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**WEED
CONTROL in
FIELD CROPS**

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FARM CROPS
AND BOTANY AND
PLANT PATHOLOGY

**MICHIGAN STATE UNIVERSITY
COOPERATIVE EXTENSION SERVICE
EAST LANSING**

Weed Control in Field Crops

Weed control is the chief reason for cultivating crops. Chemical sprays often can do the same thing at a considerable saving and, in some cases, will control weeds that cannot be controlled by normal tillage practices. However, there are some situations in which tillage is the only practical control measure.

CULTIVATION

One of the best times to kill weeds by tillage is when the seedbed is being prepared for a crop. When possible, plow the land early. Let a crop of weed seed germinate, and kill the young weed seedlings with shallow cultivation. Killing these seedlings in the topsoil layer before the crop is planted will save work later.

However, this procedure will have to be repeated two or three times because tillage will bring other layers of soil containing weed seed to the surface.

Minimum tillage methods of seedbed preparation can control annual weeds. The loose soil surface left by these methods makes for a dry topsoil layer which discourages weed seedlings.

The field cultivator equipped with duckfoot or wide shovels is one of the best tools for the control of weeds with deep roots, such as bindweed and thistles. Use the disk or springtooth harrow just before the duck-foot shovel if the soil is firm and needs loosening. Unplowed fields of quackgrass can be effectively controlled by a well-constructed field cultivator with narrow shovels if the operation is repeated often.

The rotary hoe, spiketooth harrow, and weeder are effective tools for the control of annual weed seedlings when the land is planted to row crops. Use these tools when the seedlings are just coming through the ground; if you wait until the weeds have much top-growth, it may be too late to control them by this method. Use these tools just after planting, while the crop is coming up, or just after it is up.

Plowing is usually necessary to kill and bury a heavy weed growth. Fall plowing brings roots and

rootstocks to the surface where they are injured by winter freezing.

CHEMICAL WEED CONTROL

A large number of chemical weed killers are now available and they may be used on many crops at a cost below that for cultivation. Selective control of weeds in crops may be obtained by either foliage sprays or application of the chemical to the soil.

Apply pre-emergence sprays to the soil after planting crop seeds but before the crop appears above ground. Weeds may or may not be visible when you spray. Apply post-emergence sprays, usually foliage sprays, after the crop emerges. Apply the chemical as an overall spray or in a band directed at the base of the crop plants.

PRINCIPLES OF CHEMICAL CONTROL OF WEEDS

1. Weeds are easiest to kill when they are small seedlings and when conditions favor rapid growth. Crop plants are also most easily injured under these conditions. Use a selective spray that will control the weeds with little or no injury to the crop.

2. Pre-emergence sprays are not effective in dry soil. They are more likely to injure the crop on light sandy soils than on heavier loams or clay loams. Injury on sandy soils is greatest when spraying is followed by heavy rains. The amount of water used with the chemical is less important with pre-emergence sprays than with post-emergence sprays. Pre-emergence sprays are more effective against annual grassy weeds than are post-emergence sprays with the same chemical.

3. Time of spraying and rate of application are very important. Spraying at the wrong time often results in poor weed control and greater crop injury. No crop plant is completely resistant to injury from herbicides and will be damaged if too much chemical is used.

4. Do no cultivating for at least 3 weeks after pre-emergence spraying unless weeds appear that are resistant to the chemical. Delay cultivation after post-

emergence spraying at least 2 or 3 days to allow the chemical to move into stems and roots of the weed plants.

5. No one chemical used as a selective spray will kill all species of weeds. Therefore, select the right chemical for the job. Some weeds are resistant to all of the present selective sprays.

6. Read labels carefully and never apply a chemical at rates higher than recommended on the label. Do not use chemicals in areas or on crops if the label warns against it. Store chemicals in a room not subject to freezing temperatures.

WEED SPRAYERS

Crop injuries often result when sprayers used for weed control are also used for disease and insect control. Some chemicals are more difficult to wash from a sprayer than others, and wooden tanks are more difficult to clean than steel tanks. Hand sprayers of 3- or 4-gallon capacity are suitable for small areas of 1 acre or less and for patch spraying. Tractor-mounted sprayers driven from the power takeoff are very satisfactory for larger areas.

A good weed sprayer should:

1. Have a pump which is inexpensive, easily replaced, resistant to wear and chemicals, and which has a minimum capacity of 4 gallons per minute.

2. Provide some means of keeping the solution well mixed. This can be by mechanical or jet agitation, using a bypass from the pump.

3. Have 50-mesh screens for suction line and nozzles.

4. Have a gauge which measures pressure accurately in the range of 20 to 100 pounds per square inch.

5. Have flat fan nozzles with replaceable tips. Wide-angle nozzles (73 to 80 degrees) will permit the boom to be carried closer to the ground and thus reduce spray drift.

TYPES OF BOOMS

For pre-emergence spraying, apply the solution with either a conventional multiple-nozzle boom or a cluster-nozzle boom. In either case, select a nozzle size which will spray 10 to 40 gallons per acre.

For post-emergence spraying on row crops, use a multiple-nozzle boom, with or without drop pipes.

In turf and close-drilled crops, either type of boom may be equally satisfactory in growth not more than 6 to 10 inches tall.

BAND APPLICATION

In cultivated crops, spraying narrow bands over the rows has advantages and disadvantages. It will take less material per acre and will, therefore, cost less per acre for the chemical. Where chemical costs are high (as for field beans or soybeans), band spraying may be justified. When chemicals are not too expensive, overall spraying controls weeds between the rows when the soil is too wet to cultivate.

If band spraying is used, be very careful to maintain the proper rate of application on the area sprayed. (If you lower the spray boom to narrow the area covered by a given nozzle, remember that each nozzle is still delivering the same amount of spray mixture as it did on the wider area.)

SPRAYER CALIBRATION

Be sure to apply the right amount of material per acre. To do this, you must know how much liquid the sprayer is delivering per acre at a given speed and pressure. To calibrate your sprayer:

1. Fill the spray tank with water only.

2. Spray a measured area at a fixed speed and a fixed pressure (4 miles per hour and 40 pounds suggested).

3. Measure the amount of liquid required to refill the tank.

4. Divide this amount (in 3 above) by the portion of an acre sprayed to find the gallons applied per acre.

5. Mix the amount of material recommended per acre with the number of gallons the sprayer uses per acre (the answer in 4 above).

TABLE 1.—Chemicals for Weed Control in Field Crops

Rates are expressed in pounds of active ingredient per acre for the area actually sprayed.

CROP	Chemical	Rate	Time of application	Weeds controlled	Remarks
CORN	2,4-D (ester)	2	At planting	Annuals	Do not use on sandy soil. Avoid cultivation as long as possible.
	2,4-D (ester)	1	At or near corn emergence	Annuals	Same as above.
	2,4-D	¼-½	Corn 6 to 20 inches	Broadleaved weeds	May be substituted for first cultivation.
	CMU (Karmex)	½-1	At or near corn emergence	All annual weeds	Spray after use of rod weeder.
WHEAT AND BARLEY	2,4-D (amine)	¼-½	Spring only	Broadleaved annuals	Use when grains are fully tillered but before jointing stage.
	2,4-D (ester)	½	Before boot stage	Perennials	Use only when bindweed and various thistles are present.
OATS	2,4-D (amine)	¼-⅜	Grain tillered	Broadleaved annuals	Some yield reduction may occur but generally less than caused by weeds.
	MCP	⅜-½	Grain tillered	Mustards	Less injurious than 2,4-D.
ALFALFA AND SWEET CLOVER SEEDING WITHOUT A NURSE CROP	TCA	10	4 to 6 weeks after seeding	Annual grass weeds	Effective only on germinating grasses.
	Dalapon	3	4 to 6 weeks after seeding	Annual grass weeds	Will kill young emerged grasses.
	CIPC	5	4 to 6 weeks after seeding	Annual grass weeds	Effective only on germinating grasses.
ALFALFA SEEDINGS WITH OR WITHOUT SMALL GRAIN NURSE CROP	MCP	⅜	4 to 6 weeks after seeding	Broadleaved annuals	Most effective when mustard weeds are present.
	Premerge Sinox PE	¾	4 to 6 weeks after seeding	Broadleaved annuals	
	2,4-D (amine)	¼	4 to 6 weeks after seeding	Broadleaved annuals	Use only when weeds are a real threat to the seeding.
ALFALFA (established stand)	TCA	10	Fall	Winter annual grasses	Apply in September or October when downy brome is emerging.
	Dalapon	3-5	Fall	Winter annual grasses	May be applied after grass emergence is complete.
	CIPC	5	Fall	Winter annual grasses	Apply at first sign of downy brome emergence.
	MCP	½	Fall	Yellow rocket	Apply after growth of alfalfa has stopped (October or

					November).
RED, ALSIKE, LADINO CLOVERS ALONE OR WITH SMALL GRAIN	2,4-D (amine)	$\frac{3}{8}$	Spring	Broadleaved annuals	Spray 4 to 6 weeks after seeding if seeded alone. Spray when grain is 6 to 10 inches tall if seeded with grain.
RED CLOVER (current year seeding)	MCP	$\frac{1}{2}$	Fall	Yellow rocket	Spray in October or November.
BEANS, FIELD AND SOY	(Premerge) (Sinox-PE)	3-6	At planting or 3 to 4 days after planting	Annuals	Use lower rate on sandy soil. 12-inch band can be used to reduce cost.
	CIPC	4-8	At planting	Annuals	Use higher rate when temperature is above 60° F.
SOYBEANS ONLY	Alanap	5-8	At planting		Use lower rate on light sandy soil. Not effective on muck or highly organic mineral soil.
POTATOES	Premerge Sinox-PE	3-6	When potatoes begin to emerge	Annuals	Level field with rod weeder before spraying.
	2,4-D (ester)	1	When potatoes begin to emerge	Annuals	Do not use on fields grown for certification.
	SES (Crag-1)	4-6	When potatoes begin to emerge	Annuals	
	SES (Crag-1)	4	At last culti- vation	Annuals	
	TCA	8-10	At emergence	Annual grasses	
SUGAR BEETS	2,4-D	1	Pre-harvest	Broadleaved	Apply 2 to 4 weeks before harvest.
	DNBP (oil soluble)	2	4 to 8 days before harvest	Potato vines All weeds	Apply in 5 to 10 gallons of fuel oil with 20 to 40 gallons of water.
	TCA	8-10	At planting or just before emergence	Annual grasses	Apply when quackgrass has 6 to 10 inches of fall growth.
	Dalapon	10	Fall before beets are planted	Quackgrass	
MINT	Premerge Sinox-PE	3-4 $\frac{1}{2}$	At mint emer- gence or mint 1 to 2 inches	Annuals	Use low rate on row mint, high rate on meadow mint. Delay cultivation 3 to 6 weeks.
	CMU	$\frac{1}{2}$	Mint 1 to 2 inches	Annuals	More effective on grasses than premerge.
PASTURES	2,4-D (ester)	$\frac{1}{2}$ -1	Late fall	Biennials and some perennials	Spray after frost has killed top growth of legumes.

CLEANING SPRAYERS

Keep weed sprayers clean. Where pre-emergence spraying only is practiced, thorough rinsing with water is sufficient. For other spraying purposes, wash out the sprayer (tank, hose, boom, nozzles) with one of the following in 100 gallons of water:

1. 1 gallon household ammonia (allow to stand in sprayer overnight).
2. 5 pounds sal soda.
3. 8 pounds trisodium phosphate.

AMOUNTS OF CHEMICALS FOR WEED CONTROL

Table 1 lists chemicals which will give satisfactory weed control without injury to crops, except as noted under "Remarks." Use herbicides only on crops listed on the product label.

The volume of water to use depends on the equipment available. Generally, a volume of 10 to 40 gallons per acre and a spraying pressure of 20 to 40 pounds will be satisfactory.

2,4-D formulations are available under a wide variety of trade names and in various concentrations. Use the esters for pre-emergence applications. In foliage sprays, use them at the lower dosage when a range of rates is suggested.

Spray drift from any herbicidal spray can injure nearby crops; therefore, do all spraying on calm days.