

Modifying Knapsack Sprayers for Precise Applications of Herbicides

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Knapsack sprayers properly equipped with single nozzle booms are light and adaptable for diverse applications of herbicides on small farms, nurseries, landscape plantings, Christmas tree plantings, orchards, and tank farms.

The components of a single nozzle spray attachment for knapsack sprayers that has worked well for multiple use herbicide applications consist of a shutoff valve, a pressure gauge, a short wand (18 to 24 inches) and three or four interchangeable nozzle tips. It can be assembled with standard parts for about \$65. Complete specifications of the unit are given in Fig.1. The nozzle tip selected depends primarily on the desired swath width. A Teejet 8004-E^{2/} (even spray) tip is useful for band applications from 1 to 4 ft. A Teejet TK-2^{2/} (flood jet) tip is useful for swath widths of 3 to 6 ft, and KLC-5^{2/} (field jet) tip is useful for swath widths of 6 to 4 ft. A Teejet OCO4 off-center (OC) tip is useful for side applications in orchards and small fruits such as blueberries. With each tip the swath width is varied by varying the height and by adjusting the angle of the tip relative to the direction of travel.

To simplify the operation, the 8004-E, TK-2 and OCO4 nozzles are calibrated to deliver 0.3 gal/min (38 oz/min) and the KLC-5 nozzles are calibrated to deliver 0.5 gal/min (64 oz/min). The following steps are taken in calibrating and using the sprayer.

1. The pumping pressure is adjusted to deliver 0.3 to 0.5 gal/min, depending on the nozzle chosen. A trial pressure is selected and the spray is caught for one minute and measured. This is repeated until the required pressure is obtained. Note: 0.3 gal/min is 1 qt/50 sec and 0.5 gal/min is 1 qt/30 sec.
2. The walking speed is adjusted to either 3.4 or 4.5 ft/sec, depending on the terrain and the individual preference. One simply measures out a multiple of the ft/sec and practices walking it. For example, 3 ft/sec is 30 ft/10 sec or 90 ft/30 seconds.
3. The nozzle height and angle of pattern are adjusted to cover the desired swath widths. This is easily done on a dry asphalt or concrete surface.
4. The volume of spray delivered per acre is then determined from the following delivery chart.
5. The acre rate of herbicide is added to water and made up to the acre volume or in that proportion. For example, 3 lb/acre in 10 gal/A is 1.5 lb/5 gal, or 0.3 lb/gal.
6. The same heights, pump pressures and walking speeds are used as determined in calibration. After the herbicide mix is added, a check of the volume delivered per minute may indicate that a slightly higher pressure is required than with water alone.

A simple way of measuring swath widths in fields without marked rows involves using sets of two 3 or 4 ft pointed rods connected with a rope of light chain. To one of each pair we attach a red flagging, to the other a yellow flagging. If a 10-ft swath is desired, the rope between the two stakes is adjusted to 10 ft. One set of the rods is placed at one end of the field with one rod spaced 5 ft from the edge, and the other set is similarly placed at the opposite end, with the same colored flagging 5 ft from the edge. You sight on the rods and spray a 10-ft swath from red to red with slight overlapping. When you reach the opposite end the red flagged rod is moved 10 ft beyond the yellow. Then you spray in a line from yellow to yellow. In that way any open area can be marked and sprayed by one person. Experience has shown that on the average one can mix and spray at least one acre per hour, and more if mixing is done mechanically.

There are several advantages of this system for herbicide application with knapsack sprayers. They include flexibility of use, adequate precision (1), low volume of spray, low cost, ease of calibration and reduced waste on small fields. Because of these advantages, knapsack applications have proven useful for many agricultural and commercial enterprises in the northeast.

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LITERATURE CITED

1. Ahrens, J.F. 1979. Broadcast sprayer attachment simplifies herbicide application on confined areas. American Nurseryman. June 15, 1979 issue.

Volume Delivery Chart

Spray width in feet	Nozzle	Calibrated gal/min	Gallons delivered per sprayed acre at three walking speeds*		
			3 ft/sec	4 ft/sec	4.5 ft/sec
1	8004-E	0.3	72.6	54.4	48.4
2	8004-E or 0C04	0.3	36.3	27.2	24.2
3	8004-E or 0C04	0.3	24.2	18.2	16.1
3.5	TK-2 or 8004-E or 0C04	0.3	20.7	15.5	13.8
4	TK-2 or 8004-E or 0C04	0.3	18.1	13.6	12.1
5	TK-2 or 0C04	0.3	14.5	10.9	9.7
6	TK-2	0.3	12.1	9.1	8.1
6	KLC-5	0.5	20.2	15.2	13.5
8	KLC-5	0.5	15.1	11.4	10.1
10	KLC-5	0.5	12.1	9.1	8.1
12	KLC-5	0.5	10.1	7.6	6.7
14	KLC-5	0.5	8.7	6.5	5.8

One dealer in New England selling the attachment is OESCO, Box 146, Conway, MA 01341, Tel: 413-369-4335. You also can assemble one yourself by ordering all major components, except possibly the pressure gauge from Spraying System Co., North Avenue, Wheaton, IL 60187

You also can modify a Solo sprayer (Model 475 preferred) with a Solo gauge kit and a plastic wand extension and a 45° angle coupling. However, the plastic wands are more flexible and tend to bend in hot weather.

For Mixing: The basic rule is to mix the desired acre volume or weight of herbicide into each acre volume of spray; or in that proportion. For relatively small areas a suitable measuring device is a 5-gallon white paint bucket marked off in measured gallon amounts – 1 to 4 gallons. Stir the mix before pouring it into a knapsack sprayer. Mixing in the sprayer is not advised. An example of a table to prepare for spraying follows:

Herbicide mix	lb. or volume product per sprayed acre	Spray volume 16 gal/A (determined from chart)		
		oz. wgt. or fluid oz. per 16 gallon	oz. wgt. or fluid oz. per 1 gallon	oz. wgt. or fluid oz. per 4 gallon
Princep 4 L +	2.5 qts +	80 fl.oz. +	5 fl.oz. +	20 fl.oz. +
Pendulum 60DG	4 lb	64 oz. (wgt)	4 oz. (wgt)	16 oz. (wgt)

To prevent problems in mixing, always add at least half the water first; then add wettable powders or flowables and agitate or thoroughly mix; then add emulsifiable concentrates last.

For treating large areas, mixing is best done in a 30 to 50 gal. spray tank (nurse tank) that has an engine, and pump providing good agitation, preferably mechanical. A hose off the spray tank is used to refill the knapsack sprayer. Only enough spray for the desired acreage that can be treated in one day should be mixed, because water insoluble herbicides settle out overnight and are difficult to resuspend.