An Evaluation of ATV-Mounted Boomless Spray Nozzles for Weed Control

Application Technology Series

Robert Wolf, *Associate Professor and Extension Specialist, Bio and Ag Engineering*

Dallas Peterson, *Extension Weed Management Specialist*

Walter Fick, *Extension Rangeland Management Specialist*

Jeffery Davidson, *Extension Ag & Natural Resources Agent, Eureka*

Gary Kilgore, *Extension Crops and Soils Specialist, Chanute*

In recent years, all-terrain vehicles (ATVs) equipped with small-capacity spray tanks and boomless nozzle systems have become popular for controlling and eliminating weeds in pastures, rangelands, and along roadsides. These systems are well-adapted to uneven terrain and are thought to have potential to spray 25-30 foot swaths using a centrally located single or dual nozzle arrangement.

Several nozzle designs have recently been introduced for ATV-mounted application systems. Use of these nozzles, however, is occurring without a clear understanding of correct operating procedures. These nozzles may not be effective for weed control. The large spray droplets created by these nozzle types often do not provide full weed coverage over the entire spray width.

Considerations for Using Boomless Nozzles

1. Pick the nozzle that best fits the mode of action of the herbicide used. For example, a nozzle to apply a non-selective-systemic herbicide will be different than one used for post-emergence herbicides that require contact with the plant.
2. Select spray width to achieve uniform distribution across the pattern.
3. Height of sprayed vegetation will interfere with the width of the spray pattern.
4. Wind direction relative to direction of travel will affect spray pattern width.
5. Optimum pressure will ensure maximum coverage over the entire spray pattern width.
6. Optimize pressure to achieve desirable droplet size and desired coverage with minimal drift.
7. A different pump may be required to achieve desired widths relative to vegetation height, herbicide used, and to properly atomize the spray droplets.

Field Trials

Field trials were conducted to evaluate the effectiveness of spray nozzles on ATVs.

Figure 1. Boombuster (left), XP BoomJet (upper right), and XT Boom Extender (lower right).

Trials evaluated pattern quality, swath width, droplet range, and coverage effectiveness using four different nozzle types and two herbicides. Applications were tested on a growing wheat crop planted in 20 foot wide strips. Duplicate studies were conducted using methods consistent with recommended practice for the tested nozzle systems.

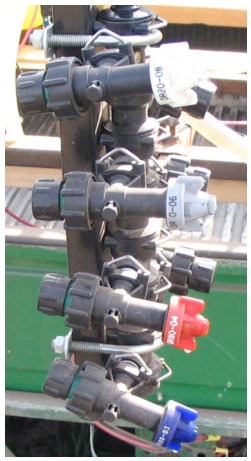

Figure 2. Wilger ComboJet nozzle group.

The nozzles compared were the TeeJet BoomJet (XP), Hypro Boom Extender (XT), Evergreen Boom Buster (BB) (Figure 1), and the Wilger Combo-Jet (WC-J) (Figure 2). Glyphosate and paraquat

were applied to the wheat crop with each nozzle treatment. Each nozzle was tested using a 12-volt, 45-pounds-per-square-inch (psi), 3.6-gallons-per-minute (gpm) pump, a type that is commonly used for an ATV-mounted sprayer.

The experiments were conducted on wheat at two different growth stages, one prior to jointing (4 to 5 inches tall) and the other after jointing (24 to 30 inches tall). Each treatment was repeated three times. Multiple water sensitive papers (WSP) were used to collect spray droplets across the swath width for each treatment. DropletScan® computer software and a flat-bed scanner were used to calculate critical droplet statistics for all treatments.

The nozzles for each treatment were configured according to manufacturer's recommendations in order to deliver the desired swath width.

Field Trial Results

- Mode of action, coverage, and droplet size affected the results in both the short and tall wheat.
- Differences in control between glyphosate and paraquat were as expected, with glyphosate control at 100 percent and paraquat ranging from 77 percent with the XT nozzle down to 60 percent with the XP nozzle. The BB nozzle offered 73 percent control and the WC-J nozzle 67 percent (Figure 3).
- Uniformity of control showed little difference among nozzles with glyphosate application, but on a scale of 1-10 with 10 being the highest level of uniformity, range varied from 8 (XT and BB) to 7 (WC-J), down to 5 (XP) with paraquat (Figure 4).
- Actual swath width was significantly less than rated by the nozzle manufacturers on all tall wheat trials (Figure 5) and somewhat less than manufacturers' rating on the short wheat trials (Figure 6).

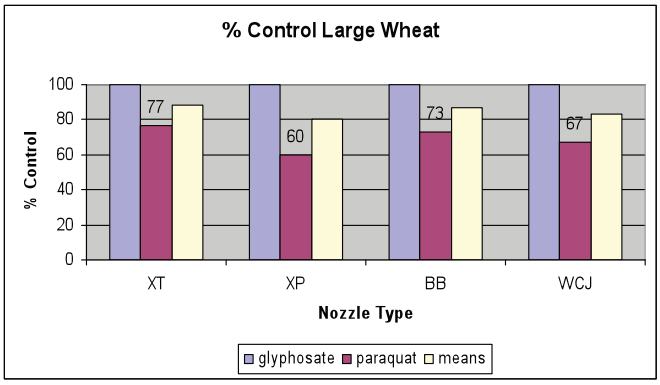

Figure 3. Percent control large wheat.

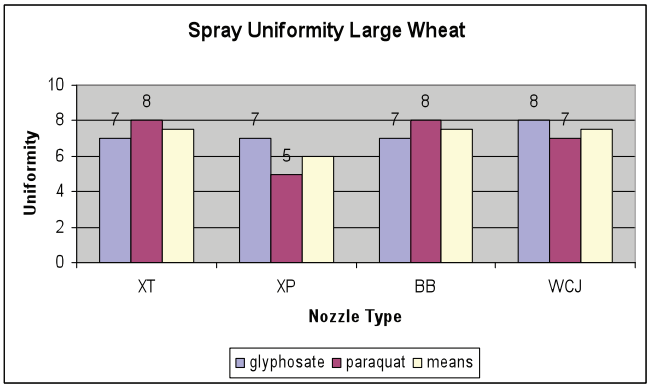

Figure 4. Uniformity

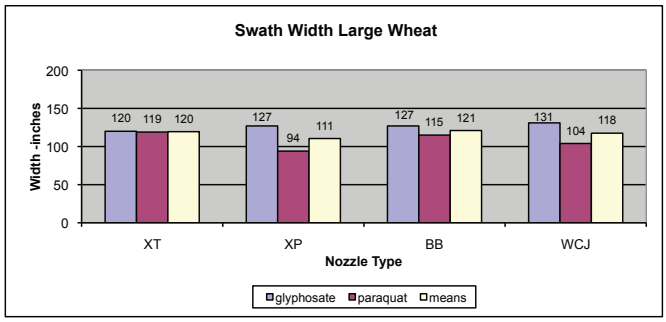

Figure 5. Large wheat swath width.

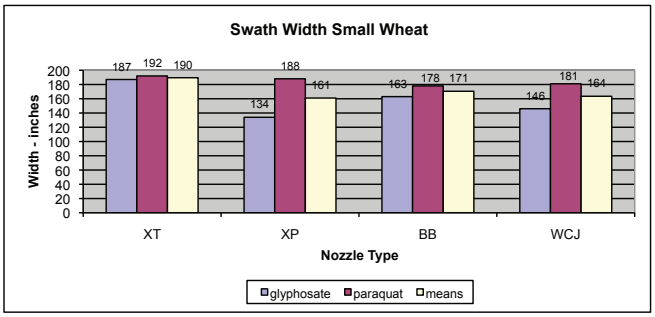

Figure 6. Small wheat swath width.

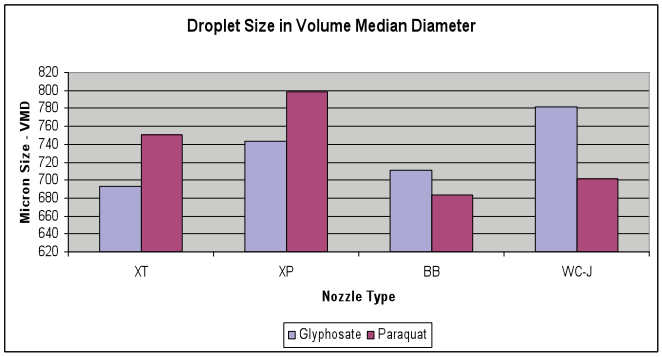

Figure 7. Droplet size.

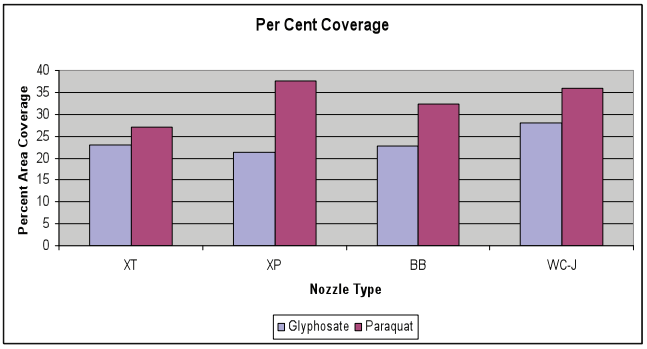

Figure 8. Coverage.

- In the tall wheat trials, the swath width based on width of control was widest for WC-J (131 inches with glyphosate) and lowest with the XP (94 inches with paraquat).
- In the small wheat trials, the XT had the widest width at 192 inches, and the XP the narrowest width at 134 inches.
- Spray droplet size ranged from 684 to 799 microns (VMD) for paraquat and 693 to 782 microns for glyphosate. Compared to desirable droplet size standards for good coverage (300-500 microns) and optimum weed control, these droplets are very large, thus having the potential for reduced weed control (Figure 7). However, larger droplets also have less potential to drift.
- Percent coverage for the compared nozzles ranged from 37.5 percent to 27.0 percent for paraquat and from 28 percent to 21.3 percent for glyphosate (Figure 8).
- Wind direction and height of spray stream may have affected results.
- To achieve manufacturer-rated swath width, spray nozzles on ATVs would have to be mounted much higher than practical, which would lead to increased drift.
- Boomless nozzles have large orifices making them harder to pressurize with the pumps typically found on ATV-mounted sprayers. A different, more powerful, pump such as a tractor-type roller pump may provide better coverage width.

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