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Controlling Problem Weeds with Specialized Equipment

T. N. Jordan

M. A. Ross

T. T. Bauman

Adm-Yes

weed science

COOPERATIVE EXTENSION SERVICE • PURDUE UNIVERSITY • DEPARTMENT OF BOTANY AND PLANT PATHOLOGY
LILLY HALL OF LIFE SCIENCES • WEST LAFAYETTE, INDIANA 47907

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Weeds, CONTROLLING PROBLEM ~~WEEDS~~ WITH SPECIALIZED EQUIPMENT

T.N. Jordan, M.A. Ross, and T.T. Bauman, Extension Weed Specialists

Recirculating Sprayer

Hard-to-control, tall-growing weeds such as johnsongrass, shattercane, redroot pigweed, volunteer corn, sunflower, cocklebur, and milkweed can now be controlled in soybeans with Roundup used in a recirculating sprayer. Although other highly translocatable chemicals such as 2,4-D and 2,4 DB may be effective on broadleaf weeds when used in the recirculating sprayer, Roundup is the only herbicide specifically labeled for use in this equipment. The recirculating sprayer was designed to specifically control weeds that have grown taller than the soybeans with which they compete. This is accomplished with only a small amount of herbicide which provides both economy and crop safety. The principle of the recirculating sprayer is shown in Figure 1. Recirculating sprayers differ from other spray systems in that they return most of the spray solution to the tank for reuse. Nozzles are set to spray horizontally just above the crop and any spray that does not strike a protruding weed is trapped for return to the spray tank rather than settling onto the soybean plants.

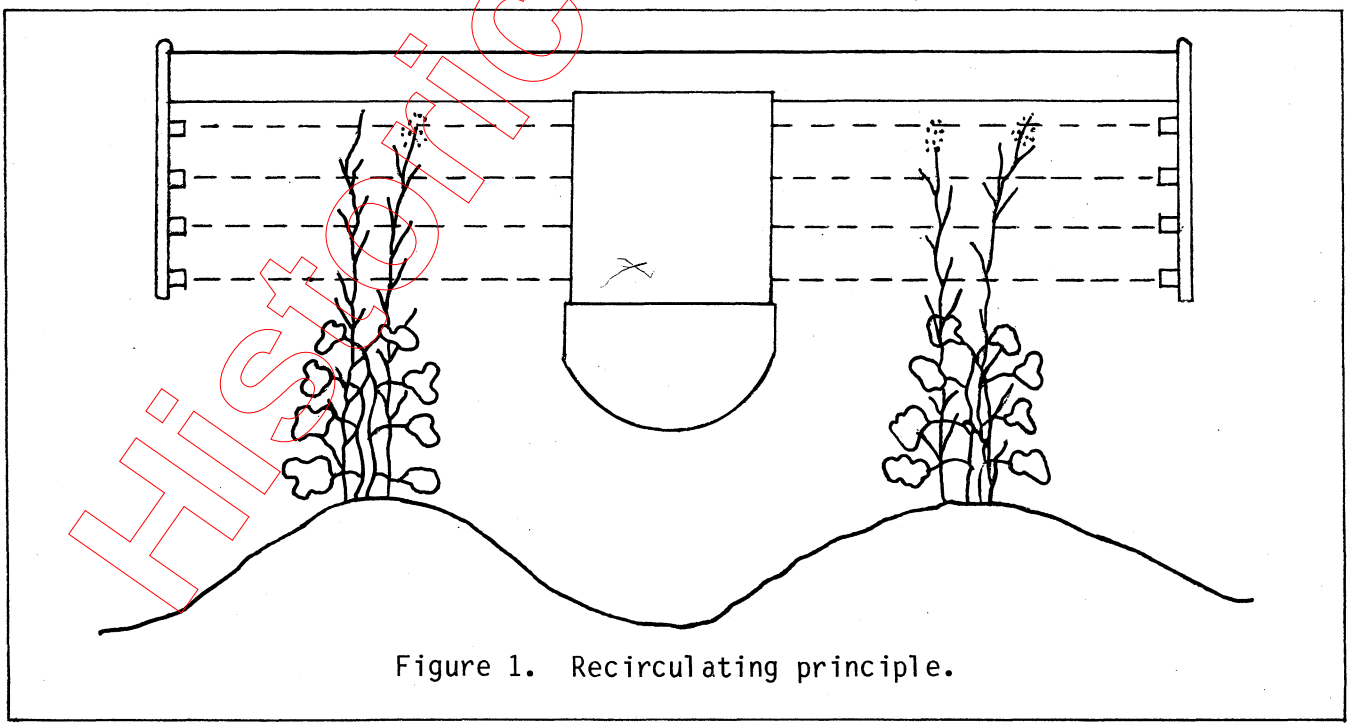

Figure 1. Recirculating principle.

The spray traps and a system to return the liquid from the traps to the spray tank are the only alterations to a conventional tractor-mounted spray system. The return system makes use of a venturi (siphon) device to return the herbicide spray from the trap back to the spray tank. Recirculating sprayers use a conventional pumping system that includes pump, hose, pressure regulator, pressure gauge, bypass systems and spray tanks. Centrifugal pumps delivering high volumes may be desirable for use on some models of recirculating sprayers simply because high volume capacity is needed for proper performance of most venturi devices. Venturies work far more effectively when the outlet hose is larger than the inlet hose.

Many recirculating sprayers come equipped with four nozzles per row, but the number of nozzles needed in the recirculating sprayer is dependent upon the weed species and size of the weed. Probably no more than two nozzles per row are needed when weeds grow no taller than 10 to 12 inches above the crop. Three nozzles are needed when weeds grow 12 to 24 inches above the crop, and four nozzles per row are needed only when weeds grow more than 2 feet above the crop. Nozzle housings, strainers, and caps are usually the same as those used on conventional sprayers. Narrow angle or solid-stream (straight-stream) nozzles are used rather than the conventional 80-degree fan nozzle to assure that the herbicide spray not deposited on the weeds enters the spray traps. For best results with the recirculating sprayer, weeds should be at least 6 to 10 inches taller than the crop. The spray unit should be adjusted so that the lower spray stream will be at least 2 to 6 inches above the desired vegetation. Contact of the spray solution from droplets of mist or splatter settling on the desirable vegetation may result in severe stunting, discoloration, or destruction of the crop.

Applications may be made any time after weeds are 6 inches or more above the desired vegetation. When more of the weed is exposed to the spray solution, better results may be obtained. Weeds not contacted by the spray solution will not be controlled. In many cases the height of weeds will vary such that not all weeds will be treated with a single application. In such situations, retreatment may be necessary for control of these weeds. Normally about 80 to 90 percent of the spray applied can be recovered with a light weed infestation and 60 to 70 percent can be recovered even with a very heavy weed growth. Trash from weeds and dust from the field tend to collect in spray traps continuously operated for several hours. These foreign materials will reduce the activity of Roundup; thus, only the amount of solution to be used during a one-day period should be mixed. The recirculating sprayer and parts should be thoroughly cleaned immediately after each use.

Types of Recirculating Sprayers: Basically there are two major versions of the recirculating sprayer: the box type and the row or broadcast type. Each manufacturer has modified the recirculating sprayer concept to fit various situations and needs. All recirculating sprayers have their advantages and disadvantages. Recirculating sprayer manufacturers are located throughout the nation, and distributors can readily be found in all states.

Recirculating Sprayer Calibration: Recirculating sprayers are calibrated on the basis of ground speed and delivery volume. Tables 1 and 2 illustrate two procedures that can be used to calibrate recirculating sprayers for using Roundup. One of the following two procedures can be used to calibrate a recirculating sprayer:

1. Determine the discharge being delivered per minute and operate at the appropriate ground speed; or
2. Select the desired ground speed and then adjust the sprayer to deliver the proper volume per minute (this may require nozzle changes). Do not operate a recirculating sprayer at speeds in excess of 6 mph or at nozzle pressures above 20 psi.

Experimental Applicators

Rope-wick: The rope-wick applicator was developed to apply nonselective systemic herbicides to weeds that grow taller than the crop using the same height differential principle and the recirculating sprayer. Movement of the herbicide through the wick is by capil-

lary action and gravitational flow and is effected by the physical properties of the nylon rope wick and the aqueous herbicide solution. Figure 2 shows a model of the rope-wick applicator.

The rope-wick applicator was conceived in 1976, and it was immediately apparent that glyphosate applied in this manner to johnsongrass provided highly effective control. The concentration of the solution of Roundup in the reservoir affects the rate of movement of solution in the wick. Adding water to Roundup causes an increase in the total volume of solution delivery and the greatest amount of Roundup is wicked out when solution ratios are in the range of 1:2 to 1:4 Roundup-water (v/v). The

Table 1. Use this table when calibrating box or row type recirculating sprayers. Box or row type sprayer calibration is based on the total discharge collected per row. For best results use only straight stream or 15° fan type nozzles

VOLUME PER MINUTE PER ROW*	
MPH	Ounces
2	26 to 35
3	38 to 51
4	51 to 68
5	65 to 86
6	77 to 102

*Note: Be certain the amount collected is for all spray streams treating one row.

Table 2. Use this table when calibrating broadcast type recirculating sprayers. Broadcast recirculating sprayer calibration is based on the discharge collected per minute from one nozzle on a 20-inch spacing

VOLUME PER MINUTE PER NOZZLE*	
MPH	Ounces
2	7 to 9
3	10 to 13
4	13 to 18
5	16 to 22
6	20 to 26

*Note: Be certain the amount collected is for all spray streams treating one row.

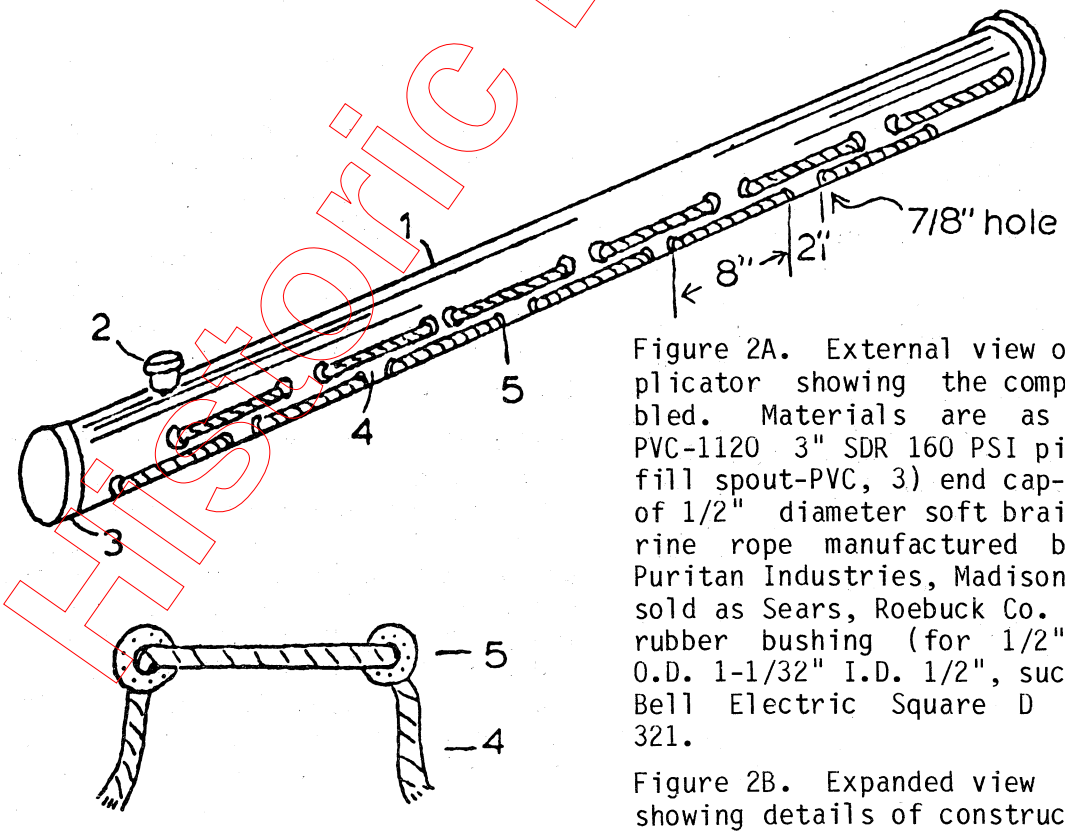

Figure 2A. External view of a wick applicator showing the components assembled. Materials are as follows: 1) PVC-1120 3" SDR 160 PSI pipe, 2) capped fill spout-PVC, 3) end cap-PVC, 4) wicks of 1/2" diameter soft braided nylon marine rope manufactured by Wellington Puritan Industries, Madison, Georgia and sold as Sears, Roebuck Co. T6V64146, 5) rubber bushing (for 1/2" knockouts), O.D. 1-1/32" I.D. 1/2", such as Rodale-Bell Electric Square D Co., Cat. No. 321.

Figure 2B. Expanded view of one wick showing details of construction.

greatest advantage of the rope-wick applicator is its simplicity. The unit consists of only a reservoir-boom and soft nylon rope wicks. The reservoir-boom can be made from a great variety of materials that include plastic pipe, rubber hose, fiberglass, and metal.

A conventional farm tractor can be used to carry the applicator through fields. Herbicide application with the rope-wick is environmentally safer than with conventional spray systems. Herbicides can be applied on windy days without hazard of drift. Also, the herbicide is placed directly on the weeds so that less herbicide reaches the soil as compared to conventional spray systems. On an acre basis, very small volumes of herbicide and carrier are used (about 0.4 pts/A). The use of small volumes of herbicide solutions with the wick applicator is advantageous because various substances found in water can inactivate Roundup. Roundup can be flushed out of the wick with water, but other herbicides may be difficult to remove. This might create problems if herbicides are changed. Since the applicator is relatively inexpensive, using different applicators for other herbicides may be advisable.

Hooded Sprayer: Hooded sprayers are designed to provide postemergence control of low-growing weeds with nonselective herbicides without injury to the crop. The original hooded sprayers were simple rigid boxes with spray nozzles mounted under them. These hoods were carried on tool bar devices and sprayed all weeds that the hoods passed over. The disadvantage of this type sprayer is that without flexibility the tractor had to be driven slowly and carefully to prevent the hoods from riding over the crop. Also, a box type hooded sprayer applies herbicide in a broadcast manner covering all the area between the crop rows. This is not necessarily a disadvantage in no-till situations, but herbicides are wasted in cultivated fields when they are applied to the middles which are cultivated for weed control.

Flexible hoods like the one shown in Figure 3 allows the application of herbicide on a band while cultivators control weeds in the row middles. This type of hooded sprayer is designed to utilize two nozzles per row in the same manner as a conventionally directed postemergence herbicide applicator. However, the hoods prevent the spray pattern from overlapping at the drill area and protects the base of the crop from the sprayer. This type of applicator has both lateral and vertical flexibility, allowing the hoods to move within 1 or 2 inches of the crop plant. The two hoods which are common to a row are connected with a metal rod and spring which allows the hoods to be adjusted according to the diameter of the crop plant. When properly adjusted, the hoods have a floating action which allows the unit to travel at speeds of 4 to 5 mph while the flexibility eliminates any pressure against the base of the crop plant from the hoods.

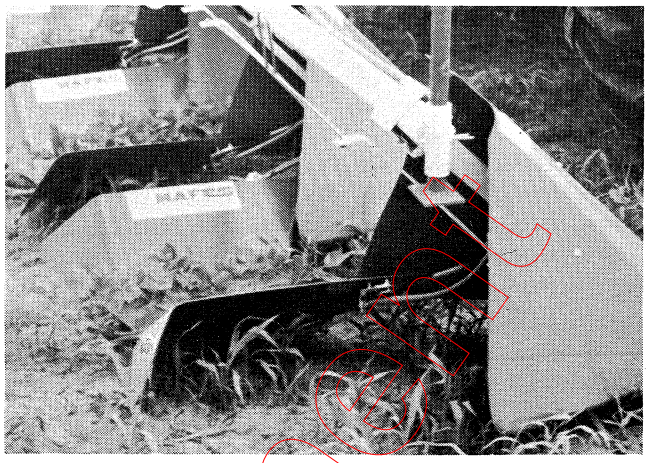

Figure 3. Hooded sprayer applying nonselective herbicide under soybeans. The hoods protect the crop by preventing the spray patterns from contacting the soybean stem.

Disclaimer

Roundup is the trade name of Monsanto. Mention of a trade name, preparatory product, or vendor does not constitute a guarantee or warranty of the product by Purdue University or the Indiana Cooperative Extension Service and does not imply its approval to the exclusion of other products or vendors that may also be suitable.