1 and Dv0.9. These are listed next to the spray droplet samples along with the Dv0.5 number. The Dv0.1 value indicates that 10% of the spray volume is in droplets smaller than this value and may be a major part of the driftable fines. The Dv0.9 value indicates that 90% of the spray volume is in droplets smaller than this value (10% of the spray volume is in droplets larger than this value).

The chart (Table 2) lists the VMD of the droplet size and the percentage of the spray volume in droplets smaller than 141 microns for those categories. Droplets smaller than 141 microns are usually considered to be very susceptible to drift.

The recommended droplet size category to use with a particular pesticide may be listed on the product label. Nozzle selection and pressure can then be based on the nozzle manufacturer's droplet size category charts. Typically, low-drift nozzles will produce spray droplets that fall in the medium to extremely coarse range.