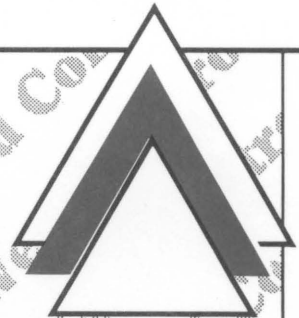




Weed Control

in Vegetable, Fruit and Nut Crops



Texas Agricultural Extension Service • Zerle L. Carpenter, Director
The Texas A&M University System • College Station, Texas

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Michael Braverman, Julian Sauls, John Lipe and Calvin Lyons
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Weed control in cropland can be accomplished through the use of cultural, mechanical and chemical means. Judicious use of these individual methods, or a combination of them, can result in effective weed management without causing economic loss or adverse environmental effects.

Deciding which practice to employ will depend largely on the weed(s) being controlled and infestation levels. Also, the crop being grown will play a major role in determining the timeliness of control measures.

Considerations for cultural and mechanical weed control should include the following:

- 1 Remove light or spotty infestations of weeds by hand-hoeing or spot-cultivation to prevent spreading of weed seed, rhizomes or roots. This is of particular importance with perennial weeds because of the nature in which they propagate (by seed and root tissue). However, one should exercise caution when plowing perennial weeds, being careful to prevent the transport and spread of plant parts to other areas of the field.
- 2 Use weed-free planting seed to protect against weed infestations in the row and introduction of new weed species.
- 3 Thoroughly clean equipment before moving from field to field.
- 4 Use mechanical tillage to remove initial weed flushes prior to planting, thereby eliminating or at least reducing the potential for continued infestation.
- 5 Consider the economics of using mechanical cultivation alone for weed control in the crop, especially where only light infestations of annual weeds are present.

6 Practice rotation to crops which physically out-compete certain weeds, resulting in gradual removal of that species. Crop rotation should also be considered when chemical methods are labeled only for certain crops.

Herbicide labels should be carefully reviewed for additional details on specific uses of each product.

Product names are not intended as endorsement of the product of a specific manufacturer, nor is there any implication that other formulations containing the same active chemical are not equally as effective. Product names are included solely to aid readers in locating and identifying the herbicides suggested.

Degree of control will depend upon herbicide rate, application timing, amount and timing of rainfall, soil type and infestation levels of the various weeds.

Sprayer Equipment

Tanks

Sprayer tanks should be rust resistant, preferably fiberglass, polypropylene or stainless steel. Filler openings should be wide enough for ease in filling. A splash proof filler should be in the tank to prevent pesticides from splashing onto people during filling or while spraying. Each tank should be equipped with a drain. Intake on the suction line should be at the bottom of the tank. Mechanical or return agitation should be used to keep pesticides in solution or suspension.

Pumps

There are several types of pumps capable of spraying pesticides. Roller, gear, centrifugal and piston pumps are most often used. Sprayer operation and pesticide formulations influence pump selection. Piston, roller and diaphragm pumps are positive displacement; therefore, the flow rate is determined by

pump speed, not pressure. Centrifugal pumps are a non-positive displacement type with flow rate influenced by pressure.

- **Gear pumps:** can be used to spray emulsifiable concentrates. Wettable powders will cause excessive wear and shorten pump life.
- **Roller pumps:** are economical, light- to moderate-duty pumps with limited life expectancy. Certain pesticides and wettable powders will significantly shorten the life of a roller pump.
- **Centrifugal pumps:** operate at over 3,000 rpm. They are high volume, low pressure pumps.
- **Piston pumps:** are often the most expensive. They operate at high and low pressure. Volume ranges from 2 to 50 gpm.

Piston and centrifugal pumps are better for handling abrasive materials such as wettable powders. Proper agitation is important in all spray mixes but is critical for wettable powders.

Before selecting a pump, the desired capacity should be determined using the following formula:

$$\frac{\text{mph} \times \text{swath width (ft)} \times \text{gpa}}{495} = \text{gpm}$$

Example: A two row sprayer with an 8 foot boom operated at 3 mph and a rate of 35 gallons per acre:

$$\frac{3 \times 8 \times 35}{495} = 1.7 \text{ gpm}$$

This is the delivery rate for the pump. Adequate return agitation requires a pump capacity about 1/3 above the calculated rate.

Pressure Regulators

Pressure regulators adjust the solution flow from the pump. When the regulator is open, a constant flow is directed to the nozzles, and the overflow returns to the tank. When closed, all flow is diverted to the tank.

Pressure Gauges

Pressure gauges show the solution pressure at the location of the gauge. The gauge should be located between the pressure regulator and nozzles. The most accurate pressure reading at the nozzles is with the gauge on the boom. However, it is more convenient to place the gauge near the regulator and operator for easier pressure adjustment. However, there will be some drop in pressure because

of flow restriction from the hoses. A pressure gauge is necessary for accurate calibration.

Strainers

Screen strainers are used to protect the pump and nozzle tips. A screen with large openings may not adequately screen out particles which can damage a pump or clog nozzles. If the openings are too small they become clogged and restrict flow. Strainers located in the nozzle should have a diameter slightly smaller than the nozzle orifice. A slotted strainer is suggested when applying wettable powders. Too, spring-loaded nozzle strainers prevent chemical loss from the lines during turns or transport to and from the field.

Nozzles

Nozzles have three functions in the spray operation. They control the flow rate, droplet atomization and droplet distribution. They are available in several different types, and each has a specific purpose in pesticide application.

- **Hollow cone nozzles:** concentrate most of the spray solution at the outer edge of a conical pattern. They operate at high pressure and produce small droplets which effectively penetrate plant canopies. Hollow cone nozzles are often used with foliar **nutrients, fungicides** and **insecticides**. They operate in a pressure range between 60 to 100 psi.
- **Flat fan spray nozzles:** produce narrow, elliptical spray patterns. A greater proportion of spray solution is deposited near the center of the pattern, and a lesser amount is deposited at the outer margin. To get a uniform application, patterns from adjacent nozzles must overlap. **Broadcast** herbicides, soil fungicides and soil insecticides are applied using **flat fan** nozzles. A pressure of 20 to 40 psi is required for optimum utilization. Even flat fan spray nozzles produce an elliptical pattern with even deposition of the material across the pattern. **Banded** pesticides are applied with **flat even fan** nozzles. Common fan angles are 65 degrees, 80 degrees and 110 degrees although some other angles are also available. Table 1 gives the nozzle height required for effective spray application with fan nozzles.
- **Flooding flat fan nozzles:** are used to apply pre-emergence and post-emergence herbicides. They deposit a fan pattern horizontally to the soil surface. Droplets are large, a condition

which is useful in reducing drift problems. They should operate at a pressure of 5 to 20 psi.

Table 1. Nozzle height for flat fan nozzles.

Spray angle	Nozzle height (inches)	
	20" spacing	30" spacing
65°	21-23	32-34
80°	17-19	24-26
110°	10-12	13-15

Hoses

Hoses used on sprayers should be oil resistant and have a test pressure twice the operating pressure. A two ply hose should be used on the suction side of the pump to prevent collapsing. Hoses should be of sufficient size to prevent excessive pressure drop or loss. Table 2 lists hose sizes and flow rates.

Table 2. Normal hose flow rates.

Hose size in inches	3/8"	1/2"	5/8"	3/4"	1"	1 1/4"
Max. flow	2 gpm	4	8	12	20	40

Number of Nozzles Per Row

The number of nozzles per row depends on the crop being sprayed and plant size. Small, flat growing plants normally require one or two nozzles over the top. Drop nozzles direct the spray on the lower half of the plant for post-directed sprays.

Table 3 lists various materials used in the manufacture of nozzles. Most producers use brass or nylon nozzles because of availability and cost. Nozzles should be checked regularly to make sure tips are free of debris, and the orifice is not worn. Clogged tips should never be cleaned with a knife; use a soft toothbrush. When the nozzles are worn or dam-

Table 3. Materials used in the manufacture of nozzles and resistance to corrosive and abrasive chemicals.

Material	Corrosive	Abrasive	Cost
Brass	Moderate to Resistant	Susceptible	Inexpensive
Nylon	Resistant	Susceptible	Inexpensive
Stainless Steel	Resistant	Resistant	Expensive
Hardened Tungsten	Resistant	Resistant	Very Expensive
Ceramic	Resistant	Resistant	Very Expensive

aged, it is time to replace them. If a herbicide treatment costs \$50 an acre, a 10 percent overspray on a 100 acre farm costs \$500. The sprayer should be washed after each use when applying herbicides, with water and ammonia or water and bleach (but not both).

Sprayer Calibration

No matter how effective or safe a pesticide is, its performance is dependent on applying the proper rate. The accurate calibration of spray equipment is the most important part of chemical pest control. Poor calibration accounts for about 90 percent of weed control failures.

Applications made using sprayers that are not properly calibrated can result in plant injury, ineffective control, excessive pesticide costs and possible residue problems. The following steps should be followed before calibrating any sprayer.

- Rinse and clean the tank with clean water.
- Remove and clean all nozzles and screens.
- Start sprayer and flush hoses and boom with clean water.
- Replace screens and nozzles. Make sure all nozzles and screens are of the correct size and type.
- Check hoses and connections for leaks.
- Adjust the pressure regulator to the desired pressure with tractor running at desired rpm.
- Operate the sprayer and check the discharge rate of all tips. Any nozzle which is off 10 percent from the average rate should be replaced.

Backpack Sprayer

Backpack sprayers are more difficult to calibrate accurately because of the variability in walking speed. Liquid materials are easier to use than wetttable powders since backpacks do not have agitation. Calibration of a backpack sprayer is similar to the calibration of a tractor-mounted boom rig. Except

for spot spraying, backpack sprayers are not generally recommended for herbicide application but are sometimes used by persons with a small tract of vegetables.

- The person carrying the backpack must walk at a uniform speed. Walking speed will vary depending on the soil surface and levelness of the bed being sprayed. Calibrate the sprayer under field conditions.
- The spray wand must be held in a reasonably fixed position above the soil or plant as the applicator walks.

Steps in Calibrating

1 Determine the calibration distance from Table 4, based on nozzle spacing (if a boom has 2 or more tips) or the width of the spray pattern (if a single spray tip is used).

(**Example:** with a 20" nozzle spacing or spray pattern width, measure a distance of 204 feet.)

Selecting Spray Tips: Backpack sprayers usually come equipped with plastic spray tips that are adequate for most pesticides, but it is better to switch to brass or stainless steel tips (for accuracy and longevity).

2 With the sprayer strapped on and at least half full of water, record the number of seconds required to walk the measured distance at a uniform, comfortable speed (2 to 3 mph).

(**Example:** 3 mph requires 46 seconds to walk 204 feet.)

3 Pump up the sprayer to the desired pressure, usually 15 to 30 psi. (Pressure regulators and a gauge to preset and read the pressure are accessories available for most backpack sprayers to maintain the desired pressure). Collect the spray from one tip for the length of time required to walk the calibrated distance. If a boom has multiple tips, repeat this on other tips to check for spray uniformity.

(**Example:** continuing with the above example and using 8003 tips at 20 psi, in 46 seconds each tip should deliver almost 21 fluid ounces of spray.)

4 The number of ounces of spray collected is equal to gallons per acre.

(**Example:** 21 ounces of water = 21 gallons per acre.)

Table 4. Spray calibration distances for different tip spacing (a boom with 2 or more tips) or spray pattern widths (single tip).

Nozzle spacing (inches)	Calibration distance (feet)
28	146
24	170
20	204
18	227
16	255
14	292
12	340
10	408

Tractor-Drawn Sprayer

Steps in Calibrating

1 Use Table 5 for distance to drive in field. Use nozzle spacing for booms. For directed and banding rigs, use the row spacing. Mark off this distance in the field.

Table 5. Required distance to travel at different nozzle spacing for calibrating.

Row width or nozzle spacing (inches)	Distance (feet)	Row width or nozzle spacing (inches)	Distance (feet)
40	102	26	157
38	107	24	170
36	113	22	185
34	120	20	204
32	127	18	227
30	136	16	255
28	146	14	291

2 Attach all equipment to the tractor that will be used during spraying. Determine the throttle setting and gear that will be used. Attain operating speed (usually 3 to 5 mph) before passing the starting mark, and note the time (in seconds) required to drive from the starting to finishing mark of the distance measured in step 1. Repeat to insure accuracy.

3 Catch the nozzle discharge for the noted time in step 2 in a container graduated in ounces. If

using a broadcast boom with evenly spaced nozzles, catch the output from one nozzle per row. If a directed spray is to be applied, catch the spray from each nozzle and combine the total number of ounces.

4 The total output in ounces from one nozzle (or group of nozzles if more than one nozzle per row is used) is equal to gallons per acre applied.

5 Check each of the nozzles to ensure they are discharging the same amount of liquid. Repeat steps 3 and 4 and replace any nozzles that vary more than 10 percent. The spray volume can be increased by decreasing tractor speed, increasing sprayer pressure, decreasing nozzle spacing or increasing nozzle size. It is better to use a larger nozzle at a lower pressure than to increase the pressure. Higher pressures will cause more drift problems. Most nozzle manufacturers and distributors can provide approximate flow rates (GPA) for a given nozzle based on pressure, nozzle spacing and tractor speed.

Calibration Examples

Situation 1 - Broadcast application

Apply Treflan 4EC at 1 pint per acre, preplant incorporated, prior to transplanting peppers, using a 200-gallon tank, flat fan nozzles spaced 20 inches apart, and a disk for incorporation.

- Measure a distance of 204 feet (based on the 20-inch nozzle spacing).
- Choose a gear and throttle setting, and with the disk engaged, travel 204 feet (assume it took 35 seconds).
- Set the spray pressure and catch one nozzle's output for 35 seconds (the time required to travel 204 feet).
- If you catch 20 ounces of spray from one nozzle in 35 seconds, the application rate is 20 gallons per acre.
- Recheck each nozzle's output to be sure they do not vary more than 10 percent (if the average spray volume is 20 ounces, then a nozzle should not deliver more than 21 ounces or less than 19 ounces).

How many acres can be sprayed from one 200 gallon tank?

$$\frac{200 \text{ gallons per tank}}{20 \text{ gallons per acre volume}} = 10 \text{ acres sprayed per tank}$$

How much Treflan 4EC should be added to the tank?

$$10 \text{ acres covered per tank} \times 1 \text{ pint/acre desired} = 10 \text{ pints}$$

Situation 2 - Banded spray

Apply Prefar on a 16-inch band preplant incorporated at 5 quarts per acre for watermelons on 80-inch rows, using a 500-gallon tank, even flat fan nozzles spaced 80 inches apart and a rototiller for incorporation.

- Measure a distance of 51 feet based on the 80-inch nozzle spacing.
- Choose a gear and throttle setting and note the time required to travel 51 feet (assume it took 12 seconds).
- Since it is difficult to accurately measure the spray output in only 12 seconds, catch the spray nozzle output from one nozzle for 24 seconds. If you collect 22 ounces in 24 seconds, divide it by 2, giving you a spray volume of 11 gallons per acre.
- Recheck each nozzle's output as previously described.

How many acres can be sprayed from one 500 gallon tank?

$$\frac{500 \text{ gallons per tank}}{11 \text{ gallons per acre spray volume}} = 45.5 \text{ acres sprayed per tank}$$

How much Prefar should be added to the tank?

$$\frac{16\text{-inch band} \times 5 \text{ quart/acre}}{80\text{-inch rows}} = 1 \text{ quart per acre}$$

$$1 \text{ quart/acre} \times 45.5 \text{ acres/tankful} = 45.5 \text{ quarts}$$

Situation 3 - Post-directed banded spray

Apply Sencor 4 at 1 1/2 pints per acre on a 14-inch band to tomatoes on 40-inch rows. The tomatoes were transplanted 2 1/2 weeks ago, and the spray rig has two cultivator mounted, flat fan nozzles per row (off-center tips are good) and a 300 gallon tank.

- Measure a distance of 102 feet (based on 40-inch rows).
- Set the speed with the cultivator down.
- Assuming it took 25 seconds to travel 102 feet, catch the total discharge at a set pressure from both nozzles for 25 seconds. Let's assume 10 ounces per tip, for a total of 20 ounces caught in 25 seconds. The spray volume is 20 gallons per acre.
- Check all the other nozzles for each row for uniformity.

How many acres can be sprayed from one 300 gallon tank?

$$\frac{300 \text{ gallon tank}}{20 \text{ gallons/acre}} = 15 \text{ acres per refill}$$

How much Sencor 4 should be added to the tank?

$$\frac{14\text{-inch band width} \times 1 \frac{1}{2} \text{ pints/acre}}{40\text{-inch row spacing}} = 0.525 \text{ pint/acre}$$

Since we already know a tankful will spray 15 acres:

$$0.525 \text{ pints/acre} \times 15 \text{ acres} = 7.8 \text{ pints per tankful}$$

For further information refer to publication L-1839 *Mixing Instructions for Liquid Herbicides*. As an aid to proper calibration, common conversions are given in Table 6.

Table 6. Conversion Table.

1 tablespoon = 3 teaspoons = 0.5 ounces
1 ounce = 2 tablespoons
1 cup = 1/2 pint = 16 tablespoons = 8 ounces
1 pint = 2 cups = 32 tablespoons = 16 ounces = 1 pound
1 gallon = 16 cups = 8 pints = 4 quarts = 8.4 pounds of water
1 cubic foot = 7.48 gallons of water = 62.4 pounds
1 acre = 43,560 square feet
1 mph = 88 feet/minute

Cleaning and Care of Sprayers

More pumps wear out from improper maintenance than from proper use. Pump wear and deterioration are brought about by ordinary use, but they are also accelerated by misuse. Following are suggestions that will help minimize labor problems and prolong the useful life of the pump and sprayer.

- Put clean chemicals and solutions into the sprayer, and use clean water. A small amount

of silt or sand particles can rapidly cause wear on pumps and other parts of the sprayer system.

- Use chemicals that the sprayer and pump were designed to use. For example, liquid fertilizers which are sometimes mixed with herbicides are corrosive to copper, bronze, ordinary steel and galvanized surfaces. If the pump is made from one of these materials, it may be completely ruined by just one application of liquid fertilizer. Stainless steel is not adversely affected by liquid fertilizers. Use pumps made from this substance for applying these types of fertilizers.
- Before using a new sprayer, dismantle it, clean the screen, nozzles, etc., of all metal chips and other foreign solid materials.
- Flush the spray system with clean water after each day of spraying.
- Inspect all strainers, screens and nozzle tips after each day of spraying. If these need cleaning, remove the accumulation by soaking and brushing. Never use a metal object for cleaning. Hard instruments scraping on a fine mesh screen can enlarge openings. This is also true of nozzle tip orifices.
- Some chemicals such as 2,4-D leave residues that are difficult to remove. When spraying susceptible crops, do not use spray equipment that has been used for 2,4-D and other herbicides.
- Clean the sprayer thoroughly after each use or when chemicals are changed. Many chemicals cause rapid corrosion of the metal in the sprayer. Remove and flush immediately after use. Sometimes a chemical residue will react with succeeding chemicals, causing a loss of effectiveness. Some of these risks may be eliminated by following this cleaning procedure:
 - Flush the sprayer with a tank of clean water.
 - Remove all strainers, screens and nozzles and wash them in kerosene with a soft brush of appropriate size.
 - Mix a medium-sized box of laundry detergent and 30 gallons of water in the sprayer tank. Circulate this mixture through the bypass pressure regulator and jet agitator for 30 minutes. Drain the mixture.
 - Replace the screens and nozzles.
 - Fill the tank one-half full with one part household ammonia to 49 parts of water.

Circulate this mixture through the pump and bypass, allowing a small amount to leak out through the nozzles. Let the solution stay in the sprayer overnight and run it out through the nozzles.

- Flush with clean water. Remove the nozzles.
- Nozzle openings should be sealed between cleaning and subsequent use to preclude insect entry and possible nest building inside the spray basin.

Recommended Herbicides for Texas Vegetables.

Herbicide	Asparagus	Beans	Cantaloupe	Carrots	Celery	Cole Crops	Cucumber	Eggplant	Garlic	Greens	Lettuce	Okra	Onions	Peas	Peppers	Potatoes	Pumpkins, Squash	Radishes	Southern Peas	Spinach	Sweet Corn	Sweet Potatoes	Table Beets	Tomatoes	Watermelons
AAtrex																					X				
Alanap			X				X																		X
Antor																				X			X		
Balan											X														
Basagran		X												X					X		X				
Buctril									X				X												
Curbit			X				X																		X
Dacthal	X	X				X	X	X	X	X			X		X	X	X	X	X				X	X	X
Devrinol															X										X
Dual		X												X		X			X		X				
Eptam		X														X							X		
Evik																					X				
Fusilade				X					X				X							X		X			
Goal						X							X												
Gramoxone	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X						X	X	X
Karmex	X																								
Kerb											X														
Lasso		X																				X			
Lexone/ Sencor	X															X								X	
Lorox				X	X											X					X				
Poast		X	X		X	X	X	X	X		X	X		X	X	X	X		X	X				X	X
Prefar			X	X		X	X				X		X		X									X	X
Princep	X																								
Prowl		X														X									
Pyramin																								X	
Ramrod														X			X					X			
Ro-Neet																					X			X	
Roundup	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Spin-Aid																					X			X	
Treflan	X	X	X	X	X	X	X			X		X		X	X				X					X	X

If the registration of a herbicide is cancelled by federal or state agencies, recommendations are no longer valid. Please read and follow the current label for proper use.

Weed Response Ratings for Vegetable Herbicides.

Herbicide	Broadleaf											Grasses									Sedges				
	Henbit	Lambsquarters	London rocket	Morningglory	Pigweed, Carelessweed	Purslane	Ragweed	Shepherds-purse	Smartweed	Sowthistle	Spurge	Sunflower	Barnyard grass	Crabgrass	Crowfoot	Fall panicum	Goosegrass	Johnsongrass, seedling	Johnsongrass, rhizome	Junglerice	Sandbur	Signalgrass	Coloradograss	Purple nutsedge	Yellow nutsedge
AAtrex	E	E	LC	G-E	E	E	E		E		E	G	G	G	F	P	G	F	P		G	F	F	P	P
Alanap		G		F	F-G	G	F	LC			P			F	P-F	P	P-F	P	P				P	P	P
Antor					LC			LC			LC		LC	LC		LC		LC		LC		LC		P	P
Balan		LC			LC	LC	P		P		G		LC	E	E	G-E	E	E	P	E	LC	E	E	P	P
Basagran	P	G-F	G	G-F	F	G	G	G	G-E		P	G	P	P	P	P	P	P	P	P	P	P	P	P	F-G
Buctril	P	G	G-E	LS	G	P	E	F	G-E	G	G	G-E	P	P	P	P	P	P	P		P			P	P
Curbit	G	G-E	P	P	G-F	E	P	P		F	P	P	G	E	E	G	E	E-G	P	LC	LC	LC	E	P	P
Dacthal	F	F-G	F	P	F-G	F-G	P	F	P	F	P	P	G	G	F	F	G	F-G	P				F	P	P
Devrinol	G	G		P-F	G-F	G					P		LC	G	E	G	G-E	F-G	P		G		P	P	P
Dual	E	G-F		P	G-E	G-E	F	G	P		P	P	E	E	E	E	E	F	P	E	G	G	P	P	G-F
Eptam	G	G-F		F-P	G	G	F	LC			P		LC	E	G	G	E	E	P	LC	LC	LC	F	F	G-F
Evik		E		G	E	E	E				G		LC	E-G	F	G	E-G	G	P		G		G-E	P	P-F
Fusilade	P	P	P	P	P	P	P	P	P	P	P	P	E-G	G		E	E	E	G-E	E	E	G	E	P	P
Goal	G	G	F		G	G		G-E		G		F	P					P						P	P
Gramoxone	G	G	G	F-G	G-E		E-G	G	F-G		F		E	G	G	G	G	G	P	E	E	E	E	P	P-F
Karmex		E		G	E	E	G	LC	F	LC	F		F	E		G	G	F	P		LC			P	P
Kerb	LC	LC	LC	LC		LC		LC	LC				LC	G		LC	F								
Lasso	E	E		P	E	E	F		P		P	P	E	E		E-G	E	F	P	E	G	G	P	P	P
Lexone/Sencor	E	G-E		F-G	E	E-G	G	G	F		F	LC	F	G	G-F	P-F	G-E	P-F	P	G	F-P	F	F	P	P
Lorox	E	E		F	E	E	E		G		P		LC	G	F	G	G	F	P	E	E	LC	G	P	P
Poast	P	P	P	P	P	P	P	P	P	P	P	P	E	E		E	E	E	E	E	E	E	E	P	P
Prefar	F	F-G	P	P	F	F	P	P		P	P	P	G	G	G	F	G	G-F	P	LC			F-G	P	P
Princep	E	E		G	E	E	E	LC	E		E		G	G	G	F	G	F	P	LC		F		P	P
Prowl	G	E-G	P	P	G-E	G-E	P	P	F	F	P	P	G-E	E-G	LC	G-E	E	E	P	E	E	G-E	E	P	P
Pyramin	E	E			LC	E	LC	LC	LC					F		F								P	P
Ramrod		LS			LC	LC	LS		LS				G	LC		LC	LC					LS			
Ro-Neet	G	G		F	G	P-F		LC					LC	E			E	E						P	F
Roundup	G	E-G	G	E	E-G		LC	G	G	LC	G	LC	G	F	E	E	E	E	G		LC	F	LC	F-P	F-G
Spin-Aid		LC	LC			LC	LC	LC		LC															
Treflan	G	G-E	P	P	E	E	P	P	P		P		E	E	E	G-E	E	E	P-F	E	E	E	E-G	P	P

E = Excellent
 G = Good
 F = Fair
 P = Poor

90-100% Control
 80-90% Control
 60-80% Control
 Less than 60% Control

LC = Labeled for control of this weed but not confirmed by Extension-based research.
 LS = Labeled for the suppression of this weed, but not confirmed by Extension-based research.

Note: These ratings are meant as a guide. Factors such as proper incorporation, soil moisture, soil type, size of weeds, etc will all influence herbicide efficacy.

Asparagus

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
napropamide 4 lb A.I.	Devrinol 50 WP	Preemergence 8 lb/A	Incorporate to a 2-4" depth or irrigate after application. Poor residual activity.
metribuzin 1-2 lb A.I.	Lexone 4L or DF Sencor 4 or DF	Preemergence Postharvest 2-4 pt/A or 1.33-2.6 lb/A	Apply prior to spear emergence in well established plantings; 14-day pre-harvest interval. Follow rotation restrictions.
simazine 2-4 lb A.I.	Princep 4L	Preemergence 2-4 qt/A	Apply at least 3 days prior to spear emergence and prior to weed emergence. Can also be applied after harvest. Other formulations and brand names are also available.
trifluralin 0.5-2.6 lb A.I.	Treflan EC	Preemergence Postharvest 1 to 4 pt/A	Apply before spear emergence or after harvest in established asparagus. Follow soil preparation and incorporation procedures. Numerous formulations are available. Do not use in Reeves County or Pecos County.
paraquat 0.62-0.94 lb A.I.	Gramoxone Extra	Preplant Postemergence 2-3 pt/A	Use to knock down existing weeds prior to crop emergence in established plantings. Apply in 25 gallon spray volume. Use 1-2 pt/100 gal of nonionic surfactant. Will kill emerged asparagus. Other formulations are also available.
diuron 0.75-3.0 lb A.I.	Karmex DF	Preemergence 1-2 lb/A light soil 2-4 lb/A heavy soil	Apply prior to weed emergence no earlier than 4 weeks before spear emergence or immediately after cutting. Do not apply to young plants in the first growing season or to newly seeded asparagus. Fair residual activity.
2,4-D Amine 1.43-1.9 lb A.I.	Formula 40	Postemergence 1.5-2.0 qt/A	Broadleaf weed control. Don't apply when asparagus spears are present or other susceptible crops are in the area. Maximum of 2 applications per season. Direct application to avoid spraying fern. Follow state phenoxy herbicide regulations.

Asparagus (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
fluazifop-p-butyl 0.094-0.375 lb A.I.	Fusilade 2000	Postemergence East of I-35 <u>0.75-1.5 pt/A</u> West of I-35 <u>1.5-3.0 pt/A</u>	For nonbearing asparagus. Do not apply to asparagus within one year of harvest. Use 1% crop oil concentrate. Only controls emerged grasses.
sethoxydim 0.3-0.5 lb A.I.	Poast	Postemergence 1.5-2.5 pt/A	Controls emerged grasses in non-bearing asparagus. Rate determined by grass species and size. Use 2 pt/A crop oil concentrate. Do not apply within one year of harvest.
glyphosate 0.25-5.0 lb A.I.	Roundup	Postemergence 0.5-10.0 pt/A	Good for perennial weeds like johnsongrass. Rate varies with weed species and size. Not selective, will kill asparagus if emerged. Don't apply within one week of spear emergence. Will only control emerged weeds and doesn't provide any residual control.

Beans and Peas

metolachlor 1.5-2.5 lb A.I.	Dual	Preemergence Soil texture Coarse (sandy) 1.5-2.0 pt/A Medium (loam) 2.0-2.5 pt/A Fine (clay) 2.0-2.5 pt/A	Can be used preemergence or pre-plant incorporated. Better weed control will be obtained with incorporation. Incorporation and use of higher rates needed for yellow nutsedge control.
pendemethalin 0.5-1.25 lb A.I.	Prowl	Preplant incorporated Soil texture Coarse (sandy) 1.5-2.0 pt/A Medium (loam) 2.0-2.5 pt/A Fine (clay) 2.0-2.5 pt/A	Do not apply preemergence. Incorporate after application
trifluralin 0.5-1.0 lb A.I.	Treflan EC	Preplant incorporated Soil texture <u>Areas with less than 20" rainfall</u> Coarse (sandy) 1 pt/A Medium (loam) 1.25-1.5 pt/A Fine (clay) 1.5 pt/A Soil texture <u>Areas with more than 20" rainfall</u> Coarse (sandy) 1 pt/A Medium (loam) 1.5 pt/A Fine (clay) 2 pt/A	Requires thorough incorporation 2-3". Do not use in Reeves County or Pecos County. Several formulations are available. Check the rate stated on the particular formulation being used. Some lower rates are suggested for specific bean types.

Beans and Peas (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
bentazon 0.5-1.0 lb A.I.	Basagran	Postemergence 1-2 pt/A	Controls small broadleaf weeds and can control or suppress yellow nut-sedge. Wait until at least one trifolate leaf is fully expanded. Use crop oil concentrate. May cause temporary speckling of leaves.
EPTC 3 lb A.I.	Eptam 7E	Postemergence 3.5 pt/A	Dry, green beans. Can also be used preplant incorporated. Postemergence application is post directed prior to pod formation. Do not feed or pasture vines to livestock until 45 days after application.
sethoxydim 0.094-0.375 lb A.I.	Poast	Postemergence	Controls only emerged grasses. Always use 2 pt of crop oil concentrate. Rate depends on grass size.
	North, East, Central and South Texas	High and Rolling Plains and West Texas	
Annual grasses	0.5 to 2.0 pt/A	1.5 to 2.0 pt/A	
Perennial grasses	1.0 to 1.5 pt/A	1 to 2 pt/A	

Beets

chloridazon 3.15-3.68 lb A.I.	Pyramin	Preemergence Postemergence 3.0-3.5 qt/A	Not recommended on coarse (sandy) soils. Can be used preemergence and early postemergence. Consider banding rather than broadcast application. Postemergence spray is applied at 2- true-leaf-stage of beets and when weeds have less than 2-4 leaves.
cycloate 1.5-1.875 lb A.I.	Ro-Neet 6E	Preplant incorporated 2.0-2.5 pt/A	Incorporate thoroughly to a depth of 3" right after application because this compound can be lost through volatilization.
phenmedipham 0.49-0.98 lb A.I.	Spin-Aid	Postemergence 3-6 pt/A	Will control small emerged weeds in beets that have at least 4-6 true leaves. Do not apply within 60 days of harvest.

Carrots

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks	
trifluralin 0.5-1.0 lb A.I.	Treflan EC	Preplant incorporated	Incorporate immediately once into the top 2-3". Follow label rotation restrictions. Do not use in Reeves County and Pecos County.	
				Soil texture <u>Areas with less than 20" rainfall</u>
				Coarse (sandy) 1 pt/A
				Medium (loam) 1.25-1.5 pt/A
				Fine (clay) 1.5 pt/A
				Soil texture <u>Areas with more than 20" rainfall</u>
fluazifop-p-butyl 0.125-0.188 lb A.I.	Fusilade 2000	Postemergence 0.75-3.0 pt/A <u>East of I-35</u> 0.75-1.5 pt/A <u>West of I-35</u> 1.5-3.0 pt/A	Controls emerged grasses. Do not exceed 96 oz (6 pt) per acre per season or within 45 days of harvest. Use 1% by volume crop oil concentrate.	
linuron 0.75-1.5 lb A.I.	Lorox DF or L	Postemergence DF: 1.5-3.0 lbs L: 1.5-3.0 pt	Apply after carrots are 3" tall and weeds are less than 6" tall.	

Celery

trifluralin 0.5-1.0 lb A.I.	Treflan EC	Preplant incorporated 1-2 pt (refer to rates listed under carrot recommendations)	Apply and incorporate prior to transplanting or direct seeding.
linuron 0.75-1.5 lb A.I.	Lorox L	Postemergence 1.5 to 3.0 pt/A	Apply before celery is 8" tall. Also has preemergence activity.
sethoxydim 0.094-0.14 lb A.I.	Poast	Postemergence 0.5 to 1.5 pt/A	Controls emerged grasses. Rate depends on grass species and size. Always use 2 pints of crop oil concentrate.

Cole Crops (Cabbage, Broccoli, Cauliflower, Brussels Sprouts)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
DCPA 7.5-10.5 lb A.I.	Dacthal 75 W	Preplant incorporated 10-14 lb/A	After seeding or immediately after transplanting. Irrigate to activate the herbicide. May also be used on chinese broccoli or tightheaded chinese cabbage.
napropamide 1-2 lb A.I.	Devrinol 50W	Preplant incorporated 2-4 lb/A	After seeding or directly after transplanting. Irrigate to activate the herbicide.
bensulide 5-6 lb A.I.	Prefar 4E	Preplant incorporated 5-6 qt/A	Incorporate to a depth of 1-2" prior to planting.
trifluralin 0.5-0.75 lb A.I.	Treflan EC	Preplant incorporated 1.0-1.5 pt/A	Incorporate to a depth of 2". May cause some stunting and stand loss.
sethoxydim 0.19-0.28 lb A.I.	Poast	Postemergence 1.0-1.5 pt/A	Controls emerged grasses. Rate depends on grass species and size. Always use 2 pints of crop oil concentrate. Not labeled for use in Brussels sprouts.

Eggplant

napropamide 1-2 lb A.I.	Devrinol 50 WP	Preplant incorporated 2-4 lb/A	Apply prior to transplanting and incorporate to a depth of 2".									
paraquat 0.625-0.94 lb A.I.	Gramoxone Extra	Preplant Preemergence 2-3 pt/A	Prepare beds as far in advance as possible to permit maximum weed emergence. Avoid disturbing treated areas when seeding or transplanting. Best if used after seeding, but prior to crop emergence.									
DCPA 4.5-10.5 lb A.I.	Dacthal W75	Postemergence 6-14 lb/A	Apply 4-6 weeks after transplanting or on direct-seeded plants at 4-6" height.									
sethoxydim 0.187-0.28 lb A.I.	Poast	Postemergence	Controls emerged grasses. Rate depends on grass species and size. Always use 2 pints of crop oil concentrate.									
		<table border="0" style="width: 100%;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center;"><u>High and Rolling Plains and West Texas</u></td> <td style="text-align: center;"><u>Other areas of Texas</u></td> </tr> <tr> <td>Annual grasses</td> <td style="text-align: center;">1.5 pt/A</td> <td style="text-align: center;">1.0-1.5 pt/A</td> </tr> <tr> <td>Perennial grasses</td> <td style="text-align: center;">1.0-1.5 pt/A</td> <td style="text-align: center;">1.0-1.5 pt/A</td> </tr> </table>			<u>High and Rolling Plains and West Texas</u>	<u>Other areas of Texas</u>	Annual grasses	1.5 pt/A	1.0-1.5 pt/A	Perennial grasses	1.0-1.5 pt/A	1.0-1.5 pt/A
				<u>High and Rolling Plains and West Texas</u>	<u>Other areas of Texas</u>							
Annual grasses	1.5 pt/A	1.0-1.5 pt/A										
Perennial grasses	1.0-1.5 pt/A	1.0-1.5 pt/A										

Greens
(Collard, Kale, Mustard, Turnip)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
DCPA 4.5-10.5 lb A.I.	Dacthal W75	Preemergence 6-14 lb W75/A	Broadcast over seeded beds. Requires irrigation to activate the herbicide.
paraquat 0.625-0.94 lb A.I.	Gramoxone Extra	Preplant Preemergence 2-3 pt/A	Prepare beds as far in advance as possible to permit maximum weed emergence. Avoid disturbing treated areas when seeding or transplanting. Best if used after seeding, but prior to crop emergence.
trifluralin 0.3 to 0.5 lb A.I.	Treflan EC	Preplant incorporated 0.6 to 1.0 pt/A	Use on preformed beds and incorporate immediately to a depth of 2".

Lettuce

benfin 1.125-1.5 lb A.I.	Balan 1.5 EC	Preplant incorporated 3-4 qt/A	Incorporate prior to seeding. All types of lettuce.
pronamide 1.5-2.0 lb A.I.	Kerb 50-W	Preplant incorporated 3-4 lb/A	Apply preplant incorporated. Post-emergence application should be before lettuce thinning but prior to weed emergence. For use on lettuce, endive and escarole. Follow variety precautions.
bensulide 5-6 lb A.I.	Prefar 4E	Preplant incorporated 5-6 qt/A	Use only on lettuce to be irrigated up.
sethoxydim 0.094 to 0.28 lb A.I.	Poast	Postemergence 0.5 to 1.5 pt/A	Controls emerged grasses and can be applied directly over the top of the lettuce.

Okra

trifluralin 0.5-0.75 lb A.I.	Treflan EC	Preplant incorporated 1.0-1.5 pt/A	Requires thorough incorporation to a depth of 1 - 1 1/2".
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Onions and Garlic (Dry Bulbs)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks									
DCPA 6.0-10.5 lb A.I.	Dacthal W 75	Preemergence 8-14 lb/A	Apply to the soil surface after seed- ing, transplanting or at layby. Layby treatment will not control emerged weeds. Can be used in onions and garlic.									
bensulide 5-6 lb A.I.	Prefar 4E	Preplant incorporated 5-6 qt/A	Apply preplant incorporated to a depth of 1-2" prior to planting. Not for use on garlic.									
bromoxynil 0.25-0.375 lb A.I.	Buctril	Postemergence 1.0-1.5 pt/A	Apply after onion plants have reached at least the two leaf stage. Avoid application during cool, wet weather. Not for use on garlic.									
fluazifop-p-butyl 0.094-0.375 lb A.I.	Fusilade 2000	Postemergence <u>East of I-35</u> 0.75-1.5 pt/A <u>West of I-35</u> 1.0-1.5 pt/A	Both Fusilade and Poast control emer- ged grasses. Fusilade is slightly bet- ter for perennial grasses while Poast is quicker acting on some annual grasses.									
oxyfluorfen 0.12-0.25 lb A.I.	Goal 1.6 E	Postemergence 0.6-1.25 pt/A	Apply after onion plants have reached at least the two true leaf stage. Avoid application during cool, wet weather. Not for use on garlic.									
sethoxydim 0.09-0.28 lb A.I.	Poast	Postemergence <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;"></td> <td style="text-align: center;"><u>High and Rolling Plains and West Texas</u></td> <td style="text-align: center;"><u>Others areas of Texas</u></td> </tr> <tr> <td>Annual grasses</td> <td style="text-align: center;">1.5 pt/A</td> <td style="text-align: center;">1.0-1.5 pt/A</td> </tr> <tr> <td>Perennial grasses</td> <td style="text-align: center;">1.0-1.5 pt/A</td> <td style="text-align: center;">1.0-1.5 pt/A</td> </tr> </table>		<u>High and Rolling Plains and West Texas</u>	<u>Others areas of Texas</u>	Annual grasses	1.5 pt/A	1.0-1.5 pt/A	Perennial grasses	1.0-1.5 pt/A	1.0-1.5 pt/A	Follow crop oil or surfactant recom- mendations closely. Rate depends on grass size and species. Only controls emerged grasses.
	<u>High and Rolling Plains and West Texas</u>	<u>Others areas of Texas</u>										
Annual grasses	1.5 pt/A	1.0-1.5 pt/A										
Perennial grasses	1.0-1.5 pt/A	1.0-1.5 pt/A										
sulfuric acid	Urea Sulfuric Acid	Postemergence 50-80 gallons of 33% solution/A	Will only burn down small weeds. Tip burn on onions can occur, but plants will recover. This is a fertilizer that also has herbicidal qualities.									

Peppers

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
napropamide 1-2 lb A.I.	Devrinol 2-E Devrinol 50WP	Preplant incorporated 2-E: 0.5-1.0 gal/A 50W: 2-4 lb/A	Incorporate into prepared bed at 1-2" prior to seeding or transplanting. Rate depends on soil type.
bensulide 5-6 lb A.I.	Prefar	Preplant incorporated 5-6 qt/A	Apply preplant incorporated to a depth of 1-2" prior to planting. Controls small-seeded broadleaf weeds and several grasses.
trifluralin 0.5-1.0 lb A.I.	Treflan EC	Preplant incorporated 1-2 pt/A	Incorporate to a depth of 2". For transplanted peppers only.
DCPA 4.5-10.5 lb A.I.	Dacthal 75-W	Post directed (Layby) 6-14 lb/A	Apply when seeded peppers are 4-6" tall or 4-6 weeks after transplanting. If weeds are present, cultivate prior to application. Controls weeds prior to their emergence.
sethoxydim 0.19-0.28 lb A.I.	Poast	Postemergence 1.0-1.5 pt/A	Controls emerged grasses. Use 2 pints of crop oil concentrate in 10 gal/acre spray volume.

Potatoes

metolachlor 1.5-3.0 lb A.I.	Dual	Preemergence 1.5-3.0 pt/A	Controls annual weeds. Can be tank mixed with Sencor/Lexone.
trifluralin 0.5-0.75 lb A.I.	Treflan EC	At drag off 1.0-1.5 pt/A	Requires thorough incorporation to a depth of 1-1.5 inches. Can be tank mixed with Eptam. Be careful not to damage seed pieces or elongating sprouts. Prowl has a similar use pattern.
paraquat 0.25-0.47 lb A.I.	Gramoxone Extra	Postemergence 1.5 pt/A Preharvest 0.8-1.5 pt/A	Use to burn down small, emerged weeds prior to potato sprout emergence. The preharvest treatment is for vine desiccation.
metribuzin 0.375-0.75 lb A.I.	Lexone or Sencor 75% DF	Postemergence 0.5-1.0 pt/A	Apply over the top of potatoes as a broadcast spray. Do not apply within 60 days of harvest. May be applied through center pivot system. Can also be tank mixed as a preemergence treatment with Dual or Prowl.

Potatoes (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks	
sethoxydim 0.09-0.375 lb A.I.	Poast	Postemergence	Controls emerged grasses only. Rate depends on grass species and size. Always use 2 pints of crop oil concentrate.	
		High and Rolling Plains and West Texas		Other areas of Texas
		Annual grasses Perennial grasses		1.5-2.0 pt/A 1-2 pt/A

Spinach

diethyl-ethyl 3-4 lb A.I.	Antor 4ES	Preemergence 3-4 qt/A	Controls small annual broadleaf and grassy weeds. Needs rain or irrigation for activation.	
cycloate 3 lb A.I.	Ro-Neet 6-E	Preplant incorporated 2 qt/A	Make only one application per season. Incorporate into the top 2-3".	
sethoxydim 0.093-0.28 lb A.I.	Poast	Postemergence	Only controls emerged grasses. Rate depends on grass species, height and geographic location. Always use 2 pints of crop oil concentrate.	
		High and Rolling Plains and West Texas		Other areas of Texas
		Annual grasses Perennial grasses		1.5 pt/A 1.0-1.5 pt/A

Sweet Corn

atrazine 2-3 lb A.I.	AAtrex (Numerous formulations, see label for specific use rates)	Preplant incorporated Preemergence Postemergence 4L 4-6 pt/A 80W 2.5-3.75 lb/A Nine-0 2.2-3.3 lb/A	Can be applied preplant incorporated, preemergence or early post-emergence. Use in combination with Dual or Lasso for better grass control. Do not plant any other vegetable crop the following year or injury may occur. Can be followed by corn or sorghum. Use lowest rates in the Panhandle, West Texas, alkaline soils and sandy soils.
metolachlor 1.5-2.5 lb A.I.	Dual 8E	Preplant incorporated 1.5-2.5 pt/A	Preplant incorporated treatment will result in more consistent weed control than preemergence treatment. Follow rotation recommendations. Can provide some control of yellow nutsedge.

Sweet Corn (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
EPTC 3.9 lb A.I.	Eradicane 6.7E	Preplant Incorporated 4.75 pt/A	Thoroughly incorporate herbicide immediately after application. Follow incorporation directions on label. Useful for suppressing bermuda-grass, nutsedge, johnsongrass and controlling many annual grasses and broadleaf weeds. Effectiveness may diminish with repeated use. Can also be applied through center pivot irrigation system; however, this method will only control annual weeds. Plant as soon as possible after application.
alachlor 2.0-2.75 lb A.I.	Lasso 4EC	Preplant incorporated 2.0-2.75 qt/A	Same as Dual, slightly less residual control.
bentazon 0.75-1.0 lb A.I.	Basagran	Postemergence 1.5-2.0 pt/A	Rate depends on weed species and size. Can burn back yellow nutsedge and control many small broadleaf weeds. Use with oil concentrate or Urea Ammonium Nitrate, depending on weed species. No residual control or rotation restrictions.
bromoxymil 0.25-0.375 lb A.I.	Buctril	Postemergence 1.0-1.5 pt/A	Apply postemergence to corn in the 4 leaf stage until tassel emergence. Controls broadleaf weeds including seedlings of silverleaf nightshade. Can be mixed with insecticides. Provides some residual control.
ametryn 0.6-2.0 lb A.I.	Evik 80W	Postemergence 0.75-2.5 lb/A	Controls grasses in addition to broad-leaf weeds. Apply as a directed spray when the smallest corn is at least 12" tall and no later than 3 weeks before tasseling. Add surfactant at the rate of 2 qts/100 gal of spray mixture (0.5% of spray volume).

SweetCorn (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
2,4-D 0.23-0.71 lb A.I.	Weedar 64 (Numerous formulations are available)	Postemergence 0.5-1.5 pt/A	Follow all state regulations for hormone type herbicides. Drift can kill other vegetable crops, cotton and other desirable plants. Do not apply on hot or windy days. Apply over the top to corn 4-8" tall and when weeds are small. When corn is taller than 8" apply post directed with drop nozzles. Good treatment for cocklebur and morningglory. No residual control. Follow state herbicide regulations.

Sweet Potatoes

DCPA 4.5-10.5 lb A.I.	Dacthal W-75	Transplanting or Layby 6-14 lb/A	Apply to the soil at transplanting. Can be sprayed directly over transplants. Layby application can be made up to 6 weeks after transplanting but prior to weed emergence.
EPTC 1.53-3.06 lb A.I.	Eptam 7E	Preplant incorporated Pre bed-over 2.25-3.5 pt/A 1.75-2.25 pt/A	Incorporate 2-3" deep just before planting. Options are available as outlined on the label.
fluazifop-p-butyl 0.093-0.375 lb A.I.	Fusilade 2000	Postemergence 0.75-3.0 pt/A	Controls emerged grasses. Do not apply more than 6 pt/A per season or within 55 days of harvest. Rate depends on grass size, species and geographic location. Use crop oil concentrate or surfactant.

Tomatoes

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
napropamide 1-2 lb A.I.	Devrinol 2E	Preplant incorporated 0.5-1.0 gal/A	Incorporate 1-2" prior to seeding or transplanting.
paraquat 0.47-0.94 lb A.I.	Gramoxone Extra	Preplant Preemergence Postemergence 1.5-3.0 pt/A	Preplant and preemergence spray are most effective if beds are prepared in advance and irrigated to encourage weed emergence. Will kill or burn down only emerged weeds without any residual activity. Will also kill any emerged tomatoes. Can be applied as a postemergence directed (preferably shielded) low pressure spray between crop rows. Do not spray on windy days or under any conditions that favor drift. Drifting paraquat can kill tomatoes or other desirable plants.
bensulide 5-6 lb A.I.	Prefar 4-EC	Preplant incorporated Preemergence 5-6 qt/A	Apply to the surface or incorporate prior to seeding or incorporate prior to transplanting. Incorporation to a depth of 1-2" will provide more consistent weed control than surface application.
pebulate 4-6 lb A.I.	Tillam 6E	Preplant incorporated 2.66-4.0 qt/A	Transplanted tomatoes only. Provides some control of purple and yellow nutsedge. Can also be tank mixed with Devrinol. Incorporate immediately after application to prevent herbicide loss.
trifluralin 0.5-0.75 lb A.I.	Treflan EC	Preplant incorporated Postemergence 1.0-1.5 pt/A	Incorporate into prepared bed 1-2" deep prior to transplanting. Can also be used as a post-directed spray when direct seeded tomatoes are blocked or thinned. Do not apply postemergence for transplanted tomatoes. The post directed spray should also be incorporated into the bed. Rate varies with soil and geographic location.
DCPA 4.5-10.5 lb A.I.	Dacthal W-75	Postemergence 6-14 lb/A	Apply 4-6 weeks after transplanting or when seeded tomatoes are 4-6" tall. Will prevent weeds from emerging but will not control emerged weeds.

Tomatoes (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast		Remarks	
metribuzin 0.25-0.50 lb A.I.	Lexone or Sencor	Postemergence		Apply no earlier than 2 weeks after transplanting and when regrowth is evident. Tomatoes should have 5-6 true leaves. Avoid cool, wet weather. For direct-seeded tomatoes, apply as a low pressure directed spray. Only herbicide that can control small emerged weeds in established tomatoes. Can also be used preplant incorporated but other products are more effective. Sencor can be applied through sprinkler irrigation equipment. Read limitations concerning rotational crops. Can be tank mixed with Treflan.	
			<u>Broadcast</u>		<u>Post-directed</u>
		Lexone 4L:	0.5-1.0 pt/A		1-2 pt/A
		Lexone 75% DF:	0.33-0.66 lb/A		0.66-1.33 lb/A
		Sencor 4:	0.5-0.75 pt/A		1-2 pt/A
Sencor 75% DF:	0.33-0.50 lb/A	0.66-1.33lb/A			
sethoxydim 0.09-0.28 lb A.I.	Poast	Postemergence 0.5-1.5 pt/A		Controls emerged grasses. Always use 2 pints of crop oil concentrate. Rate depends on grass species, size and location. Do not apply within 20 days of harvest.	

Vine Crops Quick Guide

	Treflan	Curbit	Dacthal	Alanap	Prefar	Poast	Ramrod
Cucumber	X	X	X	X	X	X	
Cantaloupe	X	X	X	X	X	X	
Watermelon	X	X	X	X	X	X	
Pumpkin						X	X
Honeydew		X	X		X		
Crenshaw		X			X		
Cassaba		X			X		
Squash			X			X	
Persian		X			X		

Vine Crops

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
naphthalam 0.375-0.625 lb A.I.	Alanap-L	Preemergence 6-10 qt/A	Avoid using on light soils. Rate depends on soil type. Can provide some control of field bindweed but does not control grasses. Apply to the soil surface after seeding.
ethalfluralin 1.25-1.7 lb A.I.	Curbit 3 EC	Preemergence 3-4.5 pt/A	Apply to the soil surface immediately after seeding. Do not incorporate. May also be used as a banded spray between rows of plastic mulch. Do not use under plastic mulch or hot caps. Stunting may occur under cool wet weather.
propachlor 4-6 lb A.I.	Ramrod	Preemergence 4-6 qt/A	Processing pumpkins only. Not for "jack-o-lantern" type. Don't use on soils with less than 1% organic matter.
bensulide 0.625-0.75 lb A.I.	Prefar 4E	Preplant incorporated 5-6 qt/A	Incorporate 1-2" deep after final bed preparation but prior to seeding.
DCPA 4.5-10.5	Dacthal W-75	Post-directed 6-14 lb/A	Apply after plants have developed 3-4 true leaves. Will not control emerged weeds. Irrigate after application to activate herbicide. Very shallow incorporation into the bed shoulders may be beneficial. Best postemergence compound for control of London rocket and shepherds purse, but poorer control of most other weeds compared to Curbit or Treflan.

Vine Crops (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
trifluralin 0.5-1.0 lb A.I.	Treflan EC	Post-directed 1-2 pt/A	Wait until plants have reached the 3-4 leaf stage. Direct spray away from plants but onto the shoulder of the bed. If planting every other 40" bed, bust out center bed and reshape shoulders prior to application. Incorporate into the bed to depth of 1-2" and throw treated soil towards the crop row.
sethoxydim 0.19-0.28 lb A.I.	Poast	Postemergence 1.0-1.5 pt/A	Use 2 pints of crop oil concentrate in a 10 gal/acre spray volume. Will only control emerged grasses. Rate depends on grass size and geographic location. Grasses are generally better controlled if sprayed not later than 2 weeks after emergence.

Recommended Herbicides for Fruit and Nut Crops.

Herbicide	Deciduous Tree Fruits					Citrus and Subtropical Fruits							Small Fruits					Nuts					
	Apple	Nectarine	Peach	Pear	Plum	Orange	Grapefruit	Lemon	Lime	Tangerine	Tangelo	Avocado	Banana	Papaya	Blackberry	Blueberry	Fig	Grape	Strawberry	English Walnut	Pecan	Pistachio	
Bueno 6	X		X	X	X	X	X	X	X	X													
Dacthal																			X				
Devrinol	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X	X
Dual						X	X	X	X		X							X					
Eptam						X	X	X		X													
Fusilade	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X		X	X	X	
Goal	X	X	X	X	X	X	X	X	X	X	X	X					X	X		X	X	X	
Gramoxone Extra	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hyvar L						X	X	X	X	X	X												
Hyvar X						X	X	X	X	X	X												
Karmex	X		X	X		X	X	X	X	X		X	X				X						
Krovar I						X	X	X	X	X	X												
Krovar II						X	X	X	X	X	X												
Poast	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X
Princep	X		X	X		X	X								X	X		X		X	X		
Prowl	X	X	X	X	X	X	X	X	X	X	X						X			X	X	X	
Roundup	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	
Sinbar	X		X			X	X	X	X	X	X				X	X							
Sollicam	X	X	X	X	X	X	X	X	X	X	X				X	X		X			X		
Surflan	X	X	X	X	X	X	X	X				X			X	X	X	X		X	X	X	
Treflan		X	X			X	X	X		X	X						X			X	X		

If the registration of a herbicide is cancelled by federal or state agencies, recommendations are no longer valid. Please read and follow the current label for proper use.

Weed Response Ratings for Fruit and Nut Herbicides.

Annual Broadleaf Weeds

Herbicide	Annual fleabane	Annual morningglory	Annual sunflower	Black nightshade	Carpetweed	Common chickweed	Common lambsquarters	Common ragweed	Common yarrow	Hairy galinsoga	Henbit	Horseweed	Knotweed	Mustards	Pennsylvania smartweed	Pigweeds	Prickly lettuce	Prickly sida	Purslane	Shepherds-purse	Speedwells	Velvetleaf	Virginia pepperweed	
Bueno 6						LC	P	P							P		P	P						
Dacthal	P	P	P	P	G	F	F-G	P		N	F		LS	N	P	F-G		P	F-G	F		P		
Devrinol	G	N		N	G	G	F-G	F	N	G	F	P	G	P	P	G	G	N	G	F		N	F	
Dual		P	P	G	G	G	G-F	F		G	E				P	G-E		P	G-E	G		P		
Eptam		F-P		P	G	F	G-F	F			G				P	G		P	G	LC		E		
Fusilade	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Goal		F		LC	E		LC	F		G	G	LC	LC	LC	LC	G	LC	E	G	G-E		LC	LC	
Gramoxone	E	G		G	E	E	E	E	P	E	E	G	F-G	P-F	G	G	G	E	G	F-G		E	G	
Hyvar L		F		G			LC	G			LC	G		LC		N			LC				G	
Hyvar X		F		G			LC	G			LC	G		LC		N			LC				G	
Karmex	G	G		G	E	E	E	E	N	E		G	G	G	G	G	E	G	E	G		F	G	
Krovar I	LC	F		G		LC	G	G				F				G			LC	LC			G	
Krovar II		F		G			G	G				F				G			LC				G	
Poast	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Princep	G	E		E	E	E	E	E		E	E	E	E	G	E	E	E	G	E	E	LC	G	E	
Prowl		P	P	P	LC		G	P			G				F	G-E			LC	P		G		
Roundup	E																							
Sinbar	E	F		LC	E	G	G	G	N	E	G	G	G	E	G	G	G		E	G		G		
Solicam	F	F		F-G	G	G	G-E	F	N		LS	G	F	F		F		P	G	G			G	
Surflan	G	P-F		P-F	G	G	G	P	N	G	P	F	G	P-F	P-F	G	F	P-F	G	G		P-F	G	
Treflan		P		P	G	E	G-E	G-E			G	N	LC		P	E		P	E	P		E	N	
Weedar 64		G	LC	E	G	G	E	E		LC			LC	LC	F	E	LC	E	G	G		G	LC	

E = Excellent

G = Good

F = Fair

P = Poor

N = No control

LC = Labeled for the control of this weed, but not confirmed by Extension-based research

LS = Labeled for the suppression of this weed, but not confirmed by Extension-based research

Weed Response Ratings for Fruit and Nut Herbicides.

Grasses and Sedges

Herbicide	Barnyardgrass	Cheat	Crabgrasses	Dallisgrass	Fall panicum	Fescues	Foxtails	Goosegrass	Guineagrass	Johnsongrass (rhizome)	Johnsongrass (seedling)	Nimblewill	Sandbur	Texas panicum	Wild garlic	Purple nutsedge	Yellow nutsedge
Bueno 6	G		G	LC	G	N	G	P		P	G		LC		N	LC	P
Dacthal	G		G		F		E	G		P	F-G		LS	F		P	P
Devrinol	G	G	E	N	G	N	E	E		N	P	N	G	P		P	N
Dual	E		E		E		E	E		P	F		G	P		P	G-E
Eptam	G		E		G		E	G		P	G		LC	F		F	G-F
Fusilade	G-E	G	G-E	G	G-E	P-F	G-E	G		G	E	F-G	E	E		N	N
Goal	P		E		F		F	E		P	F					N	N
Gramoxone	G-E	G-E	G-E	P	G-E	F	G-E	G-E		P	G-E	P	E	E		P	P
Hyvar L	LC		G					G	G	LS			G	G		P	P
Hyvar X	LC		G					G	G	LC			G	G		P	P
Karmex	G	G	G	F	F	F	G	G	F	P	G	P	LC	G		P	P
Krovar I	LC		LC				LC	G	G		LC		G	G		N	N
Krovar II	LC		LC				LC	LC	G				G	G		N	N
Poast	E		E		E	G	E	E		E	E		E	E	N	N	N
Princep	F-G	G	E	N	F-G	P	G	E	N	P	LC	P	G	F	N	P	N
Prowl	G-E		E-G		G-E		G	E		P	E		E	E		P	P
Roundup	E	E	E	F	E	E	E	E	E	E	E	G-E	LC	LC	E-G	F-P	G
Sinbar	G	G	G	F-G	G	F	G	F	LC	P	LC	P	LC	G		P	F-G
Solicam	E	G	E	P	E	F	E	G		P	G	F		LC			P-F
Surflan	G	G	E	N	G	N	E	E	LC	N	F-G	N	LC	LC		P	N
Treflan	E	LC	E		G-E		E	E	LC	P-F	E		E	E-G		N	N
Weedar 64	N	N	N	N	N	N	N	N	N	N	N	N	N	N	LC	P-F	F

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weed Response Ratings for Fruit and Nut Herbicides.

Biennial and Perennial Broadleaf Weeds

Herbicide	Bigroot morningglory	Brambles	Broadleaf plantain	Buckhorn plantain	Chicory	Common dandelion	Greenbriar	Common mallow	Common milkweed	Docks	Goldenrod	Ground Ivy	Hemp dogbane	Horsenettle	Japanese honeysuckle	Mugwort	Polson Ivy	Red sorrel	Thistles	Virginia creeper	White flowered aster	Wild carrot	Wild strawberry	Yellow rocket	Yellow woodsorrel	
Bueno 6	P																								LC	
Dacthal	N									P									F							
Devrinol	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Dual	N								P										P							
Eptam	F																									
Fusilade	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Goal	F																		G						LC	
Gramoxone	P	P	P	P	P	P	P	P	P	P	P-F	P-F	P	P	P	P	P	P	P	P	P	P-F	P	P-F	F	P
Hyvar L											G								G							
Hyvar X											G								G							
Karmex	N	N	P-F	P-F	G	P-F	N	F	N	F	G	N	N	P-F	N	P	N	N	N	N	N	N	P	G	P	F
Krovar I											G								G							
Krovar II											G								G							
Poast	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Princep	N	N	G	G	P-F	P-F	N	N	N	N	N	N	N	P	N	N	N	N	N	N	N	N	N	N	P	F
Prowl	P								P										F							
Roundup	F-G	G	E	E	E	E	P	E	G	E	E	G	F	F-G	F-G	F	G	G	G	F-G	E	E	E	E	E	E
Sinbar	N	N	F	F	G	G-E	N		N	F	P-F	N	N	F-G	N	P	N	P	G	N	N	F	N	G	G	
Solicam	N	N	P	P	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	F	P	F	F
Surflan	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Treflan	P										N								N							
Weedar 64	G		LC	LC	LC	LC			P	LC	LC	LC	LC	LC					F-G			N				

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Deciduous Tree Fruits
Apple, Nectarine, Peach, Pear and Plum

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
oxyfluorfen 0.5-2.0 lb A.I.	Goal 1.6E	Preemergence 6-10 pt/A Postemergence 2.5-10.0 pt/A	Apples, nectarines, peaches, pears and plums. Avoid drift. Post-emergence applications at higher rates will also provide preemergence control. Greater residual control can be obtained by tank mixing with Karmex, Princep, Surflan or Solicam.
diuron 1.6-4.0 lb A.I.	Karmex DF	Preemergence Apples and Pears-4 lb/A Peaches-2-5 lb/A	Apply in spring prior to weed emergence or cultivate prior to application. Do not treat dwarf varieties. Use in apples, peaches and pears. Addition of surfactant will also provide postemergence activity. Do not use on light soils.
simazine 2-4 lb A.I.	Princep	Preemergence 4L 2-4 qt/A 80W 2.5-5.0 lb/A Caliber 90 2.2-4.4 lb/A	For use in apples, peaches and pears established for at least one year. Do not use on coarse (sandy) soils. Apply only once per year except as noted otherwise. Can use lower rates on peaches as stated on the label. Limit overhead sprinkling to 0.5 inch.
pendimethalin 2-4 lb A.I.	Prowl	Preemergence 2-4 qt/A	For use in nonbearing apples, nectarines, peaches, pears and plums. Do not apply to leaves or stems. Use directed spray in at least 20 gallons of water/A. Do not apply to newly transplanted trees until ground is settled and no cracks are present.
terbacil 1.6-2.4 lb A.I.	Sinbar	Preemergence 2-3 lb/A	For use on apples and peaches established in orchard for at least 3 years. Do not use on sandy soils low in organic matter. Don't allow spray to drift onto desirable plants or fruit. Use as a directed spray either banded or broadcast in 40 gallons of water per acre. Rate depends on soil type.

Deciduous Tree Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
norflurazon 2-3 lb A.I.	Solicam DF	Preemergence 2.5-3.75 lb/A	May be applied directly after establishing apple orchards or 18 months after establishing nectarine, peach, pear or plum orchards. On sandy soils use on a few trees first to establish level of safety, especially with peaches. Rate depends on soil type. Irrigation needed for activation. Do not use on nursery rootstock.
oryzalin 2-6 lb A.I.	Surflan A.S.	Preemergence 2-6 qt/A	For use in apples, nectarines, peaches, pears and plums. Rate will determine the duration and spectrum of weed control. Can be tank mixed with Gramoxone or Roundup to control emerged weeds. Can also be tank mixed with many other preemergence herbicides to broaden the spectrum of weed control. Irrigate with 1/2 to 1" of water with a sprinkler irrigation system to activate the herbicide.
napropamide 4 lb A.I.	Devrinol 50WP	Preplant incorporated 8 lb/A	For use in apples, nectarines, peaches, pears and plums. Check label for use with irrigation systems. Incorporate by tillage or irrigation.
trifluralin 0.5-2.0 lb A.I.	Treflan E.C.	Preplant Incorporated 1-4 pt/A	For use in nectarines and peaches. Apply and incorporate 1-2 pt/A prior to transplanting or apply 2-4 pt/A in established orchards and incorporate without damaging tree roots. Rate depends on soil type.

Deciduous Tree Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
MSMA 2 lb A.I.	Bueno 6	Post-directed 2.66 pt/A	For use in nonbearing apples, peaches, pears and plums. Apply up to 3 applications per year in 100 gallons of water per acre spray volume. Can also be used as a spot treatment. Do not allow spray to contact leaves, stem or bark of trees. Gives better burn-down of perennials than Gramoxone but not as effective as Roundup.
paraquat 0.625-0.937 lb A.I.	Gramoxone Extra	Post-directed 2-3 pt/A	Use in apples, nectarines, peaches, pears and plums. Will only burn down existing weeds. Can be tank-mixed with a preemergence residual herbicide. Do not contact green stems, fruit or foliage. Use a shield or wrap plant when spraying around young trees or vines. Add a surfactant or crop oil concentrate. Complete coverage is essential for effective weed control.
fluazifop-p-butyl 0.09-0.375 lb A.I.	Fusilade 2000	Postemergence	Only controls emerged grasses. No residual activity. Rate depends on grass species, size and location. Always use crop oil concentrate or surfactant. For use on nectarines, peaches and plums. Don't apply more than 9 pints/A per season or within 14 days of harvest. For nonbearing apples and pears, use 2-3 pt/A, and don't harvest fruit for 1 year after application.
	<u>East of I-35</u>	<u>West of I-35</u>	
Annual grasses Perennial grasses	0.75-1.5 pt/A 1.0 -1.5 pt/A	1.0-1.5 pt/A 2-3 pt/A	
sethoxydim 0.28-0.46 lb A.I.	Poast	Postemergence Broadcast: 1.5-2.5 pt/A Spot treatment: 1.0-1.5% by volume	Nonbearing apples, nectarines, peaches, pears and plums. Will only control emerged grasses. Doesn't have any residual activity. Rate depends on grass size and species. Always use 2 pints of crop oil concentrate per acre.

Deciduous Tree Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
glyphosate 0.75-3.75 lb a.e.	Roundup	Postemergence 1-5 qt/A Spot treatment: 0.75-1.5% by volume	For use in apples, nectarines, peaches, pears and plums. Extreme care must be taken to avoid all contact of this herbicide with desirable vegetation. Rate depends on weed species and size. Can also be applied as a wiper application. Do not apply more than 10.6 qt/A/year. Follow surfactant recommendations. Clean sprayer properly after use. Good treatment for emerged perennial weeds.

Citrus And Subtropical Fruits

Orange, Grapefruit, Lemon, Lime, Tangerine, Tangelo, Avocado, Banana, Papaya

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
napropamide 4 lb A.I.	Devrinol 50-WP	Preemergence 8 lb/A	For use in all citrus except tangelos. Irrigate to activate the herbicide. Apply prior to weed emergence. Do not apply within 35 days of harvest. Don't apply when fruits are on the ground during harvesting period. Do not graze.
metolachlor 2-4 lb A.I.	Dual 8E	Preemergence 2-4 pt/A	For use in oranges, grapefruit, lemons, limes and tangelos. Can tank mix with Gramoxone or Roundup. Don't apply to trees in grove less than 30 days after transplanting. Do not harvest fruit within 12 months of application.
oxyfluorfen 0.5-2 lb A.I.	Goal 1.6E	Preemergence 6-10 pt/A Postemergence 2.5-10.0 pt/A	For use in avocados and nonbearing citrus. Postemergence application at higher rates will also provide preemergence control. Greater residual control can be obtained by tank mixing with Surflan. Avoid drift.

Citrus And Subtropical Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
bromacil 1.6-6.4 lb A.I.	Hyvar X or L	Preemergence or Postemergence 2-8 lb or 2-8 qt/A	For use in all citrus. Rate depends on tree age and soil type. Apply just before or just after weed emergence. Remove or mow any dense vegetation.
diuron 1.6-4.8 lb A.I.	Karmex DF	Preemergence or Postemergence 2-6 lb/A	<p>Citrus - grove should be established at least 1 year and not have had freeze damage within the last 6 months. Well established weeds should be eliminated by cultivation. Use 2-4 lb on annual weeds and 4-6 lb/A on johnsongrass seedlings.</p> <p>Banana - Use 1.5-3 lb/A on new plantings after soil has settled. Use up to 6 lb/A on established plantings. Repeat as needed with at least 6 weeks between applications and not more than 12 lb/year. Surfactant needed for postemergence control of emerged weeds at 1 pt/25 gallons of spray.</p> <p>Papaya - Must be established orchard at least 1 year old. Apply 2.5-5 lb/A, preferably before weeds emerge. If weeds have emerged, use 1 pt of surfactant per 25 gallons of spray mix.</p>
bromacil + diuron (1:1) 1.6-6.4 lb A.I.	Krovar I	Preemergence 2-8 lb/A	For use in citrus. Rate depends on tree age and soil type. Has some postemergence activity on small weeds, particularly with the use of surfactant at 1 qt/100 gal. Can be tank mixed with Gramoxone for more effective control of emerged weeds. Keep constant agitation in tank and avoid overlapping spray. Krovar I is more effective on some annual weeds than Krovar II but is slightly less persistent.

Citrus And Subtropical Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
bromacil + diuron (2:1) 2.4-6.4 lb A.I.	Krovar II	Preemergence 3-8 lb/A	For use in citrus. Rate depends on tree age and soil type. Has some postemergence activity on small weeds, particularly with the use of surfactant at 1 qt/100 gal. Can be tank-mixed with Gramoxone for more effective control of emerged weeds. Keep constant agitation in tank and avoid overlapping spray. Krovar II is slightly more effective on some perennial weeds than Krovar I and will give slightly longer control.
simazine 4.0-4.8 lb A.I.	Princep	Preemergence 4L 4.0-4.8 qt/A 80W 5-6 lb/A Caliber 90 4.4-5.3 lb/A	For use in grapefruit and oranges. Do not use in nurseries. Do not apply to bedded trees or those under stress from freeze damage for one year after the freeze.
pendimethalin 2-4 lb A.I.	Prowl	Preemergence 2-4 qt/A	For use in all types of nonbearing citrus. Use as a directed spray in at least 20 gallons of water/A. Do not apply to newly transplanted trees until ground has settled and no cracks are present.
terbacil 1.6-8.0 lb A.I.	Sinbar	Preemergence 2-10 lb/A	For use in citrus. Do not use on sandy soils with less than 1% organic matter. Rate varies with tree age, soil type and target weeds. Don't allow spray to drift onto desirable plants or fruit. Use as a directed spray either banded or broadcast in 40 gallons of water per acre. Some yellowing of leaves may occur. Do not use on trees planted in irrigation furrows.
norflurazon 2-4 lb A.I.	Solicam DF	Preemergence 2.5-5.0 lb/A	May be used in newly planted or established citrus, but not in seed-beds. Can be applied through several types of irrigation systems. Rate varies with soil type.

Citrus And Subtropical Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
oryzalin 2-6 lb A.I.	Surflan A.S.	Preemergence 2-6 qt/A	For use in grapefruit, lemons, oranges and avocados. Rate will determine the duration and spectrum of weed control. Can be tank-mixed with many other herbicides to either control emerged weeds or broaden the spectrum of control. Irrigation after application is useful in activating the herbicide.
trifluralin 0.5-2.0 lb A.I.	Treflan	Preplant incorporated 1-4 pt/A	For use in grapefruit, lemons, oranges, tangelos and tangerines. Apply and incorporate prior to transplanting or apply as a directed spray in established orchards and incorporate. The difficulty in incorporating Treflan in established orchards without causing root injury may preclude its use. Rate depends on soil, rainfall and grove age.
MSMA 2 lb A.I.	Bueno 6	Post-directed 2.66 pt/A	For use in oranges, grapefruit, lemons, limes and tangerines. Apply up to 3 applications per year in 100 gallons of water per acre spray volume. Can also be used as a spot treatment. Do not allow spray to contact leaves, stem or bark of trees. Gives better burndown of perennials than Gramoxone but not as effective as Roundup.
fluzifop-p-butyl 0.25-0.375 lb A.I.	Fusilade 2000	Postemergence	For use in all citrus listed and avocados. Controls emerged grasses. Do not use on trees to be harvested for food within 1 year of application. Use crop oil concentrate or surfactant.

Citrus And Subtropical Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
paraquat 0.625-0.937 lb A.I.	Gramoxone Extra	Post-directed 2-3 pt/A	For use in all citrus and subtropical fruits listed. Will only burn down existing weeds. Can be tank-mixed with a residual herbicide. Do not contact green stems, fruit or foliage. Use a shield or wrap plants when spraying around young trees.
sethoxydim 0.28-0.46 lb A.I.	Poast	Postemergence Broadcast: 1.5-2.5 pt/A Spot treatment: 1.0-1.5% by volume	For use in nonbearing citrus and avocados. Will only control emerged grasses. Doesn't have any residual activity. Rate depends on grass size and species. Always use 2 pints of crop oil concentrate per acre.
glyphosate 0.75-3.75 lb a.e.	Roundup	Postemergence 1-5 qt/A Spot treatment: 0.75-1.5% by volume	For use in citron, grapefruit, kumquat, lemon, lime, orange, tangelo, tangerine, avocado, banana and papaya. Can be tank-mixed with many preemergence herbicides for a more complete weed control program. Extreme care must be taken to avoid all contact with desirable vegetation. Rate depends on weed species and size. Do not apply more than 10.6 quarts/A/yr. Follow surfactant recommendations. Clean sprayer properly after use. Good treatment for emerged perennial weeds. Can also be applied as a wiper application.

Citrus And Subtropical Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
EPTC 3-6 lb A.I.	Eptam 7-E	Postplant incorporated 3.5-7.0 pt/A	Incorporate soil-applied Eptam with cultivation equipment after lining out orange, grapefruit, lemon and tangerine nursery stock and young field plantings. In established groves, apply 3.5 pt/A after clean cultivation or prior to weed emergence. Apply in established groves by metering into flood or furrow irrigation water. Do not apply within 15 days of harvest. Gives suppression of nutsedge.

Small Fruits

Blackberry, Blueberry, Fig, Grape and Strawberry

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
napropamide 4 lb A.I.	Devrinol 50-WP	Preemergence 8 lb/A	For strawberries, do not apply from bloom to harvest. May also be used in grapes, figs, blackberries and blueberries. Do not apply within 35 days of harvest. Irrigate to activate the herbicide. Apply prior to weed emergence. Don't apply when fruits are on the ground during harvesting period. Do not graze.
metolachlor 2-4 lb A.I.	Dual 8E	Preemergence 2-4 pt/A	For use in grapes. May be tank mixed with Gramoxone or Roundup. Do not apply to vines established in the vineyard less than 30 days or to be harvested within 12 months.
oxyfluorfen 0.5-2.0 lb A.I.	Goal 1.6 E	Preemergence 6-10 pt/A Postemergence 2.5-10.0 pt/A	For use in figs and grapes. Avoid drift. Postemergence application at higher rates will also provide preemergence control. Greater residual control can be obtained by tank mixing with Karmex, Princep, Surflan or Solicam.

Small Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
diuron 1.6-4.8 lb A.I.	Karmex DF	Preemergence 2-6 lb/A	For use only on grapes established for at least 3 years. Not recommended for use on light soils, if rainfall is imminent or just prior to irrigation. Use as a directed spray on a band along grape rows.
simazine 2-4 lb A.I.	Princep	Preemergence 4 L 2-4 qt/A 80 W 2.5-5.0 lb/A Caliber 90 2.2-4.4 lb/A	For use in blueberries, blackberries and grapes. In blueberries or blackberries established less than 6 months apply at 1/2 rate. Do not apply when fruit is present or illegal residues may result. Do not use in grape vineyards established less than 3 years. Do not use in sandy soils or soils with less than 1% organic matter or apply more than once per year.
pendimethalin 2-4 lb A.I.	Prowl	Preemergence 2-4 qt/A	For use in dormant grapes only. Do not apply if buds have started to swell. Use as a directed spray in at least 20 gallons of water/A. Do not apply to newly transplanted trees until ground is settled and no cracks are present.
terbacil 0.8-1.6 lb A.I. 1.6-3.2 lb A.I.	Sinbar	Preemergence Blackberries 1-2 lb/A Blueberries 2-4 lb/A	Treat only healthy plantings established for 1 year or more. Apply as a directed spray beneath the plants. Do not use on sandy soils or when subsoil or roots are exposed. Do not apply within 70 days of harvesting blackberries.
norflurazon 2-4 lb A.I.	Solicam DF	Preemergence 2.5-5.0 lb/A	For use in blackberries, blueberries and grapes. Not recommended for use in grapes on sandy soils. May be used on 6-month-old blueberry plantings. Apply to dormant blackberries only, established for at least 18 months. Temporary chlorosis (whitening of foliage) may occur. Grapes should be established for 2 years before application.

Small Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
oryzalin 2-6 lb A.I.	Surflan A.S.	Preemergence 2-6 qt/A	Can be used in blackberries, blueberries, figs and grapes. Rate will determine the duration and spectrum of weed control. Can be tank-mixed with a contact herbicide to control emerged weeds or with another preemergence herbicide for a broader spectrum of control.
DCPA 9 lb A.I.	Dacthal W-75	Preplant incorporated 12 lb/A	For use in strawberries at transplanting. Apply to soil surface and incorporate prior to transplanting.
trifluralin 0.5-2.0 lb A.I.	Treflan EC	Preplant incorporated 1-4 pt/A	For use on grapes. Apply and incorporate prior to transplanting or as a directed incorporated spray in established vineyards. The difficulty in incorporating Treflan in established vineyards without causing root damage may preclude its use. Rate depends on soil, rainfall and vineyard age. Do not apply to vineyards within 60 days of harvest.
paraquat 0.47-0.937 lb A.I.	Gramoxone Extra	Post-directed 1.5-3.0 pt/A	For blackberries, blueberries, figs and grapes, use 2-3 pt/A but only 1.5 pt/A on strawberries. Apply before emergence of new canes or shoots. Do not apply when figs to be harvested are on the ground. For grapes, treat when sucker growth is no longer than 8". Will only burn down existing weeds. Can be tank-mixed with residual herbicides. Do not contact green stems, fruit or foliage. Use a shield or wrap plants when spraying around young trees. For strawberries apply by directing a spray between the rows and using shields to prevent spray contact with crop plants.

Small Fruits (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks									
sethoxydim 0.28-0.46 lb A.I.	Poast	Postemergence Broadcast: 1.5-2.5 pt/A Spot treatment: 1.0-1.5% by volume	For use in nonbearing blackberries, blueberries, figs and grapes. Will only control emerged grasses and doesn't have any residual control. Always use 2 pints of crop oil concentrate per acre.									
sethoxydim 0.14-0.47 lb A.I.	Poast	Postemergence <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="width: 25%; text-align: center;">High and Rolling Plains and West Texas</td> <td style="width: 25%; text-align: center;">Other areas of Texas</td> </tr> <tr> <td style="text-align: left;">Annual grasses</td> <td style="text-align: center;">2.0-2.5 pt/A</td> <td style="text-align: center;">0.75-2.5 pt/A</td> </tr> <tr> <td style="text-align: left;">Perennial grasses</td> <td style="text-align: center;">1.0-1.5 pt/A</td> <td style="text-align: center;">1.0 -1.5 pt/A</td> </tr> </table>		High and Rolling Plains and West Texas	Other areas of Texas	Annual grasses	2.0-2.5 pt/A	0.75-2.5 pt/A	Perennial grasses	1.0-1.5 pt/A	1.0 -1.5 pt/A	Rates for use on strawberries. Will only control emerged grasses and doesn't have any residual activity. Always use 2 pints of crop oil concentrate per acre. Do not apply more than 2.5 pints of Poast per acre per season. Do not apply within 30 days of harvest.
	High and Rolling Plains and West Texas	Other areas of Texas										
Annual grasses	2.0-2.5 pt/A	0.75-2.5 pt/A										
Perennial grasses	1.0-1.5 pt/A	1.0 -1.5 pt/A										
fluazifop-p-butyl 0.25-0.375 lb A.I.	Fusilade 2000	Postemergence 2-3 pt/A	For use in nonbearing blueberries, blackberries, figs and grapes. Controls emerged grasses. Do not use on trees to be harvested for food within 1 year of application. Use crop oil concentrate or surfactant.									
glyphosate 0.75-3.75 lb a.e.	Roundup	Postemergence 1-5 qt/A Spot treatment: 0.75-1.5% by volume	For use in all small fruits listed including grapes. Extreme care must be taken to avoid all contact of this herbicide with desirable vegetation. Rate depends on weed species and size. Do not apply more than 10.6 qt/A/yr. Follow surfactant recommendations. Clean sprayer properly after use. Good treatment for emerged perennial weeds. Can also be applied as a wiper application.									

Nuts
English Walnut, Pecan and Pistachio

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
napropamide 4 lb A.I.	Devrinol 50-WP	Preemergence 8 lb/A	For use in walnuts, pecans and pistachios. Do not use within 35 days of harvest. Irrigate to activate the herbicide. Apply prior to weed emergence. Do not apply when nuts are on the ground during harvest season.
oxyflourfen 0.5-2lb A.I.	Goal 1.6 E	Preemergence 6-10 pt/A Postemergence 2.5-10 pt/A	For use in walnut, pecan and pistachio. Postemergence application at higher rates will also provide preemergence control. Greater residual control can be obtained by tank-mixing with Karmex, Princep, Solicam or Surflan.
simazine 2-4 lb A.I.	Princep	Preemergence 4 L 2-4 qt/A 80 W 2.5-5.0 lb/A Caliber 90 2.2-4.4 lb/A	For use in pecans and walnuts. In pecans don't apply in West Texas or when nuts are on the ground. Leveling and furrowing operations after applications will lessen effectiveness. Do not apply to orchards established less than 3 years. Do not use on gravelly, sandy, loamy sand soils, soils with a pH greater than 7.8, on soils with less than 1% organic matter or in areas you wish to apply more than 1/2" of irrigation immediately following application.
pendimethalin 2-4 lb A.I.	Prowl	Preemergence 2-4 qt/A	For use in nonbearing walnuts, pecans and pistachios. Use as a directed spray in at least 20 gallons of water /A. Do not apply to newly transplanted trees until ground has settled and no cracks are present.
norflurazon 2-4 lb A.I.	Solicam DF	Preemergence 2.5-5 lb/A	For use in pecans established for at least 18 months before treatment. Rate depends on soil type.

Nuts (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
oryzalin 2-6 lb A.I.	Surflan A.S.	Preemergence 2-6 qt/A	For use in walnuts, pecans, and pistachios. Rate will determine the duration and spectrum of weed control. Can be tank-mixed with many other herbicides to either control emerged weeds or broaden the spectrum of control. Irrigation after application is useful in activating the herbicide.
trifluralin 0.5-2 lb A.I.	Treflan EC	Preplant incorporated 1-4 pt/A	For use in pecans and walnuts. Apply and incorporate prior to transplanting or as a directed incorporated spray in established orchards. The difficulty in incorporating Treflan in established orchards without causing root damage may preclude its use. Rate depends on soil, rainfall and orchard age.
paraquat 0.625-0.937 lb A.I.	Gramoxone Extra	Post-directed 2-3 pt/A	Do not apply when nuts to be harvested are on the ground. Will only burn down existing weeds but can be tank-mixed with a residual herbicide. Do not contact green stems or foliage. Use a shield or wrap plants when spraying around young trees. rvest for 1 year.
fluazifop-p-butyl 0.09-0.375 lb A.I.	Fusilade 2000	Postemergence	For use in pecans. Only controls emerged grasses and doesn't have any residual activity. Rate depends on grass species, size and location. Always use crop oil concentrate or surfactant. Don't apply more than 9 pints per acre per season. Do not apply within 30 days of harvest or when harvestable nuts are on the ground. For use in nonbearing pistachios and walnuts, apply 2-3 pt/A, and do not harvest for 1 year.
		<u>East of I-35</u>	
		<u>West of I-35</u>	
Annual grasses		0.75-1.5pt/A	1.0-1.5 pt/A
Perennial grasses		1.0-1.5 pt/A	2-3 pt/A

Nuts (continued)

Common name and rate of active ingredient per acre broadcast	Trade name	Application time and rate per acre broadcast	Remarks
sethoxydim 0.28-0.46 lb A.I.	Poast	Postemergence Broadcast: 1.5-2.5 pt/A Spot treatment: 1.0-1.5% by volume	For use in nonbearing walnuts, pecans and pistachios. Will only control emerged grasses. Doesn't have any residual activity. Rate depends on grass size and species. Always use 2 pints of crop oil concentrate per acre.
glyphosate 0.75-3.75 lb a.e.	Roundup	Postemergence 1-5 qt/A Spot treatment: 0.75-1.5% by volume	Can be used in walnuts, pecans and pistachios. Can be tank-mixed with many preemergence herbicides for a more complete weed control program. Extreme care must be taken to avoid all contact of this herbicide with desirable vegetation. Rate depends on weed species and size. Do not apply more than 10.6 quarts/A/yr. Follow surfactant recommendations. Be sure to clean sprayer properly after use. Good treatment for emerged perennial weeds.

List of Herbicides Found in This Guide

Trade name	Common name	Manufacturer
AAtrex	Atrazine	Ciba-Geigy
Alanap	Naptalam	Uniroyal Chemical
Antor	Diethatyl-Ethyl	Nor-Am
Balan	Benefin	DowElanco
Basagran	Bentazon	BASF
Buctril	Bromoxynil	Rhone-Poulenc
Bueno 6	MSMA	ISK Biotech
Curbit	Ethalfuralin	United Ag Products
Dacthal	DCPA	ISK Biotech
Devrinol	Napropamide	ICI
Dual	Metolachlor	Ciba-Geigy
Eptam	EPTC	ICI
Eradicane	EPTC + protectant	ICI
Evik	Ametryn	Ciba-Geigy
Formula 40	2, 4-D	Rhone-Poulenc
Fusilade	Fluazifop-p-butyl	ICI
Goal	Oxyfluorfen	Rohm and Haas
Gramoxone	Paraquat	ICI
Hyvar L	Bromacil (lithium salt)	DuPont
Hyvar X	Bromacil	DuPont
Karmex	Diuron	DuPont
Kerb	Pronamide	Rohm and Haas
Krovar I	Bromacil + Diuron	DuPont
Krovar II	Bromacil + Diuron	DuPont
Lasso	Alachlor	Monsanto
Lexone/Sencor	Metribuzin	DuPont/Mobay
Lorox	Linuron	DuPont
Poast	Sethoxydim	BASF
Pefar	Bensulide	ICI
Princep	Simazine	Ciba-Geigy
Prowl	Pendimethalin	Cyanamid
Pyramin	Chloridazon	BASF
Ramrod	Propachlor	Monsanto
Roundup	Glyphosate	Monsanto
Ro-Neet	Cycloate	ICI
Sinbar	Terbacil	DuPont
Solicam	Norflurazon	Sandoz
Spin-Aid	Phenmedipham	Nor-Am
Surflan	Oryzalin	DowElanco
Tillam	Pebulate	ICI
Treflan	Trifluralin	DowElanco
USA Acid Fertilizer	Urea Sulfuric Acid	Stoller
Weedar 64	2, 4-D	Rhone-Poulenc

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