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# 1987

# WEED CONTROL GUIDE

# FOR FIELD CROPS

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COOPERATIVE EXTENSION SERVICE

MICHIGAN STATE UNIVERSITY

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# 1987 WEED CONTROL GUIDE for Field Crops

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COOPERATIVE EXTENSION SERVICE

MICHIGAN STATE UNIVERSITY

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Pesticides must be registered with the U.S. Environmental Protection Agency and the Michigan Department of Agriculture before they can be legally used in Michigan. This bulletin suggests using pesticides in the management of crop pests. Purchase only those pesticide products that are labeled for, 1.) the crop you wish to use it on and 2.) the pest you wish to manage on that crop. Remember that the pesticide label is the legal document on pesticide use. The label must be read carefully and all instructions and limitations followed closely. The use of a pesticide in a manner not consistent with the label can lead to the injury of crops, humans, animals, and the environment, and also lead to civil fines and/or condemnation of the crop. Pesticides are good management tools for the control of pests on crops but only when they are used in an effective, economical, and environmentally sound manner.

**See pesticide emergency information — Inside back cover.**

**W**eeds reduce crop yields by competing 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 often interfere with harvesting operations, and sometimes contamination with weed seeds or other plant parts may render a crop unfit for market. Profitable crop production depends on effective weed control.

Effective weed control in field crops requires the use of a combination of management techniques, including cultural methods and herbicides. Growing the same crop year after year and using the same weed control techniques encourage the development of problem weeds. Rotation of crops, herbicides, and tillage methods helps reduce this problem.

## Cultural Control of Weeds

Crop competition is a very useful method of weed control. By maintaining production practices that optimize crop growth, the crop plants can more effectively compete with weeds. Several crop management practices can improve the competitive ability of the crop. These practices include crop and variety selection, planting date and population, fertility, drainage, etc. Recommended crop production practices are also beneficial weed control practices.

Crop and herbicide rotation may also be helpful in maintaining adequate weed control. Many weeds cannot tolerate crop rotation. Using the same herbicide program each year allows weeds tolerant of the herbicides to expand. Rotate herbicide programs to prevent this problem and to reduce the likelihood of resistant weeds (i.e., triazine-resistant weeds) becoming a problem.

## Cultivation

Timely, shallow cultivation may be necessary following herbicide treatment. Be sure to cultivate as shallow as possible to prevent bringing new weed seeds from

below the herbicide layer to the soil surface.

Do not cultivate most preemergence herbicides for at least 3 weeks after application unless weeds appear that are resistant to the chemical. If weeds appear and dry weather persists for 2 weeks after herbicide application, rotary hoe or cultivate shallow. Delay cultivation after postemergence herbicide applications for at least 7 to 10 days to allow the chemical to move into stems and roots of the weed plants.

## Chemical Control of Weeds

No one chemical used as an herbicide will kill all species of weeds. Therefore, select the right herbicide for the job. The first step for successful weed control with herbicides is to identify the weed species present. Note that some weed species are resistant to all of the present selective herbicides.

Annual weeds are easier to kill when they are small seedlings and when conditions favor rapid growth. However, crop plants are also easily injured under these conditions. Selective herbicides should control the weeds with little or no injury to the crop.

Timing and rate of application are very important with chemical weed control. Spraying at the wrong time often results in poor weed control and crop injury. No crop plant is completely resistant to injury from herbicides. Too much chemical will cause crop damage.

## Types of Herbicides

Chemical control of weeds can be obtained with either preplant incorporated, preemergence, or postemergence herbicides. Many herbicides can be applied by more than one of the above methods.

**Preplant incorporated herbicides** are compounds incorporated into the soil prior to planting. Incorporation of some of these compounds is necessary to prevent losses of volatile active ingredients (ex. Treflan, Eptam) or to overcome

photodecomposition losses which would occur if the materials were left on the soil surface. Other preplant incorporated herbicides insure good activity in the absence of the rainfall otherwise required to move the herbicide into the weed-seed germination zone. This concept is often referred to as herbicide "activation." Incorporation is also often required to obtain perennial weed control from soil applications of herbicides.

### *Advantages of preplant incorporated herbicides:*

- (1) No weed competition to the crop with early control of weeds;
- (2) Weeds already controlled in cases where wet weather later delays cultivation or spraying;
- (3) Less reliance on rainfall to position the herbicides in the soil. Generally more reliable weed control than preemergence sprays;
- (4) Much more effective control of some perennial weeds (nut-sedge) than with preemergence sprays.

### *Disadvantages of preplant incorporated herbicides:*

- (1) Incorporation operation represents added cost and fuel usage in herbicide application;
- (2) Soil compaction is increased by the incorporation operation;
- (3) Herbicide may be diluted by improper incorporation (too deep) resulting in reduced weed control;
- (4) "Streaking" pattern of good and poor weed control can result from incomplete incorporation. Crosswise incorporation helps prevent this problem;
- (5) Planting operations may be slowed somewhat due to herbicide application and incorporation operation.

**Preemergence herbicides** are compounds that are applied to the soil surface after the crop has been planted but before the crop seedlings appear above the ground.

### *Advantages of preemergence herbicides:*

- (1) No weed competition to the crop with early control of weeds;
- (2) Weeds already controlled in cases where wet weather delays

cultivation or spraying;

(3) Planting and herbicide application may be done in one operation;

(4) In the case of corn, herbicides can be used which will not present a hazard to nearby 2,4-D- or Banvel-sensitive crops and plants.

#### ***Disadvantages of preemergence herbicides:***

(1) Preemergence applications are generally ineffective under dry soil conditions. Some preemergence herbicides are ineffective if dry conditions persist for only a few days; other herbicides may give weed control after as much as 10 days to 2 weeks of dry weather;

(2) On sandy soil, heavy rains may leach the herbicide down to the germinating crop seed and cause injury;

(3) Perennial weeds usually are not controlled by preemergence herbicide applications.

**Postemergence herbicides** are compounds applied to the foliage of weeds. They may burn off the above-ground parts of weeds (contact herbicides) or they may be translocated throughout the plants and kill the growing points (translocated or systemic herbicides).

#### ***Advantages of postemergence herbicides:***

(1) Can be used in an emergency, since they are not applied until the weeds are above the soil;

(2) Can be used on any soil type, and soil moisture conditions are usually not a problem;

(3) Are usually more effective (though also more injurious to the crop) at high temperatures.

#### ***Disadvantages of postemergence herbicides:***

(1) Should not be applied to weeds when the foliage is wet with dew or rain;

(2) There is a greater risk of crop injury on certain crops;

(3) With many postemergence herbicides, timing of application is critical for effective control;

(4) There is a risk that rain may prevent application at the

proper time.

Temperature greatly influences the effectiveness and volatility of many herbicides. Ideally, herbicides should be applied when temperatures range between 65° and 80°F. Low temperatures (below 60°F) can result in reduced weed control, while temperatures above 80°F can result in crop injury. Late afternoon herbicide applications are less likely to result in herbicide injury than are early morning applications. Early morning application predisposes the crop plant to danger periods of high temperatures, which increases the potential for herbicide injury.

Volatile herbicides, such as dicamba (Banvel), or ester formulations of 2,4-D may vaporize at temperatures as low as 70°F. Once they are vaporized, wind may move sufficient vapors to areas with sensitive crops to cause crop injury. Amine formulations may eliminate some of the danger of vapor drift; however, spray drift (droplets) may still occur. Extreme caution is required when applying herbicides near sensitive crops.

#### **Formulations of Herbicides**

Herbicides are available in a variety of formulations; granular and those mixed in water are most common. Usually, equal weed control can be expected from granular and those mixed in water. In some cases, however, granules have given less control. Generally, this has been due to (1) use of equipment giving nonuniform distribution of the granules or (2) formulations with too high a concentration, resulting in inadequate volume for uniform distribution.

The use of granular formulations does not eliminate the need for calibration. Various materials will "feed" differently because of variations in carrier and particle size. Therefore, granular applicators, like sprayers, should be accurately calibrated.

#### **Registration of Herbicides**

Recommendations in this bulletin are based on field trials conducted

in Michigan and other North Central states over a period of several years. Herbicides must be registered with the U.S. Environmental Protection Agency and the Michigan Department of Agriculture before they can be legally used in Michigan. The pesticide label is the legal document on pesticide use. The label must be read carefully and all the instructions followed closely. Use of an herbicide in a manner not consistent with the label can lead to civil fines and/or condemnation of the crop. Do not mix and apply together any pesticides and fertilizers if forbidden on either label.

#### **Combinations of Herbicides**

Two or more herbicides are usually applied as a tank mix versus separate applications. Combinations are used to give more consistent or broader spectrum weed control, to decrease herbicide residue (for example, atrazine carryover) or to obtain adequate season-long weed control. Growers and commercial applicators are responsible for poor weed control, crop injury and/or unwanted herbicide residue from herbicides labeled for single application but misused in combinations.

#### **Compatibility of Pesticide-Fertilizer Combinations**

Combinations of herbicides, insecticides and/or fungicides applied in either water or liquid fertilizer carriers decrease trips over the field and application costs; however, compatibility is critical. Always test the compatibility of each mixture to be applied even though the product labels allow mixing. Follow the label instructions closely during any mixing operation after you have tested for compatibility.

A single compatibility test requires only a glass quart jar and the pesticides and liquid fertilizer to be mixed. Place one pint of liquid fertilizer in the quart jar and add two teaspoons of the liquid pesticide. If the pesticide is a wettable powder, add two teaspoons of powder sufficient water to form a

slurry and add the slurry to the fertilizer. Cover the jar, shake well, and observe the mixture for 30 seconds. Check the mixture again after 30 minutes. If the mixture does not separate, it is compatible; however, check each batch of liquid fertilizer, as they may vary in mixing properties. Also, check compatibility if water source changes, as water pH and mineral content influence compatibility.

If more than one pesticide is to be mixed with liquid fertilizer or water, the pesticides should be premixed in liquid fertilizer or water and tested for compatibility by mixing appropriate proportions of all components. The combination should be thoroughly agitated before each additional pesticide is added, and a specific mixing order should be followed. Generally, unless label directions state otherwise, add the pesticides being tested in the following order:

1. wettable powders or dispersible granules,
2. flowables or aqueous liquids,
3. emulsifiable concentrates,
4. crop oil concentrates.

Spray tanks should be at least half filled with the carrier before the pesticide premixes are added. If the mixture foams excessively, separates or becomes syrupy, do not apply the mixture. Compatibility agents are available which may be added to improve mixing ability.

Even if all components appear compatible, the field tank mixture will require constant, vigorous agitation to prevent separation or improper pesticide distribution in the tank. Be sure the entire tank is agitated and mixed before spraying. Do not store pesticide mixtures overnight unless they are constantly agitated. Best results are obtained by applying the entire mixture in one day. (See Extension Bulletin E-1858, "Using Spray Additives with Herbicides.")

### Additives for Herbicides — Some Definitions

- (1) Adjuvant — any substance which enhances the herbicide effectiveness, an "added ingredient."
- (2) Surfactant — a surface active

material which can facilitate emulsifying, dispersing, spreading, wetting, sticking, or other surface-modifying characteristics of herbicide solutions.

- (3) Emulsifier — an agent that promotes the dispersion of one liquid in another.
- (4) Wetting Agent — reduces water surface tension causing better contact between spray solution and treated surfaces (spreader).
- (5) Soap — sodium or potassium salts of fatty acids. Can form insoluble materials in hard water. *Detergents* are synthetic materials used for cleaning.
- (6) Sticker — Deposit builder, increases herbicide adhesion to plant surfaces.
- (7) Defoaming Agent — "self-explanatory"
- (8) Compatibility Agent or Cosolvent — may aid in dispersion of otherwise incompatible mixtures.

During the development of an herbicide, the chemical company attempts to formulate the active ingredient to optimize performance, mixing, and handling under diverse conditions. Every commercially available herbicide formulation contains its own particular set of additives to accomplish this. However, sometimes additional additives are required for specific applications or when compatibility or mixing problems occur. The herbicide label will describe the need and use of these additives. The indiscriminate use of additives should be avoided since they may not improve herbicide performance and may actually reduce weed control, or cause crop injury.

Additives can be referred to as "adjuvants." This term merely denotes an added ingredient. Surface active additives are called surfactants. Therefore, all surfactants are also additives or adjuvants. All herbicide formulations contain surfactants. Emulsifiable concentrates contain emulsifiers which aid in the dispersion of the formulation into the water phase. Wettable powders contain wetting agents and dispersants which facilitate moistening the tiny particles and prevent clumping. Postemergent

herbicides, such as 2,4-D and Roundup, contain wetting agents which help spread the spray over the leaf surface.

### When to Use Additives

Herbicides may be applied either to the soil or to the foliage so the addition of a surfactant is left to the user. Sometimes, additives are only required for postemergence treatments made during adverse climatic conditions. In other cases, the nature of the herbicide may necessitate addition of the surfactant to the spray mixture rather than the formulation. The herbicide label always gives directions for such additive requirements.

Although claims have been made that additives increase the effectiveness of soil-applied herbicides, there is no independent data to support these claims. Research in this area was conducted at several universities across the country. These experiments failed to show any benefit from the inclusion of spray additives with soil applied herbicides. Additives are used with postemergence applications to aid coverage of leaf surfaces and increase penetration into the leaf. Use of additives for soil applications of herbicides can help prevent clogging of lines and nozzles.

### Crop Oil Concentrates

Crop oil concentrates contain higher concentrations of emulsifiers and surfactants than crop oils or vegetable oils. Crop oil concentrates are generally recommended at a rate of 1 quart per acre.

These additives are recommended for use with postemergence applications of atrazine and Basagran. They should also be used in postemergence applications on sugarbeets when large weeds are present or the weeds are not vigorously growing. Aatrex and Basagran labels contain specific directions on the use of additives.

There is a greater risk for crop injury when using additives with postemergence atrazine applications. Injury is frequently associated with cold, wet or cloudy conditions. The injury appears as a temporary stunting plus necrosis of the leaf margins. Banvel, 2,4-D, or

Bladex should not be included in a spray mix of atrazine plus crop oil concentrate or severe injury to the crop may occur.

The use of crop oil concentrate is recommended with Basagran to insure good coverage of the weed foliage. Basagran requires good coverage for optimum weed control. Soybean injury can be increased with the addition of crop oil concentrate to Basagran sprays. If soybeans are growing poorly or were injured from soil applied herbicides be careful when using Basagran plus crop oil concentrate.

### Adjuvants, Surfactants, Wetting Agents, Soaps

Many spray additives are currently available and many exaggerated claims have been made for them. In most cases, these materials are no better than crop oil concentrates. In fact, under poor environmental conditions for postemergence weed control, the crop oil concentrates can be slightly superior. Remember that any benefit comes only in postemergence, not preemergence applications. Also, they aid performance of the herbicide in adverse conditions, but are not a way to use less herbicide.

The Bladex 80W label calls for the addition of a surfactant for postemergence applications under drought conditions. Weeds can become more difficult to kill under these conditions. However, because of the increased chance of crop injury and the infrequency of these conditions in the spring, additions of surfactants or oils are not recommended for postemergence Bladex 80W use in Michigan.

The paraquat CL label calls for the addition of a non-ionic surfactant (Ortho X-77). Good coverage is required for this contact herbicide. When paraquat is sprayed in a fertilizer solution, be sure the rate of surfactant is increased as outlined on the label.

Roundup is formulated with a surfactant. Additional surfactant is needed with low volume application (refer to the Roundup label). The addition of a defoaming agent can be a help if excessive foaming is a problem. This addition is

explained in the "Mixing" portion of the Roundup label.

### Compatibility Problems

Compatibility problems in tank mixing herbicides usually occur when mixing directions are not followed. Some common causes of compatibility problems: mixing two herbicides in concentrated form, adding an EC to the spray tank before suspending the wettable powder, insufficient agitation, excessive agitation, and air leaks. Problems are much more likely when mixing herbicides with fluid fertilizers. The fertilizer solution is already loaded to near capacity with nutrients. Adding a herbicide to the already loaded solution may cause problems. Also, the fertilizer may interfere with the herbicide formulation additives. Since fertilizer may vary greatly from batch to batch, the only safe procedure is to test for compatibility in a small container before mixing a large quantity. If compatibility problems are encountered, the addition of *compatibility agents* may help.

Foaming is usually due to excessive agitation or a bypass line that empties above the spray solution level in the spray tank. When foaming is a problem, addition of a *defoamer* can help.

Pre-slurry the powder if you have problems in getting a wettable powder to wet and become suspended in solution. Adding a wetting agent to the spray tank will sometimes correct a floating powder problem.

### Application Equipment

Sprayer Implements — A good weed control sprayer should be made of non-corrosive materials, easy to clean, and have the following features:

- (1) A *tank* with a volume of 100 to 300 gallons to reduce filling and mixing operations.
- (2) A *pump* with a capacity of at least 4 gallons per minute and pressure up to 100 pounds per square inch (PSI).
- (3) An *agitation system* — The bypass from the pressure control is a good source of agitation. Direct the bypass

line into the bottom of the tank.

- (4) *Screens* — There should be 50-mesh screens in the intake line and at each nozzle.
- (5) *Pressure gauge* — The pressure gauge should be able to accurately measure pressures up to 100 PSI.
- (6) *Adjustable spray boom* — The boom should be adjustable from 18 to 36 inches above the ground.
- (7) *Nozzles* — Flat fan nozzles of 73 to 95° angle with replacement tips are best suited for most weed control work. Nozzle volume can vary from 1 to 10 gallons per minute, depending on the applications. Good general-use nozzles are 8002 or 8004. These nozzles permit the boom to be carried closer to the ground and thus reduce spray drift.

### Incorporation Implements —

Disks, especially large tandem disks, are poor tools for incorporation. Depth and riding are difficult to control and non-uniform distribution of the herbicide in the soil is likely.

A disk does have a place for special applications. It does a good job of chopping the quackgrass rhizomes required for good Eradicane activity. The disk should be used at a depth of 4 to 5 inches and a speed of 4 to 6 mph. Incorporation must be done in two directions.

A field cultivator can give acceptable one-pass incorporation of herbicides if special care is taken in set-up and operation. Wide sweeps, set-up so they meet, give better incorporation than points. Shanks should be close enough to allow for this, and three sets of sweeps are also required. It is important to follow with a leveling tool, such as a flex tine drag or spring tooth harrow, to smooth out ridges behind the cultivator.

The speed of the cultivator should be at least 6 mph, at a depth of 3 to 4 inches. Actual incorporation will occur at one-half the tool depth. Caution must be taken not to run the rear portion of the cultivator lower than the front. If the back of the tool is lower, untreated

soil can be brought to the surface, burying the herbicide.

Danish-type harrows equipped with "S" tines and rolling baskets can do a good job of one-pass incorporation. Rolling baskets outperform other trailing operations.

Operation considerations are similar to those with the field cultivator. Again, good soil tilth is a prerequisite for one-pass incorporation.

PTO driven tools do a good job of one-pass incorporation. However, their application in Michigan may be limited. These tools are operated at lower speeds and are not as wide as other implements.

## Soil Types

Soil texture (sand, silt, clay) and organic matter influence the effectiveness of soil-applied herbicides. In general, lower rates of herbicides are used on sandy (coarse textured) soils than on clays or soils high in organic matter (fine textured) to obtain the same level of control. Herbicide rate recommendations in this bulletin are given for medium-textured soils with greater than 3% organic matter. Clay and organic matter adsorb herbicides, making them less available to kill weeds. Soils with high clay and organic matter content require greater herbicide rates for adequate weed control. Sandy soils with low organic matter content require careful herbicide rate selection to avoid crop injury.

Soil pH can influence the activity of soil applied herbicides. Some herbicides (metribuzin) are more available at higher soil pH. Rates must be reduced to avoid crop injury. Knowledge of the soil pH is needed to determine proper rate.

Organic matter analysis is available through county Cooperative Extension Service offices or directly through the MSU Soil Testing Laboratory. Organic matter analysis may be determined on soil samples submitted for N-P-K analysis for an additional charge. Organic matter levels change slowly and may need to be checked every four years.

Organic matter analyses are only as accurate or representative as the

soil sample, so each field should be checked individually. See Extension Bulletin E-498, "Sampling Soils," for proper soil sampling procedures.

Remember, follow herbicide label recommendations and adjust herbicide rates for soil texture and organic matter as specified on the label.

## Accurate Calibration

Accurate applicator calibration is essential for effective chemical weed control, without crop injury. Calibrate a new sprayer before use and routinely re-calibrate the sprayer during the growing season.

### Use the following steps as a guide to calibrate a ground sprayer for broadcast application.

1. Determine the desired application volume of carrier (usually water) in gallons per acre (GPA).

For most weed control applications, 5-30 GPA at 30-40 PSI is sufficient.

2. Adjust the boom height so that the spray overlaps about 30% at the ground (or other surface to be sprayed). With 80 ft. nozzles, this places the nozzles about 20 inches apart on the boom; and 20 inches above the sprayed surface. Check each nozzle at the recommended pressure for output. Replace any defective nozzles and screens. All nozzles should deliver within 10% of each other.

3. Fill the spray tank and system with water.

4. Spray a measurable area in the field, at a fixed speed and at the desired pressure. Spray at least 20% of the total tank volume and at least 2 acres of area.

5. Measure the volume of water (in gallons) needed to refill the tank.

6. Determine the area (in acres) that was test sprayed, using the following formula: length of area sprayed (in feet  $\times$  boom width (in feet)  $\div$  43,560 = acres sprayed.

7. Divide the volume sprayed by the area sprayed to obtain the actual output of the sprayer in gallons per acre.

8. Make adjustments to tractor speed, pressure, or nozzle size and repeat steps 3-7 to change applica-

tion rate to the recommended values.

9. Calculate the amount of formulated pesticide needed to treat the desired area.

### The following procedures can be used to calibrate a ground sprayer for either banded or broadcast applications.

(1) Determine the desired application volume of GPA.

(2) Check each nozzle at the recommended pressure for output. Replace any defective nozzles and screens. All nozzles should deliver within 10% of each other.

(3) For band application, accurately determine the width, in inches, of the band sprayed. For broadcast application, measure the distance, in inches, between adjacent nozzles.

(4) Locate this width in the table below and read off the corresponding course distance.

<u>WIDTH</u> (inches)	<u>COURSE DISTANCE</u> (feet)
8	510
10	408
12	340
14	291
16	255
18	227
20	204
22	185
24	170
26	157

(5) In the field to be sprayed, mark off the course of the proper distance.

(6) Fill the tank completely with water only.

(7) Tie a quart container (graduated in ounces) to one nozzle on the sprayer to catch all of that nozzle's spray.

(8) Start a distance back from the beginning of the course to get up to operating speed, and turn the sprayer ON at the beginning of the course and OFF at the end.

(9) Remove the quart container, and read the volume collected IN OUNCES.

(10) OUNCES Collected = GPA.

## Pesticide Use Precautions

Herbicides, like all pesticides, should be handled with extreme caution and respect. There are three

important reasons for using pesticides safely and wisely:

- To protect yourself and others from poisoning.
- To avoid harming and polluting the environment.
- To avoid crop injury.

***These three points can not be emphasized enough.***

Pesticide accidents occur most often during mixing and tank filling operations. Although accidental ingestion of chemicals is considered to be the greatest health hazard, there is also great danger of poisoning when pesticides contact skin or eyes, or when the dust or vapors are inhaled. Protective clothing should be worn at all times during the handling and application of pesticides and the cleaning of spray equipment. Such equipment should include full coverage clothing, chemical resistant rubber gloves and boots, splash-guard goggles, and a MSHA/NIOSH approved respirator for the chemical compound being used. Care for these items as you would your implements. Heed all the precautionary statements on the product label and cover-up to protect yourself.

Using more chemical than is recommended on any label is illegal and can result in the carry-over of residues in the soil. Pesticides may also leach into ground and surface water. Herbicide residues can also damage sensitive crops the following year. Some long-residual herbicides last more than one year in the soil; keep this in mind when planning a crop rotation program. The herbicides recommended in this bulletin should dissipate in one growing season unless otherwise noted. Check the product labels for precautions on rotational crops.

Herbicides offer an effective and economical means of weed control. Crop plants are seldom completely resistant to herbicide injury, but have some level of tolerance. The ability of an herbicide to kill weeds without harming crop plants (selectivity) may be partially lost under unfavorable weather conditions. Herbicide drift to non-target crops often results in crop injury. Do not spray under windy conditions.

## Herbicide Residues and Bioassay

With the advent of preplant and preemergence herbicides which give season-long weed control, the accumulation of herbicides in the soil and their influence on subsequent crops in the rotation have become important in crop management. This fact is particularly true since atrazine has come into common use on corn. However, when used at recommended rates in seasons of normal rainfall and temperature, most recommended herbicides for field crops do not present a problem on crops planted the following season. Exceptions are listed in the "Remarks" column of Table 1.

There have been reports of injury to crops following atrazine applications on corn. There is more likely to be a problem with herbicide residues in a season of limited rainfall and cool temperatures, due to the slow dissipation of the herbicide (see Extension Bulletin E-1215 "A Quick Test for Atrazine Carryover").

Carryover problems have been most commonly reported for two groups of herbicides, the triazines (ex. atrazine) and the dinitroanilines (ex. trifluralin). If soybeans follow corn, or sugar beets follow a crop treated with a dinitroaniline and if herbicide carryover is a possibility, a bioassay can be done. This will indicate whether enough herbicide is present to harm the crop. Do this late in the fall prior to freeze up or early in the spring. The bioassay procedure is a relatively simple test but a few basic steps should be followed.

(1) Collect soil from several locations in the field as when taking soil samples. Reliability of the assay depends on accurate sampling. Sample soil to the depth the field has been tilled. Approximately 5 lb. of soil are needed for each sample. Collect an equal amount of soil from an adjacent field where it is known no herbicide has been applied. This second sample is used as a "check."

(2) Start the bioassay within one or two weeks after soil is collected to prevent the loss of

herbicide under warm conditions. If the assay cannot be run immediately, store the soil in a cool place, or even allow it to freeze.

(3) If the soil is wet, allow it to dry so that it may be worked easily. If the soil is cloddy, crush the clods but do not pulverize.

(4) Partially fill two, 1-qt. containers with soil, one with the soil being tested and the other with soil from the "check" field. Punch holes in the bottom of the containers to allow drainage. Tin cans or milk cartons make satisfactory containers.

(5) Plant 15 seeds of a sensitive crop in each container and cover with ½ inch of soil. Wet the soil, but do not saturate. Oats are very sensitive to both triazines and dinitroanilines. Place exactly the same number of seeds in each container. By knowing the exact number of seeds planted, seedling emergence can be measured. Do not plant too many seeds or the seedlings may compete for the herbicide and decrease the injurious effects.

(6) Place containers in a warm place (70 to 75° F.), preferably in a window to receive as much sunlight as possible. Additional artificial light should also be supplied to obtain approximately a 15-hour day length. Water plants sparingly, but do not let the soil dry out.

(7) Determine plant emergence, and monitor plant growth for at least three weeks after planting. Compare "check" plants with those in the soil being tested.

(8) Atrazine injury may cause yellowing of the oat leaves, with the plant becoming droopy and finally dying, or if carry-over is marginal, stunting may occur. Stunting can be determined by a comparison with "check" plants. Dinitroaniline injury may result in a decrease in seedling emergence and/or stunting of the seedlings.

(9) If any evidence of herbicide carry-over is observed, it is advisable to plant a resistant crop.

## Application of Herbicides

### Herbicide Spray Volumes and Rates

Table 1 lists chemicals which



will give satisfactory weed control without injury to crops, except as noted under "Remarks." The volume of water to use will vary with the herbicide, although generally 10 to 40 gal per acre and a spraying pressure of 30 to 40 psi is recommended for the phenoxy herbicides (2,4-D, MCPA, 4-(2,4-DB). With wettable powders such as atrazine and linuron, use nozzles that deliver at least 15 gal per acre. Use 30 to 40 gal of spray per acre when spraying quackgrass with atrazine or dalapon.

Some contact type postemergence herbicides (Basagran, Blazer) require a minimum of 20 gallons per acre spray volume and 40 psi spray pressure to insure adequate coverage. Flat fan nozzles are effective for herbicide applications. Hollow cone nozzles can also give good results, especially for post-emergence applications at higher pressures. If higher pressures are used, be sure the nozzles are designed to be operated at the increased pressure. Operating nozzles beyond the specified pressure range will result in a poor spray pattern, insufficient coverage, and lack of weed control.

Herbicides are available in a number of different formulations and concentrations. For this reason, the recommended rates in Table 1 (col. 3) are given as pounds of active ingredient per acre. Thus, when a liquid formulation contains 4 lb of active ingredient (or acid equivalent) per gallon, 1 pt will provide ½ lb of active ingredient, or 1 qt. will provide 1 lb of active ingredient.

### **Band Application**

In cultivated crops, spraying narrow bands of herbicide over the rows will take less material per acre, cutting the cost per acre for the chemical. Where chemical costs are high, band spraying may be justified. However, with band spraying, timely cultivation of weeds in the unsprayed area between rows is necessary.

In seasons when the soil is too wet to cultivate, overall spraying has the advantage of controlling weeds between the rows.

When band spraying, be very

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

### **Herbicide Incorporation**

The most consistent incorporation (no streaking), especially when using a disk or field cultivator alone, is achieved with two passes at an angle to each other. However, new tillage implements have made one-pass incorporation of herbicides a possibility. Many growers are asking for the best way to achieve one-pass incorporation.

### **Soil Conditions**

Although a majority of the questions concerning incorporation concern the best implement to use for one-way incorporation, soil condition influences the success of incorporation more than the tool used. The reliability of one-pass incorporation will also be influenced by the tillage system used.

In clean tillage (low crop residue) situations, preemergence applications made on wet soil will likely perform as well or better than two-pass incorporated treatments. One-pass incorporation is not a good approach with less than optimum soil tilth.

High crop residue levels (corn stalks disked or chisel plowed with one or two secondary tillage operations) make one-pass incorporation difficult. If the residue level is great enough to clog the incorporation tool, two-pass incorporation is advisable. The soil should also have good tilth, as outlined above.

Where ridges are left from fall plowing or use of a chisel plow in the spring, it is advisable to level the ground before herbicide application. Streaking is favored by application of the herbicide to rough ground.

### **Cleaning of Pesticide Sprayers**

It is important to clean weed control sprayers after each use, especially if they are used for more

than one crop and for the application of insecticides and fungicides. The need for extensive cleaning can be minimized if one sprayer is dedicated to herbicide application only.

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

When cleaning a sprayer that is used for only soil applications of herbicides, usually only a thorough water rinse is necessary. Exceptions are sulfonyl urea herbicides, such as chlorimuron-ethyl (*Classic*), where a thorough cleaning with ammonia is required. Rinse the entire sprayer, inside and out, including the boom, hoses, and nozzles. Partially fill the spray tank with water and keep the pump running so that the water is circulated throughout the entire system. Spray the water rinsate out through the nozzles. This process should be repeated when changing soil-applied herbicides and at the end of each day. Money can be saved and the environment protected if the water rinsing is done in the field using a water-filled nurse tank and if the water rinsate is applied to the crop according to label rates. Many herbicide labels have specific instructions for cleaning the spray system. Always read and follow these directions carefully.

Unless otherwise specified, thoroughly wash the entire spray system after all postemergence applications. Use one of the following cleaning agents in 100 gal of water:

- (1) 1 gal household ammonia (allowed to stand in spray tank and system overnight);
- (2) 5 lb of sal soda;
- or
- (3) 8 lb trisodium phosphate.

Run the pump so that the cleaning solution is circulated throughout the entire system for at least 2 hours and then pump it out through the nozzles. Do not dump this cleaning solution and do not apply it to any crop (crop land). Discard the cleaning solution in an appropriate pesticide rinsate degradation pit. Rinse the entire system with water after all the cleaning solution has drained from the sprayer. Do

not leave pesticide solutions or cleaning solutions in the tank overnight.

Corrosion and mechanical damage to pumps, tanks, nozzles, etc. may result from leaving water in the spray system over the winter. To prepare the spray equipment for storage, disconnect all the hoses, and allow all water to drain out. Coat all bare metal parts with oil or a rust inhibitor. Disassemble metal nozzles, and store them in oil. Prepare the spray pump for storage based on the manufacturer's recommendations.

### **Pesticide Storage and Disposal**

Reduce the need for, and the hazards of pesticide storage and disposal by buying only what will be used during a growing season and mixing only what is needed for each application. In addition, try to

apply left-overs, water rinsates, etc. to the appropriate crop rather than storing or disposing of them. Long-term storage may reduce the effectiveness and/or increase the toxicity of herbicides.

If storage is necessary, choose a suitable environment that is dry, cool, and out of direct sunlight. Avoid extreme heat or cold. Place in a location that is not accessible to children and animals and that is not near food, feed, or water. Keep pesticides under lock and key when not in use. Store herbicides separately from insecticides and fungicides to prevent possible interaction. Check the product label for specific storage instructions.

Always triple rinse pesticide containers immediately after emptying. Pour the container rinsate into the tank solution to be applied to the crop. After a triple rinse, crush or puncture the rinsed containers to prevent any misuse. Dispose of

the triple-rinsed containers in a licensed sanitary landfill or recycle through a scrap metal dealer. Consult the telephone directory for scrap metal dealers and contact your nearest county Cooperative Extension office for the nearest landfills. Finally, read the pesticide product label for any important information on disposal procedures.

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### ***Herbicide Formulations***

- DF** — *Dry Flowable Granule*
  - DS** — *Dry Soluble Granule*
  - EC** — *Emulsifiable Concentrate*
  - F** — *Flowable*
  - G** — *Granule*
  - L** — *Liquid*
  - WDG** — *Wettable Dispersible Granule*
  - WP** — *Wettable Powder*
  - WSP** — *Wettable Soluble Powder*
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# TABLE 1 — CHEMICALS FOR WEED CONTROL IN FIELD CROPS

## IMPORTANT: READ THE FOLLOWING BEFORE USING

Rates are expressed in pounds of active ingredient (a.i.) per acre for the area actually sprayed; rates in formulation column are given as pounds or liquid measure of product unless otherwise noted.

(NOTE: Commercial rates are expressed in pt or qt or gal or lb).

Apply all agricultural chemicals in accordance with regulations and labels as to rates, timing and crops for which they may be used.

Rates recommended in this bulletin are for medium textured soils with 3% or greater organic matter.

Many herbicides may also be applied as granules or impregnated on dry fertilizer. With these application methods, uniform application of the herbicide is necessary for acceptable weed control.

*Ortho Paraquat*, *Gramoxone*, *Hoelon*, and *Bladex* are classified as Restricted Use Pesticides. To purchase and legally apply these herbicides, users must be certified in pesticide application.

## CORN

### PREPLANT — MINERAL SOIL

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Annual grasses</b> (except green foxtail, giant foxtail, fall panicum, witchgrass and crabgrass)	atrazine (commercial product)	2	2½ lb 80W OR 2 qt 4L OR 2½ lb 90% WDG	<ul style="list-style-type: none"> <li>Usually obtain season-long control.</li> <li>Do not plant small grain, small seed forages, sugar beets, field beans or vegetable crops the year following corn.</li> <li>Rates of 2½ to 3 lb/A may be necessary on soil high in organic matter (5 to 8%).</li> <li>Residues more likely to persist if soil conditions are cool and dry.</li> <li>Incorporation is not necessary.</li> </ul>
<b>Annual broadleaves</b> <b>Annual grasses</b> (including green foxtail, giant foxtail, fall panicum, witchgrass, crabgrass and sandbur)	atrazine (commercial product)	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	<ul style="list-style-type: none"> <li>DO NOT USE ON CORN SEED STOCKS (Breeders, Foundation, or Increase).</li> <li>Must be incorporated or mixed into top 2 to 3 in. of soil immediately after application;</li> <li>Usually obtain season-long control.</li> </ul>
<b>Nutsedge</b>	+ butylate ( <i>Sutan Plus</i> or <i>Genate Plus</i> )	+ 4	+ 4¾ pt	<ul style="list-style-type: none"> <li><i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes, pg. 11.)</li> <li>A commercial prepackaged mix of <i>Sutan Plus</i> and atrazine (<i>Sutazine</i>) is available.</li> <li>Increase <i>Sutan Plus</i> rate to 6 pt/A for more effective nutsedge control.</li> </ul>
<b>Annual broadleaves</b> <b>Annual grasses</b> (including green foxtail, giant foxtail, fall panicum, witchgrass, and crabgrass)	atrazine (commercial product)	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	<ul style="list-style-type: none"> <li><i>Eradicane Extra</i> is also available and should be used at the rate of 5 pt/A.</li> <li>Incorporate to a depth of 4 to 5 in. immediately after application with a disk in both directions.</li> <li>Increase <i>Eradicane</i> rate to 6 pt/A for more effective nutsedge control.</li> </ul>
<b>Nutsedge</b>	+ EPTC with protectant ( <i>Eradicane</i> )	+ 4	+ 4¾ pt	<ul style="list-style-type: none"> <li><i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes, pg. 11.)</li> <li>Do not apply <i>Eradicane</i> to fields that were treated with a thiocarbamate herbicide the previous year.</li> </ul>

(Continued next page)

## CORN — PREPLANT — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.l.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual broadleaves</b> <b>Annual grasses</b> (including green fox- tail, giant foxtail, fall panicum, witchgrass and crabgrass)	atrazine (commercial product)	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	<ul style="list-style-type: none"> <li>● Gives better nutsedge control if incorporated 2 to 3 in.</li> <li>● Will be more effective preplant, especially on nutsedge, in areas where soils tend to be dry.</li> <li>● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes, pg. 11.)</li> <li>● Incorporated <i>Dual</i> rate of one quart may only give fair control of some annual grasses (especially fall panicum) and nutsedge.</li> <li>● A commercial prepackaged mix of <i>Dual</i> plus atrazine (BICEP) is available.</li> </ul>
	+ metolachlor ( <i>Dual</i> )	+	+	
<b>Nutsedge</b>		2	1 qt	
	atrazine (commercial product)	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	<ul style="list-style-type: none"> <li>● For fair to good control of nutsedge, increase rate of <i>Lasso</i> to 3 qt/A.</li> <li>● Will be more effective preplant, especially on nutsedge, in areas where soils tend to be dry.</li> <li>● 2½ qt/A of <i>Lasso</i> should be used for effective fall panicum control.</li> <li>● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks on three-way tank mixes, pg. 11.)</li> <li>● A commercial prepackaged mix of <i>Lasso</i> plus atrazine is available.</li> </ul>
	+ alachlor ( <i>Lasso</i> )	+	+	
		2½	2½ qt	
	cyanazine ( <i>Bladex</i> )	1¾	2½ lb 80W OR 1¾ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> <li>● DO NOT USE ON CORN SEED STOCKS (Breeders, Foundation, or Increase).</li> <li>● Must be incorporated or mixed into top 2 to 3 in. of soil immediately after application.</li> <li>● No residue carryover.</li> <li>● Can be used where residue problems have existed with atrazine.</li> <li>● Increase <i>Sutan Plus</i> or <i>Genate Plus</i> rate to 6 pt for more effective nutsedge control.</li> <li>● Both materials weak on pigweed.</li> </ul>
	+ butylate ( <i>Sutan Plus</i> or <i>Genate Plus</i> )	+	+	
		4	4¾ pt	
	cyanazine ( <i>Bladex</i> )	1¾	2½ lb 80W OR 1¾ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> <li>● No residue carryover.</li> <li>● Can be used where residue problems have existed with atrazine.</li> </ul>
	+ alachlor ( <i>Lasso</i> )	+	+	
		2½	2½ qt	
	cyanazine ( <i>Bladex</i> )	1¾	2½ lb 80W OR 1¾ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> <li>● No residue carryover.</li> <li>● Can be used where residue problems have existed with atrazine.</li> </ul>
	+ metolachlor ( <i>Dual</i> )	+	+	
		2	1 qt	

*(Continued next page)*

## CORN — PREPLANT — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual broadleaves Annual grasses</b> (including green fox- tail, giant foxtail, fall panicum, witchgrass and crabgrass) <b>Nutsedge</b>	atrazine (commercial product)	½	⅝ lb 80W OR ½ qt 4L OR ⅜ lb 90% WDG	<ul style="list-style-type: none"> <li>● NOTE SPECIFIC REMARKS ABOVE FOR <i>SUTAN PLUS</i>, <i>ERADICANE</i>, <i>DUAL</i> AND <i>LISSO</i>.</li> <li>● Can be used to reduce possibility of atrazine carryover.</li> <li>● The preferred treatment where fall panicum is a problem.</li> <li>● May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem.</li> <li>● <i>Eradicane Extra</i> is also available and should be used at the rate of 5 pt/A.</li> <li>● Do not apply <i>Eradicane</i> to fields that were treated with a thiocarbamate herbicide the previous year.</li> </ul>
	+	+	+	
	cyanazine ( <i>Bladex</i> )	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% DF	
	+	+	+	
	butylate ( <i>Sutan Plus</i> or <i>Genate Plus</i> )	4	4¾ pt	
	OR	OR	OR	
	EPTC with protectant ( <i>Eradicane</i> )	4	4¾ pt	
	OR	OR	OR	
	metolachlor ( <i>Dual</i> )	2	1 qt	
	OR	OR	OR	
alachlor ( <i>Lasso</i> )	2½	2½ qt		

## PREEMERGENCE — MINERAL SOIL

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves Annual grasses</b> (including fall panicum, green foxtail, giant fox- tail, witchgrass and crabgrass)	atrazine (commercial product)	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	<ul style="list-style-type: none"> <li>● 2½ qt/A of <i>Lasso</i> should be used for more effective fall panicum control.</li> <li>● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes, pg. 12.)</li> </ul>
	+	+	+	
	alachlor ( <i>Lasso</i> )	2	2 qt	
	atrazine (commercial product)	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	
	+	+	+	
	metolachlor ( <i>Dual</i> )	2	1 qt	
	atrazine (commercial product)	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	
	+	+	+	
	pendimethalin ( <i>Prowl</i> )	1½	1½ qt	
	+	+	+	

*(Continued next page)*

## CORN — PREEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual broadleaves Annual grasses</b> (including fall panicum, green foxtail, giant fox- tail, witchgrass and crabgrass)	cyanazine ( <i>Bladex</i> )	1¾	1.9 lb 80W OR 1½ qt 4L OR 1.7 lb 90% DF	<ul style="list-style-type: none"> <li>● No residue carryover.</li> <li>● Can be used where residue problems have existed with atrazine.</li> </ul>
	+ alachlor ( <i>Lasso</i> )	+ 2	+ 2 qt	
	cyanazine ( <i>Bladex</i> )	1¾	1.9 lb 80W OR 1½ qt 4L OR 1.7 lb 90% DF	<ul style="list-style-type: none"> <li>● No residue carryover.</li> <li>● Can be used where residue problems have existed with atrazine.</li> </ul>
	+ metolachlor ( <i>Dual</i> )	+ 2	+ 1 qt	
	cyanazine ( <i>Bladex</i> )	1¾	1.9 lb 80W OR 1½ qt 4L OR 1.7 lb 90% DF	<ul style="list-style-type: none"> <li>● Do not use on sandy soils with less than 1.5% organic matter.</li> <li>● Both materials weak on pigweed.</li> <li>● Do not use for no-till corn.</li> </ul>
	+ pendimethalin ( <i>Prowl</i> )	+ 1½	+ 1½ qt	
	atrazine (commercial product)	½	⅝ lb 80W OR ½ qt 4L OR ⅔ lb 90% WDG	<ul style="list-style-type: none"> <li>● Can be used to reduce possibility of atrazine carryover.</li> <li>● See specific remarks for <i>Lasso</i>, <i>Dual</i> and <i>Prowl</i> in combination with atrazine.</li> <li>● The preferred treatment where fall panicum is a problem.</li> <li>● May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem.</li> </ul>
	+ cyanazine ( <i>Bladex</i> )	+ 1	+ 1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% DF	
	+ alachlor ( <i>Lasso</i> )	+ 2	+ 2 qt	
	OR pendimethalin ( <i>Prowl</i> )	OR 1½	OR 1½ qt	
	OR metolachlor ( <i>Dual</i> )	OR 2	OR 1 qt	
	atrazine (commercial product)	2	2½ lb 80W OR 2 qt 4L OR 2½ lb 90% WDG	
<b>Annual broadleaves Annual grasses</b> (except green foxtail, giant foxtail, fall pani- cum, witchgrass and crabgrass)				<ul style="list-style-type: none"> <li>● Usually obtain season-long control.</li> <li>● Do not plant small grain, small seeded forages, sugar beets, field beans or vegetable crops the year following this treatment.</li> <li>● Rates of 2½ to 3 lb/A may be necessary on soils high in organic matter (5 to 8%).</li> <li>● Residues more likely to persist if soil conditions are cool and dry.</li> </ul>

## CORN — PREEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual grasses</b> (including fall panicum, green foxtail, giant fox- tail, witchgrass and crabgrass) <b>Pigweed</b>	alachlor ( <i>Lasso</i> )	2	2 qt	<ul style="list-style-type: none"> <li>● 2½ qt of <i>Lasso</i> should be used for more effective fall panicum control.</li> <li>● Follow with 2,4-D amine or <i>Banvel</i> postemergence for control of annual broadleaved weeds if needed.</li> <li>● Application may be made preplant.</li> <li>● (See remarks under "Nutsedge control.")</li> <li>● See 2,4-D amine and <i>Banvel</i> remarks under Post-emergence — Mineral Soils section.</li> </ul>
	metolachlor ( <i>Dual</i> )	2	1 qt	<ul style="list-style-type: none"> <li>● 2½ pt of <i>Dual</i> should be used for more effective fall panicum control.</li> <li>● Follow with 2,4-D amine or <i>Banvel</i> postemergence for control of annual broadleaved weeds if needed.</li> <li>● Application may be made preplant.</li> <li>● (See remarks under "Nutsedge control.")</li> <li>● See 2,4-D amine and <i>Banvel</i> remarks under Post-emergence — Mineral Soils section.</li> </ul>

## POSTEMERGENCE — MINERAL SOILS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> (except smartweed and wild buckwheat)	2,4-D amine	½	1 pt	<ul style="list-style-type: none"> <li>● For corn over 6 to 8 in. use drop nozzles.</li> <li>● Ester formulations will cause more crop injury and are not recommended.</li> <li>● Oil soluble amines of 2,4-D (<i>Dacamine</i>, <i>Weedar E-3</i>) are available and are used at lower rates.</li> <li>● Drift control additives can be used with some 2,4-D amine products to reduce danger of drift. Check the product label.</li> <li>● Not effective on smartweed or wild buckwheat.</li> <li>● Hybrids vary in tolerance.</li> <li>● Most effective when weeds are small (2 to 4 in.).</li> </ul>
<b>Annual broadleaves</b> (including velvetleaf, jimsonweed, smart- weed, wild buckwheat, Canada thistle)	dicamba ( <i>Banvel</i> )	½	1 pt	<ul style="list-style-type: none"> <li>● USE FOR CORN 5 IN. TALL, OR LESS. FOR CORN OVER 5 IN., REDUCE RATE TO ½ PT/A.</li> <li>● USE EXTREME CAUTION. DRIFT TO NEARBY SENSITIVE CROPS IS A HAZARD.</li> <li>● A less volatile form of <i>Banvel</i> (<i>Banvel II</i>) is available and should be used if drift to sensitive crops is possible. <i>Banvel II</i> is one-half the concentration of <i>Banvel</i>. Use twice the amount of <i>Banvel II</i> for equivalent rates.</li> <li>● For corn over 6 to 8 in. use drop nozzles.</li> <li>● Use pressure less than 20 psi.</li> <li>● Do not apply if soybeans in the vicinity are over 10 in. tall or have begun to bloom.</li> <li>● Drift control agents may be used to reduce drift danger.</li> <li>● Volatility drift is increased at temperatures above 85° F.</li> <li>● Lower rates should be used on coarser soils or soils low in organic matter.</li> </ul>

## CORN — POSTEMERGENCE — MINERAL SOILS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b>	dicamba ( <i>Banvel</i> )	1/2	1 pt	<ul style="list-style-type: none"> <li>● Treatment must follow a preplant-incorporated or preemergence herbicide application for grass control.</li> <li>● Apply after corn emergence but before the plants exceed the 5-leaf stage.</li> <li>● Do not use with crop oil concentrate or other additives.</li> <li>● See additional remarks and limitations for dicamba (<i>Banvel</i>).</li> <li>● A commercial prepackaged mix of dicamba and atrazine (<i>Marksman</i>) is available.</li> </ul>
	+	+	+	
	atrazine	1	1 1/4 lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	
	+	+	+	
	bentazon ( <i>Basagran</i> )	1	1 qt	<ul style="list-style-type: none"> <li>● Use a minimum of 40 psi and 20 gal/A of water.</li> <li>● Weak on pigweed, nightshade, and lambsquarters.</li> <li>● Controls specific broadleaves. See label.</li> <li>● Corn is tolerant to <i>Basagran</i> at all growth stages. However, best results are obtained with early applications to small weeds.</li> </ul>
+	+	+		
crop oil concentrate	1 qt	1 qt		
	bentazon ( <i>Basagran</i> )	3/4	3/4 qt	<ul style="list-style-type: none"> <li>● Gives better control of some broadleaf weeds, especially pigweed, than <i>Basagran</i> alone.</li> <li>● Combination reduces carryover from postemergence application of atrazine.</li> <li>● Corn injury is possible during stress conditions (cold, wet, cloudy weather) or if the corn is succulent from recent rainfall.</li> </ul>
+	+	+		
atrazine (commercial product)	3/4	0.9 lb 80W OR 3/4 qt 4L OR 0.8 lb 90% WDG		
+	+	+		
crop oil concentrate	1 qt	1 qt		
	bromoxynil ( <i>Buctril</i> ) OR ( <i>ME-4 Brominal</i> )	3/8	1 1/2 pt	<ul style="list-style-type: none"> <li>● Apply to weeds less than 4 in. tall for effective control.</li> <li>● Do not mix with spray additives or liquid fertilizers.</li> <li>● For ground applications, use minimum of 20 gal water/A and 30 psi.</li> <li>● Apply to corn between the 2- and 8-leaf stage, but before the plants exceed 14 in.</li> <li>● Redroot pigweed and mustard must be controlled when very small (refer to label for details).</li> </ul>
OR	OR	OR		
3/8	3/4 pt			
<b>Annual broadleaves</b> <b>Annual grasses</b> (except green foxtail, giant foxtail, fall panicum, witchgrass and crabgrass)	atrazine (commercial product)	2	2 1/2 lb 80W OR 2 qt 4L OR 2 1/2 lb 90% WDG	<ul style="list-style-type: none"> <li>● Emergency use.</li> <li>● Grasses must be less than 1 1/2 in. tall.</li> <li>● Timing of application is critical to get best results.</li> <li>● Surfactants at 1 pt/A may be used in place of crop oil concentrate but are somewhat less effective.</li> <li>● Greater chance for residue since treatment is later in season.</li> <li>● Do not add <i>Banvel</i> or 2,4-D as injury may occur.</li> <li>● Corn injury is possible during stress conditions (cold, wet, cloudy weather) or if the corn is succulent from recent rainfall.</li> </ul>
+	+	+		
	crop oil concentrate	1 qt	1 qt	



## CORN — POSTEMERGENCE — MINERAL SOILS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses (except fall panicum and witchgrass)	tridiphane ( <i>Tandem</i> )	1/2	1 pt	<ul style="list-style-type: none"> <li>● Apply when grass weeds are in the 1 to 3-leaf stage.</li> <li>● Timing is critical for adequate results.</li> <li>● Cultivation 7 to 14 days after treatment may improve results.</li> <li>● Treatment will not provide consistent control of fall panicum, or witchgrass.</li> <li>● May be applied to no-till corn.</li> </ul>
	+	+	+	
	atrazine (commercial product)	1 1/2	1.9 lb 80W OR 1 1/2 qt 4L OR 1.7 lb 90% WDG	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
Annual broadleaves Annual grasses (except fall panicum and witchgrass)	tridiphane ( <i>Tandem</i> )	1/2	1 pt	<ul style="list-style-type: none"> <li>● Apply when grass weeds are in the 1 to 3-leaf stage.</li> <li>● Timing is critical for adequate results.</li> <li>● Cultivation 7 to 14 days after treatment may improve results.</li> <li>● Treatment will not provide consistent control of fall panicum, or witchgrass.</li> <li>● May be applied to no-till corn.</li> <li>● Use 80W or 90% DF formulations of <i>Bladex</i> only.</li> <li>● Do not use with crop oil concentrate or other additives or severe crop injury may occur.</li> </ul>
	+	+	+	
	cyanazine ( <i>Bladex</i> )	1.6	2 lb 80W OR 1.8 lb 90% DF	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
Annual broadleaves Annual grasses (except fall panicum and witchgrass)	tridiphane ( <i>Tandem</i> )	1/2	1 pt	<ul style="list-style-type: none"> <li>● Apply when grass weeds are in the 1 to 3-leaf stage.</li> <li>● Timing is critical for adequate results.</li> <li>● Cultivation 7 to 14 days after treatment may improve results.</li> <li>● Treatment will not provide consistent control of fall panicum, or witchgrass.</li> <li>● May be applied to no-till corn.</li> <li>● Use 80W or 90% DF formulations of <i>Bladex</i> and atrazine only.</li> <li>● Do not use with crop oil concentrate or other additives or severe crop injury may occur.</li> </ul>
	+	+	+	
	atrazine (commercial product)	3/4	0.9 lb 80W OR 0.8 lb 90% WDG	
	+	+	+	
	cyanazine ( <i>Bladex</i> )	0.8	1 lb 80W OR 0.9 lb 90% DF	
Annual broadleaves Annual grasses (except fall panicum and witchgrass)	cyanazine ( <i>Bladex</i> )	2	2 1/2 lb 80W OR 2.2 lb 90% DF	<ul style="list-style-type: none"> <li>● USE WETTABLE POWDER OR DRY FLOWABLE ONLY.</li> <li>● Apply before weeds are 1 1/2 in. tall.</li> <li>● Apply before corn is 4 in. tall.</li> <li>● Some temporary setback or stunting of corn may occur, especially in sandy soil.</li> <li>● Do not use with crop oils, additives, or liquid herbicides as severe crop injury may occur.</li> </ul>
	atrazine (commercial product)	1 1/2	1.9 lb 80W OR 1 1/2 qt 4L OR 1.7 lb 90% WDG	
Annual broadleaves Annual grasses (except fall panicum and witchgrass)	ametryne ( <i>Evik</i> )	1 3/8	2 lb	<ul style="list-style-type: none"> <li>● CAUTION — KEEP OFF CORN FOLIAGE.</li> <li>● Do not use before corn is 12 in. tall.</li> <li>● Emergency use.</li> <li>● Use drop nozzles or directed spray.</li> <li>● See label for maximum weed size. Selectivity is based on tall corn and small weeds.</li> </ul>
	surfactant	1/2%	1/2%	

(Continued next page)

## CORN — POSTEMERGENCE — MINERAL SOILS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
(continued) Annual broadleaves Annual grasses	linuron (Lorox or Linex)	1	2 lb 50W OR 2 pt 4L OR 2 lb 50% DF	<ul style="list-style-type: none"> <li>● CAUTION—KEEP OFF CORN FOLIAGE.</li> <li>● Do not use before corn is 15 in. tall.</li> <li>● Emergency use.</li> <li>● Use directed spray.</li> <li>● Use lower rate on lighter soils low in organic matter or clay.</li> <li>● For control of small weeds not over 2 in. tall. Selectivity is based on tall corn and small weeds.</li> </ul>
	+ surfactant	+ 1/2%	+ 1/2%	

## PREEMERGENCE — ORGANIC SOILS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses	propachlor (Ramrod)	5	8 lb (65% WP)	<ul style="list-style-type: none"> <li>● Must follow with a postemergence treatment for control of broadleaved weeds.</li> </ul>

## POSTEMERGENCE — ORGANIC SOILS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (except smartweed and wild buckwheat)	2,4-D amine	1/2	1 pt	<ul style="list-style-type: none"> <li>● For corn over 6 to 8 in., use drop nozzles.</li> <li>● Ester formulations will cause more crop injury and are not recommended.</li> <li>● Oil soluble amines of 2,4-D (<i>Dacamine</i>, <i>Weedar E-3</i>) are available and are used at lower rates.</li> <li>● Drift control additives can be used with some 2,4-D amine products to reduce danger of drift. Check the product label.</li> <li>● Not effective on smartweed or wild buckwheat.</li> <li>● Hybrids vary in tolerance.</li> </ul>
Annual broadleaves (including velvetleaf, jimsonweed, smart- weed, wild buckwheat, Canada thistle)	dicamba ( <i>Banvel</i> )	1/2 lb	1 pt	<ul style="list-style-type: none"> <li>● USE FOR CORN 5 IN. OR LESS TALL. FOR CORN OVER 5 IN., REDUCE RATE TO 1/2 PT/A.</li> <li>● USE EXTREME CAUTION.</li> <li>● DRIFT TO NEARBY SENSITIVE CROPS IS A HAZARD.</li> <li>● A less volatile form of <i>Banvel</i> (<i>Banvel II</i>) is available and should be used if drift to sensitive crops is possible. <i>Banvel II</i> is one-half the concentration of <i>Banvel</i>. Use twice the amount of <i>Banvel II</i> as <i>Banvel</i> for equivalent rates.</li> <li>● For corn over 6 to 8 in., use drop nozzles.</li> <li>● Use pressure less than 20 psi.</li> <li>● Do not apply if soybeans in the vicinity are over 10 in. tall or have begun to bloom.</li> <li>● Drift control agents may be used to reduce drift danger.</li> <li>● Volatility drift is increased at temperatures above 85° F.</li> <li>● Lower rates should be used on coarser soils or soils low in organic matter.</li> </ul>

## CORN — POSTEMERGENCE — ORGANIC SOILS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> (including velvetleaf, cocklebur, and jimsonweed)	bentazon ( <i>Basagran</i> )	1	1 qt	<ul style="list-style-type: none"> <li>● Use a minimum of 40 psi and 20 gal/A of water.</li> <li>● Weak on pigweed, nightshade, and lambsquarters.</li> <li>● Controls specific broadleaves. See label.</li> <li>● Corn is tolerant of <i>Basagran</i> at all growth stages. However, best results are obtained with early applications to small weeds.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
<b>Annual broadleaves</b>	bentazon ( <i>Basagran</i> )	¾	¾ qt	<ul style="list-style-type: none"> <li>● Gives better control of some broadleaf weeds, especially pigweed, than <i>Basagran</i> alone.</li> <li>● Combination reduces carryover from postemergence application of atrazine.</li> <li>● Corn injury is possible during stress conditions (cold, wet, cloudy weather) or if corn is succulent from recent rainfall.</li> </ul>
	+	+	+	
	atrazine (commercial product)	¾	0.9 lb 80W OR ¾ qt 4L OR 0.8 lb 90% WDG	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	bromoxynil ( <i>Buctril</i> )	¾	1½ pt	<ul style="list-style-type: none"> <li>● Apply to weeds less than 4 in. tall for effective control.</li> <li>● Do not mix with spray additives or liquid fertilizers.</li> <li>● For ground application, use minimum of 20 gal water/A and 30 psi.</li> <li>● Apply to corn between the 2- to 8-leaf stage, but before the plants exceed 14 in.</li> <li>● Redroot pigweed and mustard must be controlled when very small (refer to label for details).</li> </ul>
	OR	OR	OR	
	( <i>ME-4 Brominal</i> )	¾	¾ pt	
<b>Annual broadleaves</b> <b>Annual grasses</b> (except fall panicum, green foxtail, giant fox- tail, witchgrass and crabgrass)	atrazine (commercial product)	3	3¾ lb 80W OR 3 qt 4L OR 3½ lb 90% WDG	<ul style="list-style-type: none"> <li>● Emergency use.</li> <li>● Grasses should be less than 1½ in. tall.</li> <li>● Timing of application is critical to get best results.</li> <li>● Surfactants at 1 pt/A may be used in place of crop oil concentrate but are somewhat less effective.</li> <li>● Greater chance for residue since treatment is later in season.</li> <li>● Corn injury is possible during stress conditions (cold, wet, cloudy weather) or if the corn is succulent from recent rainfall.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
<b>Annual broadleaves</b> <b>Annual grass</b>	ametryne ( <i>Evik</i> )	1¾	2 lb	<ul style="list-style-type: none"> <li>● CAUTION — KEEP OFF CORN FOLIAGE.</li> <li>● Do not use before corn is 12 in. tall.</li> <li>● Emergency use.</li> <li>● Use drop nozzles or directed spray.</li> <li>● See label for maximum weed size. Selectivity is based on tall corn and small weeds.</li> </ul>
	+	+	+	
	surfactant	½%	½%	

(Continued next page)

## CORN — POSTEMERGENCE — ORGANIC SOILS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
(continued) Annual broadleaves Annual grass	linuron (Lorox or Linex)  + surfactant	1½  + ½%	3 lb 50W OR 3 pt 4L + 3 lb 50% DF + ½%	<ul style="list-style-type: none"> <li>● CAUTION — KEEP OFF CORN FOLIAGE.</li> <li>● Do not use before corn is 15 in. tall.</li> <li>● Emergency use.</li> <li>● Use directed spray.</li> <li>● Use lower rates on lighter soils or soils low in organic matter.</li> <li>● For control of small weeds not over 2 in. tall. Selectivity is based on tall corn and small weeds.</li> </ul>

## CORN — SPECIAL WEED PROBLEMS — QUACKGRASS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Quackgrass	atrazine (commercial product)	4	5 lb 80W OR 4 qt 4L OR 4 ⅔ lb 90% WDG	<ul style="list-style-type: none"> <li>● When stand of quackgrass is heavy, apply in fall. Otherwise apply in spring before plowing when quackgrass is 4 to 8 in. tall.</li> <li>● Wait at least 10 days to plow.</li> <li>● Split application; apply 2 lb/A preplow and 2 lb/A pre-emergence to give control of annual weeds also.</li> <li>● When a total of 4 lb of atrazine is used, carryover may persist 2 to 3 years.</li> </ul>
	atrazine (commercial product)	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	<ul style="list-style-type: none"> <li>● Incorporate to a depth of 4 to 5 in. immediately after application with a disk, 2 times in opposite directions.</li> <li>● Quackgrass control with minimum soil residue or carryover.</li> <li>● Will also give nutsedge control.</li> </ul>
	+ EPTC with protectant (Eradicane)	+ 6	+ 3½ qt	<ul style="list-style-type: none"> <li>● <i>Eradicane Extra</i> is also available and should be used at the rate of 4 qt/A.</li> <li>● Do not apply <i>Eradicane</i> to fields that were treated with a thiocarbamate herbicide the previous year.</li> </ul>
	atrazine (commercial product)	2	2½ lb 80W OR 2 qt 4L OR 2 ½ lb 90% WDG	<ul style="list-style-type: none"> <li>● Postemergence. Apply when quackgrass is 2 to 4 in. tall.</li> <li>● A second application may be needed 2 to 3 weeks later for more complete control.</li> <li>● Increase rate to 3 lb/A active ingredient for heavy infestations.</li> </ul>
	+ crop oil concentrate	+ 1 qt	+ 1 qt	<ul style="list-style-type: none"> <li>● When a total of 4 lb of atrazine is used, carryover may persist 2 to 3 years.</li> <li>● Corn injury is possible during stress conditions (cold, wet, cloudy weather) or if the corn is succulent from recent rainfall.</li> </ul>
	glyphosate (Roundup)	1½	2 qt	<ul style="list-style-type: none"> <li>● Before planting in the spring or as a fall treatment.</li> <li>● Apply to actively growing quackgrass at least 8 in. tall.</li> <li>● Use 15 to 20 gal water/A.</li> <li>● No soil residue.</li> <li>● Can plow or till 3 days after application and plant crop.</li> <li>● Do not plow or till prior to treatment.</li> <li>● <i>Roundup</i> rate of 1 qt may be used for <i>single season</i> quackgrass control. Apply 1 qt in 5 to 10 gal water per acre with 0.5% nonionic surfactant. This treatment is less effective on an undisturbed quackgrass sod.</li> </ul>

## CORN — SPECIAL WEED PROBLEMS — NUTSEDGE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Nutsedge</b>	butylate ( <i>Sutan Plus</i> or <i>Genate Plus</i> )	5	3 qt	<ul style="list-style-type: none"> <li>● Preplant incorporated to a depth of 2 to 3 in.</li> <li>● Control of annual grasses.</li> <li>● Combine or follow with another herbicide (see Preplant — Mineral Soil and Postemergence — Mineral Soil sections) for additional broadleaf weed control.</li> </ul>
	EPTC ( <i>Eradicane</i> )	5	3 qt	<ul style="list-style-type: none"> <li>● Preplant incorporated to a depth of 2 to 3 in.</li> <li>● Control of annual grasses.</li> <li>● Combine or follow with another herbicide (see Preplant — Mineral Soil and Postemergence — Mineral Soil sections) for additional broadleaf control.</li> <li>● <i>Eradicane Extra</i> is also available and should be applied at the rate of 3½ qt/A.</li> <li>● Do not apply <i>Eradicane</i> to fields that were treated with a thiocarbamate herbicide the previous year.</li> </ul>
	alachlor ( <i>Lasso</i> )	3	3 qt	<ul style="list-style-type: none"> <li>● Preplant incorporated to a depth of 2 to 3 in. for consistent nutsedge control.</li> <li>● Control of annual grasses.</li> <li>● Combine or follow with another herbicide (see Preplant — Mineral Soil and Postemergence — Mineral Soil sections) for additional broadleaf weed control.</li> </ul>
	metolachlor ( <i>Dual</i> )	2½	1¼ qt	<ul style="list-style-type: none"> <li>● Preplant incorporated to a depth of 2 to 3 in. for consistent nutsedge control.</li> <li>● Control of annual grasses.</li> <li>● Follow with 2,4-D amine or <i>Barvel</i> (see Postemergence — Mineral Soil section) for additional broadleaf weed control.</li> </ul>
	bentazon ( <i>Basagran</i> ) + crop oil concentrate	¾ + ¾ + 1 qt + 1 qt	1½ pt + 1½ pt + 1 qt + 1 qt	<ul style="list-style-type: none"> <li>● Postemergence application.</li> <li>● Two applications required for best nutsedge control.</li> <li>● Controls some broadleaves also. Check label.</li> <li>● Treat when nutsedge is 4 to 6 in. tall and again 10-14 days later.</li> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> </ul>
	atrazine (commercial product) + crop oil concentrate	2 + 2 + 1 qt + 1 qt	2½ lb 80W OR 2 qt 4L OR 2½ lb 90% WDG + 1 qt	<ul style="list-style-type: none"> <li>● Apply 2 lb of atrazine/A when nutsedge is 2 in. tall, and apply 2 lb/A atrazine 10-14 days later. On muck soils, apply 2 lb of atrazine/A when the nutsedge is 2 in. tall, then apply 1 lb of atrazine/A 1 week and 2 weeks following the initial treatment.</li> <li>● Surfactants may be used in place of crop oil concentrate but are somewhat less effective.</li> <li>● Corn injury is possible during stress conditions (cold, wet, cloudy weather) or if the corn is succulent from recent rainfall.</li> <li>● High atrazine carryover potential on mineral soils.</li> </ul>

## CORN — SPECIAL WEED PROBLEMS — CANADA THISTLE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Canada thistle	bentazon ( <i>Basagran</i> )	1 + 1	1 qt + 1 qt	<ul style="list-style-type: none"> <li>● TWO APPLICATIONS REQUIRED FOR BEST CANADA THISTLE CONTROL.</li> <li>● Controls many broadleaved annuals also.</li> <li>● Treat when Canada thistle is 6 to 8 in. and again 10 to 14 days later.</li> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt	
Canada thistle	atrazine (commercial product)	2 + 2	2½ lb 80W OR 2 qt 4L OR 2½ lb 90% WDG	<ul style="list-style-type: none"> <li>● Apply 2 lb. of atrazine/A when Canada thistle is 6 to 8 in. tall, and again 10 to 14 days later.</li> <li>● Surfactants may be used in place of crop oil concentrate but are somewhat less effective.</li> <li>● Corn injury is possible during stress conditions (cold, wet, cloudy weather) or if the corn is succulent from recent rainfall.</li> <li>● High atrazine carryover potential.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt + 1 qt	1 qt	
Canada thistle	dicamba ( <i>Banvel</i> )	¼ + ¼	½ pt + ½ pt	<ul style="list-style-type: none"> <li>● Treat when Canada thistle is 6 to 8 in. tall and again 10 to 14 days later.</li> <li>● Application rate of the first treatment may be increased to ½ lb/A (1 pt/A) if the corn is 5 in. or less in height.</li> <li>● For corn over 6 to 8 in., use drop nozzles.</li> <li>● See additional remarks and limitations for dicamba (pg. 16).</li> </ul>

## HEMP DOGBANE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Hemp dogbane	dicamba ( <i>Banvel</i> )	¼	½ pt	<ul style="list-style-type: none"> <li>● <i>Preharvest</i> treatment. Apply after corn has reached the brown silk stage (R4) and all soybeans in the vicinity are <i>fully podded</i> with leaves turning yellow (R7).</li> <li>● Do not apply before September 1.</li> <li>● USE EXTREME CAUTION. DRIFT TO NEARBY CROPS IS A HAZARD.</li> <li>● Do not harvest for 7 days after application.</li> <li>● Do not graze or feed fodder from treated areas for 35 days after application.</li> <li>● This treatment is most effective when hemp dogbane is green and the underground rhizomes have swollen pink buds.</li> <li>● May require two years for complete control.</li> <li>● Treatment may be made by ground or aerial application.</li> </ul>
	+	+	+	
	2,4-D ester	1	1 qt	

## NO-TILL CORN — ALFALFA SOD

*(Predominantly alfalfa with broadleaf weeds and some grasses such as timothy, brome grass and annual weeds)*

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Alfalfa sod</b> <b>Annual broadleaves</b> <b>Annual grasses</b> (except green foxtail, giant foxtail, fall panicum, witchgrass, crabgrass and sandbur)	2,4-D ester	1¼	1¼ qt	<ul style="list-style-type: none"> <li>● Apply 2,4-D 7 to 10 days before planting.</li> <li>● Alfalfa should be at least 4 in. tall at treatment time.</li> <li>● Apply atrazine and paraquat or <i>Roundup</i> at planting time.</li> <li>● Use ½ pt X-77 or similar non-ionic surfactant/100 gal of spray when using paraquat. Double surfactant rate when using liquid N or liquid fertilizer.</li> <li>● Use 20 to 60 gal spray/A with paraquat and 20 to 30 gal spray/A with <i>Roundup</i>.</li> <li>● Paraquat provides quicker burndown. <i>Roundup</i> may provide better control if sod growth is dense.</li> <li>● Postemergence <i>Banvel</i> or 2,4-D (see sections above) may be needed to control alfalfa escapes.</li> <li>● Do not use paraquat with suspension or high phosphate carriers.</li> <li>● Follow mixing directions for paraquat or <i>Roundup</i>.</li> <li>● In a mixed alfalfa-quackgrass sod, an additional 2 lb/A of atrazine may be applied at planting time, or with 1 qt/A of crop oil concentrate with the 2,4-D ester or later as a postemergence treatment.</li> <li>● Quackgrass is usually not at the proper stage of growth (8 in. tall) for maximum effectiveness from <i>Roundup</i> treatment at corn planting. (See "Quackgrass" section for notes on <i>Roundup</i> use.)</li> <li>● <i>Lasso</i> or <i>Dual</i> may be included if annual grasses are expected to be a serious problem.</li> </ul>
	FOLLOWED BY: atrazine (commercial product)	2	2½ lb 80W OR 2 qt 4L OR 2½ lb 90% WDG	
	+	+	+	
	paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> ) OR glyphosate ( <i>Roundup</i> )	½	1 qt	
		OR	OR	
		1⅙	1½ qt	

## NO-TILL — GRASS SOD

*(Predominant species bluegrass, timothy, orchardgrass, brome grass, or tall fescue. Not quackgrass)*

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Grass sod</b> <b>Annual broadleaves</b> <b>Annual grasses</b> (except green foxtail, giant foxtail, fall panicum, witchgrass, crabgrass, and sandbur)	atrazine (commercial product)	3	3¾ lb 80W OR 3 qt 4L OR 3½ lb 90% WDG	<ul style="list-style-type: none"> <li>● Apply at planting time.</li> <li>● Use ½ pt X-77 or similar non-ionic surfactant/100 gal of spray when using paraquat. Double surfactant rate when using liquid N or liquid fertilizer.</li> <li>● Use 20 to 60 gal spray/A with paraquat and 20 to 30 gal spray/A with <i>Roundup</i>.</li> <li>● Paraquat provides quicker burndown. <i>Roundup</i> may provide better control if sod growth is dense.</li> <li>● Do not use paraquat with suspension or high phosphate carriers.</li> <li>● Follow mixing directions for paraquat or <i>Roundup</i>.</li> <li>● <i>Lasso</i> or <i>Dual</i> may be included if annual grasses are expected to be a serious problem.</li> </ul>
	+	+	+	
	paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> ) OR glyphosate ( <i>Roundup</i> )	½	1 qt	
		OR	OR	
		1⅙	1½ qt	

## NO-TILL CORN — QUACKGRASS SOD

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations	
<b>Quackgrass</b> <b>Annual broadleaves</b> <b>Annual grasses</b> (except green foxtail, giant foxtail, fall pani- cum, witchgrass, crabgrass, and sandbur)	atrazine (commercial product)	2	2½ lb 80W OR 2 qt 4L OR 2½ lb 90% WDG	<ul style="list-style-type: none"> <li>● Apply atrazine plus crop oil when quackgrass has started growth in spring, 7 to 10 days before planting. Make second application at planting.</li> <li>● High rate of atrazine (4 lb ai/A) will provide some additional annual grass control.</li> <li>● Quackgrass is usually not at the proper stage of growth (8 in. tall) for maximum effectiveness from <i>Roundup</i> treatment at corn planting. (See "Quackgrass" section for notes on <i>Roundup</i> use.)</li> <li>● When 4 lb of atrazine are used, carryover may persist 2 to 3 years.</li> <li>● See notes above for paraquat or <i>Roundup</i> use.</li> <li>● 2,4-D ester (1 lb ai/A or 1 qt/A) may be added to initial application of atrazine plus crop oil concentrate for perennial broadleaf weed suppression.</li> <li>● <i>Lasso</i> or <i>Dual</i> may be included if annual grasses are expected to be a serious problem.</li> </ul>	
	+	+	+		
	crop oil concentrate	1 qt	1 qt		
	FOLLOWED BY				
	atrazine	2	2½ lb 80W OR 2 qt 4L OR 2½ lb 90% WDG		
	+	+	+		
	paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> )	½	1 qt		
	OR	OR	OR		
	glyphosate ( <i>Roundup</i> )	1⅞	1½ qt		
	<hr/>				
	atrazine (commercial product)	4	5 lb 80W OR 4 qt 4L OR 4½ lb 90% WDG	<ul style="list-style-type: none"> <li>● Apply at planting time.</li> <li>● Atrazine carryover may persist 2 to 3 years.</li> <li>● See notes above for paraquat and <i>Roundup</i> use.</li> <li>● <i>Lasso</i> or <i>Dual</i> may be included if annual grasses are expected to be a serious problem.</li> </ul>	
+	+	+			
paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> )	½	1 qt			
OR	OR	OR			
glyphosate ( <i>Roundup</i> )	1⅞	1½ qt			



# NO-TILL CORN — GRAIN STUBBLE or ROW CROP RESIDUE.

(With rye or wheat cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses	atrazine (commercial product)	1½	2 lb 80W OR 1½ qt 4L OR 1¾ lb 90% WDG	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Paraquat applied to rye before jointing (24 to 36 in. tall) may not provide complete rye control.</li> <li>● Use 3 qt <i>Lasso</i> for heavy grass (especially fall panicum or crabgrass) infestations.</li> <li>● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for four-way tank mixes, pg. 24).</li> <li>● See notes above for paraquat or <i>Roundup</i> use.</li> <li>● Follow paraquat or <i>Roundup</i> mixing directions.</li> <li>● Prepackaged mixes of atrazine + <i>Lasso</i> or <i>Roundup</i> + <i>Lasso</i> (<i>Bronco</i>) are available.</li> <li>● A prepackaged mix of atrazine + <i>Dual</i> (<i>Bicep</i>) is available.</li> <li>● Maximum <i>Dual</i> rate in tank mixes is 2½ pt on fine textured soils.</li> </ul>
	+ alachlor ( <i>Lasso</i> ) OR metolachlor ( <i>Dual</i> ) + paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> ) OR glyphosate ( <i>Roundup</i> )	+ 2½ OR 2 + ½ OR 1⅞	+ 2½ qt OR 1 qt + 1 qt OR 1½ qt	
	cyanazine ( <i>Bladex</i> )	2	2½ lb 80W OR 2 qt 4L OR 2.2 lb 90% DF	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Paraquat applied to rye before jointing (24 to 36 in. tall) may not provide complete control.</li> <li>● Use 3 qt <i>Lasso</i> for heavy grass (especially fall panicum or crabgrass) infestations.</li> <li>● No carryover.</li> <li>● See notes above for paraquat or <i>Roundup</i> use.</li> <li>● Follow paraquat or <i>Roundup</i> label mixing directions.</li> <li>● A prepackaged mix of <i>Lasso</i> + <i>Roundup</i> (<i>Bronco</i>) is available.</li> <li>● <i>Bladex</i> rate varies depending on surface residue and soil type (refer to <i>Bladex</i> label for details).</li> </ul>
	+ alachlor ( <i>Lasso</i> ) + paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> ) OR glyphosate ( <i>Roundup</i> )	+ 2½ + ½ OR 1⅞	+ 2½ qt + 1 qt OR 1½ qt	
	cyanazine ( <i>Bladex</i> )	2	2½ lb 80W OR 2 qt 4L OR 2.2 lb 90% DF	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Paraquat applied to rye before jointing (24 to 36 in. tall) may not provide complete control.</li> <li>● Maximum <i>Dual</i> rate in <i>Bladex</i> combinations is 2½ pt on fine textured soils with over 4% organic matter.</li> <li>● No carryover.</li> <li>● See notes above for paraquat or <i>Roundup</i> use.</li> <li>● Follow paraquat or <i>Roundup</i> mixing directions.</li> <li>● <i>Bladex</i> rate varies depending on surface residue and soil type (refer to <i>Bladex</i> label for details).</li> </ul>
	+ metolachlor ( <i>Dual</i> ) + paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> ) OR glyphosate ( <i>Roundup</i> )	+ 2 + ½ OR 1⅞	+ 1 qt + 1 qt OR 1½ qt	

(Continued next page)

# NO-TILL CORN — GRAIN STUBBLE or ROW CROP RESIDUE (continued)

(With rye or wheat cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses	atrazine (commercial product)	¾	1 lb 80W OR ¾ qt 4L OR ¼ lb 90% WDG	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Reduces potential atrazine carryover.</li> <li>● Paraquat applied to rye before jointing (24 to 36 in. tall) may not provide complete control.</li> <li>● May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem.</li> </ul>
	+ cyanazine ( <i>Bladex</i> )	+ 1½	+ 2 lb 80W OR 1½ qt 4L OR 1.7 lb 90% DF	
	+ alachlor ( <i>Lasso</i> )	+ 2½	+ 2½ qt	<ul style="list-style-type: none"> <li>● See notes above for paraquat or <i>Roundup</i> use.</li> <li>● Prepackaged mixes of atrazine + <i>Lasso</i> or <i>Roundup</i> + <i>Lasso (Bronco)</i> are available.</li> <li>● <i>Bladex</i> rate varies depending on surface residue and soil type (refer to <i>Bladex</i> label for details).</li> </ul>
	+ paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> )	+ ½	+ 1 qt	
	OR glyphosate ( <i>Roundup</i> )	OR 1⅙	OR 1½ qt	
	atrazine (commercial product)	¾	1 lb 80W OR ¾ qt 4L OR ¼ lb 90% WDG	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Reduces potential atrazine carryover.</li> <li>● Paraquat applied to rye before jointing (24 to 36 in. tall) may not provide complete control.</li> <li>● May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem.</li> </ul>
	+ cyanazine ( <i>Bladex</i> )	+ 1½	+ 2 lb 80W OR 1½ qt 4L OR 1.7 lb 90% DF	
	+ metolachlor ( <i>Dual</i> )	+ 2	+ 1 qt	<ul style="list-style-type: none"> <li>● See notes above for paraquat or <i>Roundup</i> use.</li> <li>● Follow paraquat or <i>Roundup</i> mixing directions.</li> <li>● A prepackaged mix of atrazine + <i>Dual (Bicep)</i> is available.</li> <li>● <i>Bladex</i> rate varies depending on surface residue and soil type (refer to <i>Bladex</i> label for details).</li> </ul>
	+ paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> )	+ ½	+ 1 qt	
	OR glyphosate ( <i>Roundup</i> )	OR 1⅙	OR 1½ qt	

## NO-TILL CORN — GRAIN STUBBLE or ROW CROP RESIDUE (Without a cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses	atrazine (commercial product)	1½	2 lb 80W OR 1½ qt 4L OR 1¾ lb 90% WDG	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Use 3 qt <i>Lasso</i> for heavy grass (especially fall panicum or crabgrass) infestations.</li> <li>● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for four-way tank mixes, pg. 26).</li> <li>● See notes above for paraquat or <i>Roundup</i> use.</li> <li>● Follow paraquat or <i>Roundup</i> mixing directions.</li> <li>● Prepackaged mixes of atrazine + <i>Lasso</i> or <i>Roundup</i> + <i>Lasso</i> (<i>Bronco</i>) are available.</li> <li>● A prepackaged mix of atrazine + <i>Dual</i> (<i>Bicep</i>) is available.</li> <li>● Maximum <i>Dual</i> rate in tank mixes is 2½ pt on fine textured soils.</li> <li>● Where no cover crop is present and annual weeds are small, the rate of paraquat may be reduced to 1 pt/A or the rate of <i>Roundup</i> may be reduced to 1 qt/A or less (See Label.)</li> </ul>
	+ alachlor ( <i>Lasso</i> ) OR metolachlor ( <i>Dual</i> )	+ 2½ OR 2	+ 2½ qt OR 1 qt	
+ paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> ) OR glyphosate ( <i>Roundup</i> )	+ ½ OR 1⅞	+ 1 qt OR 1½ qt		
cyanazine ( <i>Bladex</i> )	2	2½ lb 80W OR 2 qt 4L OR 2.2 lb 90% DF		
+ alachlor ( <i>Lasso</i> ) + paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> ) OR glyphosate ( <i>Roundup</i> )	+ 2½ + ½ OR 1⅞	+ 2½ qt + 1 qt OR 1½ qt		
cyanazine ( <i>Bladex</i> )	2	2½ lb 80W OR 2 qt 4L OR 2.2 lb 90% DF		
+ metolachlor ( <i>Dual</i> ) + paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> ) OR glyphosate ( <i>Roundup</i> )	+ 2 + ½ OR 1⅞	+ 1 qt + 1 qt OR 1½ qt		

(Continued next page)

# NO-TILL CORN — GRAIN STUBBLE or ROW CROP RESIDUE (continued)

(Without a cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses	atrazine (commercial product)	¾	1 lb 80W OR ¾ qt 4L OR ¼ lb 90% WDG	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Reduces potential atrazine carryover.</li> <li>● May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem.</li> <li>● See notes above for paraquat or <i>Roundup</i> use.</li> <li>● Follow paraquat or <i>Roundup</i> mixing directions.</li> <li>● Prepackaged mixes of atrazine + <i>Lasso</i> or <i>Roundup</i> + <i>Lasso</i> (<i>Bronco</i>) are available.</li> <li>● Where no crop cover is present and annual weeds are small, the rate of paraquat may be reduced to 1 pt/A or the rate of <i>Roundup</i> may be reduced to 1 qt/A or less. (See Label.)</li> <li>● <i>Bladex</i> rate varies depending on surface residue and soil type (refer to <i>Bladex</i> label for details).</li> </ul>
	+	+	+	
cyanazine ( <i>Bladex</i> )	1½	2 lb 80W OR 1½ qt 4L OR 1.7 lb 90% DF		
+	+	+		
alachlor ( <i>Lasso</i> )	2½	2½ qt		
+	+	+		
paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> )	½	1 qt		
OR	OR	OR		
glyphosate ( <i>Roundup</i> )	1⅞	1½ qt		
<hr/>				
	atrazine (commercial product)	¾	1 lb 80W OR ¾ qt 4L OR ¼ lb 90% WDG	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Reduces potential atrazine carryover.</li> <li>● May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem.</li> <li>● See notes above for paraquat or <i>Roundup</i> use.</li> <li>● Follow paraquat or <i>Roundup</i> mixing directions.</li> <li>● A prepackaged mix of atrazine + <i>Dual</i> (<i>Bicep</i>) is available.</li> <li>● Where no cover crop is present and annual weeds are small, the rate of paraquat may be reduced to 1 pt/A or the rate of <i>Roundup</i> may be reduced to 1 qt/A or less (See Label.)</li> <li>● <i>Bladex</i> rate varies depending on surface residue and soil type (refer to <i>Bladex</i> label for details).</li> </ul>
	+	+	+	
cyanazine ( <i>Bladex</i> )	1½	2 lb 80W OR 1½ qt 4L OR 1.7 lb 90% DF		
+	+	+		
metolachlor ( <i>Dual</i> )	2	1 qt		
+	+	+		
paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> )	½	1 qt		
OR	OR	OR		
glyphosate ( <i>Roundup</i> )	1⅞	1½ qt		

*(Continued next page)*

# NO-TILL CORN — GRAIN STUBBLE or ROW CROP RESIDUE (continued)

(Without a cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual broadleaves</b>	cyanazine ( <i>Bladex</i> )	2.2	2.2 qt 4L	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Use <i>Bladex 4L</i> only.</li> <li>● For small annual weeds <i>no more than 3 in.</i> in height.</li> <li>● <i>Bladex 4L</i> rate must be reduced on sandy soils or soils with less than 3% organic matter to avoid injury.</li> <li>● Use a minimum of 25 gal of spray/A.</li> <li>● 28% liquid nitrogen used as the herbicide carrier will add to the effectiveness of the treatment for burndown. When this carrier is used, substitute ½% surfactant for crop oil concentrate.</li> <li>● 2,4-D ester (½ lb/A or 1 pt/A) may be included if perennials are present.</li> </ul>
	+	+	+	
<b>Annual grasses</b>	alachlor ( <i>Lasso</i> )	2½	2½ qt	
	OR	OR	OR	
	metolachlor ( <i>Dual</i> )	2	1 qt	
+	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	cyanazine ( <i>Bladex</i> )	1½	1½ qt 4L	
+	+	+	+	
	atrazine (commercial product)	½	½ qt 4L	
+	+	+	+	
	alachlor ( <i>Lasso</i> )	2½	2½ qt	
OR	OR	OR	OR	
	metolachlor ( <i>Dual</i> )	2	1 qt	
+	+	+	+	
	crop oil concentrate	1 qt	1 qt	

# SOYBEANS

## PREPLANT

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual grasses</b> <b>Annual broadleaves</b> <b>Nutsedge</b>	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	3/8	3/4 lb 50W OR 3/4 pt 4L OR 1/2 lb 75% DF	<ul style="list-style-type: none"> <li>Some control of jimsonweed, velvetleaf and cocklebur.</li> <li>Reduce metribuzin rate if soil pH is above 7.0.</li> <li>If soil pH is 7.4 or above, do not apply metribuzin.</li> <li>Note label for rotational crop restrictions.</li> <li><i>Lasso</i> rate should be increased to 3 qt/A and <i>Dual</i> to 2 1/2 pt/A for effective nutsedge control.</li> <li>A prepackaged mix if metribuzin + metolachlor (<i>Dual</i>) is available as <i>Turbo</i>.</li> </ul>
	+ alachlor ( <i>Lasso</i> or <i>Micro-Tech Lasso</i> ) OR metolachlor ( <i>Dual</i> )	+ 2  OR 2	+ 2 qt  OR 2 pt	
<b>Annual grasses</b> <b>Annual broadleaves</b> (including nightshade) <b>Nutsedge</b>	chloramben ( <i>Amiben</i> )	2	1 gal 2L OR 2 1/2 lb 75% DS	<ul style="list-style-type: none"> <li><i>Lasso</i> rate should be increased to 3 qt/A and <i>Dual</i> to 2 1/2 pt/A for effective nutsedge control.</li> </ul>
	+ alachlor ( <i>Lasso</i> or <i>Micro-Tech Lasso</i> ) OR metolachlor ( <i>Dual</i> )	+ 2  OR 2	+ 2 qt  OR 2 pt	
<b>Annual grasses</b>	trifluralin ( <i>Treflan</i> )	3/4	1 1/2 pt	<ul style="list-style-type: none"> <li>Incorporate or mix thoroughly into top 2 or 3 in. of soil within 24 hr after application.</li> <li>On sandy and sandy loam soils low in organic matter, use 1/2 lb (1 pt/A).</li> <li>Most effective control if application is made 10 days to 2 weeks ahead of planting and field reworked just prior to planting.</li> </ul>
	pendimethalin ( <i>Prowl</i> )	1	2 pt	<ul style="list-style-type: none"> <li>Incorporate in top 2 to 3 in.</li> <li>Incorporate within 7 days of application unless rainfall occurs.</li> </ul>
	ethafluralin ( <i>Sonalan</i> )	0.9	2 1/2 pt	<ul style="list-style-type: none"> <li>Incorporate in top 2 to 3 in.</li> <li>Incorporate within 2 days of application.</li> </ul>
<b>Annual grasses</b> <b>Annual broadleaves</b> (except nightshade)	Combine any of the above dinitroanilines ( <i>Treflan</i> , <i>Sonalan</i> , or <i>Prowl</i> ) with metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	3/8	3/4 lb 50W OR 3/4 pt 4L OR 1/2 lb 75% DF	<ul style="list-style-type: none"> <li>Some control of jimsonweed, velvetleaf and cocklebur.</li> <li>See specific remarks for each dinitroaniline herbicide.</li> <li>Reduce rate if soil pH is above 7.0.</li> <li>If soil pH is 7.4 or above, do not apply metribuzin.</li> <li>Note label for rotational crop restrictions.</li> </ul>
<b>Annual grasses</b> <b>Annual broadleaves</b> (including nightshade)	Combine any of the above dinitroanilines ( <i>Treflan</i> , <i>Sonalan</i> , or <i>Prowl</i> ) with chloramben ( <i>Amiben</i> )	2	1 gal 2L OR 2 1/2 lb 75% DS	<ul style="list-style-type: none"> <li>See specific remarks for each dinitroaniline herbicide.</li> </ul>

## SOYBEANS — PREPLANT FOLLOWED BY PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Annual grasses</b>	<i>Treflan, Sonalan, Prowl, Lasso or Dual</i> as listed above preplant incorporated FOLLOWED BY:			
	chloramben ( <i>Amiben</i> )	2	1 gal 2L OR 2½ lb 75% DS	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Better ragweed control preemergence with <i>Amiben</i> than when incorporated.</li> </ul>
	metribuzin ( <i>Lexone or Sencor</i> )	¾	¾ lb 50W OR ¾ pt 4L OR ½ lb 75% DF	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Some control of jimsonweed, velvetleaf and cocklebur.</li> <li>● Reduce rate if soil pH is above 7.0.</li> <li>● If soil pH is 7.4 or above, do not apply metribuzin.</li> <li>● Note label for rotational crop restrictions.</li> </ul>
	linuron ( <i>Lorox or Linex</i> )	¾	1½ lb 50W OR ¾ qt 4L OR 1½ lb 50% DF	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● If heavy rainfall occurs soon after application, injury to crop may result.</li> <li>● Do not use on coarse-textured sandy or loamy sand soils or on soils with less than 0.5% organic matter.</li> <li>● Plant soybeans at least 1¼ in. deep.</li> </ul>

## PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Annual grasses</b>	linuron ( <i>Lorox or Linex</i> )	¾	1½ lb 50W OR ¾ qt 4L OR 1½ lb 50% DF	<ul style="list-style-type: none"> <li>● If heavy rainfall occurs soon after application, injury to crop may result.</li> <li>● Do not use on coarse-textured sandy or loamy sand soils or on soils with less than 0.5% organic matter.</li> <li>● Plant soybeans at least 1¼ in. deep.</li> </ul>
	+ alachlor ( <i>Lasso or Micro-Tech Lasso</i> )	+ 2	+ 2 qt	
	OR metolachlor ( <i>Dual</i> )	OR 2	OR 2 pt	
	chloramben ( <i>Amiben</i> )	2	1 gal 2L OR 2½ lb 75% DS	<ul style="list-style-type: none"> <li>● Preferred on sandy soils low in organic matter where injury from metribuzin or linuron has been a problem.</li> </ul>
	+ alachlor ( <i>Lasso or Micro-Tech Lasso</i> )	+ 2	+ 2 qt	
	OR metolachlor ( <i>Dual</i> )	OR 2	OR 2 pt	
	metribuzin ( <i>Lexone or Sencor</i> )	¾	¾ lb 50W OR ¾ pt 4L OR ½ lb 75% DF	<ul style="list-style-type: none"> <li>● Some control of cocklebur, velvetleaf and jimsonweed.</li> <li>● Reduce metribuzin rate if soil pH is above 7.0.</li> <li>● If soil pH is 7.4 or above, do not apply metribuzin.</li> <li>● Note label for rotational crop restrictions.</li> <li>● A prepackaged mix of metribuzin + metolachlor (<i>Dual</i>) is available as <i>Turbo</i>.</li> </ul>
	+ alachlor ( <i>Lasso or Micro-Tech Lasso</i> )	+ 2	+ 2 qt	
	OR metolachlor ( <i>Dual</i> )	OR 2	OR 2 pt	

## SOYBEANS — PREPLANT OR PREEMERGENCE, FOLLOWED BY POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Annual grasses</b>	<i>Treflan, Sonalan, Prowl, Lasso</i> or <i>Dual</i> as listed above preplant incorporated, or <i>Lasso</i> or <i>Dual</i> preemergence. FOLLOWED BY: <i>Basagran</i> , acifluorfen, <i>Classic</i> , or <i>Amiben</i> . For specific broadleaf weed control, see POSTEMERGENCE section. <i>Amiben</i> or metribuzin as listed above preplant incorporated, or <i>Amiben</i> , linuron or metribuzin preemergence. FOLLOWED BY: <i>Poast</i> or <i>Fusilade 2000</i> . For annual grasses, see POSTEMERGENCE section.			

## POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> (including nightshade, pigweed and jimsonweed)	acifluorfen ( <i>Blazer 2L</i> or <i>Tackle 2L</i> ) + surfactant	1/2  + 1/8%	1 qt  + 1/8%	<ul style="list-style-type: none"> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> <li>● Addition of 1 qt/A of 10-34-0 (diammonium phosphate) instead of crop oil concentrate will improve velvetleaf control but may reduce redroot pigweed, black nightshade, and common ragweed control. However, <i>Basagran</i> is preferred for postemergence velvetleaf control.</li> <li>● DO NOT use 10-34-0 and crop oil concentrate in the same treatment.</li> <li>● Increased crop injury may occur with the addition of a surfactant to acifluorfen.</li> <li>● Weak on velvetleaf, cocklebur, and common lambsquarters.</li> <li>● Delay 7 days between acifluorfen application and <i>Fusilade 2000</i>, <i>Poast</i>, or <i>Hoelon</i> treatments.</li> </ul>
<b>Annual broadleaves</b> (including cocklebur, velvetleaf and jimsonweed)	bentazon ( <i>Basagran</i> ) + crop oil concentrate	1  + 1 qt	1 qt  + 1 qt	<ul style="list-style-type: none"> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> <li>● No activity from <i>Basagran</i> preemergence.</li> <li>● Use 1 gal/A of 28% liquid nitrogen (urea-ammonium nitrate) instead of crop oil concentrate for improved velvetleaf control. Do not use 28% liquid nitrogen if common lambsquarters or common ragweed are present.</li> <li>● DO NOT use both 28% liquid nitrogen and crop oil concentrate in the same treatment.</li> <li>● Weak on pigweed, nightshade, and lambsquarters.</li> <li>● Delay 7 days between <i>Basagran</i> application and <i>Fusilade 2000</i>, <i>Poast</i>, or <i>Hoelon</i> treatments.</li> </ul>
<b>Annual broadleaves</b>	acifluorfen ( <i>Blazer 2L</i> or <i>Tackle 2L</i> ) + bentazon ( <i>Basagran</i> ) + crop oil concentrate	1/4  + 3/4  + 1 pt	1 pt  + 1 1/2 pt  + 1 pt	<ul style="list-style-type: none"> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> <li>● Do not apply if soybeans are under stress from herbicide injury, cold or dry weather, or hail damage.</li> <li>● Most effective on small weeds. See labels.</li> <li>● Increased crop injury may occur with the addition of crop oil concentrate to acifluorfen.</li> <li>● DO NOT use a fertilizer additive in place of crop oil concentrate if common lambsquarters is present.</li> <li>● Use 2 pt/A of <i>Basagran</i> if common lambsquarters pressure is heavy.</li> </ul>



## SOYBEANS — POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> (including ragweed, pigweed, smartweed, and velvetleaf)	chloramben ( <i>Amiben</i> )	3	6 qt 2L OR 3.6 lb 75% DS	<ul style="list-style-type: none"> <li>● Provides soil activity for later germinating weeds.</li> <li>● <i>Basagran</i> and acifluorfen provide better postemergence broadleaf weed control.</li> <li>● For control of common ragweed, redroot pigweed, and smartweed less than 3 in., and velvetleaf less than 5 in.</li> <li>● Timing is critical for effectiveness.</li> <li>● Do not apply later than 33 days after planting.</li> <li>● Recommended only where preemergence application of <i>Amiben</i> is not possible.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
<b>Annual broadleaves</b> <b>Yellow nutsedge</b>	chlorimuron-ethyl ( <i>Classic</i> )	0.012	¾ oz 25% DF	<ul style="list-style-type: none"> <li>● CHECK LABEL FOR CROP ROTATION RESTRICTIONS.</li> <li>● <i>Special Precaution:</i> A special sprayer cleanout procedure is required for <i>Classic</i>. Use 1 gal household ammonia (3%) per 100 gal of water. See label for specific instructions.</li> <li>● DO NOT APPLY TO SOILS WITH A pH GREATER THAN 6.8.</li> <li>● Control of cocklebur, jimsonweed, redroot pigweed, common ragweed, and smartweed less than 4 in. tall.</li> <li>● Suppression of nutsedge less than 4 in.</li> <li>● Controls cocklebur up to 14 in.</li> <li>● A second application may be made 2 to 3 wk after initial application if needed. Do not exceed 1 oz/A in one growing season.</li> </ul>
	+	+	+	
	surfactant	¼%	¼%	
<b>Nutsedge</b> <b>Canada thistle</b>	bentazon ( <i>Basagran</i> )	¾ + ¾	1½ pt + 1½ pt	<ul style="list-style-type: none"> <li>● Increase <i>Basagran</i> rate to 1 qt/A for each application for more effective Canada thistle control.</li> <li>● Treat when nutsedge is 4 to 6 in. and again 10 days later.</li> <li>● See nutsedge remarks under Special Weed Problems.</li> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> <li>● Delay 7 days between <i>Basagran</i> application and <i>Fusilade 2000</i>, <i>Poast</i>, or <i>Hoelon</i> treatments.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt	
<b>Annual grasses</b>	diclofop ( <i>Hoelon</i> )	1	1½ qt	<ul style="list-style-type: none"> <li>● Apply to grasses less than 4 in. tall.</li> <li>● Do not tank mix with other chemicals.</li> <li>● Delay 7 days between <i>Hoelon</i> application and <i>Basagran</i> or acifluorfen treatment.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	fluazifop-P-butyl ( <i>Fusilade 2000</i> )	.188	1½ pt	<ul style="list-style-type: none"> <li>● No soil activity from <i>Poast</i> or <i>Fusilade 2000</i>. Controls only grasses present when sprayed.</li> <li>● Treat actively-growing grass up to maximum of 4 in. tall (see labels).</li> <li>● Use 5 to 40 gal/A and 40 to 60 psi for <i>Fusilade 2000</i>.</li> <li>● Use 5 to 20 gal/A and a minimum of 40 psi for <i>Poast</i>.</li> <li>● Addition of 2.5 lb/A ammonium sulfate in <i>Poast</i> applications increases large crabgrass control.</li> <li>● Wait 1 day after <i>Poast</i> application and 3 days after <i>Fusilade 2000</i> application before applying <i>Basagran</i> or acifluorfen. Wait 7 days after <i>Basagran</i> or acifluorfen application before applying <i>Poast</i> or <i>Fusilade 2000</i>.</li> <li>● Avoid drift onto corn, sorghum, small grains, and turf.</li> <li>● Rainfall within 1 hr of application will reduce control.</li> <li>● Does not control nutsedge.</li> </ul>
+	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	
	sethoxydim ( <i>Poast</i> )	0.19	1 pt	
+	+	+	+	
	crop oil concentrate	1 qt	1 qt	

## SOYBEANS — POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Volunteer corn	fluazifop-P-butyl ( <i>Fusilade 2000</i> )	0.094	¾ pt	<ul style="list-style-type: none"> <li>● Refer to above remarks on annual grass control.</li> <li>● Treat volunteer corn up to 18 in., (<i>Hoelon</i> up to 12 in.).</li> <li>● Addition of 2.5 lb/A of ammonium sulfate in <i>Poast</i> applications increases volunteer corn control.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	
	sethoxydim ( <i>Poast</i> )	0.24	1¼ pt	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	
	diclofop ( <i>Hoelon</i> )	1	1⅓ qt	
+	+	+		
	crop oil concentrate	1 qt	1 qt	

## SOYBEANS — SPECIAL WEED PROBLEMS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>Preplant Incorporated</i>				
Velvetleaf	trifluralin ( <i>Treflan</i> )	¾	1½ pt	<ul style="list-style-type: none"> <li>● Preplant incorporated.</li> <li>● Only fair control.</li> <li>● Some soybean injury may occur.</li> <li>● Reduce metribuzin rate if soil pH is above 7.0.</li> <li>● If soil pH is 7.4 or above, do not apply metribuzin.</li> <li>● Follow with postemergence application of <i>Basagran</i> or acifluorfen (see sections above) if needed for complete control.</li> </ul>
Cocklebur	OR	OR	OR	
Jimsonweed	pendimethalin ( <i>Prowl</i> )	1	1 qt	
	OR	OR	OR	
	ethalfuralin ( <i>Sonalan</i> )	0.9	2½ pt	
	OR	OR	OR	
	alachlor ( <i>Lasso</i> or <i>Micro-Tech Lasso</i> )	2	2 qt	
	OR	OR	OR	
	metolachlor ( <i>Dual</i> )	2	1 qt	
	+	+	+	
	chloramben ( <i>Amiben</i> )	2	4 qt 2L OR 2½ lb 75% DS	
	+	+	+	
	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	¾	¾ lb 50W OR ¾ pt 4L OR ½ lb 75% DF	

(Continued next page)

## SOYBEANS — SPECIAL WEED PROBLEMS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Preplant Incorporated</b>				
<b>Velvetleaf</b>	trifluralin ( <i>Treflan</i> )	¾	1½ pt	<ul style="list-style-type: none"> <li>● Preplant incorporated tank mix of dinitroaniline or acetanilide plus metribuzin followed by second application of metribuzin preemergence.</li> <li>● Both metribuzin treatments needed for effective control.</li> <li>● Some soybean injury may occur.</li> <li>● Reduce metribuzin rate if soil pH is above 7.0.</li> <li>● If soil pH is 7.4 or above, do not apply metribuzin.</li> <li>● May require postemergence application of either <i>Basagran</i> or acifluorfen for complete control. See appropriate sections above for particular weed species and use directions.</li> </ul>
<b>Cocklebur</b>	OR	OR	OR	
<b>Jimsonweed</b>	pendimethalin ( <i>Prowl</i> )	1	1 qt	
	OR	OR	OR	
	ethalfluralin ( <i>Sonalan</i> )	0.9	2½ pt	
	OR	OR	OR	
	alachlor ( <i>Lasso</i> or <i>Micro-Tech Lasso</i> )	2	2 qt	
	OR	OR	OR	
	metolachlor ( <i>Dual</i> )	2	2 pt	
	+	+	+	
	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	¼	½ lb 50W OR ½ pt 4L OR ½ lb 75% DF	
<b>FOLLOWED BY: Preemergence</b>	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	¼	½ lb 50W OR ½ pt 4L OR ½ lb 75% DF	
<b>Preplant Incorporated</b>				
<b>Velvetleaf</b>	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	¾	¾ lb 50W OR ¾ pt 4L OR ½ lb 75% DF	<ul style="list-style-type: none"> <li>● Reduce <i>Lexone</i> or <i>Sencor</i> rate if soil pH is above 7.0.</li> <li>● If soil pH is 7.4 or above, do not apply metribuzin.</li> <li>● WILL REQUIRE POSTEMERGENCE APPLICATION OF EITHER <i>BASAGRAN</i> OR ACIFLUORFEN FOR COMPLETE CONTROL. SEE APPROPRIATE SECTIONS ABOVE FOR PARTICULAR WEED SPECIES AND USE DIRECTIONS.</li> <li>● See appropriate sections above for directions on <i>Treflan</i>, <i>Prowl</i>, <i>Sonalan</i>, <i>Lasso</i> or <i>Dual</i>, plus metribuzin use.</li> <li>● <i>Lasso</i> and metribuzin or <i>Dual</i> and metribuzin may be applied preemergence.</li> </ul>
<b>Cocklebur</b>	+	+	+	
<b>Jimsonweed</b>	trifluralin ( <i>Treflan</i> )	¾	1½ pt	
	OR	OR	OR	
	ethalfluralin ( <i>Sonalan</i> )	0.9	2½ pt	
	OR	OR	OR	
	pendimethalin ( <i>Prowl</i> )	1	1 qt	
	OR	OR	OR	
	alachlor ( <i>Lasso</i> or <i>Micro-Tech Lasso</i> )	2	2 qt	
	OR	OR	OR	
	metolachlor ( <i>Dual</i> )	2	1 qt	
<b>FOLLOWED BY: Postemergence</b>	acifluorfen ( <i>Blazer 2L</i> or <i>Tackle 2L</i> )	½	1 qt	<ul style="list-style-type: none"> <li>● Increased crop injury may occur with the addition of a surfactant to acifluorfen.</li> <li>● See <i>Basagran</i> or acifluorfen remarks under postemergence section.</li> </ul>
	+	+	+	
	surfactant	⅛%	⅛%	
	OR	OR	OR	
	bentazon ( <i>Basagran</i> )	1	1 qt	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	

## SOYBEANS — SPECIAL WEED PROBLEMS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Nutsedge</b>	alachlor (Lasso or Micro-Tech Lasso)	3	3 qt	<ul style="list-style-type: none"> <li>● Preplant incorporation to a depth of 2 to 3 in.</li> <li>● Shallow incorporation will improve control under conditions of limited moisture.</li> </ul>
	OR	OR	OR	
	metolachlor (Dual)	2½	1¼ qt	
	bentazon (Basagran)	¾ + ¾ See Remarks	1½ pt + 1½ pt	<ul style="list-style-type: none"> <li>● TWO ¾-lb APPLICATIONS REQUIRED FOR BEST NUTSEDGE CONTROL.</li> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> <li>● Postemergence.</li> <li>● Treat when nutsedge is 4 to 6 in. and again 10 days later.</li> </ul>
+	+	+		
crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt		
<b>Volunteer corn Weed escapes Perennials</b>	glyphosate (Roundup)	Rate varies, see label.		<ul style="list-style-type: none"> <li>● Use with rope-wick applicator, wipe-on applicator, or recirculating sprayer.</li> </ul>
<b>Quackgrass</b>	fluazifop-P-butyl (Fusilade 2000)	.188 + .125	1½ pt + 1 pt	<ul style="list-style-type: none"> <li>● TWO APPLICATIONS ARE NEEDED FOR BEST QUACKGRASS CONTROL. MAKE SECOND APPLICATION 14 TO 21 DAYS FOLLOWING INITIAL TREATMENT. CULTIVATION MAY REPLACE SECOND APPLICATION.</li> <li>● No soil activity from <i>Poast</i> or <i>Fusilade 2000</i>. Controls only grass present when sprayed.</li> <li>● Treat actively growing quackgrass 6 to 8 in. tall.</li> <li>● Use 5 to 40 gal/A and 40 to 60 psi for <i>Fusilade 2000</i>.</li> <li>● Use 5 to 20 gal/A and a minimum of 40 psi for <i>Poast</i>.</li> <li>● <i>Fusilade 2000</i> is more effective for quackgrass control than <i>Poast</i>.</li> <li>● Addition of 2.5 lb/A of ammonium sulfate to <i>Poast</i> applications increases quackgrass control.</li> <li>● Avoid drift onto corn, sorghum, small grains, and turf.</li> <li>● Rainfall within one hour of application will reduce control.</li> <li>● Addition of other herbicides to tank may reduce quackgrass control.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt	
	OR	OR	OR	
	sethoxydim (Poast)	0.48 + 0.29	2½ pt + 1½ pt	
+	+	+		
crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt		

## PREEMERGENCE — ORGANIC SOILS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual grasses Annual broadleaves</b>	chloramben (Amiben)	3	1½ gal 2L OR 3.6 lb 75% DS	<ul style="list-style-type: none"> <li>● May require postemergence applications for complete control (see next page).</li> </ul>
	+	+	+	
	alachlor (Lasso)	4	1 gal	

## SOYBEANS — POSTEMERGENCE — ORGANIC SOILS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> (including nightshade, pigweed, and jimsonweed)	acifluorfen ( <i>Blazer 2L</i> or <i>Tackle 2L</i> )	½	1 qt	<ul style="list-style-type: none"> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> <li>● Addition of 1 qt/A of 10-34-0 (diammonium phosphate) instead of crop oil concentrate will improve velvetleaf control but may reduce redroot pigweed, black nightshade, and common ragweed control. However, <i>Basagran</i> is preferred for postemergence velvetleaf control.</li> <li>● Do not use 10-34-0 and crop oil concentrate in the same treatment.</li> <li>● Increased crop injury may occur with the addition of a surfactant to acifluorfen.</li> <li>● Weak on velvetleaf, cocklebur, and common lambsquarters.</li> <li>● Delay 7 days between acifluorfen application and <i>Fusilade 2000</i>, <i>Poast</i>, or <i>Hoelon</i> treatment.</li> </ul>
	+	+	+	
	surfactant	⅛%	⅛%	
<b>Annual broadleaves</b> (including cocklebur, velvetleaf and jimsonweed)	bentazon ( <i>Basagran</i> )	1	1 qt	<ul style="list-style-type: none"> <li>● Weak on pigweed, nightshade, and lambsquarters.</li> <li>● Use a minimum of 40 psi and 20 gal/A water. Do not use flood nozzles.</li> <li>● No activity from <i>Basagran</i> preemergence.</li> <li>● Use 1 gal/A of 28% liquid nitrogen (urea-ammonium nitrate) <i>instead of</i> crop oil concentrate for improved velvetleaf control. Do not use 28% liquid nitrogen if common lambsquarters or common ragweed are present.</li> <li>● DO NOT use both 28% liquid nitrogen and crop oil concentrate in the same treatment.</li> <li>● Delay 7 days between <i>Basagran</i> application and <i>Hoelon</i>, <i>Poast</i>, or <i>Fusilade 2000</i> treatments.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
<b>Annual broadleaves</b>	acifluorfen ( <i>Blazer 2L</i> or <i>Tackle 2L</i> )	¼	1 pt	<ul style="list-style-type: none"> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> <li>● Do not apply if soybeans are under stress from herbicide injury, cold or dry weather, or hail damage.</li> <li>● Most effective on small weeds. See labels.</li> <li>● Increased crop injury may occur with the addition of crop oil concentrate to acifluorfen.</li> <li>● DO NOT use a fertilizer additive in place of crop oil concentrate if common lambsquarters is present.</li> <li>● Use 2 pt/A of <i>Basagran</i> if common lambsquarters pressure is heavy.</li> </ul>
	+	+	+	
	bentazon ( <i>Basagran</i> )	¾	1½ pt	
	+	+	+	
	crop oil concentrate	1 pt	1 pt	
<b>Annual broadleaves</b> (including ragweed, pigweed, smartweed, and velvetleaf)	chloramben ( <i>Amiben</i> )	3	6 qt 2L OR 3.6 lb 75% DS	<ul style="list-style-type: none"> <li>● Provides soil activity for later germinating weeds.</li> <li>● <i>Basagran</i> and acifluorfen provide better postemergence broadleaf weed control.</li> <li>● For control of common ragweed, redroot pigweed, and smartweed less than 3 in., and velvetleaf less than 5 in.</li> <li>● Timing is critical for effectiveness.</li> <li>● Do not apply later than 33 days after planting.</li> <li>● Recommended only where preemergence application of <i>Amiben</i> is not possible.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	

## SOYBEANS — POSTEMERGENCE — ORGANIC SOILS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Yellow nutsedge</b>	chlorimuron-ethyl ( <i>Classic</i> )	0.012	¾ oz 25% DF	<ul style="list-style-type: none"> <li>● CHECK LABEL FOR CROP ROTATION RESTRICTIONS.</li> <li>● <i>Special Precaution:</i> A special sprayer cleanout procedure is required for <i>Classic</i>. Use 1 gal household ammonia (3%) per 100 gal of water. See label for specific instructions.</li> <li>● DO NOT APPLY TO SOILS WITH A pH GREATER THAN 6.8.</li> <li>● For control of cocklebur, jimsonweed, redroot pigweed, common ragweed, and smartweed less than 4 in.</li> <li>● Suppression of nutsedge less than 4 in.</li> <li>● Controls cocklebur up to 14 in.</li> <li>● A second application may be made 2 to 3 wk after initial application if needed. Do not exceed 1 oz/A in one growing season.</li> </ul>
	+	+	+	
	surfactant	¼%	¼%	
<b>Nutsedge</b> <b>Canada thistle</b>	bentazon ( <i>Basagran</i> )	¾ + ¾	1½ pt + 1½ pt	<ul style="list-style-type: none"> <li>● Increase <i>Basagran</i> rate to 1 qt/A for each application for more effective Canada thistle control.</li> <li>● Treat when nutsedge is 4 to 6 in. and again 10 days later.</li> <li>● See nutsedge remarks under Special Weed Problems.</li> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> <li>● Delay 7 days between <i>Basagran</i> application and <i>Fusilade 2000</i>, <i>Poast</i>, or <i>Hoelon</i> treatments.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt	
<b>Annual grasses</b>	diclofop ( <i>Hoelon</i> )	1	1⅓ qt	<ul style="list-style-type: none"> <li>● Apply to grasses less than 4 in. tall.</li> <li>● Do not tank mix with other chemicals.</li> <li>● Delay 7 days between <i>Hoelon</i> application and <i>Basagran</i> or acifluorfen treatment.</li> <li>● No soil activity from <i>Poast</i> or <i>Fusilade 2000</i>. Controls only grasses present when sprayed.</li> <li>● Treat actively growing grasses a maximum of 4 in. tall (see label).</li> <li>● Use 5 to 40 gal/A and 40 to 60 psi for <i>Fusilade 2000</i>.</li> <li>● Use 5 to 20 gal/A and a minimum of 40 psi for <i>Poast</i>.</li> <li>● Addition of 2.5 lb/A ammonium sulfate in <i>Poast</i> applications increases large crabgrass control.</li> <li>● Wait 1 day after <i>Poast</i> application and 3 days after <i>Fusilade 2000</i> application before applying <i>Basagran</i> or acifluorfen. Wait 7 days after <i>Basagran</i> or acifluorfen application before applying <i>Poast</i> or <i>Fusilade 2000</i>.</li> <li>● Avoid drift onto corn, sorghum, small grains, and turf.</li> <li>● Rainfall within one hour of application will reduce control.</li> <li>● Does not control nutsedge.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	sethoxydim ( <i>Poast</i> )	0.19	1 pt	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	
fluazifop-P-butyl ( <i>Fusilade 2000</i> )	.188	1½ pt		
+	+	+		
crop oil concentrate	1 qt	1 qt		
<b>Volunteer corn</b>	fluazifop-P-butyl ( <i>Fusilade 2000</i> )	0.094	¾ pt	<ul style="list-style-type: none"> <li>● Refer to above remarks on annual grass control.</li> <li>● Treat volunteer corn up to 18 in. (<i>Hoelon</i> up to 12 in.).</li> <li>● Addition of 2.5 lb/A of ammonium sulfate in <i>Poast</i> applications increases volunteer corn control.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	
	sethoxydim ( <i>Poast</i> )	0.24	1¼ pt	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
OR	OR	OR		
diclofop ( <i>Hoelon</i> )	1	1⅓ qt		
+	+	+		
crop oil concentrate	1 qt	1 qt		

## SOYBEANS — POSTEMERGENCE — ORGANIC SOILS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Quackgrass</b>	sethoxydim ( <i>Poast</i> )	0.48 + 0.29	2½ pt + 1½ pt	<ul style="list-style-type: none"> <li>● TWO APPLICATIONS ARE NEEDED FOR BEST QUACKGRASS CONTROL. MAKE SECOND APPLICATION 14 TO 21 DAYS FOLLOWING INITIAL TREATMENT. CULTIVATION MAY REPLACE SECOND APPLICATION.</li> <li>● No soil activity from <i>Poast</i> or <i>Fusilade 2000</i>. Controls only grass present when sprayed.</li> <li>● Treat actively growing quackgrass 6 to 8 in. tall.</li> <li>● Use 5 to 40 gal/A and 40 to 60 psi for <i>Fusilade 2000</i>.</li> <li>● Use 5 to 20 gal/A and a minimum of 40 psi for <i>Poast</i>.</li> <li>● <i>Fusilade 2000</i> is more effective for quackgrass control than <i>Poast</i>.</li> <li>● Addition of 2.5 lb/A of ammonium sulfate to <i>Poast</i> applications increases quackgrass control.</li> <li>● Avoid drift onto corn, sorghum, small grains, and turf.</li> <li>● Rainfall within 1 hr of application will reduce control.</li> <li>● Addition of other herbicides to tank may reduce quackgrass control.</li> </ul>
	+	+	+	
	crop oil concentrate OR	1 qt + 1 qt OR	1 qt + 1 qt OR	
	fluazifop-P-butyl ( <i>Fusilade 2000</i> )	.188 + .125	1½ pt + 1 pt	
<b>Volunteer corn</b> <b>Weed escapes</b> <b>Perennials</b>	+	+	+	<ul style="list-style-type: none"> <li>● Use with rope-wick applicator, wipe-on applicator, or recirculating sprayer.</li> </ul>
	crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt	
	glyphosate ( <i>Roundup</i> )	Rate varies, see label		

## NO-TILL

(Following corn, small grains, or with rye or wheat cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Annual grasses</b>	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	¾	¾ lb 50W OR ¾ pt 4L OR ½ lb 75% DF	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Reduce metribuzin rate if soil pH is above 7.0.</li> <li>● If soil pH is 7.4 or above, do not apply metribuzin.</li> <li>● Note label for rotational crop restrictions.</li> <li>● Paraquat applied before rye jointing (24 to 26 in. tall) may not provide complete control.</li> <li>● To avoid excessive cover crop growth, paraquat or <i>Roundup</i> may be applied prior to planting.</li> <li>● Use 3 qt <i>Lasso</i> with heavy annual grass (especially fall panicum and crabgrass) infestations.</li> <li>● Maximum <i>Dual</i> rate in metribuzin tank mixes is 2½ pt on fine textured soils.</li> <li>● Use 20 to 60 gal spray/A with paraquat and 20 to 30 gal spray/A with <i>Roundup</i>.</li> <li>● Use ½ pt X-77 or similar non-ionic surfactant per 100 gal water with paraquat applications. Double surfactant rate if liquid fertilizer is used as a carrier.</li> <li>● Do not use suspension or high phosphate liquid fertilizers as carriers for paraquat applications.</li> <li>● Follow mixing directions on paraquat and <i>Roundup</i> labels.</li> <li>● Paraquat gives faster knockdown. <i>Roundup</i> may provide better control if weed or cover crop growth is dense. Use <i>Roundup</i> if horseweed (marestail) is present.</li> <li>● May need follow up treatment with <i>Basagran</i>, acifluorfen, <i>Classic</i>, <i>Hoelon</i>, <i>Poast</i>, or <i>Fusilade 2000</i> (see "Postemergence" section for weeds controlled and use directions) for weed escapes.</li> <li>● Where no cover crop is present and annual weeds are small, the rate of paraquat may be reduced to 1 pt/A or the rate of <i>Roundup</i> may be reduced to 1 qt per acre or less. (See Label).</li> <li>● A prepackaged mix of <i>Lasso</i> + <i>Roundup</i> (<i>Bronco</i>) is available.</li> </ul>
	+	+	+	
	alachlor ( <i>Lasso</i> or <i>Micro-Tech Lasso</i> )	2½	2½ qt	
	OR	OR	OR	
	metolachlor ( <i>Dual</i> )	2	1 qt	
	OR	OR	OR	
	oryzalin ( <i>Surflan</i> )	1	1 qt 4L OR 1½ lb 75% WP	
	+	+	+	
	paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> )	½	1 qt	
	OR	OR	OR	
glyphosate ( <i>Roundup</i> )	1½	1½ qt		

**SOYBEANS — NO-TILL (continued)**  
*(Following corn, small grains, or with rye or wheat cover crop)*

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual broadleaves</b> <b>Annual grasses</b>	linuron ( <i>Lorox</i> or <i>Linex</i> )	¾	1½ lb 50W OR ¾ qt 4L OR 1½ lb 50% DF	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Do not use on coarse textured sandy or loamy sand soils or on soils with less than 0.5% organic matter.</li> <li>● If heavy rainfall occurs soon after application, injury to crop may result.</li> <li>● Plant soybeans at least 1¾ in. deep.</li> <li>● Paraquat applied before rye planting (24 to 36 in. tall) may not provide complete control.</li> <li>● To avoid excessive cover crop growth, paraquat or <i>Roundup</i> may be applied prior to planting.</li> <li>● Use 3 qt <i>Lasso</i> with heavy annual grass (especially fall panicum and crabgrass) infestations.</li> <li>● Maximum <i>Dual</i> rate in <i>Lorox</i> tank mixes is 2½ pt on fine textured soils.</li> <li>● Use 20 to 60 gal spray/A with paraquat and 20 to 30 gal spray/A with <i>Roundup</i>.</li> <li>● Use ½ pt X-77 or similar non-ionic surfactant per 100 gal water with paraquat applications. Double surfactant rate if liquid fertilizer is used as a carrier.</li> <li>● Do not use suspension or high phosphate liquid fertilizers as carriers for paraquat applications.</li> <li>● Follow mixing directions on paraquat or <i>Roundup</i> labels.</li> <li>● Paraquat gives faster knockdown. <i>Roundup</i> may provide better control if weed or cover crop growth is dense.</li> <li>● Use <i>Roundup</i> if horseweed (marestail) is present.</li> <li>● Where no cover crop is present and annual weeds are small, the rate of paraquat may be reduced to 1 pt/A or the rate of <i>Roundup</i> may be reduced to 1 qt/A or less. (See Label.)</li> <li>● May need follow up treatment with <i>Basagran</i>, acifluorfen, <i>Classic</i>, <i>Hoelon</i>, <i>Poast</i>, or <i>Fusilade 2000</i> (see "Postemergence" section for weeds controlled and use directions) for weed escapes.</li> <li>● A prepackaged mix of <i>Lasso</i> + <i>Roundup</i> (<i>Bronco</i>) is available.</li> </ul>
	+	+	+	
	alachlor ( <i>Lasso</i> or <i>Micro-Tech Lasso</i> )	2½	2½ qt	
	OR	OR	OR	
	metolachlor ( <i>Dual</i> )	2	1 qt	
	OR	OR	OR	
	oryzalin ( <i>Surflan</i> )	1	1 qt 4L OR 1½ lb 75% WP	
	+	+	+	
	paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> )	½	1 qt	
	OR	OR	OR	
	glyphosate ( <i>Roundup</i> )	1½	1½ qt	

*(Continued next page)*



## SOYBEANS — NO-TILL (continued)

(Following corn, small grains, or with rye or wheat cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual broadleaves</b> <b>Annual grasses</b>	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	3/8	3/4 lb 50W OR 3/4 pt 4L OR 1/2 lb 75% DF	<ul style="list-style-type: none"> <li>● Applied preemergence.</li> <li>● Reduce metribuzin rate if soil pH is above 7.0.</li> <li>● If soil pH is 7.4 or above, do not apply metribuzin.</li> <li>● Note label for rotational crop restrictions.</li> <li>● Paraquat applied before rye jointing (24 to 26 in. tall) may not provide complete control.</li> <li>● To avoid excessive cover crop growth, paraquat or <i>Roundup</i> may be applied prior to planting.</li> <li>● Use 3 qt <i>Lasso</i> with heavy annual grass (especially fall panicum and crabgrass) infestations.</li> <li>● Maximum <i>Dual</i> rate in metribuzin tank mixes is 2 1/2 pt on fine textured soils.</li> <li>● Use 20 to 60 gal spray/A with paraquat and 20 to 30 gal spray/A with <i>Roundup</i>.</li> <li>● Use 1/2 pt X-77 or similar non-ionic surfactant/100 gal water with paraquat applications. Double surfactant rate if liquid fertilizer is used as a carrier.</li> <li>● Do not use suspension or high phosphate liquid fertilizers as carriers for paraquat applications.</li> <li>● Follow mixing directions on paraquat and <i>Roundup</i> labels.</li> <li>● Paraquat gives faster knockdown. <i>Roundup</i> may provide better control if weed or cover crop is dense. Use <i>Roundup</i> if horseweed (marestalk) is present.</li> <li>● Where no cover crop is present and annual weeds are small, the rate of paraquat may be reduced to 1 pt/A or the rate of <i>Roundup</i> may be reduced to 1 qt/A or less. (See Label.)</li> <li>● May need follow up treatments with <i>Basagran</i>, acifluorfen, <i>Classic</i>, <i>Hoelon</i>, <i>Poast</i>, or <i>Fusilade 2000</i> (see "Postemergence" section for weeds controlled and use directions) for weed escapes.</li> <li>● A prepackaged mix of <i>Lasso</i> + <i>Roundup</i> (<i>Bronco</i>) is available.</li> </ul>
	+	+	+	
	chloramben ( <i>Amiben</i> )	2	4 qt 2L OR 2 1/2 lb 75% DS	
+	+	+		
	alachlor ( <i>Lasso</i> or <i>Micro-Tech Lasso</i> )	2 1/2	2 1/2 qt	
OR	OR	OR	OR	
	metolachlor ( <i>Dual</i> )	2	1 qt	
+	+	+	+	
	paraquat ( <i>Paraquat</i> , <i>Gramoxone</i> )	1/2	1 qt	
OR	OR	OR	OR	
	glyphosate ( <i>Roundup</i> )	1 1/8	1 1/2 qt	

# SMALL GRAINS

## BARLEY AND WHEAT (WITHOUT LEGUME SEEDINGS)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	2,4-D amine	1/2	1 pt	<ul style="list-style-type: none"> <li>Apply at or after full tillering but before the boot stage (the grain is usually 6 to 8 in. tall at full tillering, and the boot stage is reached when the upper sheath is beginning to swell with the enlarging head).</li> <li>Do not apply in the fall.</li> </ul>
	bromoxynil (Buctril) OR (ME-4 Brominal)	3/8 OR 3/8	1 1/2 pt OR 3/4 pt	<ul style="list-style-type: none"> <li>May be applied from emergence and up to boot stage.</li> <li>Good coverage essential.</li> <li>Bromoxynil must be applied to small weeds (less than 4 in. tall, or 1 in. rosettes) for effective control.</li> <li>Redroot pigweed and mustard must be controlled when very small (refer to label for details).</li> </ul>
Perennials (bindweed, thistles)	2,4-D ester	3/4	1 1/2 pt	<ul style="list-style-type: none"> <li>Use when grain is fully tillered but before the boot stage.</li> <li>Control is limited.</li> <li>Injury may occur.</li> <li>Some control of wild onion and wild garlic.</li> </ul>
	dicamba (Banvel) OR (Banvel II)	1/8 OR 1/8	1/4 pt OR 1/2 pt	<ul style="list-style-type: none"> <li>Do not apply to spring-seeded barley.</li> <li>Some control of wild onion and wild garlic.</li> <li>Injury may occur on some varieties of wheat — Tecumseh, Abe, Arthur — do not use on these varieties.</li> <li>May be applied from early spring until full tillering (the grain is usually 6 to 8 in. tall at this stage).</li> </ul>
Wild garlic Wild onion	dicamba (Banvel) OR (Banvel II) + 2,4-D	1/8 OR 1/8 + 1/2	1/4 pt OR 1/2 pt + 1 pt	<ul style="list-style-type: none"> <li>Do not apply to spring-seeded barley.</li> <li>Injury may occur on some varieties of wheat — Tecumseh, Abe, Arthur — do not use on these varieties.</li> <li>May use either ester or amine 2,4-D.</li> <li>Should be applied at full tillering (the grain is usually 6 to 8 in. tall at this stage).</li> </ul>

## OATS WITHOUT LEGUME SEEDINGS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	2,4-D amine	3/8	3/4 pt	<ul style="list-style-type: none"> <li>Use when grain is fully tillered but before boot stage.</li> <li>Some yield reduction may occur but generally less than caused by weeds.</li> </ul>
	MCPA	3/8	3/4 pt	<ul style="list-style-type: none"> <li>Less injurious than 2,4-D</li> <li>Less effective than 2,4-D.</li> <li>Use when grain is tillering but before the boot stage.</li> </ul>
	bromoxynil (Buctril) OR (ME-4 Brominal)	3/8 OR 3/8	1 1/2 pt OR 3/4 pt	<ul style="list-style-type: none"> <li>May be applied from emergence and up to boot stage.</li> <li>Good coverage essential.</li> <li>Bromoxynil must be applied to small weeds (less than 4 in. tall, or 1 in. rosettes) for effective control.</li> <li>Redroot pigweed and mustard must be controlled when very small (refer to label for details).</li> </ul>

## SMALL GRAINS SEEDED TO LEGUMES

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b>	MCPA	3/8	3/4 pt	<ul style="list-style-type: none"> <li>● Use when grain is fully tillered but before the boot stage.</li> <li>● A canopy of grain and weeds over the seeding will reduce the possibility of injury to the legume.</li> <li>● Apply at 5 to 6 GPA to minimize crop injury.</li> <li>● Sweet clover is very sensitive to MCPA.</li> </ul>

# FORAGES

## ALFALFA, TREFOIL AND CLOVER SEEDINGS

*(clear seedings without small grain companion crops)*

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Annual grasses</b>	EPTC <i>(Eptam or Genep)</i>	3	3 1/2 pt	<ul style="list-style-type: none"> <li>● Work into soil immediately after application.</li> <li>● Seed may be planted immediately after this operation.</li> <li>● Do not use when grass is seeded with legumes.</li> </ul>
	benfin <i>(Balan)</i>	1 1/8	3 qt	<ul style="list-style-type: none"> <li>● See remarks above for EPTC.</li> </ul>
<b>Annual broadleaves</b>	4-(2,4-DB) amine <i>(Butoxone 200 or Butyrac 200)</i>	1	2 qt	<ul style="list-style-type: none"> <li>● Apply postemergence when legume seedlings are at or beyond the 2 to 3 trifoliolate leaf stage.</li> <li>● Can use if annual broadleaf problem develops after using <i>Eptam</i>, <i>Genep</i> or <i>Balan</i>.</li> <li>● This treatment is not labeled for use with small grain companion crops.</li> <li>● Do not apply to sweet clover or established clovers grown for seed.</li> <li>● Do not graze or feed hay from forage for 60 days after application.</li> <li>● Do not apply when crop is under stress.</li> <li>● Do not apply when the daytime temperature is expected to exceed 90°F within the next 3 days. Do not apply if temperature is expected to fall below 40°F shortly after treatment.</li> </ul>
<b>Perennial weeds</b> (quackgrass, Canada thistle, milkweed, etc.)	glyphosate <i>(Roundup)</i>	Rate varies, see label.		<ul style="list-style-type: none"> <li>● Apply to perennials at labeled rate and growth stage before alfalfa establishment.</li> </ul>

## ALFALFA (ESTABLISHED STAND)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Yellow rocket and broadleaved winter annuals	simazine ( <i>Princep</i> )	1	1¼ lb 80W OR 1.1 lb 90% WDG	<ul style="list-style-type: none"> <li>● Forage grasses will be injured or killed.</li> <li>● Use 2 lb <i>Princep</i> on fine textured soils with 4 to 6% organic matter (established stands only).</li> <li>● Some control of seedling white cockle.</li> <li>● For fall application on established (1 year) alfalfa or after the last cutting (before the ground freezes) of a spring seeded (by June 1) new alfalfa stand.</li> <li>● Will control winter annuals: yellow rocket, henbit, chickweed, peppergrass, shepherd's purse and downy brome.</li> <li>● Some injury to alfalfa may occur on sands and loamy sands low in organic matter.</li> </ul>
	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	½	1 lb 50W OR 1 pt 4L OR ¾ lb 75% DF	<ul style="list-style-type: none"> <li>● Apply to <i>dormant</i> alfalfa in late fall or early spring.</li> <li>● Non-dormant alfalfa may be severely injured.</li> </ul>
	terbacil ( <i>Sinbar</i> )	1	1¼ 80W	<ul style="list-style-type: none"> <li>● Apply to <i>dormant</i> alfalfa in late fall or early spring.</li> <li>● Note label for rotational crop restrictions.</li> <li>● Early spring applications will control other broadleaf weeds and suppress quackgrass infestations.</li> </ul>
	hexazinone ( <i>Velpar</i> )	½	.6 lb 90W OR 1 qt 2L	<ul style="list-style-type: none"> <li>● Apply in spring before alfalfa growth exceeds 2 in. Spring applications to <i>dormant</i> alfalfa provide the greatest crop safety.</li> <li>● Application can be made between cuttings before regrowth exceeds 2 in. in height, however, alfalfa injury may result if plants are under stress. Do not make more than one application in one growing season.</li> <li>● Do not apply to seedling alfalfa or alfalfa-forage grass mixtures.</li> <li>● Do not apply when crop is under stress.</li> <li>● Do not apply to snow covered or frozen ground.</li> <li>● Use at least 20 gal water/A for ground application.</li> <li>● Do not graze or feed treated forage to livestock for 30 days following application.</li> <li>● <b>Rotational restriction:</b> Corn may be planted 12 mo following the last application provided the soil is moldboard plowed prior to planting. Do not plant any other crop for two years after application.</li> </ul>
Dandelions	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	1	2 lb 50W OR 1 qt 4L OR 1½ lb 75% DF	<ul style="list-style-type: none"> <li>● Apply in spring <i>before</i> alfalfa breaks dormancy.</li> <li>● Non-dormant alfalfa may be severely injured.</li> <li>● Perennial grasses may also be suppressed.</li> <li>● Early spring applications will control other broadleaf weeds and suppress quackgrass infestations.</li> </ul>
	hexazinone ( <i>Velpar</i> )	1	1.1 lb 90W OR 2 qt 2L	<ul style="list-style-type: none"> <li>● Apply in spring before alfalfa growth exceeds 2 in. Spring applications to <i>dormant</i> alfalfa provide the greatest crop safety.</li> <li>● Application can be made between cuttings before regrowth exceeds 2 in. in height, however, alfalfa injury may result if plants are under stress. Do not make more than one application in one growing season.</li> <li>● Do not apply to seedling alfalfa or alfalfa-forage grass mixtures.</li> <li>● Do not apply when crop is under stress.</li> <li>● Do not apply to snow covered or frozen ground.</li> <li>● Use at least 20 gal water/A for ground application.</li> <li>● Do not graze or feed treated forage to livestock for 30 days following application.</li> <li>● <b>Rotational restriction:</b> Corn may be planted 12 mo following the last application provided the soil is moldboard plowed prior to planting. Do not plant any other crop for two years after application.</li> <li>● Will also provide partial control of quackgrass.</li> </ul>

## FORAGES — ALFALEA (ESTABLISHED STAND) — (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Hoary alyssum Annual broadleaves	4-(2,4-DB) amine (Butoxone 200 or Butyrac 200)	1	2 qt	<ul style="list-style-type: none"> <li>• Early April.</li> <li>• Spray when hoary alyssum seedlings are in two to four leaf stage.</li> <li>• Do not graze or feed hay from forage for 30 days after application.</li> <li>• Do not apply when crop is under stress.</li> <li>• Do not apply when the daytime temperature is expected to exceed 90°F within the next 3 days. Do not apply if temperature is expected to fall below 40°F shortly after treatment.</li> </ul>
Quackgrass	pronamide (Kerb)	1½	3 lb	<ul style="list-style-type: none"> <li>• Apply in late fall when soil temperatures are below 55°F.</li> <li>• For light to moderate quackgrass infestations, rate can be reduced to 1 lb a.i./A (2 lb/A of formulated product).</li> </ul>

## BIRDSFOOT TREFOIL (ESTABLISHED STAND)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Hoary alyssum Annual broadleaves	4-(2,4-DB) amine (Butoxone 200 or Butyrac 200)	1	2 qt	<ul style="list-style-type: none"> <li>• Early April.</li> <li>• Spray when hoary alyssum seedlings are two to four leaf stage.</li> <li>• Do not graze or feed hay from forage for 60 days after application.</li> <li>• Do not apply when crop is under stress.</li> <li>• Do not apply when the daytime temperature is expected to exceed 90°F within the next 3 days. Do not apply if temperature is expected to fall below 40°F shortly after treatment.</li> </ul>
Quackgrass	pronamide (Kerb)	1½	3 lb	<ul style="list-style-type: none"> <li>• Apply in late fall when soil temperatures are below 55°F.</li> <li>• For light to moderate quackgrass infestations, rate can be reduced to 1 lb a.i./A (2 lb/A of formulated product).</li> </ul>

## RED CLOVER (CURRENT YEAR SEEDING)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Yellow rocket and broadleaved winter annuals	MCPA	½	1 pt	<ul style="list-style-type: none"> <li>• Spray after killing frost; legumes dormant.</li> </ul>

## GRASS PASTURE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Biennials and Perennials	2,4-D ester	1	1 qt	<ul style="list-style-type: none"> <li>• Apply in fall or spring.</li> </ul>

## LEGUME PASTURE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Perennial broad- leaves, Biennials	2,4-D ester	1	1 qt	<ul style="list-style-type: none"> <li>• Legumes may be injured or killed.</li> <li>• Spot spray patches.</li> </ul>

# DRY EDIBLE BEANS

## PREPLANT

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> (including nightshade)	alachlor (Lasso)	2	2 qt	<ul style="list-style-type: none"> <li>● Incorporate to 2 in. depth.</li> <li>● Do not use <i>Lasso</i> on sands or loamy sands or injury can occur.</li> <li>● Reduce <i>Dual</i> rate on coarse textured soils low in organic matter (see label).</li> <li>● This treatment is used for black nightshade control.</li> <li>● <i>Lasso</i> or <i>Dual</i> should be preplant incorporated to minimize danger of bean injury.</li> <li>● <i>Amiben</i> may be applied preplant incorporated or preemergence.</li> <li>● <i>Lasso</i> will provide better nightshade control than <i>Dual</i>.</li> <li>● <i>Dual</i> will provide yellow nutsedge suppression.</li> </ul>
<b>Annual grasses</b>	OR	OR	OR	
	metolachlor (Dual)	2	1 qt	
	+	+	+	
	chloramben (Amiben)	2	4 qt 2L OR 2½ lb 75% DS	
<b>Annual broadleaves</b> (except nightshade)	EPTC (Eptam or Genep)	2¼	1¼ qt	● Incorporate immediately after application.
<b>Annual grasses</b>	+	+	+	
	trifluralin (Treflan)	½	1 pt	
	OR	OR	OR	
	pendimethalin (Prowl)	¾	1½ pt	
	OR	OR	OR	
	ethalfuralin (Sonalan)	¾	2 pt	
<b>Annual broadleaves</b>	EPTC	2¼	1¼ qt	<ul style="list-style-type: none"> <li>● Incorporate immediately after application.</li> <li>● Rainfall isn't critical for activation of <i>Amiben</i> as when it is surface applied.</li> <li>● Provides some nightshade control.</li> <li>● Black nightshade and common ragweed control is improved when <i>Amiben</i> is applied as a preemergence overlay (see below).</li> </ul>
<b>Annual grasses</b>	(Eptam or Genep)			
	+	+	+	
	chloramben (Amiben)	2	4 qt 2L OR 2½ lb 75% DS	
	+	+	+	
	trifluralin (Treflan)	½	1 pt	
	OR	OR	OR	
	pendimethalin (Prowl)	¾	1½ pt	
	OR	OR	OR	
	ethalfuralin (Sonalan)	¾	2 pt	

## PREPLANT FOLLOWED BY PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>Preplant Incorporated</i>				
<b>Annual broadleaves</b> (including nightshade)	EPTC (Eptam or Genep)	2¼	1¼ qt	<ul style="list-style-type: none"> <li>● Incorporate immediately after application.</li> <li>● Follow with preemergence for complete control.</li> </ul>
<b>Annual grasses</b>	+	+	+	
	trifluralin (Treflan)	½	1 pt	
	OR	OR	OR	
	pendimethalin (Prowl)	¾	1½ pt	
	OR	OR	OR	
	ethalfuralin (Sonalan)	¾	2 pt	
<b>FOLLOWED BY: Preemergence</b>	chloramben (Amiben)	2	4 qt 2L OR 2½ lb 75% DS	● Effectiveness depends on adequate rainfall after treatment.

## DRY EDIBLE BEANS — PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> (including nightshade)	metolachlor ( <i>Dual</i> )	2	1 qt	<ul style="list-style-type: none"> <li>● Reduce <i>Dual</i> rate on coarse textured soil low in organic matter (see label).</li> <li>● DANGER of bean injury is greater when <i>Dual</i> is applied preemergence.</li> <li>● This treatment is used for black nightshade control.</li> <li>● Requires rainfall for activation.</li> </ul>
<b>Annual grasses</b>	+ chloramben ( <i>Amiben</i> )	+ 2	+ 4 qt 2L OR 2½ lb 75% DS	

## POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b>	bentazon ( <i>Basagran</i> )	¾	1½ pt	<ul style="list-style-type: none"> <li>● Controls only certain broadleaves. Does not control redroot pigweed or black nightshade. See label and postemergence soybean section.</li> <li>● Check label for specific rate and proper weed growth stage.</li> <li>● Beans must have 1 to 2 trifoliolate leaves before application.</li> </ul>
	+ crop oil concentrate	+ 1 qt	+ 1 qt	
<b>Nutsedge</b> <b>Canada thistle</b>	bentazon ( <i>Basagran</i> )	¾ + ¾	1½ pt + 1½ pt	
	+ crop oil concentrate	+ 1 qt + 1 qt	+ 1 qt + 1 qt	<ul style="list-style-type: none"> <li>● See remarks for nutsedge control under soybeans.</li> <li>● Beans must have 1 to 2 trifoliolate leaves before application.</li> </ul>

# SUNFLOWERS

## PREPLANT

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual grasses</b> <b>Annual broadleaves</b>	chloramben ( <i>Amiben</i> )	2	1 gal 2L OR 2½ lb 75% DS	<ul style="list-style-type: none"> <li>● Incorporate <i>Treflan</i> thoroughly into top 2 or 3 in. of soil within 24 hours after application. <i>Prowl</i> incorporation may be delayed 7 days.</li> <li>● On light soils (sandy and sandy loam) low in organic matter use ½ lb <i>Treflan</i> or ¾ lb <i>Prowl</i>.</li> <li>● Use 6 qt of <i>Amiben</i> for heavy ragweed, mustard, or nightshade populations.</li> </ul>
	+ trifluralin ( <i>Treflan</i> )	+ ¾	+ 1½ pt	
	OR pendimethalin ( <i>Prowl</i> )	OR 1	OR 2 pt	
	chloramben ( <i>Amiben</i> )	2	1 gal 2L OR 2½ lb 75% DS	
	+ alachlor ( <i>Lasso</i> )	+ 2½	+ 2½ qt	<ul style="list-style-type: none"> <li>● May be applied either preplant incorporated or pre-emergence.</li> </ul>
<b>Annual grasses</b> <b>Annual broadleaves</b> (except ragweed, smartweed, mustard, and nightshade)	trifluralin ( <i>Treflan</i> )	¾	1½ pt	<ul style="list-style-type: none"> <li>● Incorporate <i>Treflan</i> within 24 hours or <i>Prowl</i> within 7 days into top 2 or 3 in. of soil.</li> <li>● On light soils (sandy and sandy loam) low in organic matter use ½ lb <i>Treflan</i> or ¾ lb <i>Prowl</i>.</li> </ul>
	OR pendimethalin ( <i>Prowl</i> )	OR 1	OR 2 pt	

## SUNFLOWERS — PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses Annual broadleaves	chloramben ( <i>Amiben</i> )	2	1 gal 2L OR 2½ lb 75% DS	<ul style="list-style-type: none"> <li>Do not graze or feed sunflower forage from <i>Amiben</i>-treated areas.</li> <li><i>Amiben</i> may follow preplant treatments of <i>Treflan</i> or <i>Prowl</i>.</li> <li>Use 6 qt of <i>Amiben</i> for heavy ragweed, mustard, or nightshade populations.</li> </ul>
	chloramben ( <i>Amiben</i> )	2	1 gal 2L OR 2½ lb 75% DS	<ul style="list-style-type: none"> <li>May be applied either preplant incorporated or pre-emergence.</li> </ul>
	+ alachlor ( <i>Lasso</i> )	+ 2½	+ 2½ qt	

# POTATOES

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Quackgrass	dalapon ( <i>Dowpon M</i> )	10	13½ lb	<ul style="list-style-type: none"> <li>Spray in spring when quackgrass is 4 to 6 in. tall. Wait one week before plowing.</li> <li>Use in 30 to 40 gal water/A.</li> <li>Control of quackgrass will be reduced when heavy stand of rye cover is present.</li> </ul>
	glyphosate ( <i>Roundup</i> )	1½	2 qt	<ul style="list-style-type: none"> <li>Apply to actively growing quackgrass at least 8 in. tall.</li> <li>Use 15 to 20 gal water/A.</li> <li>No soil residue.</li> <li>Can plow or till 3 days after application and plant crop.</li> <li>Do not plow or till prior to treatment.</li> <li><i>Emerged</i> potatoes are very sensitive to <i>Roundup</i> damage. Do not use near growing potato plants.</li> <li>Heavy stand of rye cover may reduce quackgrass control.</li> <li><i>Roundup</i> rate of 1 qt may be used for <i>single season</i> quackgrass control. Apply 1 qt in 5 to 10 gal water/A with 0.5% non-ionic surfactant.</li> </ul>

## PREPLANT FOLLOWED BY DELAYED PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>Preplant Incorporated</i> Annual grasses Annual broadleaves	EPTC ( <i>Eptam</i> or <i>Genep</i> )	4	4½ pt	<ul style="list-style-type: none"> <li>Work into soil immediately after application.</li> <li>Use 6 lb/A if nutsedge is a problem.</li> <li>Preplant incorporated.</li> </ul>
FOLLOWED BY: <i>Delayed Preemergence</i>	linuron ( <i>Lorox</i> or <i>Linex</i> )	1	2 lb 50W OR 1 qt 4L OR 2 lb 50% DF	<ul style="list-style-type: none"> <li>Treatment should be made prior to potato emergence and after weeds have emerged, but are very small.</li> <li>A preemergence application of <i>Sencor</i> to Atlantic and Shepody varieties is not recommended since injury can occur, especially under adverse weather conditions and when high <i>Sencor</i> rates are used.</li> </ul>
	OR metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	OR ½	OR 1 lb 50W OR 1 pt 4L OR ¾ lb 75% DF	



## POTATOES — EARLY PREEMERGENCE FOLLOWED BY DELAYED PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Early Preemergence</b>				
<b>Annual grasses</b> (especially barnyard-grass)	metolachlor (Dual)	2	2 pt	<ul style="list-style-type: none"> <li>● If field leveling is necessary it should be done soon after planting.</li> <li>● Apply <b>early preemergence</b>—make application soon after planting.</li> <li>● Most effective on germinating grasses that have <i>not</i> emerged.</li> <li>● Do not use <i>Prowl</i> on muck soils or loamy sands with less than 1.5% organic matter.</li> <li>● A preemergence application of <i>Sencor</i> to Atlantic or Shepody varieties is not recommended since injury can occur, especially under adverse weather conditions where high <i>Sencor</i> rates are used.</li> <li>● Over application of <i>Surflan</i> can result in rotational crop injury (carryover).</li> <li>● Do not apply <i>Surflan</i> if corn is to be planted the following year and minimum tillage or no-tillage of the field is planned.</li> <li>● Follow with <i>Lexone</i> or <i>Sencor</i> or <i>Lorox</i> or <i>Linex</i>.</li> </ul>
		OR	OR	
<b>Annual broadleaves</b>	pendimethalin (Prowl)	3/4	1 1/2 pt	
		OR	OR	
	oryzalin (Surflan)	3/4	1 1/2 pt 4L OR 1 lb 75% W	
		OR	OR	

FOLLOWED BY:

### Delayed Preemergence

	metribuzin (Lexone or Sencor)	1/2	1 lb 50W OR 1 pt 4L OR 2/3 lb 75% DF	<ul style="list-style-type: none"> <li>● These treatments follow <i>Prowl</i>, <i>Dual</i> or <i>Surflan</i> preemergence.</li> <li>● Delayed preemergence.</li> <li>● Apply before potato emergence.</li> <li>● Most effective on small <i>emerged</i> weeds.</li> <li>● A preemergence application of <i>Sencor</i> to Atlantic or Shepody varieties is not recommended since injury can occur, especially under adverse weather conditions where high <i>Sencor</i> rates are used.</li> </ul>
		OR	OR	
	linuron (Lorox or Linex)	1	2 lb 50W OR 1 qt 4L OR 2 lb 50% DF	
		OR	OR	
		OR	OR	
		OR	OR	

## DELAYED PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b>	linuron (Lorox or Linex)	1 1/2	3 lb 50W OR 1 1/2 qt 4L OR 3 lb 50% DF	<ul style="list-style-type: none"> <li>● If field leveling is necessary, it should be done soon after planting to allow weed emergence before spraying.</li> <li>● Apply delayed preemergence before grasses are 2 in. and broadleaves are 4 in., but before potatoes emerge.</li> <li>● On soils with greater than 5% organic matter apply 2 lb a.i./A to emerged weeds.</li> </ul>
		OR	OR	
	metribuzin (Lexone or Sencor)	1/2	1 lb 50W OR 1 pt 4L OR 2/3 lb 75% DF	<ul style="list-style-type: none"> <li>● Use up to 1 lb a.i. metribuzin on high organic (muck) soil.</li> <li>● If field leveling is necessary, it should be done soon after planting to allow weed emergence before spraying.</li> <li>● Apply delayed preemergence before weeds are 1 in., and before potatoes emerge.</li> <li>● A preemergence application of <i>Sencor</i> to Atlantic or Shepody varieties is not recommended since injury can occur, especially under adverse weather conditions where high <i>Sencor</i> rates are used.</li> </ul>

## POTATOES — POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Annual grasses</b>	metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	1/4	1/2 lb 50W OR 1/2 pt 4L OR 1/3 lb 75% DF	<ul style="list-style-type: none"> <li>● Do not make overall postemergence applications following 3 days of cool, wet or cloudy weather as crop injury may occur.</li> <li>● Not recommended for early maturing varieties.</li> <li>● Not recommended for red skin varieties.</li> <li>● Do not apply postemergence within 60 days of harvest.</li> <li>● Greater possibility of injury to potatoes when sprayed overall at 12- to 15-in. stages.</li> <li>● Treat when weeds are less than 1 in. tall.</li> <li>● Not recommended on Atlantic, Shepody, Chip Belle, Bell Chip, or Centennial varieties.</li> </ul>
	metolachlor ( <i>Dual</i> )	2	2 pt	<ul style="list-style-type: none"> <li>● Will not control emerged weeds.</li> <li>● Do not apply within 40 days of harvest.</li> <li>● Do not apply to potatoes at green tip (cracking).</li> </ul>
	metolachlor ( <i>Dual</i> ) + metribuzin ( <i>Lexone</i> or <i>Sencor</i> )	2 + 1/4	2 pt + 1/2 lb 50W OR 1/2 pt 4L OR 1/3 lb 75% DF	<ul style="list-style-type: none"> <li>● Refer to remarks for metribuzin postemergence.</li> <li>● Application should be made only as a directed or semi-directed spray to avoid chlorosis, minor necrosis, and leaf distortion.</li> </ul>

# MINT

## ROW MINT AND MEADOW MINT

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Annual grasses</b>	terbacil ( <i>Sinbar</i> )	1 2/3	2 lb	<ul style="list-style-type: none"> <li>● Apply preemergence only.</li> <li>● Rates may be reduced to 1 lb/A if terbacil was used the previous year.</li> <li>● Do not plant any other crop for two years following application.</li> <li>● Terbacil is also labeled postemergence. (See label for details.)</li> </ul>
<b>Annual broadleaves</b> (See label for specific species)	bentazon ( <i>Basagran</i> ) + crop oil concentrate	1 + 1 qt	1 qt + 1 qt	<ul style="list-style-type: none"> <li>● Postemergence application.</li> <li>● Controls only certain broadleaves.</li> <li>● Use a minimum of 40 psi and 20 gal/A of water.</li> <li>● Do not use flood nozzles.</li> <li>● Check label for proper weed stage for application.</li> <li>● Weak on pigweed, nightshade and lambsquarters.</li> </ul>
<b>Nutsedge</b>	bentazon ( <i>Basagran</i> ) + crop oil concentrate	3/4 + 3/4 + 1 qt + 1 qt	3/4 qt + 3/4 qt + 1 qt + 1 qt	<ul style="list-style-type: none"> <li>● Postemergence application.</li> <li>● See "Remarks" under nutsedge control in soybean section (Page 33).</li> </ul>
<b>Canada thistle</b>	bentazon + crop oil concentrate	1 + 1 + 1 qt + 1 qt	1 qt + 1 qt + 1 qt + 1 qt	<ul style="list-style-type: none"> <li>● Postemergence application.</li> <li>● Two applications required for best thistle control.</li> <li>● Make first application when thistle is 8 in. tall and second application 7 to 10 days later.</li> <li>● Use a minimum of 40 psi and 20 gal/A of water. Do not use flood nozzles.</li> </ul>

# SUGAR BEETS

## PREPLANT

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses	cycloate ( <i>Ro-Neet</i> )	3 lb	2 qt	<ul style="list-style-type: none"> <li>● Incorporate immediately to 2 to 3 in.</li> <li>● Must be followed preemergence by <i>Pyramin</i>.</li> <li>● Injury may occur when <i>Betamix</i> or <i>Betanex</i> are applied postemergence.</li> <li>● Do not apply TCA where <i>Ro-Neet</i> has been applied.</li> </ul>
Annual grasses Redroot pigweed	diethatyl ethyl ( <i>Antor</i> )	2	2 qt	<ul style="list-style-type: none"> <li>● Incorporate to 1 to 2 in.</li> <li>● Follow preemergence with <i>Pyramin</i> or <i>Nortron</i> + <i>Pyramin</i>.</li> <li>● Apply 3 qt/A on clay loam soils.</li> </ul>

## PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses	ethofumesate ( <i>Nortron</i> )	2	5½ qt EC	<ul style="list-style-type: none"> <li>● Soybeans or alfalfa may be injured following <i>Nortron</i>.</li> <li>● On sandy soil with less than 1½% organic matter reduce <i>Nortron</i> rate to 1½ lb/A a.i.</li> <li>● In order to approach 100% weed control it will, in most cases, be necessary to follow with a postemergence application.</li> </ul>
	+ pyrazon ( <i>Pyramin</i> )	+	+	
	+ TCA ( <i>TCA</i> )	+	+	
	pyrazon ( <i>Pyramin</i> )	4	4 qt	<ul style="list-style-type: none"> <li>● TCA should be included even if grasses aren't a problem, as better control of annual broadleaves will result.</li> <li>● In order to approach 100% weed control it will, in most cases, be necessary to follow with a postemergence application.</li> <li>● For soils high in clay content or organic matter, the rate should be 4 lb <i>Pyramin</i> + 8 lb <i>TCA</i>.</li> <li>● For soils low in clay and organic matter the <i>Pyramin</i> rate may be reduced to 3 lb/A a.i.</li> </ul>
	+ TCA ( <i>TCA</i> )	+	+	
	pyrazon ( <i>Pyramin</i> )	4	4 qt	<ul style="list-style-type: none"> <li>● <i>Antor</i> should be included even if grasses are not a problem, since better control of annual broadleaves, especially redroot pigweed, will result.</li> <li>● In order to approach 100% weed control it will, in most cases, be necessary to follow with a postemergence application.</li> </ul>
	+ diethatyl ethyl ( <i>Antor</i> )	+	+	
	pyrazon ( <i>Pyramin</i> )	3	3 qt	<ul style="list-style-type: none"> <li>● See remarks for <i>Pyramin</i> + <i>Nortron</i> + <i>TCA</i>.</li> </ul>
	+ ethofumesate ( <i>Nortron</i> )	+	+	
	+ diethatyl ethyl ( <i>Antor</i> )	+	+	

## SUGAR BEETS — POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (including smartweed)	desmedipham + phenmedipham ( <i>Betamix</i> )	1	6.2 pt	<ul style="list-style-type: none"> <li>● Add 1 qt crop oil concentrate/A for hard to control large weeds or if plants are not vigorously growing. <i>Betamix</i> rate may be reduced 25% to reduce injury.</li> <li>● Apply when the beets are in the 2 to 4 true leaf stage, and weeds 4 leaves or less.</li> <li>● When cultivating the unsprayed area, care should be taken so as to cut away a portion of the sprayed area on the first cultivation and don't roll fresh unsprayed soil back beyond the cut away point.</li> <li>● When temperature is 75°F or greater, apply in late afternoon or early evening.</li> <li>● Do not apply when plants are under stress such as temperatures above 85°F, or when rapid climatic changes from cool, overcast days to hot, bright days occurs, or injury can occur.</li> </ul>
	+	+	+	
	endothall ( <i>H273</i> )	½	1 ⅓ pt	
	desmedipham ( <i>Betanex</i> )	1	6.2 pt	<ul style="list-style-type: none"> <li>● Refer to remarks under <i>Betamix</i> + <i>H273</i>.</li> <li>● More effective pigweed control than <i>Betamix</i>.</li> <li>● Does not control green or yellow foxtail.</li> </ul>
	+	+	+	
	endothall ( <i>H273</i> )	½	1 ⅓ pt	
	ethofumesate ( <i>Nortron</i> )	¾	4 pt EC	<ul style="list-style-type: none"> <li>● Provides full season weed control.</li> <li>● Refer to remarks under <i>Betamix</i> + <i>H273</i>.</li> <li>● Do not use crop oil concentrate.</li> <li>● Apply when beets are in the 4 true leaf stage.</li> </ul>
	+	+	+	
	desmedipham + phenmedipham ( <i>Betamix</i> )	1	6.2 pt	
	+	+	+	
	endothall ( <i>H273</i> )	½	1 ⅓ pt	
	ethofumesate ( <i>Nortron</i> )	¾	4 pt EC	<ul style="list-style-type: none"> <li>● Provides full season weed control.</li> <li>● Refer to remarks under <i>Betamix</i> + <i>H273</i>.</li> <li>● Do not use crop oil concentrate.</li> <li>● More effective pigweed control with <i>Betanex</i> than <i>Betamix</i>.</li> </ul>
	+	+	+	
	desmedipham ( <i>Betanex</i> )	1	6.2 pt	
	+	+	+	
	endothall ( <i>H273</i> )	½	1 ⅓ pt	

(Continued next page)

## SUGAR BEETS — POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
<b>Annual broadleaves</b> (including smartweed)	pyrazon ( <i>Pyramin</i> )	2	2 qt	<ul style="list-style-type: none"> <li>● Apply when the beets are in the 2 to 4 true leaf stage, and weeds 4 leaves or less.</li> <li>● When cultivating the unsprayed area, be sure to cut away a portion of the sprayed area on the first cultivation and don't roll fresh unsprayed soil back beyond the cut away point.</li> <li>● Maximum total amount of pyrazon that can be used for beets grown and processed in Michigan is 8 lb/A a.i. (2 lb on a 7-in. band).</li> <li>● When temperature is 75°F or greater, apply in late afternoon or early evening.</li> <li>● Do not apply when plants are under stress such as temperatures above 85°F, or when rapid changes from cool overcast days to hot bright days occurs, or injury can occur.</li> <li>● Add one qt crop oil concentrate/A for hard to control large weeds or if plants are not vigorously growing.</li> </ul>
	+	+	+	
	desmedipham + phenmedipham ( <i>Betamix</i> )	1	6.2 pt	
	+	+	+	
	endothall ( <i>H273</i> )	½	1½ pt	
	+	+	+	
	pyrazon ( <i>Pyramin</i> )	2	2 qt	<ul style="list-style-type: none"> <li>● Refer to remarks under <i>Pyramin + Betamix + H273</i>.</li> <li>● More effective pigweed control than <i>Betamix</i>.</li> <li>● Does not control green or yellow foxtail.</li> </ul>
	+	+	+	
desmedipham ( <i>Betanex</i> )	1	6.2 pt		
	+	+	+	
	endothall ( <i>H273</i> )	½	1½ pt	
<b>Annual broadleaves</b> (except smartweed and wild buckwheat)	pyrazon ( <i>Pyramin</i> )	2	2 qt	<ul style="list-style-type: none"> <li>● Refer to remarks under <i>Pyramin + Betamix + H273</i>.</li> </ul>
	+	+	+	
	dalapon ( <i>Dowpon M</i> )	1	1½ lb	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
<b>Smartweed and buckwheat</b>	endothall ( <i>H273</i> )	1	2¾ pt	<ul style="list-style-type: none"> <li>● Refer to remarks under <i>Betamix</i> and <i>H273</i>.</li> </ul>
<b>Annual grasses</b> <b>Volunteer corn</b>	sethoxydim ( <i>Poast</i> )	0.19	1 pt	<ul style="list-style-type: none"> <li>● Use 1¼ pt/A <i>Poast</i> for volunteer corn.</li> <li>● No soil activity from <i>Poast</i>. Controls only grasses present when sprayed.</li> <li>● Treat actively growing grass. Treat foxtails, fall panicum, and barnyardgrass up to 8 in. and crabgrass up to 4 in.</li> <li>● Use a minimum of 5 gal/A water and 40 psi for <i>Poast</i>.</li> <li>● Avoid drift onto corn, sorghum, small grains or turf.</li> <li>● Rainfall within one hour of application will reduce control.</li> <li>● Does not control nutsedge.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
<b>Small grains</b>	sethoxydim ( <i>Poast</i> )	0.29	1½ pt	<ul style="list-style-type: none"> <li>● Apply before tillering (6 in. tall).</li> <li>● Spring seeded cereals only.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	

## SUGAR BEETS — POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Quackgrass	sethoxydim (Poast)	0.48 + 0.29	2½ pt + 1½ pt	<ul style="list-style-type: none"> <li>● TWO APPLICATIONS ARE NEEDED FOR BEST QUACKGRASS CONTROL. MAKE SECOND APPLICATION 14 TO 21 DAYS FOLLOWING INITIAL TREATMENT. CULTIVATION MAY REPLACE SECOND APPLICATION.</li> <li>● No soil activity from Poast. Controls only grass present when sprayed.</li> <li>● Treat actively growing quackgrass 6 to 8 in. tall.</li> <li>● Use a minimum of 5 gal/A water and 40 psi for Poast application.</li> <li>● Avoid drift onto corn, sorghum, small grains or turf.</li> <li>● Rainfall within one hour of application will reduce control.</li> <li>● Addition of other herbicides to tank may reduce quackgrass control.</li> </ul>
	+ crop oil concentrate	+ 1 qt + 1 qt	+ 1 qt + 1 qt	

# FORAGE SORGHUM

## PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b> <b>Annual grasses</b> (except fall panicum, green foxtail, giant foxtail, witchgrass, and crabgrass)	atrazine (commercial product)	2	2½ lb 80W OR 2 qt 4L OR 2.2 lb 50% WDG	<ul style="list-style-type: none"> <li>● Do not use on sands, loamy sands, sandy clay loams, or any soil with less than 1% organic matter.</li> <li>● Heavy rains following application may cause injury.</li> <li>● May be applied preplant incorporated.</li> <li>● Do not apply to sudangrass.</li> <li>● See label for details.</li> </ul>
<b>Annual broadleaves</b> <b>Annual grasses</b>	propazine (Milogard)	2	2 qt 4L OR 2.2 lb 90% WDG	<ul style="list-style-type: none"> <li>● Preemergence only.</li> <li>● Do not use on sand or loamy sand.</li> <li>● Crop damage may occur on highly alkaline or eroded soils.</li> <li>● Corn may be planted 12 months after application. Do not rotate to any other crop for 18 months after application.</li> <li>● Do not use on sudangrass or sorghum-sudangrass hybrids.</li> </ul>
	atrazine (commercial product)	1	1¼ lb 80W OR 1 qt 4L OR 1.1 lb 90% WDG	<ul style="list-style-type: none"> <li>● CAUTION: Seed must be treated with CGA-92194 (<i>Concep II</i>) herbicide antidote.</li> <li>● See label for additional restrictions.</li> <li>● A commercial prepackage mix (<i>Bicep</i>) is available.</li> <li>● May be applied preplant incorporated.</li> <li>● Do not apply to sudangrass or sorghum-sudangrass hybrids.</li> </ul>
	+ metolachlor (Dual)	+ 1½	+ 1½ pt	

## FORAGE SORGHUM — POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<b>Annual broadleaves</b>	atrazine (commercial product)	1.2	1.5 lb 80W OR 1.2 qt 4L OR 1.3 lb 90% WDG	<ul style="list-style-type: none"> <li>● Apply after sorghum has reached the 3-leaf stage.</li> <li>● Apply before common lambsquarter and redroot pigweed reach 6 in. and other broadleaf weeds 4 in.</li> <li>● Heavy rainfall following application may cause injury.</li> <li>● Do not apply on sands or loamy sands.</li> <li>● Do not graze or cut for feed for 21 days following application.</li> <li>● Do not apply to sudangrass.</li> </ul>
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	bromoxynil ( <i>Buctril</i> ) OR ( <i>ME-4 Brominal</i> )	3/8  OR 3/8	1 1/2 pt  OR 3/4 pt	<ul style="list-style-type: none"> <li>● Apply to weeds less than 4 in. tall for effective control.</li> <li>● Do not mix with spray additives or liquid fertilizers.</li> <li>● Redroot pigweed and mustard must be controlled when very small (refer to label for details).</li> <li>● Some leaf burn may occur, especially under cool and cloudy or hot and humid conditions.</li> <li>● Do not cut for feed or graze for 30 days after application.</li> <li>● Do not apply to sudangrass or sorghum-sudangrass hybrids.</li> </ul>

**TABLE 2 — WEED RESPONSE TO HERBICIDES IN CORN\***

	ANNUAL BROADLEAVES									ANNUAL GRASSES							PERENNIALS					
	COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEED	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	WILD PROSO MILLET	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEDGE
<b>Preplant Incorporated</b>																						
ATRAZINE	F	F	E	E	G	E	G	F	E	G	P	F	F	G	P	P	P	P	P	F	G	F
BLADEX	F	P	E	G	F	E	G	P	G	G	F	F	G	G	F	F	F	N	N	N	N	N
DUAL	N	N	P	F	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	E
ERADICANE	P	P	G	P	F	F	F	F	F	E	E	E	E	E	E	E	G	N	N	N	G	G
ERADICANE EXTRA	P	P	G	P	F	F	F	F	F	E	E	E	E	E	E	E	G	N	N	N	G	G
GENATE + /SUTAN +	P	P	P	N	P	P	P	P	P	E	E	E	E	E	E	E	F	N	N	N	P	G
LASSO	N	N	P	G	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	G
PRINCEP	G	F	E	E	E	E	G	F	E	G	F	F	F	G	P	P	P	P	P	P	F	F
<b>Preemergence</b>																						
ATRAZINE	F	F	E	E	G	E	G	F	E	G	P	F	F	G	P	P	P	P	P	F	G	F
BLADEX	F	P	E	G	F	E	G	P	G	G	F	F	G	G	F	F	F	N	N	N	N	N
DUAL	N	N	P	F	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	G
LASSO	N	N	P	G	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	F
PRINCEP	G	F	E	E	E	E	G	F	E	G	F	F	F	G	P	P	P	P	P	P	F	F
PROWL	N	N	G	P	F	P	P	P	P	E	E	E	E	E	E	E	F	N	N	N	N	N
RAMROD	N	P	P	N	F	P	P	P	P	G	E	E	E	E	G	G	-	N	N	N	N	N
<b>Postemergence</b>																						
ATRAZINE + OIL	G	G	E	G	E	E	G	G	E	F	P	F	G	G	P	P	P	P	P	G	G	G
BANVEL	G	G	G	G	G	E	G	F	N	N	N	N	N	N	N	N	F	G	F	N	N	
BASAGRAN + OIL	E	G	F	P	P	F	G	E	N	N	N	N	N	N	N	N	N	N	G	N	G	
BLADEX	F	P	E	G	F	E	G	P	G	G	F	F	G	G	P	P	F	N	N	N	N	N
BUCTRIL/ME-4 BROMINAL	G	G	G	G	F	G	G	F	N	N	N	N	N	N	N	N	P	P	P	N	N	
EVIK <sup>1</sup>	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	F	F	F	P	F	
LINEX/LOROX <sup>1</sup>	F	F	G	G	G	G	G	G	F	F	F	F	F	F	F	F	N	N	N	N	N	
2,4-D AMINE	F	F	G	G	G	P	F	G	N	N	N	N	N	N	N	N	P	F	F	N	N	
2,4-D ESTER	F	F	G	G	G	P	F	G	N	N	N	N	N	N	N	N	F	G	G	N	N	
TANDEM + "TRIAZINE"	G	G	E	G	E	E	G	E	G	G	G	G	G	P	P	G	P	P	F	F	F	

P = Poor; G = Good; E = Excellent; N = None

<sup>1</sup>Post Directed Only

\*The above ratings are a relative comparison of herbicide effectiveness. Weather conditions greatly influence the herbicide's effectiveness and weed control may be better under favorable conditions or poorer under unfavorable conditions.



**TABLE 3 — WEED RESPONSE TO HERBICIDES IN SOYBEANS\***

	ANNUAL BROADLEAVES									ANNUAL GRASSES							PERENNIALS					
	COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEED	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	WILD PROSO MILLET	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEGE
<b>Preplant Incorporated</b>																						
AMIBEN	P	P	G	G	G	G	G	F	F	P	P	P	P	P	P	P	P	N	N	N	N	N
DUAL	N	N	P	F	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	E
LISSO	N	N	P	G	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	G
LEXONE/SENCOR	G	F	E	N	E	E	E	G	E	F	F	F	G	G	F	F	P	N	N	N	N	N
PROWL	N	N	G	P	F	P	P	P	P	E	E	E	E	E	E	E	F	N	N	N	N	N
SONALAN	N	N	G	F	G	P	P	N	P	E	E	E	E	E	E	E	F	N	N	N	N	N
TREFLAN	N	N	G	N	G	N	P	N	P	E	E	E	E	E	E	E	F	N	N	N	N	N
<b>Preemergence</b>																						
AMIBEN	P	P	G	G	E	E	G	F	F	F	F	E	F	F	F	F	F	N	N	N	N	N
DUAL	N	N	P	F	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	N
LISSO	N	N	P	G	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	F
LEXONE/SENCOR	G	F	E	N	E	E	G	G	E	F	F	F	G	G	F	F	P	N	N	N	N	N
LINEX/LOROX	P	P	G	G	G	G	G	F	G	F	F	F	F	F	F	F	P	N	N	N	N	N
SURFLAN	N	N	G	P	G	P	P	P	P	E	E	E	E	E	E	E	F	N	N	N	N	N
<b>Postemergence</b>																						
AMIBEN (Foliar Activity)	N	N	P	P	F	F	F	F	P	N	N	N	N	N	N	N	N	N	N	N	N	N
BASAGRAN	E	G	F	P	P	F	G	G	E	N	N	N	N	N	N	N	N	N	N	G	N	G
BLAZER 2L/TACKLE 2L	F	G	F	G	E	G	G	F	E	N	N	F	N	N	F	N	N	P	P	P	N	N
CLASSIC	E	G	P	P	G	G	G	F	-	N	N	P	P	P	N	N	N	N	N	N	N	G
FUSILADE 2000	N	N	N	N	N	N	N	N	N	E	E	E	E	E	E	E	E	N	N	N	G	N
HOELON	N	N	N	N	N	N	N	N	N	G	G	G	G	G	G	G	G	N	N	N	N	N
POAST	N	N	N	N	N	N	N	N	N	E	G	E	E	E	E	E	E	N	N	N	F	N

**TABLE 4 — WEED RESPONSE TO HERBICIDES IN FORAGES\***

	ANNUAL BROADLEAVES										ANNUAL GRASSES							PERENNIALS						
	COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEED	SMARTWEED	VELVETLEAF	WILD MUSTARD	HOARY ALLYSUM	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	WILD PROSO MILLET	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEGE	DANDELION
BALAN	N	N	G	N	G	N	P	N	P	P	E	E	E	E	E	E	G	P	N	N	N	N	P	N
EPTAM/GENEP	P	P	G	P	F	F	F	F	F	F	E	E	E	E	E	E	E	F	N	N	N	F	P	N
KERB	P	P	P	P	P	P	P	P	P	P	F	F	P	F	F	P	P	P	N	N	N	G	N	N
LEXONE/SENCOR	E	G	E	N	E	E	E	E	E	E	G	G	G	E	E	G	G	-	N	N	N	P	P	G
MCPA	F	F	G	G	G	G	G	F	G	G	N	N	N	N	N	N	N	N	P	P	F	N	N	P
PRINCEP	G	F	E	E	E	E	G	F	E	E	G	F	F	F	G	P	P	P	P	P	P	P	F	P
SINBAR	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	P	P	P	F	F	P	F
2,4-DB	P	P	G	F	G	F	P	F	F	G	N	N	N	N	N	N	N	N	P	P	P	N	N	N
VELPAR	G	G	E	F	E	E	E	G	E	E	G	G	E	E	E	E	E	-	F	F	F	F	F	G

P = Poor; G = Good; E = Excellent; N = None

\*The above ratings are a relative comparison of herbicide effectiveness. Weather conditions greatly influence the herbicide's effectiveness and weed control may be better under favorable conditions or poorer under unfavorable conditions.

**TABLE 5 — WEED RESPONSE TO HERBICIDES  
IN DRY EDIBLE BEANS\***

	ANNUAL BROADLEAVES									ANNUAL GRASSES									PERENNIALS				
	COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEED	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	WILD PROSO MILLET	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEGE	
<b>Preplant Incorporated</b>																							
AMIBEN	P	P	G	G	G	G	G	F	F	P	P	P	P	P	P	P	P	N	N	N	N	N	
DUAL	N	N	P	F	G	P	P	N	P	F	F	F	F	F	G	G	F	N	N	N	N	G	
EPTAM/GENEP	P	P	G	P	F	F	F	F	F	F	F	F	F	F	F	F	F	N	N	N	F	P	
LASSO	N	N	P	G	G	P	P	N	P	F	F	F	F	F	G	G	F	N	N	N	N	F	
TREFLAN	N	N	G	N	G	N	P	N	P	F	F	F	F	F	F	F	F	N	N	N	N	N	
SONALAN	N	N	G	F	G	P	P	N	P	F	F	F	F	F	F	F	F	N	N	N	N	N	
PROWL	N	N	G	P	F	P	P	F	P	F	F	F	F	F	F	F	F	N	N	N	N	N	
<b>Preemergence</b>																							
AMIBEN	P	P	G	G	E	G	G	F	F	F	F	F	F	F	F	F	F	N	N	N	N	N	
<b>Postemergence</b>																							
BASAGRAN	E	G	F	P	P	F	G	G	E	N	N	N	N	N	N	N	N	N	N	G	N	G	

**TABLE 6 — WEED RESPONSE TO HERBICIDES IN POTATOES\***

	ANNUAL BROADLEAVES									ANNUAL GRASSES									PERENNIALS				
	COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEED	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	WILD PROSO MILLET	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEGE	
<b>Preplant Incorporated</b>																							
EPTAM/GENEP	P	P	G	P	F	F	F	F	F	F	F	F	F	F	F	F	F	N	N	N	F	F	
<b>Preemergence</b>																							
DUAL	N	N	P	F	G	P	P	N	P	F	F	F	F	F	G	G	F	N	N	N	N	F	
LEXONE/SENCOR	G	F	E	N	E	E	E	G	E	F	F	F	G	G	F	F	P	N	N	N	N	N	
LINEX/LOROX	P	P	G	G	G	G	G	F	G	F	F	F	F	F	F	F	P	N	N	N	N	N	
PROWL	N	N	G	P	F	P	P	P	P	F	F	F	F	F	F	F	F	N	N	N	N	N	
SURFLAN	N	N	G	P	G	P	P	P	P	F	F	F	F	F	F	F	F	N	N	N	N	N	
<b>Postemergence</b>																							
LEXONE/SENCOR	G	F	E	N	E	E	E	G	E	F	F	F	F	F	F	F	P	N	N	N	N	N	

P = Poor; G = Good; E = Excellent; N = None

\*The above ratings are a relative comparison of herbicide effectiveness. Weather conditions greatly influence the herbicide's effectiveness and weed control may be better under favorable conditions or poorer under unfavorable conditions.

**TABLE 7 — WEED RESPONSE TO HERBICIDES IN SUGARBEETS\***

	ANNUAL BROADLEAVES									ANNUAL GRASSES							PERENNIALS				
	COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEED	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEDEGE
<b>Preplant Incorporated</b>																					
ANTOR	N	N	P	F	F	P	P	N	P	G	G	G	G	G	G	G	N	N	N	N	G
RO-NEET	P	P	P	P	P	P	P	P	P	G	G	G	G	G	G	G	N	N	N	N	F
<b>Preemergence</b>																					
ANTOR	N	N	P	F	F	P	P	N	P	G	G	G	G	G	G	G	N	N	N	N	G
NORTRON	F	F	G	G	G	P	G	P	G	P	G	P	F	F	P	P	N	N	N	N	P
PYRAMIN	P	P	E	G	G	G	G	P	G	F	F	F	F	F	F	F	N	N	N	N	N
TCA	N	N	F	P	F	F	F	N	P	G	G	G	G	G	G	G	N	N	N	G	P
<b>Postemergence</b>																					
BETAMIX	F	F	E	F	F	G	G	P	G	P	P	P	P	P	P	P	N	N	N	N	N
BETANEX	F	F	G	F	G	G	G	P	G	P	P	P	P	P	P	P	N	N	N	N	N
DOWPON	N	N	N	N	N	N	N	N	N	G	F	G	G	G	G	G	N	N	N	G	P
H273	P	P	P	P	P	P	E	P	P	N	N	N	N	N	N	N	N	N	P	N	N
NORTRON	F	F	G	G	G	P	G	P	G	P	G	P	F	F	P	P	N	N	N	N	P
POAST	N	N	N	N	N	N	N	N	N	E	E	E	E	E	E	E	N	N	N	F	N

**TABLE 8 — WEED RESPONSE TO MISCELLANEOUS AND NON-SELECTIVE HERBICIDES\***

	ANNUAL BROADLEAVES									ANNUAL GRASSES							PERENNIALS				
	COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEED	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	WILD PROSO MILLET	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS
GRAMOXONE/PARAQUAT	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	P	P	P	P	P
MILOGARD	G	F	G	E	E	E	E	P	E	G	P	F	P	G	P	P	P	P	P	F	F
ROUNDUP	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	G	G	G	E	P

P = Poor; G = Good; E = Excellent; N = None

\*The above ratings are a relative comparison of herbicide effectiveness. Weather conditions greatly influence the herbicide's effectiveness and weed control may be better under favorable conditions or poorer under unfavorable conditions.

## TABLE 9 — GLOSSARY OF CHEMICAL NAMES

COMMON NAME	TRADE NAME* AND MANUFACTURER	CONCENTRATION AND COMMERCIAL FORMULATION†
ACIFLUORFEN	BLAZER 2L (Rohm and Haas) TACKLE 2L (Rhône-Poulenc)	2 lb/gal L
ALACHLOR	LASSO, MICRO-TECH LASSO (Monsanto)	4 lb/gal L; 15% G
ALACHLOR + ATRAZINE	LASSO-ATRAZINE (Monsanto)	4 lb/gal L (2.5 + 1.5)
AMETRYN	EVIK (Ciba-Geigy)	80% WP
ATRAZINE	Several (various)	80% WP; 4 lb/gal L; 90% WDG
ATRAZINE + BUTYLATE + R-25788	SUTAZINE (Stauffer)	6 lb/gal L (1.2 + 4.8)
ATRAZINE + DICAMBA	MARKSMAN (Sandoz)	3.2 lb/gal L (2.1 + 1.1)
ATRAZINE + METOLACHLOR	BICEP (Ciba-Geigy)	4.5 lb/gal L (2 + 2.5)
BENEFIN	BALAN (Elanco)	1½ lb/gal L
BENTAZON	BASAGRAN (BASF)	4 lb/gal L
BROMOXYNIL	ME-4 BROMINAL (Union Carbide) BUCTRIL (Rhône-Poulenc)	4 lb/gal L 2 lb/gal L
BUTYLATE + R-25788	SUTAN PLUS (Stauffer) GENATE PLUS (PPG)	6.7 gal L; 10% G
CHLORAMBEN	AMIBEN (Union Carbide)	10% G; 2 lb/gal L; 75% DS
CHLORIMURON ETHYL	CLASSIC (DuPont)	25% DF
CYANAZINE	BLADEX (DuPont)	80% WP; 4L; 90% DF; 15% G
CYCLOATE	RO-NEET (Stauffer)	6 lb/gal L; 10% G
DALAPON	DOWPON M (Vertac)	74% WSP
DESMEDIPHAM	BETANEX (Nor-Am)	1.3 lb/gal L
DESMEDIPHAM + PHENMEDIPHAM	BETAMIX (Nor-Am)	1.3 lb/gal L (.65 + .65)
DICAMBA	BANVEL or BANVEL II (Sandoz)	4 lb/gal or 2 lb/gal L
DICLOFOP	HOELON (Hoechst-Reusset)	3 lb/gal L
DIETHATYL ETHYL	ANTOR (Nor-Am)	4 lb/gal L
ENDOTHALL	HERBICIDE 273 (Pennwalt)	3 lb/gal L; 5% G
EPTC	EPTAM (Stauffer) GENEP (PPG)	7 lb/gal L; 10% G
EPTC + R-25788	ERADICANE (Stauffer)	6.7 lb/gal L
EPTC + R-25788 + R-33865	ERADICANE EXTRA (Stauffer)	6 lb/gal L
ETHALFLURALIN	SONALAN (Elanco)	3 lb/gal L
ETHOFUMESATE	NORTRON (Nor-Am)	1½ lb/gal L
FLUAZIFOP-P-BUTYL	FUSILADE 2000 (ICI)	1 lb/gal L
GLYPHOSATE	ROUNDUP (Monsanto)	3 lb/gal L
HEXAZINONE	VELPAR (DuPont)	2 lb/gal L; 90% WP
LINURON	LOROX (Dupont) LINEX (Griffin)	50% WP; 4 lb/gal L; 50% DF
MCPA	Several (various)	Various L
METOLACHLOR	DUAL (Ciba-Geigy)	8 lb/gal L; 25% G
METRIBUZIN	LEXONE, LEXONE DF, LEXONE 4L (DuPont) SENCOR, SENCOR DF, SENCOR 4 (Mobay)	50% WP; 75% DF; 4 lb/gal L
METRIBUZIN + METOLACHLOR	TURBO (Mobay)	8 lb/gal L (1.45 + 6.55)
ORYZALIN	SURFLAN (Elanco)	75% WP; 4 lb/gal L
PARAQUAT	ORTHO PARAQUAT (Chevron) GRAMOXONE (ICI)	2 lb/gal L
PENDIMETHALIN	PROWL (American Cyanamid)	4 lb/gal L
PRONAMIDE	KERB (Rohm and Haas)	50% WP (in soluble pouches)
PROPACHLOR	RAMROD (Monsanto)	65% WP; 20% G
PROPAZINE	MILOGARD (Ciba-Geigy)	4 lb/gal L; 80% WP; 90% WDG
PYRAZON	PYRAMIN (BASF)	80% WP; 4 lb/gal L
SETHOXYDIM	POAST (BASF)	1.53 lb/gal L
SIMAZINE	PRINCEP (Ciba-Geigy)	80% WP; 4% G; 4 lb/gal L; 90% WDG
TCA	TCA (various)	4.76 lb/gal L
TERBACIL	SINBAR (DuPont)	80% WP
TRIDIPHANE	TANDEM (Dow)	4 lb/gal L
TRIFLURALIN	TREFLAN (Elanco)	4 lb/gal L; 5% G
2,4-D	Several (various)	L, G, various
2,4-DB	BUTYRAC (Union Carbide) BUTOXONE (Vertac)	2 lb/gal L

\*"Several" means there are numerous 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.

†DF—dry flowable, G—granular, L—liquid, WDG—water dispersible granule, WP—wetable powder, WSP—water soluble powder.



# PESTICIDE EMERGENCY INFORMATION



(Please post in an appropriate place)

For any type of emergency involving a pesticide, the following Emergency Information Centers should be contacted immediately for assistance. This Cooperative Extension Service Bulletin is the latest information available as of July 1986, and replaces all previous listings of similar information.

## HUMAN PESTICIDE POISONING

### Eastern Half of Michigan

*within the Detroit City proper*

**\*(313) 745-5711**

*within the 313 area code*

**\*(800) 462-6642**

*statewide*

**\*(800) 572-1655**

*Poison Control Center  
Children's Hospital of Michigan  
3901 Beaubien  
Detroit, MI 48201*

### Western Half of Michigan

*within the Grand Rapids City proper*

**\*(616) 774-7854**

*within the 616 area code*

**\*(800) 442-4571**

*statewide*

**\*(800) 632-2727**

*Blodgett Regional Poison Center  
Blodgett Memorial Medical Center  
1840 Wealthy, S.E.  
Grand Rapids, MI 46506*

### Upper Peninsula of Michigan

*within the Marquette City proper*

**\*(906) 225-3497**

*Upper Peninsula only*

**\*(800) 562-9781**

*U.P. Poison Control Center  
Marquette General Hospital  
420 West Magnetic Street  
Marquette, MI 48955*

## SPECIAL PESTICIDE EMERGENCIES

### Animal Poisoning

Your Personal Veterinarian

( ) -

and/or

Animal Health Diagnostic Laboratory  
Michigan State University

**(517) 353-1683**

### Pesticide Fire

Local Fire Department

( ) -

and

Fire Marshal Division, Michigan State Police

(Local authorities will assist in contacting the State Fire Marshal)

### Traffic Accident

Local Police Department or Sheriff's Department

( ) -

and

Motor Carrier Division, Michigan State Police

( ) -

### Environmental Pollution

Pollution Emergency Alerting System (PEAS)  
Michigan Department of Natural Resources

**\*(800) 292-4706**

### Pesticide Use Incident

Pesticides & Plant Pest Management Division  
Michigan Department of Agriculture

**(517) 373-1087**

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