

POSTEMERGENCE DIRECTED SPRAY EQUIPMENT AND CALIBRATION

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Introduction

Sandy soils with low organic matter content combined with intense pressure from difficult to control weeds are major problems found by producers in Florida and much of the southern United States. These soils often eliminate the use of certain herbicides or the herbicides must be used at low rates. In addition, frequent rains which move rapidly through these soils often leach the herbicides. Intense weed pressure, low herbicides rates, and leaching are a few of the factors which result in poor weed control or at best, short-term weed control. Effective weed control for the first four to six weeks is often sufficient for many crops to produce good yields but producing a good yield is beneficial only if the crop can be harvested. Weeds which emerge four to six weeks after the crop and are not controlled can result in tremendous harvesting problems. In conventionally planted crops many of these weeds can be controlled by cultivation; however, adverse weather conditions which delay cultivation may result in weeds in the row becoming too large to kill with cultivation. In no-till plantings, cultivation is not an option for controlling these late emerging weeds. Many weeds can be effectively controlled by spraying over the top of the crop; however, in certain situations there are no herbicides which can be sprayed over the crop without serious crop injury. In these situations, a post-emergence directed spray is the best answer for control of these weeds in either conventional or no-till plantings.

Time of Application

The objective of a directed spray is to spray the weeds with minimum contact of the herbicide on the crop leaves. Directed sprays will be effective only if there is a height differential between the crop and weed. For most of the herbicides to be safely used, the crop should be at least 12 inches tall and the weeds less than 4 inches tall (Figure 1). If the crop is smaller or the weed larger than this, increased crop injury will generally result. If the crop is taller than 12 inches and the weeds are less than 4 inches then a greater height differential exists and less crop injury will result. In this situation, it is generally advisable to delay the application and allow as many weeds as possible to emerge before the largest weed reaches 4 inches.

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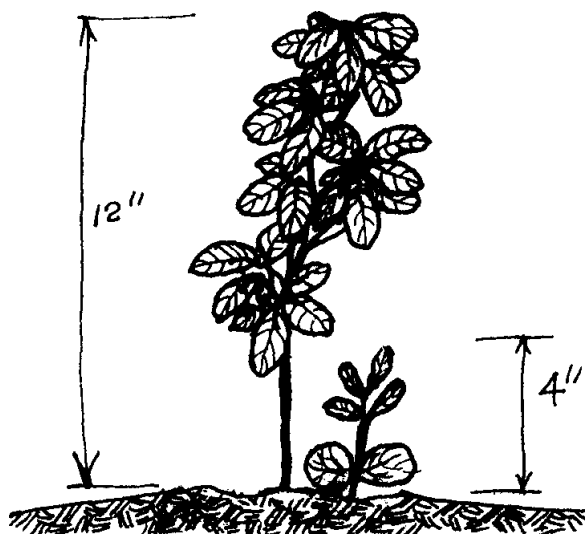


Figure 1. Minimum crop height and maximum weed height for effective control without crop injury when applying post-directed sprays.

Equipment Needed

Several types of directed spray applicators are commercially available. The equipment is not complicated and many producers have constructed their own applicators.

The basic requirement of the equipment is to allow setting the height and orientation of the spray nozzle in a constant position in relation to the soil and crop. This can be accomplished by mounting the nozzles on equipment such as slides, gauge wheels, or cultivators (Figure 2). Once the nozzles have been adjusted to spray the lower 4 inches of the crop, they will remain in that position even in rough fields. Nozzle height and orientation must be set for the crop and weed situation in each field to be sprayed. Boom sprayers with drop nozzles are not well suited for this type application since the height of the nozzle is not constant in rough fields. Each time the boom bounces, the nozzle sprays higher than 4 inches on the crop and injury results. Applicators are also available with shields which protect the crop from the spray. This type equipment may be useful in certain situations, but will generally result in uncontrolled weeds in the row.

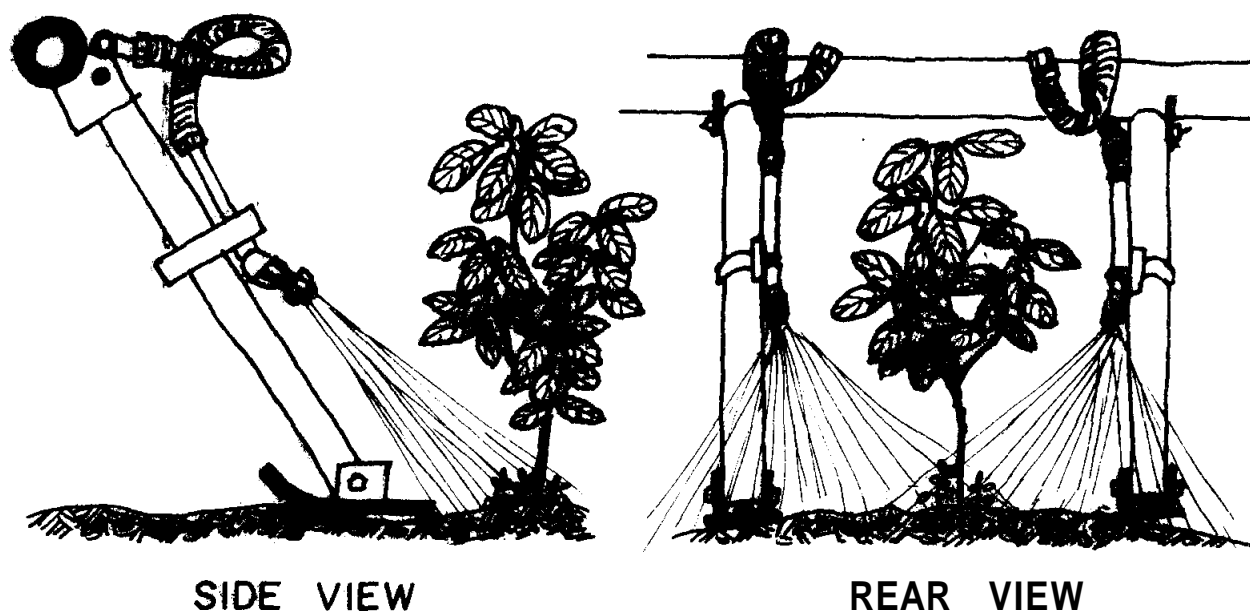


Figure 2. Side and rear view of 2-nozzle per row arrangement mounted on slides.

Nozzles, Pressure, and Spray Volume

Most of the herbicides used for directed sprays require good spray coverage of the weed for effective control. Proper choice of nozzles, pressure, and gallonage can be critical for effective control with minimum crop injury.

Nozzles

Flat fan nozzles are well suited for directed sprays. These nozzles can be operated at low pressure and the spray pattern overlapped in the drill (Figure 2). The overlap should be about 6 inches for uniform distribution. A typical flat fan nozzle tip is a Tee Jet 8004. This type tip is available for different gallonage or different spray angles. For example, if higher gallonage is desired an 8005 or 8006 may be used. If lower gallonage is desired, an 8003 or 8002 may be used. If a wider spray angle is needed, 95 and 110 degree spray angles are available. For example a 9504 will apply the same gallonage as an 8004 but with a wider angle (95° versus 80°). This can be helpful since the wider spray angle allows spraying the same area with the nozzle at a lower height.

Floodjet (TK series) nozzles provide wide spray angles at low pressure; however, in dense weed situations the large droplets produced may not provide sufficient coverage.

Off-center (OC series) tips are also available. This type sprays only from one side of the tip and no coverage will be achieved in the middles unless multiple nozzles per row are used. If cultivation is to be used for the middles then two off-center tips per row can be effectively used.

Cone (D and TX series) tips are not well suited for directed sprays. These tips are designed for high pressure and produce fine spray particles. These fine particles will drift onto the crop leaves and result in injury. In addition the cone shape of the pattern is not well suited for spraying low on the crop.

Pressure

The lowest possible pressure which will provide sufficient spray coverage of the weeds should be used. Pressures in the range of 15 to 25 psi are desirable. If sufficient coverage is not achieved at these pressures, choose a tip with a larger orifice. This will increase gallonage without increasing pressure. High pressure creates small particles which drift and should be avoided.

Spray Volume

The gallons per acre needed will vary depending on the density and size of the weeds. In most situations 20 to 30 gallons per acre is adequate.

Speed

Directed sprays can be applied at any speed which can safely be used to operate the equipment without crop injury. Choose the speed which can be safely used for the size of the crop and select nozzle tips which will deliver the desired gallonage at that speed.

Sprayer Calibration

Proper calibration is critical since herbicide rates which are too high may result in crop injury and will increase costs. Rates which are too low may result in poor weed control. Any method of calibration which is accurate can be used for directed sprays. One of the easiest to use methods which is accurate is outlined in the following steps:

- Step 1. Measure the swath width sprayed by one nozzle in inches (Figure 3). This width will vary with nozzle height and orientation therefore measurements should be made after these adjustments are made in the field to be sprayed.

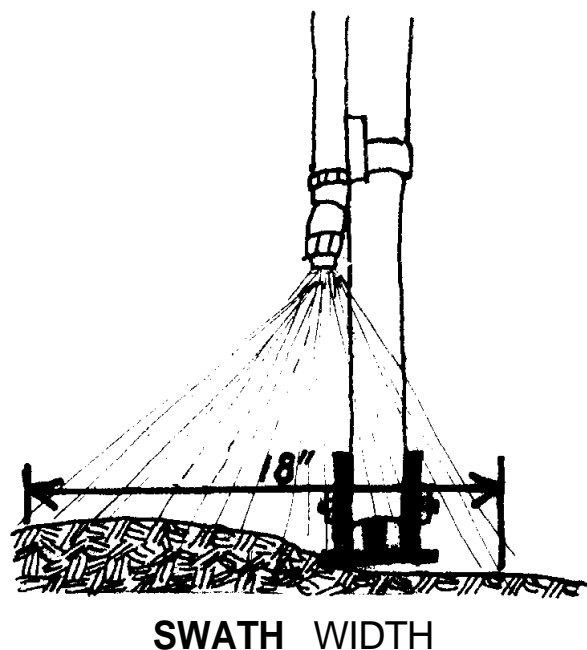


Figure 3. Measure the swath width sprayed by one nozzle to determine the course length required to equal 1/128 acre.

Step 2. Determine the course length required for the measured swath width to equal 1/128th acre.

Swath width of one nozzle (inches)	Course length to equal acre (feet)
10	408
12	340
14	292
16	255
18	226
20	204

Step 3. Measure and mark this course length in the field.

Step 4. Choose the gear and RPM to be used, drive the measured course and record the time required to travel that distance. The tractor should be moving prior to crossing the start of the course and the time begun when the tractor crosses the marker.

- Step 5. Start the sprayer and adjust the regulator to the desired pressure.
- Step 6. Check the uniformity of the nozzles. This is a critical step in the calibration of any sprayer with any calibration method. Catch the flow from a nozzle in a baby bottle or graduated cylinder for 10 seconds and record the amount. Repeat this procedure for 10 seconds at each nozzle. Compare the amount caught from each nozzle for uniformity. If the flow from a nozzle is 15% higher or lower than the other nozzles, replace it.
- Step 7. Catch the flow in ounces from one nozzle for the length of time required to drive the measured course (from step 4). The ounces caught in this length of time is equal to the gallons per acre being applied by the sprayer. If 4 nozzles per row (2 nozzles per slide) are used and the front and rear nozzles on one slide are spraying the same swath, then collect the flow from both nozzles.
- Step 8. Determine the acres sprayed per tank.

$$\frac{\text{Gallons per tank}}{\text{Gallons per acre}} = \text{acres per tank}$$

- Step 9. Determine the amount of herbicide needed per tank. Acres per tank \times herbicide rate per acre = herbicide per tank.

- Example:
- Step 1. Swath width measured - 18 inches.
 - Step 2. Course length from chart = 226 ft.
 - Step 3. Measure and mark 226 foot course.
 - Step 4. Time to drive 226 ft. in 5th gear at 1400 rpm = 34 seconds.
 - Step 5. Sprayer adjusted to 20 psi.
 - Step 6. Nozzles checked and uniform.
 - Step 7. Catch flow from one nozzle for 34 seconds. Amount collected = 20 ounces. Sprayer is applying 20 gallons per acre.
 - Step 8. Sprayer tank capacity is 200 gallons.

$$\frac{200 \text{ gal per tank}}{20 \text{ gal per acre}} = 10 \text{ acres sprayed per tank}$$
 - Step 9. Recommended herbicide rate = 1 quart per acre. Ten, acres per tank \times 1 quart per acre = 10 quarts per tank.

Summary

A directed spray applicator is similar to an insurance policy. Purchase it and hope you never need to use it. Unfortunately herbicides applied preplant or preemergence seldom provide full season control and directed sprays are needed. Directed spray equipment is available and is not difficult to use. Herbicides are available and are effective. The major need is to have a sufficient height differential between the crop and the weed.