
Features of MTDC's Design



MTDC's shielded herbicide sprayer was designed to be used on nursery beds. The tires are on 6-foot centers to treat beds about 4 feet wide. The sprayer was specifically designed for use with glyphosate. The use of any other chemical may not be compatible with the pump and valve seals and may present a health hazard to the operator on the back of the machine. The design of the machine permits tree seedlings shorter than 18 inches to pass under the toolbar without striking it.

Sprayer hoods can be added or taken off the toolbar to accommodate up to eight rows on a 4-foot-wide bed. The width of the in-row sprayer hoods can be adjusted. The sprayer hoods are mounted on a parallel linkage, which permits the hoods to follow the contours of the nursery bed independently. The angles of the two outside sprayer hoods are adjustable to ensure that spray does not escape, whether the sprayer is used on raised beds or flat beds.

The sprayer is intended to be mounted on a category II three-point hitch (it may work on other hitches with appropriate adapters), while the sprayer's pump needs to be attached to a 540-revolutions-per-minute power takeoff shaft on the tractor. The tractor operator controls the vertical position of the sprayer's toolbar. The sprayer operator uses a tiller bar to control the horizontal position of the sprayer's toolbar. The sprayer operator controls flow volume and pressure.

The sprayer's tank holds up to 85 gallons of chemical mixture that is pumped with a roller pump mounted on the end of the tractor's power takeoff shaft.

A bank of see-through control meters helps the operator keep track of clogged nozzles. The spray nozzles have inline check valves to keep chemical from leaking when the unit is moved from bed to bed. An operator's manual is available to help the tractor and sprayer operators adjust and maintain the sprayer.



Initial Field Test

The first MTDC sprayer prototype (figure 18) was tested at the New Kent and Augusta Forestry Centers in Virginia. The original machine featured a steering wheel guidance system and sprayer hoods with sled runners. Two sets of sprayer hoods were sent out for evaluation—one set with fixed width and one set that could be adjusted in the field to vary the spacing between rows.



Figure 18—The first-generation MTDC sprayer prototype with fixed-width spray hoods and the original steering wheel.

Feedback from Donald Hixson (at the New Kent center) and Tommy Frazier (at the Augusta center) was that the sled runners were leaving shallow ruts in nursery beds with sandy soils. This did not happen in beds with clay-based soils. The steering also seemed awkward and counterintuitive. The adjustment mechanism for the hoods needed refinements. They shipped the machine back to MTDC and asked for a:

- New steering system
- Height gauge wheel for the individual sprayer hoods
- Positive sprayer width adjustment mechanism for the individual in-the-row sprayer units
- Shade umbrella for the sprayer operator

Second Field Test



MTDC redesigned the steering system of the shielded herbicide sprayer (figure 19) with a tiller bar (figure 20) that actuates a wheel assembly. A mechanism was added to allow the width of the sprayer hood to be adjusted (figure 21). A gauge wheel was added to the back side of the individual in-row sprayer hoods and a gauge wheel was added to the front side of the wheel-row sprayer hoods. A mist barrier was added to the bottom of the sprayer hoods to reduce the chance that herbicide mist would escape (figure 22).



Figure 19—The second-generation MTDC Shielded Herbicide Sprayer has adjustable spray hoods, a tiller steering system, and a sun shade.



Figure 20—A closeup of the tiller bar used to steer the MTDC Shielded Herbicide Sprayer.



Figure 21—The mechanism used to adjust the width of a sprayer hood on the MTDC Shielded Herbicide Sprayer.

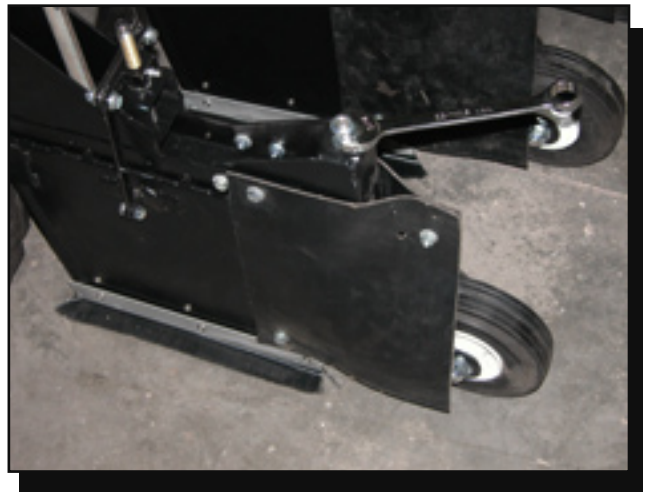


Figure 22—An adjustable spray hood with the height gauge wheel and bristle mist guard on the MTDC Shielded Herbicide Sprayer.

The second MTDC prototype was evaluated during field tests at the Augusta Forestry Center. According to Joshua McLaughlin, the unit was used for 6 days. It was used to apply Roundup Pro on five-row crops including white oak, northern red oak, bald cypress, sawtooth oak, and hazelnut. The seedbeds were about 4 feet wide. The chemical mixtures tested were 1 ounce per gallon or 2 ounces per gallon of Roundup Pro. A surfactant, *Induce*, was also added at a rate of 1 percent to quickly wet the plants and spread a uniform spray. Evaluators said they

Second Field Test



could not tell the difference in weed mortality between the 1- and 2-ounce mixtures. The tractor was operated at $1\frac{1}{2}$ or $1\frac{3}{4}$ miles per hour. Even at the higher speed, enough herbicide was being applied.

A little herbicide escaped, damaging some trees. Evaluators were unsure whether the escape was human error or whether mist leaked from the hoods. The applicators did not notice herbicide leaking out. McLaughlin wondered whether the mixture might have been too concentrated. Some of the sprayer's tips and strainers were plugged, but evaluators attributed these problems to storage over the winter. When the sprayer was in full operation, there were no problems. The check valves did not leak. The flow-control gauges could not be evaluated because none of the spray units became clogged.

Evaluators started the spraying using the original nozzle tips (8001E and TR80-02) and worked some days with 8006 nozzle tips. Although the 8006 tips allowed more product to be applied, evaluators wonder whether these tips might have allowed a little herbicide to escape, damaging some trees.

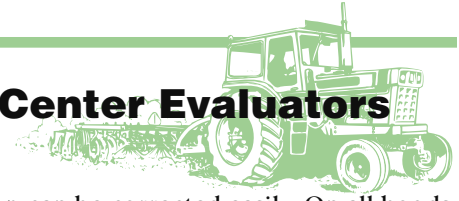
Evaluators discovered that the steering wheels were not durable enough for their uses of the machine. Evaluators installed a sturdier wheel assembly (figure 23).



Figure 23—The improved version of the steering guide wheel on the MTDC Shielded Herbicide Sprayer.—*Courtesy of the Virginia Department of Forestry*

The new wheel assembly made it much easier to guide the sprayer unit. MTDC has incorporated this modification into the final design. The brushes on the bottom of each hood were seen as a plus, but the wheels on the back of each hood were installed too close to the hoods. Under wet conditions, mud built up between the wheels and the back of the sprayer hoods. Also, these gauging wheels were difficult to clean. The gauge wheels will be positioned farther back to correct the problem.

Comments from the Augusta Forestry Center Evaluators



Alton Dean felt there was no difference between the Egedal sprayer and the MTDC prototype. He was concerned by the weight of the MTDC sprayer (about 1,300 pounds for a five-row system), compared to just 1,072 pounds for the Egedal system. He thought weight could play an important role in mobility.

Tommy Frazier felt there was no difference between the effectiveness of the MTDC and Egedal machines. His only concern was the bulkiness of the hoods on the MTDC machine; it is easier to treat eight rows with the Egedal machine than with the MTDC prototype, because the sprayer operator can see between the hoods.

Both machines can apply herbicide at the same rate. Evaluators liked the larger spray tank on the MTDC prototype. The operator's control of the machines was the same.

The mud buildup can be corrected easily. On all hoods (including the outside sprayers) the distance between the wheel and the hood should be increased to prevent buildup.

Joshua McLaughlin said he would recommend the MTDC prototype sprayer to others. He said it was easy to use, tips were easy to change, and the machine was more durable than the Egedal machine. Frazier said he would recommend the MTDC prototype for the same reasons.

For additional information on the field trials, contact Joshua McLaughlin, Larry Estes, or Tommy Frazier at the Virginia Department of Forestry, Augusta Forestry Center (phone: 540-363-5732) or Dwight Stallard at the Garland Gray Forestry Center (phone: 804-834-2855). It may be possible to make arrangements with these individuals to watch the machine in use (varies with time of year) or to borrow it for your own evaluations.