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Chemical Weed Control in Vegetable Crops
Michigan State University Cooperative Extension Service
F Folder Series
Horticulture, Botany and Plant Pathology
Issued March 1955
6 pages

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EXTENSION FOLDER F-193

CHEMICAL WEED CONTROL *in* VEGETABLE CROPS

Prepared by the
DEPARTMENTS OF
HORTICULTURE
and BOTANY AND
PLANT PATHOLOGY

MICHIGAN STATE COLLEGE
COOPERATIVE EXTENSION SERVICE
EAST LANSING

CHEMICAL WEED CONTROL IN VEGETABLE CROPS

Chemical weed control is not a gamble. It is a sound, economical practice. Weeds compete with food crops for water, light, nutrients, and space. Weeds cause a great reduction in yields and sometimes a total loss of the crop. Weeds also impair the quality of the harvested product and harbor insects and disease organisms. It has been estimated that the reduction in the value of crops due to weeds is from four to five billion dollars each year. The loss of crops to weeds is greater than the loss from diseases and insects combined.

Principles of Chemical Weed Control

The effective use of weed-control chemicals requires that certain fundamental principles be observed. These principles should be followed more closely than those for any other cultural or cropping practice.

1. *Weeds are killed most readily when environmental conditions are favorable for weed-seed germination and rapid plant growth.* Crop plants are also most readily injured under these conditions, but the chemicals recommended are designed to selectively kill weeds under conditions favorable for plant growth. Poor results from pre-emergence sprays frequently are due to the lack of sufficient moisture after spraying to activate the chemicals or bring about weed seed germination in the surface soil.

2. *Chemicals recommended for selective weed control are most effective in killing germinating seeds or young plants.* With the exception of 2,4-D, they will not kill older plants at the recommended rates.

3. *Close attention must be given to the recommended rate of application.* The selectivity of chemicals for crop plants occurs only within certain ranges. The greater the range of tolerance of a crop plant the better the chemical is for weed control, provided the chemical will kill weeds throughout this range.

There is no crop plant which is completely resistant to injury from herbicides.

4. *After chemicals have been applied the soil in the crop-row should not be disturbed.* The crop may be cultivated, but care must be taken not to throw soil into the row. If the area close to the plants is disturbed, the chemical layer is destroyed. Weed seeds may also be brought to the surface where they readily germinate.

5. *Rates vary with soil type.* In general, the lower recommended rates should be used on the light or sandy soils. Recommendations applying to mineral soils may not be effective on muck soils. For instance, no concentration of NP (Ala-nap-1) which is practical to use, will control weeds effectively in cucumbers grown on muck soil.

6. *Know your weed species.* This is important because several of the chemicals are effective on only certain species. For instance, CIPC (Chloro IPC) will kill purslane, chickweed, and smartweed at the recommended rates, but will not kill lambs quarters or pigweed. If the latter are the only species present, CIPC will appear ineffective.

7. *Most chemicals have certain limitations which must be considered when they are applied.* These limitations appear on the label of the product, which should be read carefully. Following is the type of information given on labels:

"DNBP (Di-Nitro) should not be used in sprayers which have contained copper unless the sprayer is thoroughly cleaned, because the copper will react with the DNBP to form a substance which will clog screens."

"CMU (Karmex W) is formulated as a wettable powder and the spray solution must be kept under constant agitation to insure uniform suspension of the chemical."

"SES (Crag Herbicide 1) is effective only if it is applied before weed seedlings are more than ¼ inch high."

Weed Sprayers

Chemicals for weed control may be applied in all types of sprayers. However, if new equipment is purchased it is not necessary to buy expensive, high gallonage, high pressure spray equipment. A complete weed control sprayer should have the following features:

1. A pump which is inexpensive, easily replaced, will not be damaged if wettable powders are used, and has a minimum capacity of 4 gallons per minute.

2. Solution agitation, either mechanical or by using a by-pass from the pump. If a power take-off sprayer does not provide agitation, it may easily be modified by adding a by-pass to a galvanized tee between the pump and pressure regulator. If a pressure regulator is built into the pump, then the by-pass may be inserted between the pump and pressure gauge. A separate valve on the by-pass line will, in this case, regulate pressure. If the pump does not have a sufficient capacity for agitation under specific spraying conditions, agitation may be provided by using both the next lower tractor gear and nozzle tips with a smaller orifice.

3. 50-mesh screens for suction line and nozzles. Wettable powders will not go through the 100-mesh screens which are usually provided.

4. A spray boom which has adjustable nozzles for band spraying.

5. A gauge which measures pressure accurately up to 100 pounds per square inch.

6. Flat fan nozzles. The best nozzle size for general usage is equivalent to an 8004 Teejet or a No. 59 Monarch nozzle. For most work, a wide angle nozzle (73°-80°) is best, because the boom may be held close to the ground to reduce drift.

Calibration of Sprayer

One of the most important features in applying weed sprays is the accurate calibration of the sprayer. A range of 20 to 60 gallons per acre, at a pressure of 20 to 60 pounds per square inch, is satisfactory. The boom should be adjusted so that the spray nozzle patterns overlap about $\frac{1}{3}$ at the top of weeds being sprayed or at the ground level. For over-all spraying, this places the nozzles about 18 to 20 inches apart on the boom and 18 to 20 inches from the sprayed surface. A satisfactory method of calibrating a sprayer is:

1. Fill the spray tank.

2. Spray a measured area at a fixed tractor speed and pressure gauge setting. (Be sure to allow for partial coverage if bands are used.)

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

4. This amount divided by the portion of an acre sprayed will give the gallons per acre applied.

5. The amount of material desired per acre may be mixed with this much water.

For example, if 10 gallons were applied on $\frac{1}{4}$ acre, the volume would be 40 gallons per acre. If changes are made in the tractor speed or gear, pressure setting, nozzle size, or number of nozzles, the amount of liquid applied per acre will be changed and recalibration will be necessary.

Band Application

Since weeds in the crop row are usually the most difficult to control, it is often economical and practical to spray herbicides in a band over the row rather than cover the whole area. The cost may be reduced by as much as 80 percent. *If band applications are used, it is important that adjustment be made for the area actually sprayed and not the total acres of crop sprayed.* For example, if the recommendation for a chemical is 4 pounds per acre, and 12 inch strips are sprayed over 36 inch rows, only $1\frac{1}{3}$ pounds of chemical will be required per acre, or the 4 pounds will cover 3 acres of the crop.

To adjust the sprayer for band application, lower the boom so that there is one nozzle over each row and plug the nozzles between rows. This is not easily done with standard booms, but adjustable booms or adapters may be purchased.

Cleaning Weed Control Sprayers

It is important to keep weed control sprayers clean. This is particularly true if they are to be used for spraying more than one crop or for the application of fungicides and insecticides. *Sprayers which have contained 2,4-D should not be used for application of insecticides and fungicides.*

In cleaning a sprayer it is important that the whole sprayer, inside and out, including boom, hoses and nozzles, be thoroughly rinsed with water both *before* and *after* the cleaning procedure. The sprayer should be partially filled with water before the cleaning agent is added. The pump should be running so that the cleaning solution will circulate throughout the sprayer. Corrosive cleaning agents should not be allowed to stand in tanks more than two hours.

Where pre-emergence spraying only is practiced, adequate rinsing with water is sufficient. For other spraying purposes weed-killers may be removed from sprayers by adding one of the following to 100 gallons of water.

- 1) 1 gallon household ammonia
- 2) 5 pounds sal soda (sodium carbonate)
- 3) 8 pounds of activated charcoal
- 4) 5 pounds paint cleaner (tri-sodium phosphate)

Copper may interfere with the effectiveness of herbicides, particularly the di-nitros. To remove copper residues, add 1 gallon vinegar or commercial acetic acid to each 100 gallons of water, and allow to stand in the sprayer for *two hours only*. Drain the sprayer immediately and rinse thoroughly with water.

Warning

Suggestions in this folder are based upon data secured from two or more years of trials. Use of these methods, however, is dependent upon registration of the product by the U.S. Pure Food and Drug Administration. Growers are hereby warned that the use of a chemical on a food crop for which the compound is not registered may lead to confiscation of the crop if a residue is found on the produce. Tables of registered compounds will indicate the amount of residue, if any, permitted by current regulations. *Do not use any herbicide unless the label states that the chemical may be used on the specific crop to be sprayed.*

SUGGESTED WEED CONTROL PRACTICES

Rates Given Are for Pounds of ACTIVE INGREDIENTS per Acre Covered.
Always Read the Label on the Container.

CROP	Chemical or Symbol	Rate per Acre Sprayed	Time of Application	Weeds Controlled	Remarks
ASPARAGUS (seedlings)	DNBP (Di-Nitro)	3 pounds	Two days before seedlings emerge	Annuals	Adequate only if weeds are above ground
	Stoddard Solvent	75-100 gals.	Two days before seedlings emerge	Annuals except ragweed	
ASPARAGUS (established beds)	CMU (Karmex W)	1-3 pounds	Just before first spears emerge in the spring	Annuals	Best results with 1-1½ pounds applied both after disking in spring and again after cutting season
	Cyanamid	300 pounds	Just before first spears emerge in the spring	Annuals	Granular grade
	DNBP	6 pounds	After disking at end of cutting season	Annuals	
	NP (Alanap-1)	4-6 pounds	Just before first spears emerge in the spring	Annuals	
	SES (Crag Herbicide 1)	3-6 pounds	Just before first spears emerge in the spring	Annuals	Apply before weeds are above ground
	TCA	5-8 pounds	Just before first spears emerge in the spring	Annual grasses	Apply only once a year
BEANS (snap and lima)	DNBP	3-4 pounds	From emergence to crook stage before leaves emerge	Annuals	Spray when temperatures are between 65° and 85° F
	DNBP	6-9 pounds	Time of planting	Annuals	
	PCP	16-20 pounds	Time of planting	Annuals	
	CIPC (Chloro IPC)	4-6 pounds	Time of planting	Annuals	Not effective on ragweed, lambs quarters and pigweed
BEETS	TCA	7-10 pounds	Just prior to come-up	Annual grasses	Should spray on a well-prepared seedbed
	Common Salt	200-400 pounds	Post-emergence	Annuals	Requires 200-400 gallons of water
CABBAGE, BROCCOLI, and CAULIFLOWER	TCA	5-8 pounds	Just prior to come-up	Annual grasses	Use only on direct-seeded crops
CARROTS	Stoddard Solvent	75-100 gals.	After two true leaves have formed	Annuals except ragweed	Spray when weeds are not more than 2 inches high. Carrot roots should not be thicker than a lead pencil
CELERY	Stoddard Solvent	75-100 gals.	In the seedling stage	Annuals except ragweed	Use only on seedbeds
ONIONS (seeds, sets and slips)	CIPC	6-8 pounds	From planting to crook stage	Annual grasses, purslane, chickweed and smartweed	Use 6 pounds when temperature is below 60° F
	CIPC	8-10 pounds	After 3-4 leaves	Annual grasses, purslane, chickweed and smartweed	Do not apply in flag stage Direct spray at base of plant May cause injury to fall-sown grains
	Xanthogen disulphide (Herbisan)	10 pounds	Pre- or post-emergence as above	Annuals	Direct post-emergence spray at base of plant
	Sulphuric Acid	2½-3 gals.	2-3 leaf stage	Annuals	Apply in 100 gals. of water
	KOCN	16-20 pounds	Post-emergence	Annuals	Apply in 100 gals. of water
PEAS	DNBP	¾-1½ pounds	2-4 leaf stage	Annuals	Apply until peas are 3 inches high. Temperature should be 65°-85° F. Not effective on grasses
	MCP	⅜-¼ pounds	2-4 leaf stage	Annuals	Not effective on grasses
POTATOES	DNBP	6 pounds	Just prior to come-up	Annuals	On muck or mineral soil
	CMU	1-2 pounds	Just prior to come-up	Annuals	Use 1 pound on mineral soil; 2 pounds on muck soil
SPINACH	CIPC	1-3 pounds	Immediately after planting	Annual grasses, purslane, chickweed and smartweed	Use 1-2 pounds if temperatures below 60° F., 2-3 pounds if temperatures above 60° F
SWEET CORN	DNBP	4 pounds	Spike stage (1 inch)	Annuals	Temperatures should be 65°-85° F
	2,4-D	1 pound	Spike stage (1 inch)	Annuals	May not control grasses. Do not use on early varieties such as North Star
VINE CROPS Cucumber Muskmelon Watermelon	NP	4-6 pounds	Immediately after planting	Annuals	Apply within 1 day of planting
	NP	3-4 pounds	Just before vining	Annuals	No weeds should be visible
Squash, Pumpkin	NP	2-4 pounds	Immediately after planting only	Annuals	Use only on varieties Zuchinni, Boston Marrow, Delicious, Buttercup and Sweet Cheese

PEAS	DNBP	¾-1½ pounds	2-4 leaf stage	Annuals	high. Temperature should be 65°-85° F. Not effective on grasses
	MCP	⅛-¼ pounds	2-4 leaf stage	Annuals	Not effective on grasses
POTATOES	DNBP	6 pounds	Just prior to come-up	Annuals	On muck or mineral soil
	CMU	1-2 pounds	Just prior to come-up	Annuals	Use 1 pound on mineral soil; 2 pounds on muck soil
SPINACH	CIPC	1-3 pounds	Immediately after planting	Annual grasses, purslane, chickweed and smartweed	Use 1-2 pounds if temperatures below 60° F., 2-3 pounds if temperatures above 60° F
SWEET CORN	DNBP	4 pounds	Spike stage (1 inch)	Annuals	Temperatures should be 65°-85° F
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FOR ELIMINATION OF ALL HERBACEOUS VEGETATION

CMU	40-80 pounds	Any time	All vegetation	Will last more than 2 years
TCA	40-80 pounds	Fall	All vegetation	Will last 1 year

Cooperative extension work in agriculture and home economics, Michigan State College and the U.S. Department of Agriculture, cooperating. D. B. Varner, Director, Cooperative Extension Service, Michigan State College, East Lansing. Printed and distributed under Acts of Congress, May 8 and June 30, 1914.

MARCH 1955—20M