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1985 Weed Control Guide for Vegetable Crops



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1985 Weed Control Guide for Vegetable Crops

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OTHER EXTENSION PUBLICATIONS WITH INFORMATION ON WEED CONTROL

These publications are available from your county Extension office, or from the MSU Bulletin Office, P.O. Box 231, East Lansing, MI 48824-0231. Prices are subject to change due to revisions. Contact your county office for up-to-date prices.

E-154	Fruit pesticide handbook	\$1.85	E-1363	Guide to the identification of common weed seedlings of Michigan	\$0.65
E-434	Weed control guide for field crops	\$0.60	E-1517	Poison ivy control	\$0.25
E-653	Lawn weed control guide	\$0.20	NCR-158	Herbicide symptoms in dry edible beans	\$0.25
E-791	Problem perennial weeds in Michigan	\$1.00	NCR-164	Nightshade control in field crops	\$0.15
E-1215	A quick test for atrazine carryover	\$0.20	NCR-185	Comprehensive guide to tolerance and susceptibility of weeds and crops to herbicides	\$0.80
E-1296	Herbicide-fertilizer combinations	\$0.10	NCR-281	Weeds of the north central states	\$2.50

WEEDS REDUCE CROP YIELDS by competing with crops for water, nutrients and light. Some weeds release toxins that inhibit crop growth, and others may harbor insects, diseases, or nematodes that attack crops. Weeds may interfere with harvesting operations, and in some instances, contamination with weed seeds or other plant parts may render a crop unfit for market. It is obvious that profitable crop production depends on effective weed control.

Some Basic Principles

You should never attempt to establish a vegetable crop in fields that are badly infested with perennial weeds such as quackgrass, yellow nutsedge, or Canada thistle. Herbicides and tillage should be used to control these pests at least one year in advance.

Usually, effective weed control in vegetable crops requires a combination of management techniques. You may need to use a combination of different herbicides or alternative methods. In some cases, minimizing tillage can effectively reduce weed populations. Growing the same crop year after year, using the same weed control techniques, will encourage the development of problem weeds. Rotation of crops, herbicide or tillage methods can help solve this problem. Whenever you see a small infestation of a problem perennial weed invading a field, it should be eradicated immediately. Wherever possible, weeds should be prevented from producing seed. One plant can produce thousands of seeds, and these seeds will live in the soil for many years.

Although herbicides offer an effective and economical means of weed control, certain risks are inherent in their use. Crop injury is one of these risks. No crop plant is completely resistant to herbicide injury, but is able to tolerate a certain dosage range. Selectivity, or the ability of a herbicide to kill weeds without harming plants, may be partially lost under favorable weather conditions. Careless application can also result in injury to your plants or those of a neighbor. Injury can range from complete destruction of plants to slight stunting or discoloration which often has no long-term adverse effect.

Types of herbicides: — Many of the herbicides used in vegetable crops are chemicals that kill germinating weed seedlings in the soil. They may be applied and mixed into the soil prior to planting (pre-plant incorporated) or applied to the soil surface after planting and before crops or weeds emerge. As a group, these are called **pre-emergence herbicides**.

Surface moisture must follow surface treatment for most soil-applied herbicides to be effective; you will obtain best results when these herbicides are carried into the soil by rainfall or overhead irrigation. Rates of application vary with soil type. In general, lower rates are needed on sandy (coarse textured soils) than are needed on clays or mucks (fine textured soils).

Other herbicides are applied to the foliage of plants. As a group they may be called post-emergence herbicides. They may burn off the tops of weeds (**contact herbicides**) or they may be transported throughout the plants and kill the underground parts (**translocated or systemic herbicides**). The latter type of chemical is particularly useful for controlling perennial weeds. The performance of post-emergence herbicides is altered by the amount of water used per acre, wetting agents, and the size and vigor of the vegetation. Follow directions carefully to assure good weed kill with minimal crop injury.

Use Chemicals Safely

Herbicides, like all other pesticides, should be handled with extreme caution. There are two good reasons for using pesticides safely:

- To keep yourself and other people from being poisoned.
- To avoid harming the environment.

Many pesticide accidents have occurred when the operator was filling the spray tank. Although the greatest health hazard is considered to be ingestion of these chemicals by mouth, there is also danger of irritation to skin and eyes. Rubber gloves and goggles should be worn when handling herbicides. Avoid breathing vapors of these chemicals. Heed all handling precautions that are printed on the label.

Using more chemical than is recommended can produce a residue carryover in the soil. This could damage sensitive crops planted in the next season. Some chemicals that are used for control of perennial weeds will last more than one year in the soil. Be sure to keep this in mind when planning your crop rotations. The suggested chemicals in this bulletin should dissipate in one growing season unless otherwise specified. Check product labels for precautions on rotational crops.

Registration of Herbicides and Mixtures

Suggestions in this bulletin are based on field trials conducted in Michigan and other states over a period of several years. Use of these chemicals and methods requires registration of the products by the Environmental Protection Agency. Growers or commercial applicators should not use a chemical on a crop for which the compound is not registered; to do so could lead either to a **severe fine** for misuse or **confiscation of the crop** if excessive residues are found in that crop.

Do not mix herbicides with other herbicides or pesticides unless compatibility and safety have been demonstrated. Herbicide combinations suggested in this bulletin are either formulated together, registered for use as tank mixes, or have been used together for many years with good safety.

Weed Sprayers

Many types of sprayers are suitable for chemical weed control. You do not need to buy expensive,

high-gallonage, high-pressure spray equipment. A complete weed-control sprayer should have the following features:

1. **A low pressure pump.** It should be easily replaced, not subject to damage by wettable powders, and have minimum capacity of 9 gallons per minute.

2. **Solution agitation (stirring).** It can be either mechanical or a bypass from the pump. If a power takeoff sprayer does not provide agitation, add a bypass to a galvanized tee between the pump and pressure gauge. To increase agitation in the tank, place an agitator nozzle on the end of the overflow hose. In this case, a separate valve on the bypass line will regulate pressure. If the pump does not have enough capacity for agitation under specific spraying conditions, provide it 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 sometimes provided.

4. **A spray boom.** It should have nozzles adjustable for distance between nozzles on the boom and for height above the ground. This is especially important for band spraying.

5. **A gauge** to measure pressure accurately up to 100 pounds per square inch.

6. **Flat fan nozzles.** The best nozzle size for general use is equivalent to an 8004 Teejet. For most work, a wide-range nozzle—73 or 80 degrees—is best because the boom can be held close to the ground to reduce drift. This is most important when it is windy.

Cleaning Weed Control Sprayers

It is important to keep weed control sprayers clean. This is especially true if you use them to spray more than one crop or to apply fungicides and insecticides.

Do not use a sprayer to apply either insecticides or fungicides if the sprayer has contained 2,4-D type herbicides.

When cleaning a sprayer, thoroughly rinse the whole sprayer with water, inside and out, including boom, hoses and nozzles, both before and after cleaning. Partially fill the sprayer with water before you add the cleaning agent. Keep the pump running so that the cleaning solution will circulate throughout the sprayer. Do not leave corrosive cleaning agents in the tank or spray system more than 2 hours.

When you are using only pre-emergence sprays, a good rinsing with water is enough. For other spraying purposes, remove weed-killers from sprayers by adding 1 gallon of household ammonia or 5 pounds of sal soda to 100 gallons of water. Allow this solution to stand in the sprayer for at least 2 hours. Drain it out through the boom and nozzles, and rinse the sprayer with water. Do not let spray solutions stand in the tank overnight. Do not allow solutions to run into streams or other water sources.

Sprayer Calibration

One of the most important factors in effective weed spraying is accurate calibration—determining the amount of spray material applied per acre. A range of 20 to 60 gallons per acre, at a pressure of 20 to 60 pounds per square inch, is satisfactory.

Adjust the boom height so that the spray overlaps about a third at ground level. For overall spraying, using 80 degree nozzles, this places the nozzles about 18 to 20 inches apart on the boom and 18 to 20 inches from the sprayed surface.

A good way to calibrate a sprayer is to:

1. Fill the spray tank with water only.

2. Spray a measured area, in a field if possible, 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 water needed to refill the tank.

4. Divide this amount by the fraction of an acre sprayed to get the gallons applied per acre.

5. Mix the amount of chemical desired per acre with water to give this much spray material.

For example, if 10 gallons were applied on one-fourth acre, the volume of spray material applied would be 40 gallons per acre. If you change the tractor speed or gear, pressure setting, nozzle size, or number of nozzles, the amount of liquid applied per acre will be different and recalibration will be necessary.

Band Application in Row Crops

Since weeds in the crop row are usually the hardest to control, it may cost only 50 percent as much to spray herbicides in a band over the row rather than to cover the whole area.

For band applications, adjust for the area actually sprayed and not for the total acres in the field. For example, suppose the recommendation for a chemical is 4 pounds per acre, and 12-inch strips are sprayed over 36-inch rows. Only one-third of the ground area will be covered with spray materials, so only $1\frac{1}{3}$ pounds of chemical (one-third of 4 pounds) will be required per acre. Four pounds of chemical will then cover 3 acres of the crop.

To adjust the sprayer for band application, place the boom so that there is one nozzle over each row and plug the nozzle between rows. This is not always easy with standard booms, but you can buy adjustable booms or adapters.

Trade names and formulations of herbicides are given for the convenience of the users. Other formulations of the same herbicides, or other herbicides with the same active ingredients may also be labeled for use on certain crops. The Cooperative Extension Service and Michigan State University do not endorse any product nor discriminate against those not mentioned.

WEED CONTROL RECOMMENDATIONS FOR VEGETABLE CROPS

Crop	Weed Problem	Chemical	Pounds Active Ingredient/Acre	Amount of Commercial Formulation/Acre	Remarks and Limitations
ASPARAGUS (Seedlings or newly planted crowns)	Germinating or emerged annuals	linuron (LOROX) (4 L)	½ - 1½	½ - 1½ qt	Apply before emergence and after fern is 6 inches high. Plant seed at least 1 inch deep; use 1 lb rate postemergence. Do not exceed 2 lb a.i./acre/year. Does not control crabgrass postemergence. Pre-emergence weed control will be reduced in soils with organic matter greater than 5%
	Germinating annuals	chloramben (AMIBEN DS) (75% DS)	2 - 3	2½ - 4 lb	Apply before asparagus and weeds emerge. Use lowest rate on sandy soils. If soil is dry, irrigate after application.
ASPARAGUS (Seedlings)	Germinating annuals	terbacil (SINBAR) (80 WP)	0.8 - 1.6	1 - 2 lb	Spray 300 lb/acre activated charcoal in a 1 inch band over rows at planting. Then apply Sinbar. One-half inch moisture within 2 weeks of application will improve control. Do not use on soils with less than 1% organic matter. Do not plant any crop other than asparagus within 2 years of application. Use lowest rate on sand and sandy loam soils.
	Emerged annuals	paraquat (PARAQUAT CL) (2 lb/gal)	¼	1 qt	Apply after weeds emerge, but before asparagus emerges. For maximum knockdown, add a surfactant at 1 qt/100 gal of spray solution.
ASPARAGUS (Established one year or more)	Germinating annuals	diuron (KARMEX) (80 WP)	2 - 3	2½ - 4 lb	Apply after tillage or chopping fern in the spring and again after the harvest season, if necessary. Apply before weeds emerge. Total dosage should not exceed 4.8 lb a.i./acre/year.
	Germinating or emerged annuals	simazine (PRINCEP) (80 WP)	2 - 4	2½ - 5 lb	Apply after tillage or chopping fern in the spring and again after the harvest season, if necessary. Apply before weeds emerge. Total dosage should not exceed 4 lb a.i./acre/year.
ASPARAGUS (Established one year or more)	Germinating or emerged annuals	napropamide (DEVINOL) (50 WP)	4	8 lb	Apply before emergence in the spring and incorporate 1 to 2 inches. Gives good grass control.
	Germinating or emerged annuals	linuron (LOROX) (4 L)	¾ - 2	¾ - 2 qt	Apply before or after crop emergence. Use high rate preemergence. Make 1 to 4 applications of ½ to 1 lb a.i./acre postemergence. Do not apply within 1 day of harvest. Do not exceed 4 lb a.i./acre/year. Does not control crabgrass postemergence. Preemergence control will be reduced in soils with organic matter greater than 5%.
ASPARAGUS (Established one year or more)	Germinating annuals, Sandbur	metribuzin (SENCOR, LEXONE) (4 F)	1 - 2	1 - 2 qt	Apply after tillage or chopping fern in the spring and again after the harvest season, if necessary. Apply before weeds emerge. Total dosage may not exceed 2 lb a.i./acre/year. Two applications are necessary for good season-long sandbur control.
	Germinating annuals, quackgrass	terbacil (SINBAR) (80 WP)	1.2 - 2.4	1½ - 3 lb	Apply prior to spear emergence or after a clean cutting. Do not use on soils with less than 1% organic matter. Do not apply to diseased plants. Do not apply more than 2.4 lb a.i./acre/year. Do not apply more than 2 applications per year. Do not plant to any crop other than asparagus within 2 years of application. Use lowest rate on sandy and sandy-loam soils.

Crop	Weed Problem	Chemical	Pounds Active Ingredient/Acre	Commercial Amount of Formulation/Acre	Remarks and Limitations
	Quackgrass	glyphosate (ROUNDUP) (3 lb./gal)	1½	2 qt	Apply immediately after the last harvest when all spears are snapped off. Do not let herbicide contact fern, or asparagus will be injured.
		dalapon (DOWPON, BASFAPON) (85% salt)	10	12 lb	Apply before, during, or at the end of the harvest season when quackgrass is 4 to 6 inches high. During the harvest season, spray immediately following a harvest. Two applications may be necessary for complete control. Do not spray fern.
	Emerging milkweed, field bindweed, and other broadleaf weeds	glyphosate (ROUNDUP) (3 lb./gal)	1½ - 3	2 - 4 qt	Apply immediately after the last harvest when all spears are snapped off. Do not let herbicide contact fern or asparagus will be injured.
		2,4-D Alkanolamine salts (FORMULA 40) (4 lb./gal)	2	2 qt	Apply before, during, or after the harvest season when weeds are growing rapidly. During the harvest season spray immediately after a harvest to minimize injury to asparagus. When spraying after the harvest season, use drop nozzles to avoid spraying fern.
BEANS (LIMA)	Germinating broadleaves and some grasses	chloramben (AMIBEN DS) (75% DS)	2 - 3	2½ - 4 lb	Apply before beans or weeds emerge. If soil is dry, irrigate after application.
		dinoseb (PREMERGE) (3 lb./gal)	3 - 6	4 - 8 qt	Apply before beans emerge to crook stage. When applying at crook stage, use lower rate. If possible, apply when soil is moist.
	Germinating grasses and some broadleaves	metolachlor (DUAL) (8 E)	1½ - 3	¾ - 1½ qt	Use lower rate on sandy soils with less than 3% organic matter. Incorporate 1 to 2 inches before planting, or apply preemergence after planting.
		trifluralin (TREFLAN 4 EC)	¾ - ¾	¾ - ¾ qt	Apply before planting. Incorporate into soil 2 to 3 inches soon after spraying. Use lowest rate on sandy soils.
	Emerging annuals, yellow nutsedge, Canada thistle	bentazon (BASAGRAN) (4 lb./gal)	¾ - 1	¾ - 1 qt	Apply after beans have more than 1 expanded trifoliolate leaf, or injury will occur. Two applications are needed for nutsedge and Canada thistle control. Do not apply more than 2 lb a.i./acre/year.
BEANS (SNAP)	Quackgrass	glyphosate (ROUNDUP) (3 lb./gal)	1½	2 qt	Apply to 8 to 10 inch tall quackgrass in the fall or spring prior to planting. Allow at least 5 days prior to plowing.
	Germinating broadleaves and some grasses	chloramben (AMIBEN DS) (75% DS)	2 - 3	2½ - 4 lb	Apply before emergence to crook stage on beans. When applying at high rate on heavy, high-organic-matter soils, and for black nightshade control. Do not use on very light sandy soils.
		dinoseb (PREMERGE) (3 lb./gal)	3 - 6	4 - 8 qt	Apply before emergence to crook stage on beans. When applying at crook stage use lower rate of application. If possible, apply when soil is moist.

Germinating grasses and some broadleaves	EPTC (EPTAM) (7 E)	3	2 qt	Apply before planting. Incorporate into soil 2 to 4 inches immediately after spraying. Gives good nutsedge control.
	metolachlor (DUAL) (8 E)	1½ - 3	¾ - 1½ qt	Use lower rate on sandy soils with less than 3% organic matter. Incorporate 1 to 2 inches before planting, or apply preemergence after planting.
	trifluralin (TREFLAN 4 EC)	¾ - ¾	¾ - ¾ qt	Apply before planting. Incorporate into soil 2 to 3 inches soon after spraying. Use lowest rate on sandy soils. Does not control ragweed.
Emerged annuals, yellow nutsedge, Canada thistle	bentazon (BASAGRAN) (4 lb/gal)	¾ - 1	¾ - 1 qt	Apply after beans have more than 1 expanded trifoliolate leaf, or injury will occur. Two applications are needed for nutsedge and Canada thistle control. Do not apply more than 2 lb a.i./acre/year.
Germinating and emerged annuals	pyrazon (PYRAMIN RB) (75 WP)	3 - 4	4 - 5 lb	Apply from planting to before weeds are 1 inch high. On muck soils, better control is obtained by spraying small weeds after beets have two true leaves. Add crop oil at 1 gal/40 gal of spray or a surfactant such as X-77 at 1 pt/50 gal of spray.
Germinating annuals, particu- larly grasses	cycloate (RO-NEET) (6 E)	3 - 4	2 - 3 qt	Apply before planting. Incorporate into soil 2 to 3 inches after spraying. Use lowest rate on sandy soils. Not effective on muck soils.
Emerged broadleaves	phenmedipham (SPIN-AID) (1.3 EC)	1	3 qt	Apply after beets have 4 true leaves. Use no more than 22 gal spray solution per acre. Do not apply if beets are under any type of stress. CHECK LABEL FOR WEEDS CONTROLLED AND PRECAUTIONS. Does not control redroot pigweed. 60 day harvest restriction.
Perennials	glyphosate (ROUNDUP) (3 lb/gal)	1½ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.
Germinating grasses and some broadleaves	DCPA (DACTHAL 75 WP)	8 - 10	10 - 13 lb	Apply after seeding and before weeds germinate. Not effective on muck soils.
	trifluralin (TREFLAN) (4 EC)	¾ - ¾	¾ - ¾ qt	Apply before seeding. Incorporate into soil 2 to 3 inches soon after spraying. Use lowest rate on sandy soils and highest rate on soils high in clay or organic matter. Not effective on muck soils.
Germinating grasses and some broadleaves	trifluralin (TREFLAN) (4 EC)	¾ - 1	¾ - 1 qt	Apply before transplanting. Incorporate into soil 2 to 3 inches soon after spraying. Use lowest rate on sandy soils and highest rate on soils high in clay or organic matter. Not effective on muck soils.
	DCPA (DACTHAL 75 WP)	8 - 10	10 - 13 lb	Apply after transplanting and before weeds emerge. Most effective on sandy soils for grass control.
Perennials	glyphosate (ROUNDUP) (3 lb/gal)	1½ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.

**BEETS
(TABLE)**

**BROCCOLI,
CABBAGE,
CAULIFLOWER**

(Seed beds or field seeded)

**BROCCOLI,
CABBAGE,
CAULIFLOWER**
(Transplants)

Crop	Weed Problem	Chemical	Pounds Active Ingredient/Acre	Amount of Commercial Formulation/Acre	Remarks and Limitations
CARROTS	Germinating or emerged annuals	linuron (LOROX) (4 L)	½ - 1½	½ - 1½ qt	Apply before emergence and after carrots are 3 to 4 inches high. Use higher rate on weeds more than 2 inches high. Do not apply over carrots when temperature exceeds 85° F. and do not apply at pressures greater than 40 psi. Do not mix with other pesticides or wetting agents. Do not apply within 2 days of an application of Stoddard solvent. Do not exceed 2 lb a.i./acre/year.
	Selected germinating annuals	chlorpropham (FULFLOE-CHLORO IPC) (4 E)	4	4 qt	Apply before carrots emerge. Provides weed control for 3 to 4 weeks on muck soil. Extremely effective on chickweed, smartweed, and field dodder.
	Emerged annuals	stoddard solvent (several trade names)	40 - 60 gallons		Apply after carrots have 2 true leaves. Do not spray within 42 days of harvest. Do not apply within 14 days after applying Lorox.
CARROTS (Mineral soil)	Perennials	glyphosate (ROUNDUP) (3 lb/gal)	1½ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.
	Germinating grasses and some broadleaves	trifluralin (TREFLAN 4 EC)	½ - 1	½ - 1 qt	Apply before planting. Incorporate into soil 2 to 3 inches soon after spraying. Use lowest rate on sandy soils. Does not control ragweed.
CELERY (Transplants)	Germinating or emerged annuals	prometryne (CAPAROL 4 L)	1 - 2	1 - 2 qt	Make 2 applications, 2 and 6 weeks after transplanting and before weeds are 2 inches high. Do not exceed 4 lb a.i./acre/year.
	Emerged annuals	linuron (LOROX) (4 L)	1	1 qt	Apply after transplanting and before weeds are 2 inches high. Do not exceed 40 psi pressure. Do not apply when temperatures exceed 85° F. and do not mix with wetting agents or other pesticides.
CELERY (Outdoor seedbeds)	Emerged annuals	stoddard solvent (several trade names)	50 - 60 gallons		Apply after celery has formed true leaves.
CUCUMBERS (seeded)	Germinating broadleaves and grasses	naptalam (ALANAP) (2 lb/gal) plus bensulide (PREFAR) (4 E)	3 - 4 plus 4 - 6	6 - 8 qt plus 4 - 6 qt	Apply after planting or in a split application. With irrigation, apply the two chemicals in a tank mix and irrigate immediately. With no irrigation, apply bensulide prior to planting and incorporate 2 to 3 inches. Apply naptalam to surface after planting. Use the lowest rates on sandy soils. A second application of naptalam can be made a month after planting, before cucumbers vine out.
	Emerged annuals	naptalam (ALANAP) (2 lb/gal) plus dinoseb (PREMERGE) (3 lb/gal)	4 plus 2	8 qt plus 3 qt	Apply before cucumbers emerge. Plant seed to a depth of at least 1 inch or injury may result. Do not use on sandy soils.

CUCUMBERS (Transplants)	Germinating broadleaves	naptalam (ALANAP) (2 lb./gal)	4	8 qt	Apply before or after transplanting and before weeds emerge. Irrigate after application if soil is dry. Apply with bensulide before planting when grasses are a problem.
	Germinating grasses	bensulide (PREFAR 4 E)	6	6 qt	Apply before transplanting. Irrigate or incorporate into top 2 inches of soil.
DILL	Germinating broadleaves and grasses	dinoseb (PREMERGE) (3 lb./gal)	2	3 qt	For use under clear plastic mulch. Apply to well prepared soil in spring and lay plastic immediately. Wait 2 weeks before transplanting.
	Emerged annuals	stoddard solvent	40 - 60 gallons		Apply after two true leaves are formed.
EGGPLANT	Germinating annuals	DCPA (DACTHAL 75 WP)	8	11 lb	Apply after transplanting and before weeds emerge.
		napropamide (DEVROLINOL) (50 WP)	1 - 2	2 - 4 lb	Apply before transplanting. Incorporate into the soil 1 to 2 inches. Use lower rate on coarse, sandy soils and higher rate on heavy, clay soils. Carry-over the following year may affect sensitive crops, especially small grains.
ENDIVE, ESCAROLE	Germinating annuals, quack grass	pronamide (KERB) (50 WP)	1 - 1½	2 - 3 lb	Apply before or after seeding and before weeds emerge. Must be incorporated or irrigated into soil. Can be applied post-emergence to crop. Weed control will be marginal on muck soil.
	Germinating annuals	DCPA (DACTHAL 75 WP)	8 - 10	11 - 13 lb	Apply after seeding and before weeds emerge. Not effective on muck soils.
HORSERADISH	Perennials	glyphosate (ROUNDUP) (3 lb./gal)	1½ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.
	Germinating annuals, quack grass	pronamide (KERB) (50 WP)	1 - 2	2 - 4 lb	Apply before or after seeding lettuce and before weeds emerge. Must be incorporated or irrigated into soil. Can be applied post-emergence to lettuce. Use high rate on muck soils; weed control will be marginal.
LETTUCE	Germinating annuals, especially grasses	benfen (BALAN) (1.5 LC)	1 - 1½	3 - 4 qt	Apply before planting. Incorporate into soil 2 to 3 inches immediately after spraying. Not effective on muck soils.
	Perennials	glyphosate (ROUNDUP) (3 lb./gal)	1½ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.
MUSKMELONS (Transplants)	Germinating broadleaves	naptalam (ALANAP) (2 lb./gal)	4	8 qt	Apply before or after transplanting and before weeds emerge. If soil is dry, irrigate after application. When grasses are a problem, use with PREFAR before planting.
	Germinating grasses	bensulide (PREFAR 4 E)	6	6 qt	Apply before transplanting. Irrigate or incorporate into soil 2 to 3 inches immediately after spraying.

Crop	Weed Problem	Chemical	Pounds Active Ingredient/Acre	Amount of Commercial Formulation/Acre	Remarks and Limitations
	Germinating broadleaves and grasses	naptalam (ALANAP) (2 lb/gal) plus dinoseb (PREMERGE) (3 lb/gal)	4 plus 2	8 qt plus 3 qt	Apply before transplanting. Can be utilized under clear plastic mulch. Wait 5 days before transplanting.
MUSTARD, KALE, TURNIP GREENS, COLLARDS	Germinating annuals	DCPA (DACTHAL 75 WP)	8 - 10	11 - 13 lb	Apply after seeding and before weeds emerge. Not effective on muck soils.
	Perennials	trifluralin (TREFLAN 4 EC)	$\frac{1}{2}$ - $\frac{3}{4}$	$\frac{1}{2}$ - $\frac{3}{4}$ qt	Apply before planting. Incorporate into soil 2 to 3 inches soon after spraying. Use lowest rate on sandy soils. Not effective on muck soils.
		glyphosate (ROUNDUP) (3 lb/gal)	1 $\frac{1}{2}$ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.
OKRA (Seeded or transplants)	Germinating annuals	metolachlor (DUAL 8 E)	1 $\frac{1}{2}$ - 3	$\frac{1}{2}$ - 1 $\frac{1}{2}$ qt	May be preplant incorporated or applied preemergence.
		trifluralin (TREFLAN 4 EC)	$\frac{1}{2}$ - 1	$\frac{1}{2}$ - 1 qt	Apply and incorporate before planting.
		diphenamid (ENIDE 90 W)	3 - 5	3 $\frac{1}{2}$ - 5 $\frac{1}{2}$ lb	Apply after seeding. Use higher rate on heavier soil. May reduce stands of fall seeded small grains.
ONIONS (Seeded—muck soil)	Germinating annuals	CDA (RANDOX) (4 EC)	3 - 6	3 - 6 qt	Apply after planting until loop stage and again as needed after 2 true leaves form. Always apply before or just as weeds are emerging. Particularly good on grasses, purslane, and pigweed. Apply Randox liquid no closer than 45 days before harvest. Use Randox granules no closer than 30 days before harvest.
Use these 2 herbicides according to your weed problem. A mixture of Randox + Chloro IPC at 3 plus 3 lbs. per acre usually controls more weeds than either chemical alone. Three or 4 applications at these lower rates give effective weed control without crop injury.		chlorpropham (FURLOE-CHLORO IPC) (4 E)	3 - 6	3 - 6 qt	Apply after planting until loop stage and again as needed after 2 true leaves form. Always apply before or just as weeds are emerging. Particularly good on purslane, chickweed, and smartweed. Apply no closer than 30 days before harvest.
	Emerged broadleaves	oxyfluorfen (GOAL 1.6 E)	$\frac{1}{16}$ - $\frac{1}{8}$	5 - 10 fl oz	Apply as a broadcast spray in 20 - 40 gal water per acre. Apply after onions have at least 2 expanded true leaves. Spray during sunny, warm weather. Do not apply more than $\frac{1}{2}$ lb a.i. (30 fl oz) total per acre per year. Do not apply after bulbings begins, or within 60 days of harvest.
		bromoxynil (BROMINAL ME 4)	$\frac{1}{4}$ - $\frac{1}{2}$	8 - 12 fl oz	Use for control of wild mustards, shepherdspurse, and other cruciferous weeds. Follow label precautions carefully or onions may be injured.
	Perennials	glyphosate (ROUNDUP) (3 lb/gal)	1 $\frac{1}{2}$ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.

ONIONS (Mineral soil)	Germinating annuals	DCPA (DACTHAL) (75 WP)	6 - 10	8 - 14 lb	Can be used on seed, sets, or transplants. Apply immediately after planting or after a clean cultivation. Use higher rate on heavier, darker soils.
GREEN ONIONS	Germinating annuals	DCPA (DACTHAL 75 WP)	6 - 10	8 - 14 lb	Apply immediately after sowing, or after a clean cultivation. Use high rate on heavier soils.
PARSLEY	Emerged annuals	stoddard solvent	40 - 60 gallons		Apply after 2 true leaves have formed.
PARSNIPS	Germinating annuals	linuron (LOROX) (4 L)	1 - 2	1 - 2 qt	Apply before parsnips emerge and again after they are 4 inches high. Apply when weeds are less than 2 inches high. Do not apply when temperatures exceed 85° F. Do not apply at pressure greater than 40 psi. Do not apply within 2 days of stoddard solvent.
	Emerged annuals	stoddard solvent (several trade names)	40 - 60 gallons		Apply after 2 true leaves are formed. Do not apply within 14 days after Lorox application.
PEAS	Quackgrass	glyphosate (ROUNDUP) (3 lb./gal)	1½	2 qt	Apply to 8 to 10 inch tall quackgrass in the fall or spring prior to planting. Allow at least 5 days prior to plowing.
	Germinating grasses and some broadleaves	trifluralin (TREFLAN 4 EC)	½ - ¾	½ - ¾ qt	Apply before planting. Incorporate into soil 2 to 3 inches soon after spraying. Use lower rate on early plantings on sandy soils.
		metolachlor (DUAL 8 E)	1½ - 3	¾ - 1½ qt	Use lower rate on sandy soils with less than 3% organic matter. Apply preemergence only; do not incorporate.
		oryzalin (SURFLAN AS) (4 lb./gal) plus trifluralin (TREFLAN 4 EC)	¾	¾ qt	Also suppresses common root rot (<i>Aphanomyces euteiches</i>). Follow normal TREFLAN procedures for soil incorporation. May be applied up to 2 weeks before planting.
		propachlor (RAMROD 4 L)	3 - 4	3 - 4 qt	Apply before peas emerge. Use lower rate on sandy soils.
	Emerged annuals	dinoseb (PREMERGE) (3 lb./gal)	1 - 2	1½ - 2½ qt	Apply at 2 to 4-leaf stage. Use 1 lb/acre when temperature is 80° F., 1.5 lb when temperature is 70° F., and 2 lb when temperature is 60° F. Do not apply after peas are 6 inches high. Do not graze or feed vines to livestock within 40 days after application.
	Canada thistle and emerged annuals	MCPB (CAN-TROL, THISTROL) (2 lb./gal)	¾ - 1	1 - 2 qt	Apply when peas have developed 6 to 12 nodes. Do not apply later than 3 nodes before pea flowering or yields may be reduced. Do not apply when peas are under stress or when temperatures exceed 90° F.
	Emerged annuals, yellow nutsedge, Canada thistle	bentazon (BASAGRAN) (4 lb./gal)	¾ - 1	¾ - 1 qt	Apply after peas have 3 pairs of leaves, or injury will occur. Two applications are needed for nutsedge and Canada thistle control. Do not apply more than 2 lb a.i./acre/year.

Crop	Weed Problem	Chemical	Pounds Active Ingredient/Acre	Amount of Commercial Formulation/Acre	Remarks and Limitations
PEAS (Southern)	Germinating annuals	metolachlor (DUAL) (8 E)	1½ - 3	¾ - 1½ qt	Use lower rate on sandy soils with less than 3% organic matter. Incorporate 1 to 2 inches before planting, or apply preemergence after planting.
		trifluralin (TREFLAN 4 EC)	¾ - 1	¾ - 1 qt	Apply before planting and incorporate into soil 2 to 3 inches. Use lower rate on sandy soils.
PEPPERS (Seeded)	Emerged annuals, yellow nutsedge, Canada thistle	bentazon (BASAGRAN) (4 lb/gal)	¾ - 1	¾ - 1 qt	Apply after peas have 3 pairs of leaves, or injury will occur. Two applications are needed for nutsedge and Canada thistle control. Do not apply more than 2 lb a.i./acre/year.
	Germinating annuals	diphenamid (ENIDE 90 W)	5	5½ lb	Apply before peppers and weeds emerge. Irrigate after application if soil is dry.
PEPPERS (Transplants)	Germinating annuals	napropamide (DEVRINOL) (50 WP)	1 - 2	2 - 4 lb	Apply before planting. Incorporate into soil 1 to 2 inches. Use lower rate on coarse, sandy soils and higher rate on heavy, clay soils. Carry-over the following year may affect sensitive crops.
		diphenamid (ENIDE 90 WP)	5	5½ lb	Apply after transplanting and before weeds emerge. Irrigate after application if soil is dry.
		napropamide (DEVRINOL) (50 WP)	1 - 2	2 - 4 lb	Apply before planting. Incorporate into soil 1 to 2 inches. Use lower rate on coarse, sandy soils and higher rate on heavy, clay soils. Carry-over the following year may affect sensitive crops.
POTATOES	Quackgrass	dalapon (DOWPON M) (85% salt)	10	13½ lb	Apply in spring when quackgrass is 4 to 6 inches tall. Wait 1 week before plowing. Use 30 to 40 gal water/acre.
	Germinating annual grasses and broadleaves	EPTC (EPTAM) (7 lb/gal)	4 - 6	2¼ - 3¾ qt	Apply and incorporate immediately to a depth of 2 to 3 inches. Use higher rate for nutsedge control. May stunt Superior variety. EPIC should be followed by linuron, metribuzin, or dinoseb after weeds emerge but before potatoes emerge.
		alachlor (LASSO) (4 EC)	2	2 qt	Apply soon after planting before weeds emerge. Alachlor should be followed by metribuzin, linuron or dinoseb after weeds emerge but before potatoes emerge.
		metolachlor (DUAL) (8 E)	1½ - 3	¾ - 1½ qt	Use lower rate on light, sandy soils with less than 3% organic matter. May be incorporated to 3 inches before planting, applied preemergence after planting, or incorporated after planting before potatoes emerge. Cool, wet soil conditions after application may delay maturity or reduce yields of early maturing varieties.

Germinating and emerged broadleaves and some grasses	linuron (LOROX 4 L)	1	1 qt	Apply to emerged weeds before potatoes emerge. Apply after field leveling.
	metribuzin (SENCOR 4 F, LEXONE 4 F)	½ - 1	½ - 1 qt	Apply on weeds up to 1 inch high, before potatoes emerge. Use higher rate on muck soils. Apply after field leveling.
	dinoseb (PREMERGE) (3 lb./gal)	3	4 qt	Apply 2 to 4 days before potatoes emerge.
Emerged annual broadleaves	metribuzin (SENCOR, LEXONE) (4 F)	¾	8 fl oz	Apply post-emergence over the top of potatoes. Avoid spraying during the 12 to 15 inch stage to avoid injury. Do not apply after 3 cool, cloudy days. Do not use on early maturing or red skin varieties. Do not apply within 1 day of other pesticides. Do not apply more than 1 lb a.i. metribuzin/acre/year. May cause injury to sensitive crops the following year. 60 day harvest restriction.
Perennials	glyphosate (ROUNDUP) (3 lb./gal)	1½ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.
RHUBARB	paraquat (PARAQUAT CL) (2 lb./gal)	¾ - 1	1 - 2 qt	For use on dormant rhubarb, use higher rate for heavier weed infestation. Do not exceed 2 applications per season. Gives some suppression of quackgrass.
RUTABAGA, TURNIP	DCPA (DACTHAL 75 WP)	8	11 lb	Apply before crop and weeds emerge. If soil is dry, irrigate lightly after application.
SPINACH	chlorpropham (FURLOE-CIPC 4 E)	1 - 2	1 - 2 qt	Apply immediately after planting. Use lower rate when temperatures are below 60° F.
	glyphosate (ROUNDUP) (3 lb./gal)	1½ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.
SQUASH, PUMPKINS	chloramben (AMIBEN DS) (75% DS)	2	2½ lb	Apply before crop or weeds emerge. If soil is dry, irrigate after application.
	propachlor (RAMROD 4L)	4 - 6	4 - 6 qt	Apply after seedling but before weeds emerge. Use high rate on heavier soils.
STRAWBERRIES (New and established plantings)	diphenamid (ENIDE) (90 W)	4 - 6	4½ - 6½ lb	Apply about 5 days after planting and before weeds emerge; in spring or fall on established fields. Do not use on new plantings on sandy soil. Do not apply within 60 days of harvest. Controls seedling grains if applied prior to mulching.
	DCPA (DACTHAL) (75 WP)	6 - 8	8 - 11 lb	Apply about 5 days after planting and before weeds emerge; in spring on established fields. Particularly effective on sandy soils. Do not apply after first bloom.
	napropamide (DEVIRINOL) (50 WP)	1 - 2	2 - 4 lb	Apply before weeds emerge in spring, fall or following cultivation. May inhibit runner rooting on extremely light sandy soils. Must be irrigated in or incorporated into the soil 2 inches deep prior to planting.

Crop	Weed Problem	Chemical	Pounds Active Ingredient/Acre	Amount of Commercial Formulation/Acre	Remarks and Limitations
	Germinating and emerged broadleaves	chloroxuron (TENORAN) (50 WP)	4	8 lb	Apply after transplanting and before weeds are 2 inches high; apply in fall or spring on established fields. Do not apply within 60 days of harvest. Do not apply more than twice in a season.
NOTE: Select herbicides according to your weed problem. If both grasses and broadleaves are problems use either napropamide, diphenamid, or DCPA in combination with chloroxuron.					
STRAWBERRIES (Established plantings)					
	Emerged broadleaved weeds	2,4-D (FORMULA 40) (4 lb/gal)	1	1 qt	Apply after harvest at renovation time. Do not apply after August 1 or misshapen fruit may be produced the next season.
	Emerged and germinating annuals	terbacil (SINBAR) (80 WP)	$\frac{1}{4}$ - $\frac{1}{2}$	5 - 12 oz	Apply at renovation (after mowing) or in late fall. Use the lowest rate on sandy soils. Do not use on the "Guardian" variety. Check the label for crops that can be planted after strawberries.
SWEET CORN					
	Germinating broadleaves	atrazine (several trade names) (80 WP)	1	1 $\frac{1}{2}$ lb	Apply after planting and before weeds are 1 inch high. Observe label warnings on crop rotations.
	Germinating annuals	atrazine (several trade names) (80 WP) plus alachlor (LASSO 4 EC)	1 plus 2	1 $\frac{1}{2}$ lb plus 2 qt	Apply before crop or weeds emerge. Observe label warnings on crop rotations.
		cyanazine (BLADDEX 80 W) plus alachlor (LASSO 4 EC) or metolachlor (DUAL 8 E)	.6 - 2 plus 2 - 2 $\frac{1}{2}$ or 1 - 2 $\frac{1}{2}$	$\frac{1}{2}$ - 2 $\frac{1}{2}$ lb 2 - 2 $\frac{1}{2}$ qt $\frac{1}{2}$ - 1 $\frac{1}{2}$ qt	Apply after planting and before weeds emerge. Use highest rates on soils with 4% or more organic matter. Bladex is not very effective on muck soil. If used at correct rates, there should be no herbicide carry-over the following year.
	Emerged broadleaves	metolachlor (DUAL) (8 E)	1 $\frac{1}{2}$ - 3	$\frac{1}{2}$ - 1 $\frac{1}{2}$ qt	Use lower rate on sandy soils with less than 3% organic matter. Incorporate 1 to 2 inches before planting, or apply preemergence after planting.
		2,4-D amine salts (several trade names)	$\frac{1}{2}$		Spray after corn and weeds emerge and before corn is 8 inches tall. Avoid drift onto sensitive crops.
Quackgrass					
		atrazine (80 WP)	3 - 4	4 - 5 lb	Apply before corn emerges. Do not plant crops other than corn the following year.
		glyphosate (ROUNDUP) (3 lb/gal)	1 $\frac{1}{2}$	2 qt	Apply to 8-inch quackgrass in the fall or spring before planting. Wait at least 5 days prior to plowing.
		EPTC (ERADICANE EXTRA 6-E)	6	4 qt	Incorporate immediately after application. Do not use on soils with more than 10% organic matter. Suppresses emergence of quackgrass and nutsedge.

Nutsedge	butylate (SUTAN +) (6.7 E)	4	2½ qt	Apply before planting. Incorporate into soil 2 to 3 inches after spraying. Also controls annual grasses.
	alachlor (LASSO 4 EC)	3	3 qt	Apply before corn emerges. If soil is dry, shallow incorporation may increase effectiveness.
	EPTC (ERADICANE 6.7 E)	4	2½ qt	Apply before planting. Incorporate into soil 2 to 3 inches after spraying. Also controls annual grasses.
Nutsedge, Canada thistle, other broadleaves	bentazon (BASAGRAN) (4 lb./gal)	¾ - 1	¾ - 1 qt	Treat nutsedge at 4 to 6 inches, and again 10 days later. Apply to broadleaves when they are small and actively growing. Always add 1 qt crop oil concentrate per acre to the spray mix.
Germinating annuals	diphenamid (ENIDE 90 W)	5	5½ lb	Apply after transplanting, but before weeds emerge.
	oryzalin (SURFLAN AS) (4 lb./gal)	¾ - 1	¾ - 1 qt	Apply after transplanting, but before weeds emerge. Use lower rate on light soils.
Perennials	glyphosate (ROUNDUP) (3 lb./gal)	1½ - 2	2 - 3 qt	Apply to emerged perennials before planting in the spring or after harvest in the fall. Check label for best time of year, stage of growth, and rate for each problem perennial weed.
Germinating annuals	diphenamid (ENIDE 90 W)	5	5½ lb	Apply before tomatoes or weeds emerge. If soil is dry, irrigate after application.
	napropamide (DEVRIINOL) (50 WP)	1 - 2	2 - 4 lb	Apply before planting. Incorporate into soil 1 to 2 inches. Use lower rate on coarse, sandy soils and higher rate on heavy, clay soils. Carry-over may affect corn, small grains, alfalfa, lettuce, sugar beets.
Germinating or emerged broadleaves	metribuzin (SENCOR, LEXONE) (4 F)	¾	8 fl oz	Apply as a directed or broadcast spray after tomatoes have 5 to 6 leaves. Apply after 3 sunny, warm days. Do not apply within 1 day of application of other pesticides. Do not tank mix with other pesticides. Multiple applications can be made with a minimum of 14 days between applications. Up to 1 lb a.i./acre can be applied as a directed spray. (Avoid contact with tomato foliage.) 7 days harvest restriction. Do not apply more than 1 lb a.i./acre/year.
Germinating nightsshade, ragweed, smartweed	chloramfen (AMIBEN DS) (75% DS)	2 - 3	2½ - 4 lb	Use only with a vermiculite anticrustant and activated carbon seed protection system. After seeding with the anticrustant, broadcast Amiben in 10 - 40 gal water per acre. Some weeds will germinate in the row.
	chloramfen (AMIBEN GRANULAR) (10 G)	3 - 4	30 - 40 lb	Apply after the last cultivation to weed-free soil. Apply when tomato foliage is dry. Use granular formulation only.
Nutsedge	pebulate (TILLAM 6 E)	4 - 6	2½ - 4 qt	Apply as a directed spray to clean cultivated soil and incorporate or irrigate in.

Crop	Weed Problem	Chemical	Pounds Active Ingredient/Acre	Amount of Commercial Formulation/Acre	Remarks and Limitations
TOMATOES (Transplants)	Germinating annuals	napropamide (DEVIRINOL) (50 WP)	1 - 2	2 - 4 lb	Apply before planting. Incorporate into soil 1 to 2 inches. Use lower rate on coarse, sandy soils and higher rate on heavy, clay soils. Carry-over may affect corn, small grains, alfalfa, lettuce, sugar beets.
		trifluralin (TREFLAN 4 EC)	½ - 1	½ - 1 qt	Apply before transplanting. Incorporate into soil 2 to 3 inches soon after application. Use lowest rate on sandy soils.
		diphenamid (ENIDE 90 W)	4 - 6	4½ - 6½ lb	Apply after transplanting and before weeds emerge.
	Germinating nightshade, ragweed, smartweed	chloramben (AMIBEN GRANULAR) (10 G)	3 - 4	30 - 40 lb	Apply 3 to 5 days after transplanting and before weed emergence or later in the season after a cultivation. Use granular formulations only. Effective on ragweed, smartweed, and nightshade. Use lowest rate on sandy soils.
	metribuzin (SENCOR, LEXONE) (4 F)	¾	8 fl oz	Apply after transplants have started growth and before weeds are 2 inches tall. Repeat as necessary. Apply after 3 sunny, warm days. Do not apply within 1 day of application of other pesticides. Do not tank mix with other pesticides. Do not apply more than 1 lb a.i./acre/year. Do not use hotcaps on treated plants within 7 days of application.	
	Nutseedge	pebulate (TILLAM 6 E)	4 - 6	2½ - 4 qt	Apply and incorporate to a depth of 2 to 3 inches before planting. Use lower rate on light colored soils with less than 2% organic matter.
WATERMELONS (Transplants)	Germinating broadleaves	naptalam (ALANAP) (2 lb./gal)	4	8 qt	Apply before or after transplanting and before weeds emerge. If soil is dry, irrigate after application. When grasses are a problem, use with PREFAR before planting.
	Germinating grasses	bensulide (PREFAR 4 E)	6	6 qt	Apply before transplanting. Irrigate or incorporate into soil 2 to 3 inches immediately after spraying.
	Germinating broadleaves and grasses	naptalam (ALANAP) (2 lb./gal) plus dinoscb (PREMERGE) (3 lb./gal)	4 plus 2	8 qt plus 3 qt	Apply before transplanting. Can be utilized under clear plastic mulch. Wait 5 days before transplanting.
NON-CROP LAND	Bare ground-long term control of annual and perennial weeds	atrazine (several trade names) (80 WP)	10 - 20	12 - 25 lb	For use around buildings, storage areas, fence rows, etc. Use higher rate for hard-to-control perennials. Addition of sodium chlorate will improve control of field bindweed, goldenrod, and milkweed.
		diuron (several trade names) (80 WP)	15 - 20	19 - 25 lb	Same as above.
		simazine (several trade names) (80 WP)	10 - 20	12 - 25 lb	Same as above.

Bare ground- long term control of annual and perennial weeds (Continued from page 16)	hexazinone (VELPAR) (90% SP)	2 - 4½	2 - 5 lb	Use higher rate on hard to kill weeds, clay soils, or soils containing more than 5% organic matter. Apply before or soon after weed emergence. Will injure or kill woody perennials, so should not be used around shade trees or ornamentals.
	bromacil (HYVAR X) (80 WP)	2½ - 9	3 - 12 lb	Use lower rate for control of annuals, higher rate for control of perennials. Bromacil is quite soluble in water, and may move in run off water to non-target areas. Therefore, do not use in or near turf, ornamentals, or other plants of value.
Cattails, quackgrass, other grasses	clalapon (DOWPON M) (85% salt)	8% - 17	10 - 20 lb	Apply after flowers have formed.
Perennial broadleaves and grasses	glyphosate (ROUNDUP) (3 lb/gal)	1½ - 3	2 - 4 qt	Apply to actively growing foliage. Check label for most susceptible stage of target weed.
	amitrole (AMINO TRIAZOLE) (90% SP)	2 - 3%	2 - 4 lb	Kills most herbaceous broadleaves and grasses. Use higher rate to control tough perennials such as Canada thistle, milkweed, quackgrass. Use 10 lb for cattail control. Apply to actively growing foliage. Avoid contact or drift to non-target plants, as it will injure ornamentals and shrubs.
Annual broadleaves	2,4-D (several trade names and formulations)	1½ - 3		Apply to actively growing foliage. Use amine or low-volatile ester formulations. Check label for amount of product per acre.
Annual and perennial broadleaves	dicamba (BANVEL) (4 lb/gal)	¾ - 2	¾ - 2 qt	Controls many annual and perennial herbaceous weeds. Check label for rate for specific weeds. Avoid drift to non-target areas.
Brush control	dicamba (BANVEL) (4 lb/gal) plus 2,4-D			Apply 2-4 lb dicamba plus 4 lb 2,4-D amine or low-volatile ester in 100 gal water. Thoroughly wet leaves and branches of target brush. Brush is most easily controlled during late spring and early summer.
	hexazinone (VELPAR GRIDBALL) (10% pellets)	1 - 2	10 - 20 lb	Velpar Gridball pellets are scattered on the soil surface and allowed to dissolve in rain. Kills most brush and tree species. Space pellets uniformly for best results. Follow label carefully to avoid damage to shade or ornamental trees.
	triclopyr (CARLON) (4 lb/gal)	1 - 8	1 - 8 qt	Use higher rates for hard to kill tree and brush species. Thoroughly wet leaves and bark of brush. Do not exceed 40 psi pressure. Avoid contact with non-target species.
	fosamine (KRENITE) (4 lb/gal)	6 - 12	6 - 12 qt	Apply to brush in late summer or early fall. Response will be seen the following year. Thoroughly wet brush but do not spray to run off. Apply in 50 to 300 gal/acre. Avoid contact with non-target plants.

Names, Sources, and Formulations of Herbicides Used on Vegetable Crops.

Common Name	Trade Name ¹ and Manufacturer	Concentration and Commercial Formulations ²	Common Name	Trade Name ¹ and Manufacturer	Concentration and Commercial Formulations ²
alachlor	LASSO (Monsanto)	4 lb/gal L	glyphosate	ROUNDUP (Monsanto)	3 lb/gal L
atrazine	SEVERAL (Various)	80% WP; 4 lb/gal L	hexazinone	VELPAR (DuPont)	90% SP; 2 lb/gal L
benefin	BALAN (Elanco)	1.5 lb/gal L	linuron	LOROX (DuPont)	50% WP, 4 lb/gal L
bensulide	PREFAR (Stauffer)	4 lb/gal L	MCPB	CAN-TROL (Rhône-Poulenc)	2 lb/gal L
bentazon	BASAGRAN (BASF)	4 lb/gal L	metolachlor	THISTROL (Union Carbide)	
bromacil	HYVAR X (DuPont)	80% WP	metribuzin	DUAL (Ciba-Geigy)	8 lb/gal L
bromoxynil	BROMINAL (Union Carbide)	4 lb/gal L	napropamide	LEXONE (DuPont)	50% WP; 75% DF; 4 L
butylate	SUTAN + (Stauffer)	6.7 lb/gal L	naptalam	SENCOR (Mobay)	50% WP; 75% DF; 4 L
CDA	RANDOX (Monsanto)	4 lb/gal L	oryzalin	DEVIRINOL (Stauffer)	50% WP; 2 lb/gal L
chloramben	AMIBEN (Union Carbide)	2 lb/gal L; 10% G	oxyfluorfen	ALANAP (Uniroyal)	2 lb/gal L
chloroxuron	TENORAN (Ciba-Geigy)	50% WP	paraquat	SURFLAN (Elanco)	2 lb/gal L; 75% WP
chlorpropham	FURLOE-CHLORO IPC (PPC)	4 lb/gal L	pendimethalin	GOAL (Rohm and Haas)	2 lb/gal L
cyanazine	BLADEX (Shell)	80% WP	phenmedipham	ORTHO PARAQUAT (Chevron)	2 lb/gal L
cycloate	RO-NEET (Stauffer)	6 lb/gal L	prometryn	PROWL (Amer. Cyanamid)	4 lb/gal L
dalapon	DOWPON (Dow)	85% salt	pronamide	SPIN-AID (Nor-Am)	1.3 lb/gal L
DCPA	BASFAPON (BASF)		propachlor	CAPAROL (Ciba-Geigy)	80% WP, 4 lb/gal L
diethyl-ethyl	DACTHAL (Diamond Shamrock)	75% WP	pyrazon	KERB (Rohm & Haas)	50% WP
dinoseb	ANTOR (NOR-AM)	4 lb/gal L	sethoxydim	RAMROD (Monsanto)	4 lb/gal L
diphenamid	PREMERGE (Vertac)	3 lb/gal L	simazine	PYRAMIN RB (BASF)	75.5% WP
diuron	ENIDE (Upjohn)	90% WP	stoddard solv.	POAST (BASF)	1.53 lb/gal L
EPTC	KARMEX (DuPont)	80% WP	terbacil	PRINCEP (Ciba-Geigy)	80% WP
ethalfuralin	EPTAM (Stauffer)	7 lb/gal L	trifluralin	SEVERAL (Various)	100% oil
fluzifop-butyl	ERADICANE (Stauffer)	6.7 lb/gal L	2,4-D	SINBAR (DuPont)	80% WP
	SONALAN (Elanco)	3 lb/gal L		TREFLAN (Elanco)	4 lb/gal L
	FUSILADE (ICI)	4 lb/gal L		SEVERAL (Various)	

¹"SEVERAL" means there are several trade names for the chemical. The mention of trade names does not imply that they are endorsed or recommended over those of similar nature not listed.

²ae — acid equivalent, ai — active ingredient, DF — dry flowable, DS — dry soluble, E or EC — emulsifiable concentrate, ES — emulsifiable solution, F or FL — flowable, G — granular, L — liquid, S or SP — soluble powder, w or WP — wettable powder.

Effectiveness of Herbicides on Weeds¹

Know Your Weed Species! — All herbicides have their strengths and weaknesses. Knowing what weeds are in your field will help you choose the most effective chemical among those registered for your crop.

HERBICIDE (TRADE NAMES)	REDROOT FIGWEED	COMMON LAMBSQUARTER	GALINSOGA	MUSTARDS	NIGHTSHADE	COMMON PURSLANE	COMMON RAGWEED	SMARTWEED	CRABGRASS	FOXTAILS	BARNYARD-GRASS	FALL PANICUM	STINKGRASS	QUACKGRASS	YELLOW NUTSEDGE
Preplant Incorporated Herbicides															
BALAN	C	F	P	P	P	P	P	P	E	E	E	E	P	P	P
DEVINOL	C	P	P	P	P	P	P	P	E	E	E	E	P	P	P
DUAL	C	G	G	P	G	F	P	F	E	E	E	E	P	F	F
EPTAM	C	G	F	F	F	F	F	F	E	E	E	E	G	G	G
PREFAR	G	P	P	P	P	P	P	P	E	E	E	E	P	P	P
RO-NEET	C	F	F	P	P	P	P	P	E	E	E	F	P	F	F
SUTAN +	F	P	F	P	P	P	P	P	E	E	E	E	P	G	G
TILLAM	F	F	F	P	P	P	P	P	E	E	E	F	P	G	G
TREFLAN	C	F	P	P	P	P	P	P	E	E	E	E	P	P	P

HERBICIDE (TRADE NAMES)	REDROOT FIGWEED	COMMON LAMBSQUARTER	GALINSOGA	MUSTARDS	NIGHTSHADE	COMMON PURSLANE	COMMON RAGWEED	SMARTWEED	CRABGRASS	FOXTAILS	BARNYARD-GRASS	FALL PANICUM	STINKGRASS	QUACKGRASS	YELLOW NUTSEDGE
Herbicides with Postemergence Activity															
AATREX	E	E	G	E	G	E	E	E	E	C	G	G	F	G	G
BASAGRAN	P	C	G	F	F	G	C	E	P	P	P	P	P	P	G
BASFAPON	P	P	P	P	P	P	P	P	F	G	G	G	G	G	P
BLADEX	F	C	G	G	G	C	C	C	G	G	G	G	C	P	P
BROMINAL	F	E	G	G	G	G	G	E	P	P	P	P	P	P	P
CAPAROL	E	E	G	G	G	E	F	F	F	F	F	F	F	F	P
DOWPON	P	P	P	P	P	P	P	P	F	F	G	G	G	G	P
FORMULA 40	E	E	C	G	E	P	E	E	P	P	P	P	P	P	P
GOAL	E	E	C	G	C	E	C	G	F	F	F	F	C	P	P
LEXONE	C	E	E	E	P	E	E	E	F	G	F	F	F	P	P
LOROX	E	E	G	G	C	E	E	P	P	F	F	P	P	P	P
PARAQUAT	E	E	G	E	E	E	E	E	E	E	E	E	E	E	E
ROUNDUP	E	E	E	E	E	E	E	E	E	E	E	E	E	E	F
SENCOR	C	E	E	E	P	E	E	E	F	C	F	F	F	P	P
SPIN-AID	P	C	G	G	F	G	C	G	C	P	P	P	P	P	P
STODDARD SOLVENT	E	E	F	E	E	P	E	E	P	E	E	E	E	E	F
TENORAN	E	G	G	E	C	G	F	F	F	F	F	F	F	P	P

HERBICIDE (TRADE NAMES)	REDROOT FIGWEED	COMMON LAMBSQUARTER	GALINSOGA	MUSTARDS	NIGHTSHADE	COMMON PURSLANE	COMMON RAGWEED	SMARTWEED	CRABGRASS	FOXTAILS	BARNYARD-GRASS	FALL PANICUM	STINKGRASS	QUACKGRASS	YELLOW NUTSEDGE
Preemergence Surface-Applied Herbicides															
AATREX	E	E	G	E	E	E	E	E	C	G	G	F	G	G	G
ALANAP	C	G	F	F	P	F	F	G	P	P	P	P	P	P	P
AMIBEN	E	E	F	F	C	G	G	G	F	F	F	F	P	P	P
BLADEX	F	E	G	G	E	E	G	G	F	F	F	F	G	P	P
CAPAROL	E	E	F	C	G	G	F	F	F	F	F	F	F	F	P
DACTHAL	F	F	P	P	P	P	P	P	P	E	E	C	E	P	P
DUAL	C	G	G	P	G	F	F	F	E	E	E	E	P	F	F
ENIDE	C	F	P	P	P	G	P	F	E	E	E	E	P	P	P
FURLOE CHLORO IPC	F	F	P	P	P	G	P	E	F	F	F	F	F	P	P
KARMEX	E	E	G	G	E	E	E	E	E	E	E	E	E	E	E
KERB	P	F	P	P	C	F	F	F	F	F	F	F	G	P	P
LASSO	E	F	C	P	C	C	F	F	E	E	E	E	P	F	F
LEXONE	C	E	E	E	P	E	E	F	G	C	G	C	P	P	P
LOROX	E	E	G	G	E	E	G	F	E	G	F	E	P	P	P
PREMERGE	E	G	G	G	E	C	F	P	P	P	P	P	P	P	P

¹Assuming that the chemicals are applied at the proper time and at the appropriate rate for each soil type. This information is based on performance of these chemicals in vegetable crops. E = Excellent, G = Good, F = Fair, P = Poor
²Kill of top growth only.

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