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1997 WEED CONTROL GUIDE FOR FIELD CROPS

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This publication contains pesticide recommendations based on research and pesticide regulations. However, changes in pesticide regulations occur constantly. Some pesticides mentioned may no longer be available, and some uses may no longer be legal. If you have questions about the legality and/or registration status for using pesticides, contact your county MSU Extension office.

To protect yourself and others and the environment, always read the label before applying any pesticide.

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1997

WEED CONTROL GUIDE

for Field Crops

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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 labeled for 1) the crop you wish to use it on and 2) the pest you wish to manage on that crop. Remember, 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 management tools for the control of pests in crops but only when they are used in an effective, economical, and environmentally sound manner.

See pesticide emergency information — Inside Back Cover.

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Weeds 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 at times 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 help reduce this problem.

Cultural Control of Weeds

Crop competition is a very useful method of weed control. Maintaining production practices that optimize crop growth means the crop plants can compete more effectively with weeds. Several crop management practices can improve the competitive ability of the crop. These practices include crop and variety selection, planting date, population, soil 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 (e.g., triazine-resistant weeds) becoming a problem.

Cultivation

Timely, shallow cultivation may be necessary following herbicide treatment. Be sure to cultivate as shallowly 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 2 weeks after application unless weeds appear. If dry weather persists for 2 weeks after herbicide application, rotary hoe or cultivate shallowly. Delay cultivation after postemergence herbicide applications for at least 7 to 10 days to allow the chemical to move into weed stems and roots.

Chemical Control of Weeds

No one chemical used as a herbicide will kill all species of weeds. 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 can damage the crop.

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 these 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 if the

materials are left on the soil surface. Preplant incorporated herbicides have increased activity in the absence of rainfall 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 suppression from soil-applied herbicides.

Advantages of preplant incorporated herbicides:

- (1) No weed competition to the crop with early control of weeds;
- (2) Weeds already controlled 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 on some perennial weeds (nutsedge) 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. Two pass 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 emerge through the soil.

Advantages of preemergence herbicides:

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

tion or spraying;

(3) Planting and herbicide application may be 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 present in the field;

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

(3) Are usually more effective (though 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 for 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 postemergence 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 injury than are early morning applications. Early morning application predisposes the crop plant to danger periods of high temperatures, which increase 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. Wind may then move sufficient vapors to areas with sensitive crops and cause crop injury. Amine formulations of 2,4-D 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.

Herbicide Formulations and Additives

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, granules have given less control. Generally, this has been due to (1) use of equipment giving non-uniform 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.

Herbicide Formulations

DC — *Dry Concentrate*

DF — *Dry Flowable Granule*

DG — *Dispersible Granule*

DS — *Dry Soluble Granule*
EC — *Emulsifiable Concentrate*
F — *Flowable*
G — *Granule*
L — *Liquid*
WP — *Wettable Powder*
WSP — *Wettable Soluble Powder*
SC — *Suspension Concentrate*

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 a 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 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 in 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 pre-mixed 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 spreader) — reduces water surface tension, causing better contact between spray solution and treated surfaces.
- (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 a 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. 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. Experiments conducted by several universities 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.

Crop Oil Concentrates

Crop oil concentrates contain a mixture of emulsifiers and surfactants. A common ratio is 80% oil and 20% surfactant. Crop oil concentrates are generally recommended at a rate of 1 quart per acre or less.

These additives are recommended with postemergence applications of several herbicides. Herbicide 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.

Adjuvants, Surfactants, Wetting Agents

Many spray additives are currently available and many exaggerated claims have been made. 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. Additives aid performance of the herbicide in adverse conditions but are not a way to use less herbicide.

The *Bladex 90DF* label calls for the addition of a non-ionic 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, additives are not recommended for postemergence *Bladex 90DF* use in Michigan.

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, exces-

sive 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 an 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.

Herbicide Application Equipment

Sprayer Implements — A good weed control sprayer should be made of non-corrosive materials, be 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 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.

Herbicide Incorporation

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, such as chopping the quackgrass rhizomes, which is required for *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 setup and operation. Wide sweeps 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.

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. 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.

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 her-

bicides, making them less available to kill weeds. Soils with high clay and organic matter content require higher 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 are more persistent at higher soil pH, and crop rotation must be considered before applying a herbicide. Some herbicides (metribuzin) are more available at higher soil pH. Rates must be reduced to avoid crop injury. Knowledge of the soil pH in a field is critical, as soil pH may vary from 6.5 to 7.5 in areas within a field.

Organic matter analysis is available through Cooperative Extension Service county 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.

Soil sample 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, always know the soil pH, 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 application, 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 degree 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) × boom width (in feet) ÷ 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 application 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 cannot be emphasized enough.

Pesticide accidents occur most often during mixing and tank filling operations. Although accidental ingestion of chemicals is considered 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 carryover 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 a 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 Bioassays

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. 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 Tables 1-11 and Table 22 for each herbicide combination.

Atrazine carryover to rotation crops is a common problem. A problem with herbicide residues is more likely to occur the year following a

season of limited rainfall and cool temperatures because of the slow dissipation of the herbicide.

Herbicide bioassays can indicate whether enough herbicide is present to harm the crop. Obtain soil for a bioassay 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. 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 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 bottoms 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 1/2 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. Knowing the exact number of seeds planted enables seedling emergence to 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; if carryover 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 carryover is observed, it is advisable to plant a resistant crop.

Soil can also be analyzed in a laboratory for the amount of herbicide remaining in the soil. Most herbicides can be detected with a chemical soil analysis. This procedure is more expensive than a plant bioassay. Consult your county Cooperative Extension Service agent for a listing of commercial laboratories.

Herbicide Application

Herbicide Spray Volumes and Rates

Tables 1-8 list 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. With wettable powders use nozzles that deliver at least 15 gal per acre. Use 30 to 40 gal of water per acre when spraying quackgrass with atrazine. Use 10 gal of water per acre or less when spraying quackgrass or annual grasses with *Poast*.

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 postemergence 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 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, reducing the cost per acre for the chemical. Where chemical costs are high, band spraying may be justified. 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.) Use nozzles designed for banding, as the spray volume with these nozzles is the same across the entire band.

Cleaning of Pesticide Sprayers

It is important to clean pesticide 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 used only for soil applications of herbi-

cides, usually only a thorough water rinse is necessary. Exceptions are sulfanyl urea herbicides, such as *Accent*, *Beacon*, *Coassic*, *Express*, *Harmony Extra*, *Lorox Plus*, *Pinnacle*, and *Preview*; and also *Command*. Consult these specific herbicide labels for detailed spray tank cleaning procedures.

In general, 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 1 gal household ammonia in 100 gal of water as a cleaning agent.

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 or 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.

Pesticides and the Environment

Many people who live in rural Michigan get their drinking water from wells. Well water is groundwater, so it is easy to see why you should be concerned about keeping herbicides out of groundwater. Several processes determine the fate of herbicides and whether they will end up in your drinking supply. Sometimes these processes are beneficial and enhance weed control. For example, the leaching of a root-absorbed herbicide into the root zone can enhance weed control. The degradation of pesticides can remove non-essential pesticide residues from the environment. Often, however, these processes are detrimental. Runoff can move a herbicide away from target weeds. As a result, chemical is wasted, weed control is reduced and there is an increased chance of damage to non-target plants, hazard to human health, and pollution of nearby soil and water.

In this section we will examine the fate of pesticides and the various processes that affect their stability and persistence following an application, disposal, or spill.

Adsorption is the binding of chemicals to soil particles. (This term is sometimes confused with absorption, the process by which plants intake chemicals.) The amount and persistence of pesticide adsorption varies with pesticide properties, soil moisture content, soil pH, and soil texture. Soils high in organic matter or clay are the most adsorptive; coarse, sandy soils that lack organic matter or clay are much less adsorptive.

A soil-adsorbed herbicide is less likely to volatilize, leach or be degraded by microorganisms. When herbicides are tightly held by soil particles, they are less available for absorption by plants. Therefore certain herbicides used on highly adsorptive soils may require higher rates or more frequent applications to compensate for the portion of

the herbicide that binds to the soil particles and is unavailable for plant uptake.

Volatilization occurs when a solid or a liquid turns into a gas. Volatilization of pesticides increases with higher air temperature and air movement, higher temperature at the treated surface (soil, plant, etc.), low relative humidity, and decreasing size of spray droplets. Pesticides also volatilize more readily from coarse-textured soils and from medium- to fine-textured soils with high moisture content.

A pesticide in a gaseous state can be carried away from the treated area by air currents. The movement of pesticide vapors in the atmosphere is called vapor drift. Unlike the drift of sprays and dusts that can sometimes be seen during an application, **vapor drift** is invisible.

Avoid applying volatile herbicides such as *Banvel* (dicamba) or *Eptam* (EPTC) when conditions favor volatilization. The vapor pressure rating of the herbicide may help indicate the volatility of the material. The higher the vapor pressure rating, the more volatile the pesticide. Herbicide labels usually mention the potential for volatility of the herbicides. Volatilization can sometimes be reduced through the use of low volatile formulations or soil incorporation of the herbicide (e.g. *Eptam* or *Sutan*).

Photodegradation is the breakdown of herbicides, such as *Treflan*, by the action of sunlight. Herbicides applied to foliage, the soil surface, or structures vary considerably in their stability when exposed to natural light. Like other degradation processes, photodegradation reduces the amount of chemical present, which can subsequently reduce the level of weed control. Soil incorporation by mechanical means during or after application, or by irrigation water or rainfall following application, can reduce herbicide exposure to sunlight.

Microbial degradation occurs when microorganisms such as fungi and bacteria use an herbicide as a food source. Microbial degradation can be rapid and thorough under soil conditions favoring microbial

growth. These conditions include warm temperatures, favorable pH levels, adequate soil moisture, aeration (oxygen), and fertility. The amount of adsorption also influences microbial degradation.

Adsorbed herbicides are more slowly degraded because they are less available to some microorganisms.

Chemical degradation is the breakdown of a herbicide by soil processes not involving a living organism. The adsorption of herbicides to the soil, soil pH levels, soil temperature and moisture all influence the rate and type of chemical reactions that occur. Some pesticides, especially the organophosphate insecticides, are susceptible to degradation by hydrolysis in high pH (alkaline) soils or spray mixes. Some herbicides, such as atrazine and *Classic*, are more rapidly degraded on low pH soils.

Absorption of plant uptake is the process by which plants and microorganisms take up chemicals. It is another process that can transfer herbicides in the environment. Once absorbed, most herbicides are degraded within plants. Residues may persist inside the plant or be released back into the environment as the plant tissues decay.

Crop removal is another herbicide transfer process. When treated crops are harvested, the herbicide residues are removed with them and transferred to a new location. After harvest, many agricultural commodities are washed or processed, which can remove or degrade much of the remaining residue.

Runoff moves herbicides in water. Runoff occurs as water moves over a sloping surface, carrying herbicides either mixed in the water or bound to eroding soil. The amount of herbicide runoff depends on the grade or slope of the field, the erodibility and texture of the soil, the soil moisture content, the amount and timing of irrigation or rainfall (especially in relation to the time of herbicide application), and properties of the herbicide. For example, a herbicide application made to a heavy clay soil already saturated with water is highly susceptible to runoff. Established vege-

tation or plant residues also influence runoff because of their ability to retain soil and moisture.

Herbicide losses from runoff are greatest when heavy rainfall occurs shortly after an herbicide application. If heavy rainfall is expected, delay applying pesticides. Some no-tillage and minimum-tillage cropping systems have been found to reduce herbicide runoff, as do soil incorporation application methods. In addition, adjuvants that promote postemergence herbicide retention on leaf surfaces can reduce the pesticide content in runoff water. Finally, surface grading, drainage ditches and dikes, and the use of border vegetation can help reduce the amount and control the movement of runoff waters.

Surface water contamination is a major concern associated with the runoff of herbicides from treated fields, mixing and rinsing sites, waste disposal areas, and manufacturing facilities. In the 1988 inventory of water quality, pesticides were ranked sixth as river and stream pollutants, behind siltation, nutrients, pathogens, organic enrichment, and metals. Refer to the next section, "Groundwater and Surface Water Contamination" for information on how to prevent contamination.

Leaching is another process that moves herbicides in water. In contrast to runoff, which occurs as water moves on the surface of the soil, leaching occurs as water moves through the soil. Several factors influence the leaching of herbicides. These include the water solubility of the herbicide. A herbicide dissolved in water can move readily with the water as it seeps through the soil. Soil structure and texture influence soil permeability (how fast the water moves through soil), as well as the amount and persistence of herbicide adsorption to soil particles. Adsorption is probably the most important factor influencing leaching of herbicides. If an herbicide is strongly adsorbed to soil particles, it is less likely to leach, regardless of its solubility, unless the soil particles themselves move with the water flow.

Groundwater contamination is a

major concern associated with the leaching of herbicides from treated fields, mixing and rinsing sites, waste disposal areas, and manufacturing facilities. Refer to the next section, "Groundwater and Surface Water Contamination", for information on how to prevent contamination.

Groundwater and Surface Water Contamination

Groundwater is the water beneath the earth's surface occupying the saturated zone (the area where all the pores in the rock or soil are filled with water). It is stored in water-bearing geological formations known as **aquifers**. Groundwater moves through aquifers and can be obtained at points of natural discharge such as springs or streams, or by drilling a well into the aquifer.

The upper level of the saturated zone in the ground is called the **water table**. The water table depth below the soil surface fluctuates throughout the year, depending on the amount of water removed from the ground and the amount of water added by recharge and connected surface waters. **Recharge** is water that seeps through the soil from rain, melting snow, or irrigation. **Surface waters** are visible bodies of water such as lakes, rivers, and oceans.

Both surface water and groundwater are subject to contamination by **point source and non-point source pollution**. The key to preventing pesticides in groundwater and surface waters is identification of the source and route to the water. Point source contamination refers to situations where movement of a pesticide into water can be traced to a specific site. Nonpoint sources occur over a wide area and most pesticides detected in groundwater and surface water can be traced to nonpoint sources. This type of pollution generally results from land runoff, precipitation, acid rain, or percolation rather than from a discharge at a specific, single location, such as a single pipe or well head.

The potential for the pollution of groundwater and surface water

from improper waste disposal is a major concern. Problems result from domestic waste (e.g., septic systems, landfills, waste treatment plants), industrial waste (e.g., landfills, brine and mine wastes, deep well disposal), and government-generated waste (e.g., radioactive wastes).

Improper agricultural practices are another concern. Inadequate handling of livestock waste storage facilities and improper application of manures and fertilizers can cause unacceptable levels of nitrate in groundwater. Pesticides in groundwater and surface water are receiving considerable national attention. Evidence suggests that, in certain areas, agriculture's relative contribution to groundwater and surface water contamination may be significant.

Herbicides in Groundwater

Earlier we discussed herbicide fate and the numerous transfer and breakdown processes that occur in the environment. Those processes help determine whether herbicides reach groundwater or are degraded before reaching these underground waters. Geological characteristics, such as the depth of the water table and the presence of sinkholes, are also critical. If the water table is close to the soil surface, fewer opportunities may exist for adsorption and degradation to occur.

On the soil surface and within the first few inches of soil, herbicides can be volatilized, adsorbed to soil particles, taken up by plants, broken down by sunlight, or degraded by soil microorganisms and chemical reactions. The extent of herbicide leaching is affected by both pesticide and soil properties. Weather conditions and management practices also affect leaching of herbicides through the soil. Too much rain or irrigation water can leach herbicides beyond the zone where weeds are controlled. A herbicide that is not volatilized, absorbed by plants, bound to soil, or degraded can potentially move through the soil to groundwater.

After herbicides reach groundwater, they may continue to break

down, but at a much slower rate, because of less available light, heat and oxygen. The movement of groundwater is often slow and difficult to predict. Substances that enter the groundwater in one location can turn up years later in other locations. A major difficulty in dealing with groundwater contaminants is that the sources of pollution are not easily recognizable. The problem is occurring underground, out of sight.

Herbicides in Surface Water

Nonpoint source contamination of surface water can occur in several ways. Pesticides can reach surface water through drift or volatilization or by wind erosion of dust particles carrying pesticides into the atmosphere followed by rainfall deposition in the water; from groundwater discharging into surface water; and in surface water runoff.

Pesticides have been detected in rainfall in many states in the midwest, including Iowa, Indiana, Wisconsin and Ohio. The greatest number of detections and the highest concentrations were observed in May. When detected, most pesticide concentrations are below 1 ppb.

The majority of pesticides detected in surface water are from surface runoff events. The pesticides are either attached to the soil particles that are being transported in the runoff water or the pesticides are dissolved in the runoff water. The degree of pesticide loss to surface water is dependent on the degree of surface water runoff in the field. This is dependent on the slope of the field, the vegetative and/or residue cover on the field site, the soil texture, and the soil moisture content at the time of the rainfall that produces the runoff event. Pesticide application methods have a strong influence on the potential for the pesticide to be carried in surface water runoff. Preemergence herbicide applications have a greater potential for surface loss compared to applications where the herbicide is incorporated and applications where the herbicide is applied postemergence. The pesticide appli-

cation rate is important too. The higher the pesticide application rate, the greater the potential amount of pesticide that could be lost in runoff.

Once a pesticide reaches surface water it may or may not degrade. Some pesticides degrade by hydrolysis or by direct or indirect photodegradation. Our knowledge of which pesticides are degraded in surface waters is quite limited.

Keeping Herbicides Out of Groundwater and Surface Water

It is very difficult to purify or clean contaminated groundwater or surface water. Treatment is complicated, time consuming, expensive, and often not feasible. The best solution to groundwater and surface water contamination is to prevent the problem in the first place. Management practices can be implemented to effectively reduce pesticide runoff and leaching and protect groundwater and surface water.

- **Use integrated pest management programs**—Minimize herbicide use by combining chemical control with other pest management practices such as tillage, cultivation, crop rotation, and pest scouting.

- **Reduce compaction**—Surface water runoff increases when soils are compacted.

- **Rotate crops**—Crop rotation improves water infiltration which reduces runoff. Crop rotations also may provide more surface crop residue and may reduce the application of specific pesticides repeatedly to a given field site.

- **Utilize conservation practices that reduce erosion and surface runoff**—These practices include but are not limited to no-till and other forms of conservation tillage, increasing crop residues or planting of cover crops, planting grass waterways to retard soil and water runoff, and keeping buffer strips to protect surface water boundaries.

- **Consider the geology of your area**—When planning herbicide applications, be aware of the water table depth and the perme-

ability of the geological layers between the surface soil and groundwater.

- **Consider soil and field characteristics**—The susceptibility of the soil or field site to leaching or runoff should be determined. Soil texture and organic matter content, in particular, influence chemical movement into groundwater while slope of the field influences surface runoff.

- **Select herbicides carefully**—Remember, herbicides that are highly soluble, relatively stable, and not readily adsorbed to soil tend to be the most likely to leach. Choose herbicides with the least potential for leaching into groundwater or for runoff into surface water. Read labels carefully and consult a specialist from an Extension office or your chemical dealer, if necessary.

The following herbicides contain advisory statements regarding groundwater protection:

Aatrex
Arena
Atrazine
Basis Gold
Bicep
Bladex
Broadstrike + Treflan
Broadstrike + Dual
Broadstrike Plus Corn Pre/PPI
Bronco
Buctril-Atrazine
Bullet
Canopy
Extrazine II
Guardman
Harness
Harness Xtra
Laddok
Lariat
Lasso
Lexone
Marksman
Micro-Tech
Partner
Salute
Sensor
Shotgun
Surpass
Surpass 100
Sutazine
Turbo

The following herbicides contain advisory statements regarding surface water protection:

Aatrex
 Atrazine
 Basis Gold
 Bicep
 Bladex
 Bucril-Atrazine
 Bullet
 Extrazine II
 Guardsman
 Harness Xtra
 Laddok
 Lariat
 Marksman
 Shotgun
 Surpass 100
 Sutazine

These herbicides may not be mixed or loaded within 50 feet of perennial or intermittent streams and rivers, lakes, or reservoirs. These herbicides may not be mixed or loaded within 50 feet of any well unless conducted on an impervious pad designed and maintained to contain any product spills, leaks, or rinse water.

These herbicides cannot be applied within 66 feet of the points where field surface water runoff enters perennial or intermittent streams and rivers or within 200 feet of lakes or reservoirs.

These herbicides can only be applied to HEL (highly erodible land) acres if the 66 foot buffer or setback from runoff points is planted to a crop or seeded with grass.

- **Follow label directions**—The label carries crucial information about the proper rate, timing, and placement of the herbicide.

- **Reduce herbicide application rates**—Use the lowest rate of the pesticide which provides adequate pest control. Band applications of preemergence herbicides reduce the potential of herbicides to leach or runoff by 50% or more.

- **Incorporate pesticides**—On fields not considered highly erodible, incorporation of pesticides can be used to reduce runoff by moving some of the pesticide below the soil surface away from overland water flow. Incorporation of herbicides will not be compatible with surface residue requirements in some fields.

- **Calibrate accurately**—Equipment should be calibrated carefully and often. During calibration, check

the equipment for leaks and malfunctions.

- **Measure accurately**—Concentrates need to be carefully measured before they are placed into the spray tank. Do not “add a little extra” to ensure the herbicide will do a better job. Such practices only increase the likelihood of injury to the treated crop, the cost of pest control, and the chance of groundwater and surface water contamination.

- **Avoid back-siphoning**—The end of the fill hose should remain above the water level in the spray tank at all times to prevent back-siphoning of chemical into the water supply. Use an anti-backflow device when siphoning water directly from a well, pond, or stream. These practices also reduce the likelihood of the hose becoming contaminated with herbicides.

- **Consider weather and irrigation**—If you suspect heavy or sustained rain, delay applying herbicides. Control the quantity of irrigation to minimize the potential for herbicide leaching and runoff.

- **Avoid spray drift and volatilization**—Preemergence herbicide applications have the greatest potential for volatilization and runoff.

- **Clean up spills**—Avoid spills. When they do occur, contain and clean them up quickly with an absorbent material such as cat litter. Chemicals spilled near wells and sinkholes can move directly and rapidly into groundwater. Chemicals spilled near ditches, streams, or lakes can move rapidly into surface water.

- **Change the location of mixing areas**—Mix and load pesticides on an impervious pad, if possible. If mixing is done in the field, change the location of the mixing area regularly. Do not mix herbicides adjacent to the water source, and do not let the water run inadvertently on the soil near the mixing area. This will increase herbicide leaching and/or runoff.

- **Dispose of wastes properly**—All herbicide wastes must be disposed of in accordance with local, state, and federal laws. Triple-rinse containers. Pour the rinsewater into the spray tank for use in treating the

site or the crop. *Do not* pour rinsate on the soil, particularly repeatedly in the same location. This will saturate the soil and increase the potential for herbicide leaching.

- **Store herbicides away from water sources**—Herbicide storage facilities should be situated away from wells, cisterns, springs, and other water sources.

Michigan's water resources currently provide a vast supply of clean water for agriculture, homes, and industry. They can ensure high water quality for future needs only if they are protected now. Be sure to understand how your activities, including herbicide usage, can affect them.

Pesticide Emergency Preparedness

When purchasing a pesticide, obtain a specimen label from the dealer and keep it on file on the farm. This label will be available immediately if an emergency involving a pesticide occurs. Take the label along to a medical treatment center if an individual has suffered pesticide poisoning.

Read and observe closely the *Precautionary Statements* section of the label. Make sure that several people are aware of and can administer treatments for pesticide poisoning contained in the *Statement of Practical Treatment* on the label.

Transporting Pesticides

Have pesticides delivered directly to your pesticide storage facility to avoid liability and potential accidents and spills in transit whenever possible. DOT shipping rules must be followed for transporting large quantities of pesticides, including proper placarding of the vehicle, liability insurance, special handling requirements, etc.

Storing Pesticides

Pesticides must be stored in a facility that will protect them from temperature extremes, high humidity, and direct sunlight. The storage facility should be heated, dry and well ventilated. It should be designed for easy containment and

cleanup of pesticide spills and made of materials that will not absorb any pesticide material that leaks out of a container. Store only pesticides in such a facility and always store them in their original containers.

Do not store any feed, seed, food, or fertilizer with pesticides. Do not store any protective clothing or equipment in the pesticide storage facility. Store herbicides separately from insecticides and fungicides to avoid contamination of one material by another and accidental misuse.

Keep the facility locked at all times when not in use to prevent animals, children, and irresponsible adults from entering and becoming poisoned. Post the facility as a *Pesticide Storage Facility* to warn others that the area is off limits. Maintain an accurate inventory of the pesticides stored in the facility at all times in case of emergency.

Always read and follow the Storage and Disposal section of pesticide labels for specific storage and handling instructions.

For additional information on pesticide storage, refer to Midwest Plan Service bulletin 37, *Designing Facilities for Pesticide and Fertilizer Containment*, and MSU Bulletin E-2335.

Handling and Mixing Pesticides

Always wear protective clothing and equipment when handling, mixing, and applying pesticides and during cleanup of application equipment. Protective clothing should include full coverage clothing, chemical resistant gloves and boots, eye protection, hard hat and a MSHA/NIOSH approved respirator with a chemical absorbent material as specified on the pesticide label.

Mix pesticides downwind and below eye level. Avoid excessive splashing and sloshing. If pesticides are spilled on you, wash them off immediately with lots of water and change clothing. Resume spraying only after cleaning up any spills. Try to use closed handling/mixing systems when appropriate.

Mix only what is required for the area to be sprayed according to label directions. Avoid mixing exces-

sive amounts. To do otherwise will create a hazardous waste which is difficult and expensive to dispose of. Keep unauthorized persons out of the area in which you handle pesticides.

Handling and Disposing of Pesticide Containers

Pesticide containers are considered hazardous waste until they are cleaned or disposed of properly. When possible, reduce the number of pesticide containers by using bulk or returnable containers. Buy pesticides in larger volume containers, containers that may be recycled, or in water soluble bags to avoid disposal problems.

All pesticide containers can be rendered nonhazardous waste by triple rinsing (or equivalent). The rinsate should be added to the spray tank. After triple rinsing, perforate both ends so the container cannot be reused.

All metal and plastic triple-rinsed containers should be recycled, if possible. If this option is not available, dispose of them in a state-licensed sanitary landfill. Dispose of all paper containers in a sanitary landfill or a municipal waste incinerator. Do not bury or burn any pesticide containers. Do not reuse any empty pesticide containers for any purpose.

Unused and Unwanted Pesticides

Pesticides that for some reason cannot be used on a crop must be disposed of as hazardous waste. To avoid the difficulty and expense of hazardous waste disposal, use your pesticides on labeled crops. If you have to dispose of some pesticides, contact Michigan Department of Natural Resources Hazardous Waste Management Division for instructions on the legal disposal of pesticide waste.

Protect Nontarget Organisms

Applying pesticides carelessly can harm nontarget organisms that are beneficial to agriculture and our

environment. The best way to avoid injury of beneficial insects and microorganisms is to minimize pesticide use. Selective pesticides should be used whenever possible and applied only when necessary as part of a total pest management program.

Bees and other pollinating insects are essential for successful production of many crops, such as deciduous tree fruits, small fruits, most seed crops and certain vegetables. Many pesticides, particularly insecticides, are highly toxic to pollinating honeybees and wild bees. Check herbicide labels to identify those that are toxic to bees. *Gramoxone Extra* (paraquat), for example, is an herbicide toxic to bees. Be aware of how bee poisoning can occur and how to prevent them.

The following precautions reduce the chance of bee poisoning.

- Do not apply herbicides (such as *Gramoxone Extra*) that are toxic to bees during bloom. Even shade trees and weeds should not be sprayed during bloom. Mow cover crops and weeds to remove blooms before spraying.

- Reduce drift during application. Aerial applications usually are more hazardous to bees than ground applications.

- Time pesticide applications carefully. Evening applications are less hazardous than early morning ones; both are safer than midday application.

- Do not treat near hives. Bees may need to be moved or covered before you use insecticides near colonies.

Pesticides can be harmful to all kinds of vertebrates such as **fish and wildlife**. Most recognizable are the direct effects from acute poisoning. Fish kills often result from water pollution by a pesticide (usually insecticides). Pesticides can enter water via drift, surface runoff, soil erosion, and leaching.

Bird kills from pesticides can occur when birds ingest the toxicant in granules, baits, or treated seed; or are exposed directly to the spray; or consume a treated crop; or drink and use contaminated water; or feed

on pesticide-contaminated prey.

Worker Protection Standard

New federal rules for farm worker protection, issued during 1992, require farmers to provide additional training and notification to farm workers to prevent accidental or occupational exposure to pesticides. Farmers should contact Extension agents to learn the details of this standard and availability of training materials for education of workers and handlers.

Read and follow the label instructions on **Restricted Entry Intervals (REI)** for every pesticide used. Some pesticide labels require both oral warning and posted signs to notify workers of pesticide applications. If the label doesn't require *both* forms of notification, notify workers *either* orally *or* by posting warning signs at entrances to treated areas. (Greenhouses *must* post warning signs for every application.) When using posted signs, post 24 hours or less before the pesticide application and remove signs within three days after the end of the restricted entry interval. Keep workers out during the entire time the signs are posted (except for early-entry workers wearing the proper personal protective equipment).

Record Keeping

The 1990 Farm Bill requires that all applicators who apply restricted use pesticides (RUP) keep records and maintain them for two years. Records to be kept include:

- brand name or product name and the EPA registration number.
- total amount of the product used.
- size of the area treated.
- crop, commodity, stored product or site to which the pesticide was applied.
- location of the application.
- month, day and year of the application.
- name and certification number of the applicator or applicator's supervisor.

The spray record sheet at the end of this publication, or E-2340 to E-2345 which includes directions and

forms for a complete farm record keeping system, can be used for recording your sprays. Any record form is acceptable as long as the required data is included. Penalties are up to \$500 for the first violation and up to \$1000 for subsequent violations. Provisions for protecting the identity of the individual producers are included in the law. Commercial applicators must furnish a copy of the required records to the customer of the RUP application. Revisions to this rule may be finalized by January 1995. Contact your Extension office for final revisions.

Endangered Species Act

To minimize the adverse impact of pesticides on endangered species, the EPA has initiated The Endangered Species Act. The Michigan Department of Natural Resources (MDNR) administers the Michigan Endangered Species Act and maintains the federal and state endangered species lists in the state. Pesticide applications are a potential problem, particularly affecting birds, butterflies and moths. Alteration of the farm landscape can also negatively affect resident endangered species.

The Environmental Protection Agency (EPA) has determined threshold pesticide application rates that may affect listed species. This information is or will be included on pesticide labels. Counties with vulnerable endangered or threatened species will be identified on pesticide labels. Farmers must take the initiative and consult with the MDNR and the Fish and Wildlife Service (FWS) to be sure there are no endangered species in their area. The Nature Conservancy, a private land and habitat conservation organization, is working with the MDNR and the FWS and is conducting a landowner contact program to work with landowners who own property important for endangered species protection.

SARA Title III Emergency Planning and Community Right to Know Act

The Emergency Planning and Community Right to Know Law, under SARA Title III, requires farmers to notify their State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC), and local fire department that they store extremely hazardous materials along with the name and telephone number of the facility representative. Check with your state Department of Natural Resources or Extension to receive a list of EPA established "Extremely Hazardous Substances" and their threshold planning quantities.

The LEPC and fire chief may request maps of your storage facility and detailed lists of materials you store.

This law also requires, in the event of a spill, the SERC, LEPC and National Response Commission be notified. The reportable quantities for spills is much less than for storage and can be obtained from the above sources.

Right to Farm

Farmers in Michigan are protected from nuisance lawsuits under the Right to Farm Act if they follow specific acceptable management practices. The Generally Accepted Agricultural and Management Practices for pesticide utilization and pest control, nutrient utilization, and manure management have been completed and are revised annually. Contact your Extension agent or regional office of the Michigan Department of Agriculture to obtain copies.

Restricted Use Pesticides

Several herbicides are currently classified as Restricted Use Pesticides and as such, can be purchased and applied only by Certified Commercial or Private Pesticide Applicators. Certification of pesticide applicators is administered by the Michigan

Department of Agriculture. The following list contains the herbicides included in this guide that are classified as Restricted Use Pesticides.

Aatrex	Harness
Arena	Harness Xtra
Atrazine	Harness Xtra 5.6L
Basis Gold	Laddok
Bicep	Lariat
Bicep Lite	Lasso
Bicep II	Marksman
Bladex	Micro-Tech
Bronco	Option II
Buctril-Atrazine	Partner
Bullet	Shotgun
Contour	Surpass
Double Play	Surpass 100
Extrazine II	Sutazine
Gramoxone Extra	TopNotch
Guardsman	

Herbicide Resistance in Weeds

Triazine-resistant common lambsquarters has been confirmed in sites throughout most of the corn production regions of Michigan. In addition, resistance has been confirmed in pigweed species, common ragweed, common groundsel, and marehail (horseweed). The occurrence of triazine-resistance is generally associated with cropping systems where triazine herbicides (i.e., atrazine, *Bladex*, and *Princep*) have been frequently used for weed control. Triazine-resistant common lambsquarters are often identified in fields where corn is grown continuously. Triazine-resistant biotypes of several other species have been identified in other states and countries.

There is growing concern about resistance to sulfonylureas and imidazolinones. Resistance to these herbicides has not been observed in Michigan but has become a serious problem in western regions of the U.S. Resistance to these herbicides has been recently confirmed in many sites throughout the north central region of the U.S. Resistance to these herbicide groups is a major concern because both affect the same process in plants.

An understanding of the practices that lead to herbicide resistance is

important since prevention is the best approach. This is particularly important with the introduction of herbicide resistant crops such as Pursuit resistant corn hybrids. Herbicide resistant crops increase the possibilities for one herbicide to be applied for multiple years to the same field even with rotation of crops.

Farmers should include weed control practices that delay or prevent the development of herbicide resistance. The following list of practices was modified from a list developed by the North Central Weed Science Society Herbicide Resistance Committee. Some practices may be impractical in certain situations. However, no single practice is likely to be successful alone.

Practices to Reduce Risk of Herbicide Resistant Weeds

(1) Rotate herbicides using herbicides of differing modes of action. Do not make more than two consecutive applications of herbicides with the same mode of action against the same weed unless other effective control practices are also included in the management system.

(2) Apply herbicides in tank-mixed, prepackaged, or sequential mixtures which include multiple modes of action. Combining herbicides with different modes of action and similar persistence in soil will help prevent herbicide resistance. **Note: The herbicide modes of action which are at greatest risk of developing resistant weed populations are the following:**

- A. ALS Inhibitors
 - B. ACCase Inhibitors
 - C. Photosynthesis Inhibitors
- (See description of modes of action below.)

(3) Scout fields regularly and identify weeds present.

(4) Rotate crops, particularly those with different life cycles.

(5) Combine mechanical control practices such as rotary hoeing and cultivation with herbicide treatments.

(6) Clean tillage and harvest equipment before moving from fields infested with resistant weeds to those which are not infested.

Herbicide Mode-of-Action

Herbicide Mode-of-Action refers to the method by which the herbicide kills plants. An understanding of herbicide mode of action is useful in developing herbicide programs that prevent herbicide resistance. The following list categorizes herbicides into general modes of action. Individual herbicide families and herbicide examples are listed within each mode of action. In addition, the mode-of-action is listed for each herbicide on the weed response tables for each crop. For additional details on herbicide mode of action, refer to NCR 377 "Herbicide Mode of Action and Injury Symptoms."

HERBICIDE MODE OF ACTION:

Mode of Action	Chemical Family	Herbicide
ALS Inhibitors	Imidazolinones	Imazaquin (<i>Scepter</i>) Imazethapyr (<i>Pursuit</i>)
	Sulfonylureas	Chlorimuron (<i>Classic</i> , component in <i>Canopy, Lorox Plus</i>) Thifensulfuron (<i>Pinnacle</i> , component in <i>Harmony Extra</i>) Tribenuron (<i>Express</i> , component in <i>Harmony Extra</i>) Nicosulfuron (<i>Accent</i>) Primisulfuron (<i>Beacon</i>) Halosulfuron (<i>Permit</i>) Rimsulfuron + Thifensulfuron (<i>Basis</i>) Rimsulfuron + Nicosulfuron (<i>Basis Gold</i>) Primisulfuron + Prosulfuron (<i>Exceed</i>)
ACCase Inhibitors	Sulfonamides	Flumetsulam (<i>Broadstrike</i> , component in <i>Scorpion III, Hornet</i>)
	Cyclohexanediones	Sethoxydim (<i>Poast, Poast Plus</i>) Clethodim (<i>Select</i>)
Photosynthesis Inhibitors	Aryloxyphenoxypropionates	Fluazifop (<i>Fusilade DX</i> , component in <i>Fusion</i>) Fenoxaprop (<i>Option II</i> , component in <i>Fusion</i>) Quizalofop (<i>Assure II</i>)
	Triazines	Atrazine Cyanazine (<i>Bladex</i>) Simazine (<i>Princep</i>) Metribuzin (<i>Lexone, Sencor</i>) Hexazinone (<i>Velpar</i>)
Photosynthesis Inhibitors (Nonmobile)	Phenylureas	Linuron (<i>Lorox</i>)
	Uracils	Terbacil (<i>Sinbar</i>)
Growth Regulators	Benzothiadiazoles	Bentazon (<i>Basagran</i>)
	Nitriles	Bromoxynil (<i>Buctril</i>)
Seedling Growth Inhibitors (Root Inhibitors)	Phenoxy Acetic Acids	2,4-D 2,4-DB (<i>Butyrac 200, Butoxone 200</i>) MCPA
	Benzoic Acids	Dicamba (<i>Banvel, Clarity</i>)
	Pyridines	Clopyralid (<i>Stinger</i>)
EPSPS Inhibitors	Amino Acid Derivatives	Glyphosate (<i>Roundup Ultra, Touchdown</i>)
Seedling Growth Inhibitors (Shoot Inhibitors)	Dinitroanilines	Trifluralin (<i>Treflan, Tri-4</i>) Ethalfuralin (<i>Sonalan</i>) Pendimethalin (<i>Prowl, Pentagon</i>)
	Acetamides	Alachlor (<i>Lasso, Micro-Tech, Partner</i>) Acetochlor (<i>Harness, Surpass, Topnotch</i>) Dimethenamid (<i>Frontier</i>) Metolachlor (<i>Dual</i>) Propachlor (<i>Ramrod</i>)
Cell Membrane Disrupters	Thiocarbamates	EPTC (<i>Eptam</i>) EPTC plus safener (<i>Eradicane</i>) Butylate plus safener (<i>Sutan +</i>) Cycloate (<i>Ro-Neet</i>)
	Bipyridiliums	Paraquat (<i>Gramoxone Extra</i>) Diquat (<i>Diquat</i>)
Pigment Inhibitors	Diphenylethers	Acifluorfen (<i>Blazer</i>) Lactofen (<i>Cobra</i>) Fomesafen (<i>Reflex, Flexstar</i>)
	unclassified	Flumiclorac (<i>Resource</i>)
Pigment Inhibitors	Isoxazolidinones	Clomazone (<i>Command</i>)

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.

TABLE 1A—CHEMICAL WEED CONTROL IN CORN

PREPLANT — MINERAL SOIL

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses (including green foxtail, giant foxtail, fall panicum, witchgrass, crabgrass and sandbur) Nutsedge	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> • Must be incorporated or mixed into top 2 to 3 in. of soil. • <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes.) • Increase <i>Sutan Plus</i> rate to 6 pt/A for more effective nutsedge control. • Do not use on corn seed stocks (Breeders, Foundation, or increase). • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ butylate (<i>Sutan Plus</i>)	+	+ 4% pt	
	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> • Must be incorporated or mixed into top 2 to 3 in. of soil. • Increase <i>Eradicane</i> rate to 6 pt/A for more effective nutsedge control. • <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes.) • Do not apply <i>Eradicane</i> to fields that were treated with a thiocarbamate herbicide (<i>Eptam</i>, <i>Ro-Neet</i>, <i>Eradicane</i>, <i>Sutan Plus</i>) the previous year. • Do not use on corn seed stocks (Breeders, Foundation, or increase). • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ EPTC with protectant (<i>Eradicane</i>)	+	+ 4% pt	

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CORN — PREPLANT — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses (including green fox-tail, giant foxtail, fall panicum, witchgrass, and crabgrass)	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● Fair to good control of nutsedge. ● Will be more effective on nutsedge when incorporated. ● <i>Bladex</i> may be included for more effective fall panicum control. ● <i>Frontier</i> rate varies based on soil type (see label for details). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ dimethenamid (<i>Frontier</i>)	+	+	
Nutsedge	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● Gives better nutsedge control if incorporated 2 to 3 in. ● Will be more effective preplant, especially on nutsedge, in areas where soils tend to be dry. ● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes.) ● Incorporated <i>Dual</i> rate of one quart may give only fair control of some annual grasses (especially fall panicum) and nutsedge. ● <i>Dual II</i> contains a safener which increases corn tolerance to metolachlor. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ metolachlor (<i>Dual, Dual II</i>)	+	2	
	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● For fair to good control of nutsedge, increase rate of alachlor to 3 lb a.i./A. ● Will be more effective preplant, especially on nutsedge, in areas where soils tend to be dry. ● 2½ lb a.i./A of alachlor should be used for effective fall panicum control. ● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes.) ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ alachlor (<i>Lasso, Micro-Tech</i>)	+	+	
	OR (<i>Partner</i>)	2½	2½ qt 4L OR 3.8 lb 65% DG	
	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● Do not apply acetochlor to the following soils if ground water depth is 30 feet or less: sands with less than 3% organic matter, loamy sands with less than 2% organic matter, or sandy loams with less than 1% organic matter. ● Restricted Use Pesticide ● See Label or Table 11 for crop rotation restrictions. ● <i>Harness, Surpass, and TopNotch</i> each contain a safener that increases corn tolerance to acetochlor. ● Application rate varies by soil type. See label for details. ● <i>TopNotch</i> is a micro-encapsulated formulation of acetochlor. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ acetochlor (<i>Harness</i>)	+	+	
	OR (<i>Surpass</i>)	1.6	1.8 pt 7L OR 2 pt 6.4L	
	OR (<i>TopNotch</i>)		OR 4 pt 3.2L	

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CORN — PREPLANT — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses (including green foxtail, giant foxtail, fall panicum, witchgrass, and crabgrass) Nutsedge	flumetsulam + metolachlor <i>(Broadstrike + Dual)</i>	.056 + 2.1	2¼ pt	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. SEE LABEL FOR DETAILS. ● See label or Table 11 for crop rotation restrictions. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not use if organic matter is >5% and soil pH is < 5.9 as poor weed control may result. ● Do not use on peat or muck soils. ● This product has a groundwater advisory statement. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent, Beacon, Basis, Exceed, Permit</i>) if plants are under stress. ● Do not apply to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury. ● Control of only light to moderate common ragweed, cocklebur, and jimsonweed. Control may be improved by adding atrazine to the tank mix. ● Rotary hoe and cultivate if dry weather follows application. ● <i>Broadstrike</i> available in prepackaged mixes only. See Table 1F.
	flumetsulam + metolachlor <i>(Broadstrike + Dual)</i>	.056 + 2.1	2¼ pt	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. SEE LABEL FOR DETAILS. ● See label or Table 11 for crop rotation restrictions. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not use if organic matter is >5% and soil pH is < 5.9 as poor weed control may result. ● Do not use on peat or muck soils. ● This product has a groundwater advisory statement.. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent, Beacon, Basis, Exceed, Permit</i>) if plants are under stress. ● Do not apply to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury. ● Rotary hoe and cultivate if dry weather follows application. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● <i>Broadstrike</i> available in prepackaged mixes only. See Table 1F. ● Reduced rates of <i>Broadstrike + Dual</i> may be tank mixed with reduced rates of <i>Bicep II</i> to reduce risk of crop injury. See supplemental label for details.
	+ atrazine (commercial product)	+	+ 1 qt 4L OR 1.1 lb 90% DG	

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CORN — PREPLANT — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses (including green foxtail, giant foxtail, fall panicum, witchgrass, and crabgrass) Nutsedge	flumetsulam + clopyralid (<i>Hornet</i>)	.056 + .156	.25 lb 86% DG	<ul style="list-style-type: none"> ● MUST BE TANK MIXED WITH MICRO-TECH, LASSO, PARTNER, DUAL, DUAL II, ERADICANE, SUTAN PLUS, FRONTIER, HARNESS, OR SURPASS FOR CONTROL OF GRASSES. ● Groundwater advisory statement. ● See label or Table 11 for crop rotation restrictions. ● Application rate varies by soil type. See label for details. ● Improved control of common ragweed and cocklebur compared to <i>Broadstrike + Dual</i>. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not use if organic matter is >5% and soil pH is < 5.9 as poor weed control may result. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent, Beacon, Basis, Exceed, Permit</i>) if plants are under stress. ● Do not apply to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury.
	cyanazine (<i>Bladex</i>)	1%	1¼ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> ● Must be incorporated or mixed into top 2 to 3 in. of soil immediately after application. ● No residue carryover. ● Increase <i>Eradicane</i> rate to 6 pt/A for more effective nutsedge control. ● Do not use on corn seed stocks (Breeders, Foundation, or Increase). ● Both herbicides weak on pigweed. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ EPTC with protectant (<i>Eradicane</i>)	+	+	
	cyanazine (<i>Bladex</i>)	1%	1¼ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> ● Must be incorporated or mixed into top 2 to 3 in. of soil immediately after application. ● No residue carryover. ● Increase <i>Sutan Plus</i> rate to 6 pt for more effective nutsedge control. ● Both herbicides weak on pigweed. ● Do not use on corn seed stocks (Breeders, Foundation, or Increase). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
+ butylate (<i>Sutan Plus</i>)	+	+		
cyanazine (<i>Bladex</i>)	1%	1¼ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> ● No residue carryover. ● <i>Frontier</i> and <i>Bladex</i> rates vary depending on soil type (See labels for details). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. 	
+ dimethenamid (<i>Frontier</i>)	+	+		
		1.17	20 oz 7.5L OR 25 oz 6L	

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CORN — PREPLANT — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses (including green foxtail, giant foxtail, fall panicum, witchgrass, and crabgrass) Nutsedge	cyanazine (<i>Bladex</i>)	1¼	1¼ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> • No residue carryover. • Can be used where residue problems have existed with atrazine. • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+	+	+	
	alachlor (<i>Lasso</i> , <i>Micro-Tech</i>) OR (<i>Partner</i>)	2½	2½ qt 4L OR 3.8 lb 65% DG	
	cyanazine (<i>Bladex</i>)	1¼	1¼ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> • No residue carryover. • Can be used where residue problems have existed with atrazine. • <i>Dual II</i> contains a safener which increases corn tolerance to metolachlor. • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+	+	1 qt	
	metolachlor (<i>Dual</i> , <i>Dual II</i>)	2		
	cyanazine (<i>Bladex</i>)	1¼	1¼ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> • Do not apply acetochlor to the following soils if ground water depth is 30 feet or less: sands with less than 3% organic matter, loamy sands with less than 2% organic matter, or sandy loams with less than 1% organic matter. • Restricted Use Pesticide. • See Label or Table 11 for crop rotation restrictions. • <i>Harness</i>, <i>Surpass</i>, and <i>TopNotch</i> each contain a safener that increases corn tolerance to acetochlor. • Application rate varies by soil type. See label for details. • Requires less rainfall for activation than alachlor, metolachlor, or pendimethalin. • <i>TopNotch</i> is a micro-encapsulated formulation of acetochlor. • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+	+	+	
	acetochlor (<i>Harness</i>) OR (<i>Surpass</i>) OR (<i>TopNotch</i>)	1.6	1.8 pt 7L OR 2 pt 6.4L OR 4 pt 3.2L	
	atrazine (commercial product)	½	½ qt 4L OR ¾ lb 90% DG	
	+	+	+	
	cyanazine (<i>Bladex</i>)	1¼	1¼ qt 4L OR 1.4 lb 90% DF	
				<ul style="list-style-type: none"> • TANK MIX WITH <i>SUTAN PLUS</i>, <i>ERADICANE</i>, <i>FRONTIER</i>, <i>DUAL</i>, <i>DUAL II</i>, <i>HARNES</i>, <i>SURPASS</i>, <i>MICRO-TECH</i>, <i>PARTNER</i>, OR <i>LASSO</i> FOR BROAD SPECTRUM CONTROL INCLUDING GRASSES AND NUTSEDGE. • Note specific remarks and limitations for herbicides listed above in "Corn — Preplant — Mineral Soil" section. • Can be used to reduce risk of atrazine carryover. • The preferred treatment where fall panicum is a problem. • May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem. • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. • See Table 1F for prepackaged herbicide mixes.

CORN — PREPLANT FOLLOWED BY POSTEMERGENCE — MINERAL SOIL

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses	<i>Sutan Plus, Eradicane, Lasso, Micro-Tech, Partner, Frontier, Harness, Surpass, Dual, or Dual II</i> as listed under "Corn — Preplant — Mineral Soil" section.			
FOLLOWED BY:				
See "Corn — Postemergence — Mineral Soil" section.				

CORN — PREEMERGENCE — MINERAL SOIL

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses (including fall panicum, green foxtail, giant foxtail, witchgrass, and crabgrass)	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● 2½ lb a.i./A of alachlor should be used for more effective fall panicum control. ● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes.)
	+ alachlor (<i>Lasso, Micro-Tech</i>) OR (<i>Partner</i>)	+	+	
	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ metolachlor (<i>Dual, Dual II</i>)	2	1 qt	
	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes.) ● <i>Dual II</i> contains a safener which increases corn tolerance to metolachlor. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ dimethenamid (<i>Frontier</i>)	1.17	+	
			20 oz 7.5L OR 25 oz 6L	
	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● Will be more effective on nutsedge when incorporated. ● <i>Bladex</i> may be included for more effective fall panicum control. ● <i>Frontier</i> rate varies based on soil type (see label for details). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ acetochlor (<i>Harness</i>) OR (<i>Surpass</i>) OR (<i>TopNotch</i>)	+	+	
		1.6	1.8 pt 7L OR 2 pt 6.4L OR 4 pt 3.2L	
				<ul style="list-style-type: none"> ● Do not apply acetochlor to the following soils if ground water depth is 30 feet or less: sands with less than 3% organic matter, loamy sands with less than 2% organic matter, or sandy loams with less than 1% organic matter. ● Restricted Use Pesticide ● See Label or Table 11 for crop rotation restrictions. ● <i>Harness, Surpass, and TopNotch</i> each contain a safener that increases corn tolerance to acetochlor. ● Application rate varies by soil type. See label for details. ● <i>Harness</i> and <i>Surpass</i> require less rainfall for activation than alachlor, metolachlor, or pendimethalin. ● <i>TopNotch</i> is a micro-encapsulated formulation of acetochlor. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.

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CORN — PREEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses (including fall panicum, green foxtail, giant foxtail, witchgrass, and crabgrass)	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● APPLY AFTER PLANTING. ● DO NOT INCORPORATE. ● Plant at least 1½ in. deep. ● Adjust <i>Prowl</i> rate according to soil type (refer to <i>Prowl</i> label for details). ● Do not use on sandy soil with less than 1.5% organic matter. ● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for three-way tank mixes.) ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ pendimethalin (<i>Prowl</i>)	+	1½	
	flumetsulam + metolachlor (<i>Broadstrike</i> + <i>Dual</i>)	.056 + 2.1	2¼ pt	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. SEE LABEL FOR DETAILS. ● See label or Table 11 for crop rotation restrictions. ● Corn should be planted at least 1.5 inches deep. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not use if organic matter is >5% and soil pH is < 5.9 as poor weed control may result. ● Do not use on peat or muck soils. ● This product has a groundwater advisory statement. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent</i>, <i>Beacon</i>, <i>Basis</i>, <i>Exceed</i>, <i>Permit</i>) if plants are under stress. ● Do not apply to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury. ● Control of only light to moderate common ragweed, cocklebur, and jimsonweed. Control may be improved by adding atrazine to the tank mix. ● Rotary hoe and cultivate if dry weather follows application. ● <i>Broadstrike</i> available in prepackaged mixes only. See Table 1F.

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CORN — PREEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses (including fall panicum, green foxtail, giant foxtail, witchgrass, and crabgrass)	flumetsulam + metolachlor (<i>Broadstrike + Dual</i>)	.056 + 2.1	2½ pt	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. SEE LABEL FOR DETAILS. ● See label or Table 11 for crop rotation restrictions. ● Corn should be planted at least 1.5 inches deep. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not use if organic matter is >5% and soil pH is < 5.9 as poor weed control may result. ● Do not use on peat or muck soils. ● This product has a groundwater advisory statement. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent, Beacon, Basis, Exceed, Permit</i>) if plants are under stress. ● Do not apply to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury. ● Rotary hoe and cultivate if dry weather follows application. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● <i>Broadstrike</i> available in prepackaged mixes only. See Table 1F. ● Reduced rates of <i>Broadstrike + Dual</i> may be tank mixed with reduced rates of <i>Bicep II</i> to reduce risk of crop injury. See supplemental label for details.
	+ atrazine (commercial product)	+ 1	+ 1 qt 4L OR 1.1 lb 90% DG	
	flumetsulam + clopyralid (<i>Hornet</i>)	.056 + .156	.25 lb 86% DG	<ul style="list-style-type: none"> ● MUST BE TANK MIXED WITH MICRO-TECH, LASSO, PARTNER, DUAL, DUAL II, ERADICANE, SUTAN PLUS, FRONTIER, HARNESS, OR SURPASS FOR CONTROL OF GRASSES. ● Groundwater advisory statement. ● See label or Table 11 for crop rotation restrictions. ● Corn should be planted at least 1.5 inches deep. ● Application rate varies by soil type. See label for details. ● Improved control of common ragweed and cocklebur compared to <i>Broadstrike + Dual</i>. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not use if organic matter is >5% and soil pH is < 5.9 as poor weed control may result. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent, Beacon, Basis, Exceed, Permit</i>) if plants are under stress. ● Do not apply to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury.

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CORN — PREEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses (including fall panicum, green foxtail, giant foxtail, witchgrass, and crabgrass)	cyanazine (<i>Bladex</i>)	1¾	1¾ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> ● Can be used where residue problems have existed with atrazine. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ alachlor (<i>Lasso</i> , <i>Micro-Tech</i>) OR (<i>Partner</i>)	+	+ 2 qt 4L OR 3 lb 65% DG	
	cyanazine (<i>Bladex</i>)	1¾	1¾ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> ● Can be used where residue problems have existed with atrazine. ● <i>Dual II</i> contains a safener which increases corn tolerance to metolachlor. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ metolachlor (<i>Dual</i> , <i>Dual II</i>)	+	+ 2 qt	
	cyanazine (<i>Bladex</i>)	1¾	1¾ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> ● No residue carryover. ● <i>Frontier</i> and <i>Bladex</i> rates vary depending on soil type (See labels for details). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ dimethenamid (<i>Frontier</i>)	+	+ 20 oz 7.5L OR 25 oz 6L	
	cyanazine (<i>Bladex</i>)	1¾	1¾ qt 4L OR 1.9 lb 90% DF	<ul style="list-style-type: none"> ● Do not apply acetochlor to the following soils if ground water depth is 30 feet or less: sands with less than 3% organic matter, loamy sands with less than 2% organic matter, or sandy loams with less than 1% organic matter. ● Restricted Use Pesticide. ● See Label or Table 11 for crop rotation restrictions. ● <i>Harness</i>, <i>Surpass</i>, and <i>TopNotch</i> each contain a safener that increases corn tolerance to acetochlor. ● Application rate varies by soil type. See label for details. ● <i>Harness</i> and <i>Surpass</i> require less rainfall for activation than alachlor, metolachlor, or pendimethalin. ● <i>TopNotch</i> is a micro-encapsulated formulation of acetochlor. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ acetochlor (<i>Harness</i>) OR (<i>Surpass</i>) OR (<i>TopNotch</i>)	+	+ 1.6 1.8 pt 7L OR 2 pt 6.4L OR 4 pt 3.2L	
	cyanazine (<i>Bladex</i>)	1¾	1¾ qt 4L OR 1.9 lb 90% DF	
	+ pendimethalin (<i>Prowl</i>)	+	+ 1½ 1.8 qt 3.3 EC	
		1¾		

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CORN — PREEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	atrazine	½	½ qt 4L	<ul style="list-style-type: none"> ● TANK MIX WITH FRONTIER, HARNESS, SURPASS, DUAL, DUAL II, PROWL, MICRO-TECH, PARTNER, OR LASSO FOR BROAD SPECTRUM CONTROL INCLUDING GRASSES. ● Note specific remarks and limitations for herbicides listed above in "Corn — Preemergence — Mineral Soil" section. ● Can be used to reduce risk of atrazine carryover. ● The preferred treatment where fall panicum is a problem. ● May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
Annual grasses (including fall panicum, green foxtail, giant foxtail, witchgrass, and crabgrass)	(commercial product)		OR ¾ lb 90% DG	
	+	+	+	
	cyanazine (<i>Bladex</i>)	1¼	1¼ qt 4L OR 1.4 lb 90% DF	
	+	+	+	
	cyanazine (<i>Bladex</i>)	1%	1¼ qt 4L OR 1.9 lb 90% DF	
	+	+	+	
	atrazine (commercial product)	¾	¾ qt 4L OR ¾ lb 90% DG	
	+	+	+	
	atrazine (commercial product)	¾	¾ qt 4L OR ¾ lb 90% DG	

CORN — PREEMERGENCE FOLLOWED BY POSTEMERGENCE — MINERAL SOIL

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	<i>Lasso, Micro-Tech, Frontier, Partner, Harness, Surpass, TopNotch, Prowl, Dual, or Dual II</i> as listed under "Corn — Preemergence — Mineral Soil" section.			
Annual grasses				
	FOLLOWED BY: See "Corn — Postemergence — Mineral Soil" section.			

CORN — PREEMERGENCE FOLLOWED BY POSTEMERGENCE — ORGANIC SOIL

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses	propachlor	5	5 qt	<ul style="list-style-type: none"> ● Must be followed with a postemergence treatment for control of broadleaved weeds.
Annual broadleaves	(<i>Ramrod</i>)			
	FOLLOWED BY: See "Corn — Postemergence — Mineral Soil" section.			

CORN — EARLY POSTEMERGENCE — MINERAL SOIL

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses (except crabgrass)	rimsulfuron + thifensulfuron (<i>Basis</i>)	0.0156	½ oz 75% DG	<ul style="list-style-type: none"> ● Timing is critical. Application window is narrow. ● Treatment must be made when corn is between spike and 2-collar stage. DO NOT TREAT CORN OVER 6 INCHES TALL OR CORN WITH 3 COLLARS AS SEVERE INJURY MAY OCCUR. ● Do not make more than 1 application per season. ● <i>Basis</i> may also be tank mixed with atrazine 90DF or <i>Marksman</i>. See label for details. ● Tank mixes containing dicamba (<i>Banvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). ● Weeds must be 2 in. or less for adequate control. ● Since this treatment provides limited residual weed control, application when grasses are 1 to 2 inches in height will usually provide the optimum results. ● Rainfall within 5–7 days after application is required for residual activity of <i>Basis</i>. ● Cultivation 10–14 days after application is usually needed for adequate season-long weed control and is generally recommended. ● This program fits best in sites with low to moderate weed density. ● Application of <i>Basis</i> alone for broad-spectrum weed control is not recommended. ● Corn hybrids with a relative maturity rating less than 88 days vary in tolerance to <i>Basis</i>. Treatment of these hybrids may result in severe crop injury and is not recommended. ● Refer to Table 11 for rotation crop restrictions. <p>INSECTICIDE INTERACTION Conventional and IT Corn:</p> <ul style="list-style-type: none"> ● See Table 1J. ● Do not apply <i>Basis</i> to corn previously treated with <i>Counter 15G</i> insecticide as severe injury may occur. ● <i>Basis</i> application to corn previously treated with <i>Counter 20CR</i>, <i>Thimet Dyfonate</i>, or <i>Lorsban</i> is not recommended. Risk of injury is especially great on soils with less than 4% organic matter. <p>IR/IMR Corn:</p> <ul style="list-style-type: none"> ● There are no restrictions for <i>Basis</i> regarding organophosphate insecticides on IR/IMR corn. ● Treat IT corn as conventional non-resistant corn.
Annual broadleaves	+	+	+	
	dicamba (<i>Banvel</i> , <i>Clarity</i>)	¼	¼ pt	
	+	+	+	
	surfactant	¼%	¼%	
	+	+	+	
	28% liquid nitrogen	2 qt	2 qt	

CORN — POSTEMERGENCE — MINERAL SOIL

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (except smartweed and wild buckwheat)	2,4-D amine	½	1 pt	<ul style="list-style-type: none"> ● For corn over 6 to 8 in., use drop nozzles. ● Ester formulations will cause more crop injury and are not recommended. ● Use drift control additives with some 2,4-D amine products to reduce risk of spray particle drift. Check product label. ● Not effective on smartweed or wild buckwheat. ● Hybrids vary in tolerance. ● If 2,4-D ester is used, an application rate no higher than 1/4 lb ai/A is advised. 2,4-D ester is not recommended on corn due to risk of injury. ● Most effective when weeds are small (2 to 4 in.). See Table 1H.

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CORN — POSTEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations	
<i>(continued)</i>					
Annual broadleaves (except lambsquarters)	halosulfuron <i>(Permit)</i>	0.03125	2/3 oz 75% DS	<ul style="list-style-type: none"> ● Controls several broadleaved weeds including pigweed, ragweed, cocklebur, and velvetleaf. ● Ineffective on lambsquarters. ● Liquid nitrogen fertilizer (28% N) added at 4 qt/A may improve velvetleaf and pigweed control. ● Apply to corn from spike through lay-by stage (canopy closure). ● Use drop nozzles when corn canopy will prevent complete spray coverage of the weeds. ● <i>Permit</i> may be tank mixed with 2,4-D, <i>Banvel</i>, <i>Clarity</i>, <i>Buctril</i>, <i>Buctril + atrazine</i>, atrazine, <i>Marksman</i>, <i>Accent</i>, or <i>Beacon</i>. See Table 11. ● Tank mixes containing dicamba (<i>Banvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). ● There are no restrictions for <i>Permit</i> use regarding organophosphate insecticides. ● Refer to Table 11 for rotation crop restrictions. 	
	+	+	+		
	surfactant OR	¼%	¼%		¼%
	crop oil concentrate	1%	1%		1%
Annual broadleaves	prosulfuron + primisulfuron <i>(Exceed)</i>	0.036	1.0 oz 57% DG	<ul style="list-style-type: none"> ● Controls several broadleaved annual weeds including pigweed, lambsquarters, ragweed, cocklebur, and velvetleaf. ● Liquid nitrogen fertilizer (28% N) added at 4 qt/A or spray grade ammonium sulfate (AMS) at 2 lbs/A may improve velvetleaf control. ● Apply to corn from 4 to 20 inches in height, or 6 collars. ● For corn from 20 to 48 inches in height, drop nozzles are recommended. ● <i>Exceed</i> may be tank-mixed with <i>Banvel</i>, <i>Clarity</i>, 2,4-D, atrazine, <i>Buctril</i>, <i>Buctril + atrazine</i>, <i>Marksman</i>, <i>Accent</i>, or <i>Beacon</i>. See Table 11. ● <i>Exceed</i> application rate may be reduced to 0.8 oz/A when tank-mixed. ● Tank mixes containing dicamba (<i>Banvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). ● Refer to Table 11 for crop rotation restrictions. <p>INSECTICIDE INTERACTION</p> <p>Conventional and IT Corn:</p> <ul style="list-style-type: none"> ● See Table 1J. ● Do not apply <i>Exceed</i> to corn previously treated with <i>Counter 15G</i> (any application method) or <i>Counter 20CR</i> (in-furrow at planting or over the row at cultivation) as severe injury may occur. ● <i>Exceed</i> may be applied to corn previously treated with a banded (surface band or T-band) application of <i>Counter 20CR</i>, however this practice is not recommended. ● Applying <i>Exceed</i> to corn previously treated with other soil-applied organophosphate insecticides (<i>Dyfonate</i>, <i>Lorsban</i>, <i>Thimet</i>, etc.) may cause temporary crop injury. ● Do not make a foliar or soil application of any organophosphate insecticide within 10 days before or 7 days after <i>Exceed</i> application, as severe injury may occur. <p>IR/IMR Corn:</p> <ul style="list-style-type: none"> ● There are no restrictions for <i>Exceed</i> regarding organophosphate insecticides on IR/IMR corn. ● Treat IT corn as conventional non-resistant corn. 	
	+	+	+		+
	crop oil concentrate OR	1 qt	1 qt		1 qt
	surfactant	¼%	¼%		¼%

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CORN — POSTEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	flumetsulam	0.023	.25 lb 84% DG	<ul style="list-style-type: none"> ● Apply to corn up to 8 inches tall. ● Use drop nozzles for corn over 8 inches tall to minimize corn exposure to the herbicide. ● Do not cultivate for 10 days after application. ● Do not apply to field corn grown for seed. ● Do not apply to sweet corn or popcorn. ● Foliar-applied organophosphate insecticides may increase risk of corn injury from flumetsulam. A time interval of at least 7 days between application of <i>Scorpion III</i> and organophosphate insecticides is advised. See Table 1J. ● Refer to Table 11 for rotation crop restrictions. ● Do not apply to corn previously treated with a pre-emergence or preplant incorporated application of <i>Broadstrike</i>. ● Can be tank mixed with <i>Accent</i>. See Table 11.
	+ clopyralid + 2,4-D (<i>Scorpion III</i>)	+ 0.06 + 0.125		
	+ surfactant	+ ¼%	+ ¼%	
	+ 28% liquid nitrogen	+ 2.5% (V/V)	+ 2.5% (V/V)	
	flumetsulam + clopyralid (<i>Hornet</i>)	.03 + .09	2.4 oz 85.6% DG	<ul style="list-style-type: none"> ● Apply to corn up to 24 inches tall. ● Do not apply to corn previously treated with <i>Counter</i> insecticide, as severe injury may occur. See Table 1J. ● A time interval of at least 7 days between application of <i>Hornet</i> and organophosphate insecticides is advised. ● Refer to Table 11 for rotation crop restrictions. ● Tank mixing required for control of pigweed and lambsquarters. ● Preharvest interval is 85 days.
	+ surfactant	+ ¼%	+ ¼%	
	+ 28% liquid nitrogen	+ 2.5%	+ 2.5%	
	dicamba (<i>Banvel, Clarity</i>)	½	1 pt	
				<ul style="list-style-type: none"> ● Apply postemergence to corn from emergence up to the 5-leaf stage or 8 in. tall, whichever comes first. ● <i>Banvel</i> may be applied at ½ pt/A to corn up to 36 in. tall or 15 days before tassel emergence. Drop nozzles are recommended for corn over 8 in. tall. ● USE EXTREME CAUTION. DRIFT TO NEARBY SENSITIVE CROPS IS A HAZARD. ● To reduce the risk of volatilization, do not apply if the air temperature is expected to exceed 85° F on the day of application. ● Use pressure no greater than 20 psi. ● Do not apply if soybeans in the vicinity are over 10 in. tall or have begun to bloom. ● Drift control agents may be used to reduce the risk of spray particle drift. ● Most effective when weeds are small (2 to 4 in.). See Table 1H.

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CORN — POSTEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	dicamba (<i>Banvel, Clarity</i>)	½	1 pt	<ul style="list-style-type: none"> ● Apply postemergence to corn from emergence up to the 5-leaf stage or 8 in. tall, whichever comes first. For larger corn, reduce <i>Banvel</i> rate to 1/2 pt/A. Do not apply to corn over 12 in. tall. Drop nozzles are recommended for corn over 8 in. tall. See Table 1H. ● Use lower rates on coarser soils or soils low in organic matter. ● Treatment must follow a preplant-incorporated or pre-emergence herbicide application for grass control. ● Do not apply if soybeans in the vicinity are over 10 in. tall or have begun to bloom. ● Drift control agents may be used to reduce the risk of spray particle drift. ● Do not use with crop oil concentrate or other additives. ● See additional remarks and limitations for dicamba (<i>Banvel</i>). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+	+	+	
	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	
	bentazon (<i>Basagran</i>)	1	1 qt	<ul style="list-style-type: none"> ● Corn is tolerant to Basagran at all growth stages. For best results, apply early to small weeds. See Table 1H. ● Weak on pigweed, nightshade, and lambsquarters. ● Use a minimum of 40 psi and 20 gal of water/A. ● Urea ammonium nitrate (28% liquid nitrogen) may be used at 1 gal/A instead of crop oil concentrate for improved velvetleaf control. Do not use urea ammonium nitrate if common lambsquarters is present.
+	+	+		
crop oil concentrate	1 qt	1 qt		
	bentazon (<i>Basagran</i>)	¾	¾ qt	<ul style="list-style-type: none"> ● Do not apply to corn over 12 in. tall. ● Gives better control of some broadleaf weeds, especially pigweed, than <i>Basagran</i> alone. ● Combination reduces risk of carryover from post-emergence application of atrazine alone. ● Urea ammonium nitrate (28% liquid nitrogen) may be used at 1 gal/A instead of crop oil concentrate. Do not use urea ammonium nitrate if common lambsquarters is present. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes. ● Rates may be reduced to ½ lb/A for each herbicide if weeds are small. See <i>Laddok</i> label for details.
+	+	+		
atrazine (commercial product)	¾	¾ qt 4L OR 0.8 lb 90% DG		
+	+	+		
crop oil concentrate	1 qt	1 qt		
	bromoxynil (<i>Buctril</i>)	¾	1½ pt 2L OR ¾ pt Gel	<ul style="list-style-type: none"> ● Apply to corn between the 4-leaf stage (4 visible leaves) and prior to tassel emergence. ● For best results, weeds must be small (see label or Table 1H). ● Do not mix with spray additives or liquid fertilizers unless specified for tank mixes. ● For ground applications, use minimum of 20 gal of water/A and 30 psi. ● Redroot pigweed and mustard must be controlled when very small (refer to label for details).

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CORN — POSTEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	bromoxynil (<i>Buctril</i>)	¼	1 pt OR ½ pt Gel	<ul style="list-style-type: none"> ● Apply to corn after emergence but before corn is 12 in. tall. ● Apply to weeds less than 4 in. tall for effective control. See Table 1H. ● Do not mix with spray additives or liquid fertilizers. ● Better control of redroot pigweed and wild mustard than <i>Buctril</i> alone. ● Combination reduces risk of carryover from post-emergence application of atrazine alone. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ atrazine (commercial product)	+	+ ½ qt 4L OR 0.6 lb 90% DG	
	2,4-D amine + metribuzin (<i>Sencor</i>)	¼ + 0.09	½ pt + 2 oz 75% DF	<ul style="list-style-type: none"> ● DO NOT APPLY DURING OR SHORTLY AFTER PERIODS OF COOL, WET OR CLOUDY WEATHER. ● For corn over 8 in. tall, use drop nozzles. ● Do not treat plants under stress. ● Do not use additives. ● Do not apply more than 5½ oz. <i>Sencor</i> 75% DF per acre per season. ● <i>Sencor</i> may also be tank mixed with atrazine, <i>Banvel</i>, <i>Clarity</i>, <i>Basagran</i>, <i>Buctril</i>, <i>Buctril Gel</i>, <i>Laddok</i>, <i>Marksman</i>, or <i>Pursuit</i> (IMI-corn hybrids only). See label for rates, additives, application timing, and other restrictions. ● Do not graze or harvest for silage or grain for 60 days after treatment.
ONLY ragweed, cocklebur, jimsonweed, and Jerusalem artichoke	clopyralid (<i>Stinger</i>)	0.094	¼ pt	<ul style="list-style-type: none"> ● Apply to field corn up to 24 in. tall. ● Apply in 10 gal. of water or more per acre. ● Treat ragweed, cocklebur, jimsonweed, and Jerusalem artichoke up to the 5-leaf stage. ● Do not apply more than ¾ pt per acre per year.
Perennial sowthistle, Canada thistle	clopyralid (<i>Stinger</i>)	0.188	½ pt	<ul style="list-style-type: none"> ● Apply to field corn up to 24 in. tall. ● Apply in 10 gal. of water or more per acre. ● Treat thistle plants at least 6 to 8 in. in diameter or height but before the bud stage. ● Do not cultivate before treatment. ● Cultivation may be used 14 to 20 days after treatment. ● Rate may be increased to ¾ pt per acre for dense infestations. ● Do not apply more than ¾ pt per acre per year.
Velvetleaf	flumiclorac (<i>Resource</i>) + crop oil concentrate	0.027 + 1 pt	4 oz .86L + 1 pt	<ul style="list-style-type: none"> ● Very effective on velvetleaf. ● Apply to corn between the 2-collar and 10-collar stage. ● Use drop nozzles when corn canopy will prevent complete spray coverage of the weeds. ● <i>Resource</i> may be tank mixed with atrazine, <i>Accent</i>, <i>Banvel</i>, and 2,4-D. See Table 11. ● There are no restrictions for <i>Resource</i> regarding organophosphate insecticides. ● There are no rotation crop restrictions.

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CORN — POSTEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A		Formulation/A	Remarks and Limitations
		a.i.			
Annual broadleaves Annual grasses (except green foxtail, giant foxtail, fall panicum, witchgrass, and crabgrass)	atrazine (commercial product)	2		2 qt 4L OR 2½ lb 90% DG	<ul style="list-style-type: none"> ● Do not apply to corn over 12 in. tall. ● Emergency use. ● Grasses must be less than 1½ in. tall. See Table 1H. ● Timing of application is critical to get best results. ● Surfactant at 1 pt/A may be used in place of crop oil concentrate but is less effective. ● Greater chance for carryover because treatment is later in season. ● Do not add <i>Banvel</i> or 2,4-D or crop injury may occur. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ crop oil concentrate	+	1 qt	+	
Annual broadleaves Annual grasses (except fall panicum and witchgrass)	cyanazine (<i>Bladex</i>)	2		2.2 lb 90% DF	<ul style="list-style-type: none"> ● USE DRY FLOWABLE ONLY. ● Apply before weeds are 1½ in. tall. See Table 1H. ● Apply postemergence through the 4-leaf stage of corn (before 5th leaf is visible). ● Some temporary stunting of corn may occur, especially in sandy soil. ● Do not use with crop oil concentrate or other additives or severe crop injury may occur. ● Application rate is lower if treatment follows a previous <i>Bladex</i> or <i>Extrazine II</i> application. See label. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ atrazine (commercial product)	+	½	+	
					<ul style="list-style-type: none"> ● USE DRY FLOWABLE ONLY. ● Apply before weeds are 1½ in. tall. ● Apply postemergence through the 4-leaf stage of corn (before 5th leaf is visible). ● Application rate is lower if treatment follows a previous <i>Bladex</i> or <i>Extrazine II</i> application. See label. ● Some temporary stunting of corn may occur. ● Do not use with crop oil concentrate or other additives or severe crop injury may occur. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.

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CORN — POSTEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses (except crabgrass)	nicosulfuron (<i>Accent</i>)	0.03125	¾ oz 75% DF	<ul style="list-style-type: none"> ● Apply broadcast or with drop nozzles to corn up to 20 in. tall (free-standing) or that exhibits 6 or fewer collars, whichever is more restrictive. ● For corn 20-36 in. tall use drop nozzles. Do not apply to corn taller than 36 in. or exhibiting 10 collars, whichever is more restrictive. ● A second application may be made 2 to 4 weeks later. Do not apply more than 1½ oz. per acre in one season. ● Crop oil concentrate or surfactant must be added to obtain adequate control. Liquid nitrogen fertilizer (28% N) added at 4 qt/A in addition to crop oil concentrate or surfactant may improve control of certain species. ● Cultivation 7 to 14 days after treatment may improve control. ● <i>Accent</i> may be tank mixed with atrazine, <i>Buctril</i>, <i>Buctril Gel</i>, <i>Buctril + Atrazine</i>, <i>Banvel</i>, <i>Clarity</i>, or <i>Marksman</i> for control of a broader spectrum of weeds. See Table 11 for details on application timing and spray additives. ● Tank mixes containing dicamba (<i>Banvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). ● Control of green and yellow foxtail may be antagonized with tank mixes of <i>Accent</i> with <i>Buctril</i>, <i>Banvel</i>, <i>Clarity</i>, or <i>Marksman</i>. Timely cultivation or a second application may be required for complete control. ● Refer to Table 11 for rotation crop restrictions. ● Refer to label for special sprayer cleanup instructions. <p>INSECTICIDE INTERACTION</p> <p>Conventional and IT Corn:</p> <ul style="list-style-type: none"> ● See Table 1J. ● Do not apply <i>Accent</i> to corn previously treated with <i>Counter 15G</i> insecticide as severe corn injury may result. ● <i>Accent</i> may be applied to corn previously treated with a banded (surface band or T-band) application of <i>Counter 20CR</i>. However, planned programs which include both <i>Accent</i> and <i>Counter</i> are not recommended. The risk of crop injury is reduced, but not eliminated, by banded application of <i>Counter 20CR</i>. Risk of corn injury is greatest on soils with 4% or less organic matter. ● Applying <i>Accent</i> to corn previously treated with other soil-applied organophosphate insecticides (<i>Thimet</i>, <i>Dyfonate</i>, <i>Lorsban</i>, etc.) may result in temporary crop injury. ● Soil-applied insecticides other than organophosphates do not increase corn injury from <i>Accent</i>. ● Do not apply to corn that has been treated within seven days before with foliar-applied organophosphate insecticides such as <i>Lorsban</i> or malathion or with the herbicides <i>Basagran</i> or <i>Laddok</i> as severe injury may result. Do not apply these materials within three days after <i>Accent</i> application. <p>IR/IMR Corn:</p> <ul style="list-style-type: none"> ● There are no restrictions for <i>Accent</i> regarding organophosphate insecticides on IR/IMR corn. ● Treat IT corn as conventional non-resistant corn.
Pigweed, Smartweed, Jimsonweed	+	+	+	
	crop oil concentrate OR surfactant	1% + ¼%	1% + ¼%	

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CORN — POSTEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Fall panicum	primisulfuron (<i>Beacon</i>)	0.0356	0.76 oz. 75% DG	<ul style="list-style-type: none"> ● Apply to corn between 4 in. and 20 in. in height. ● The recommended rate may be split into two applications. The second application of the split should be made when the new weed growth is at the optimum height. Use drop nozzles if corn is over 20 inches high but before tassel emergence. Do not treat corn after tassel emergence. Do not apply more than 0.76 oz. of <i>Beacon</i> per acre in one season. ● Crop oil concentrate or surfactant must be added to obtain adequate results. Liquid nitrogen fertilizer (28% N) added at 4 qt/A in addition to crop oil concentrate or surfactant may improve control of certain species. ● Cultivation 7 to 14 days after treatment may improve control. ● A small number of corn hybrids are classified as "potentially susceptible." Use of <i>Beacon</i> on these hybrids is not recommended. Consult the chemical dealer, seed dealer, or manufacturer for the current list of potentially susceptible hybrids. ● Inbred lines grown for hybrid seed production may be severely injured by <i>Beacon</i> application. Therefore inbred lines should be thoroughly tested for potential sensitivity to <i>Beacon</i> before treating large acreage. ● <i>Beacon</i> may be tank mixed with <i>Banvel</i>, <i>Clarity</i>, <i>Buctril</i>, <i>Buctril Gel</i>, or 2,4-D for control of a broader spectrum of weeds. See Table 11 for details on application timing and spray additives. ● Tank mixes containing dicamba (<i>Banvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). ● Refer to Table 11 for rotation crop restrictions. ● Refer to label for special sprayer cleanup instructions. <p>INSECTICIDE INTERACTION</p> <p>Conventional and IT Corn:</p> <ul style="list-style-type: none"> ● See Table 1J. ● Do not apply <i>Beacon</i> to corn previously treated with <i>Counter 15G</i> (any application method) or <i>Counter 20CR</i> applied in-furrow. ● <i>Beacon</i> application to corn previously treated with <i>Counter 20CR</i> banded (surface band or T-band) is not recommended. ● Applying <i>Beacon</i> to corn previously treated with other soil-applied organophosphate insecticides (<i>Thimet</i>, <i>Dyfonate</i>, <i>Lorsban</i>, etc.) may result in temporary crop injury. ● Soil-applied insecticides other than organophosphates do not increase corn injury from <i>Beacon</i>. ● Do not treat with a foliar-applied organophosphate insecticide such as <i>Lorsban</i> or malathion or with <i>Basagran</i> or <i>Laddok</i> within 10 days before or 7 days after <i>Beacon</i> application. <p>IR/IMR Corn:</p> <ul style="list-style-type: none"> ● There are no restrictions for <i>Beacon</i> regarding organophosphate insecticides on IR/IMR corn. ● Treat IT corn as conventional non-resistant corn.
	+	+	+	
	crop oil concentrate OR surfactant	1% OR ¼%	1% OR ¼%	

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CORN — POSTEMERGENCE — MINERAL SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A		Formulation/A	Remarks and Limitations
		a.i.			
Annual grasses (except crabgrass)	nicosulfuron	.012		14 oz 89.5% DG	<ul style="list-style-type: none"> ● Apply to corn up to 12 inches or 6 collars. ● To minimize risk of corn injury: <ul style="list-style-type: none"> – DO NOT treat if nighttime temperatures are below 40°F or daytime temperatures are above 92°F. – DO NOT treat corn hybrids with a relative maturity (RM) rating of less than 88 days. – Risk of injury is greater following several days of cool, cloudy conditions. – Risk of injury increases with corn height. ● <i>Basis Gold</i> may be tank mixed with <i>Banvel</i> or <i>Clarity</i> to improve broadleaf control, especially larger weeds and weeds under drought stress. ● Tank mixes containing dicamba (<i>Banvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). ● See Table 11 for rotation crop restrictions. <p>INSECTICIDE INTERACTION Conventional and IT Corn:</p> <ul style="list-style-type: none"> ● See Table 1J. ● Do not apply <i>Basis Gold</i> to corn previously treated with <i>Counter 15G</i> or an in-furrow application of <i>Counter 20CR</i> as severe injury may occur. ● <i>Basis Gold</i> application to corn previously treated with <i>Counter 20 CR</i> (T-band), <i>Thimet</i>, <i>Dyfonate</i>, or <i>Lorsban</i> is not recommended. Risk of injury is especially great on soils with less than 4% organic matter. <p>IR/IMR Corn:</p> <ul style="list-style-type: none"> ● There are no restrictions for <i>Basis Gold</i> regarding organophosphate insecticides on IR/IMR corn. ● Treat IT corn as conventional non-resistant corn.
Annual broadleaves	+ rimsulfuron	+ .012			
	+ atrazine (<i>Basis Gold</i>)	+ .76			
	+	+		+	
	crop oil concentrate	1%		1%	
	+	+		+	
	28% liquid nitrogen	2 qt		2 qt	
	OR	OR		OR	
	ammonium sulfate	2 lb		2 lb	

CORN — POSTEMERGENCE — ORGANIC SOIL

Weed Controlled	Herbicide	Rate lb/A		Formulation/A	Remarks and Limitations
		a.i.			
Annual					
Annual broadleaves (except smartweed and wild buckwheat)	2,4-D amine	½		1 pt	<ul style="list-style-type: none"> ● For corn over 6 to 8 in. tall, use drop nozzles. ● Most effective when weeds are small (2 to 4 in.) See Table 1H. ● Ester formulations will cause more risk of crop injury. ● Use drift control additives with some 2,4-D amine products to reduce risk of spray particle drift. Check the product label. ● Not effective on smartweed or wild buckwheat. ● Hybrids vary in tolerance. ● If 2,4-D ester is used, an application rate no higher than 1/4 lb ai/A is advised. 2,4-D ester is not recommended on corn due to risk of injury.

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CORN — POSTEMERGENCE — ORGANIC SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (except lambsquarters)	halosulfuron (<i>Permit</i>)	0.03125	2/3 oz 75% DS	<ul style="list-style-type: none"> ● Controls several broadleaved weeds including pigweed, ragweed, cocklebur, and velvetleaf. ● Ineffective on lambsquarters. ● Liquid nitrogen fertilizer (28% N) added at 4 qt/A may improve velvetleaf and pigweed control. ● Apply to corn from spike through lay-by stage (canopy closure). ● Use drop nozzles when corn canopy will prevent complete spray coverage of the weeds. ● <i>Permit</i> may be tank mixed with 2,4-D, <i>Banvel</i>, <i>Clarity</i>, <i>Butril</i>, <i>Buctril + atrazine</i>, atrazine, <i>Marksman</i>, <i>Accent</i>, or <i>Beacon</i>. See Table 11. ● Tank mixes containing dicamba (<i>Banvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). ● There are no restrictions for <i>Permit</i> use regarding organophosphate insecticides. ● Refer to Table 11 for rotation crop restrictions.
	+	+	+	
	surfactant	¼%	¼%	
	OR	OR	OR	
	crop oil concentrate	1%	1%	
Annual broadleaves	prosulfuron + primisulfuron (<i>Exceed</i>)	0.036	1.0 oz 57% DG	<ul style="list-style-type: none"> ● Controls several broadleaved annual weeds including pigweed, lambsquarters, ragweed, cocklebur, and velvetleaf. ● Liquid nitrogen fertilizer (28% N) added at 4 qt/A or spray grade ammonium sulfate (AMS) at 2 lbs/A may improve velvetleaf control. ● Apply to corn from 4 to 20 inches in height, or 6 collars. ● For corn from 20 to 48 inches in height, drop nozzles are recommended. ● <i>Exceed</i> may be tank-mixed with <i>Banvel</i>, <i>Clarity</i>, 2,4-D, atrazine, <i>Buctril</i>, <i>Buctril + atrazine</i>, <i>Marksman</i>, <i>Accent</i>, or <i>Beacon</i>. See Table 11. ● <i>Exceed</i> application rate may be reduced to 0.8 oz/A when tank-mixed. ● Tank mixes containing dicamba (<i>Banvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). ● Refer to Table 11 for crop rotation restrictions. <p>INSECTICIDE INTERACTION</p> <p>Conventional and IT Corn:</p> <ul style="list-style-type: none"> ● See Table 1J. ● Do not apply <i>Exceed</i> to corn previously treated with <i>Counter 15G</i> (any application method) or <i>Counter 20CR</i> (in-furrow at planting or over the row at cultivation) as severe injury may occur. ● <i>Exceed</i> may be applied to corn previously treated with a banded (surface band or T-band) application of <i>Counter 20CR</i>, however this practice is not recommended. ● Applying <i>Exceed</i> to corn previously treated with other soil-applied organophosphate insecticides (<i>Dyfonate</i>, <i>Lorsban</i>, <i>Thimet</i>, etc.) may cause temporary crop injury. ● Do not make a foliar or soil application of any organophosphate insecticide within 10 days before or 7 days after <i>Exceed</i> application, as severe injury may occur. <p>IR/IMR Corn:</p> <ul style="list-style-type: none"> ● There are no restrictions for <i>Exceed</i> regarding organophosphate insecticides on IR/IMR corn. ● Treat IT corn as conventional non-resistant corn.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	
	surfactant	¼%	¼%	

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CORN — POSTEMERGENCE — ORGANIC SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	flumetsulam	0.023	.25 lb 84% DG	<ul style="list-style-type: none"> ● Apply to corn up to 8 inches tall. ● Use drop nozzles for corn over 8 inches tall to minimize corn exposure to the herbicide. ● Do not cultivate for 10 days after application. ● Do not apply to field corn grown for seed. ● Do not apply to sweet corn or popcorn. ● Foliar-applied organophosphate insecticides may increase risk of corn injury from flumetsulam. A time interval of at least 7 days between application of <i>Scorpion III</i> and organophosphate insecticides is advised. See Table 1J. ● Refer to Table 11 for rotation crop restrictions. ● Do not apply to corn previously treated with a pre-emergence or preplant incorporated application of <i>Broadstrike</i>. ● Can be tank-mixed with <i>Accent</i>. See Table 11.
	+ clopyralid + 2,4-D (<i>Scorpion III</i>)	+ 0.06 + 0.125		
	+	+	+	
	surfactant	1/4%	1/4%	
	+	+	+	
	28% liquid nitrogen	2.5% (V/V)	2.5% (V/V)	
	flumetsulam	.03 + .09	2.4 oz 85.6% DG	<ul style="list-style-type: none"> ● Apply to corn up to 24 inches tall. ● Do not apply to corn previously treated with <i>Counter</i> insecticide, as severe injury may occur. See Table 1J. ● A time interval of at least 7 days between application of <i>Hornet</i> and organophosphate insecticides is advised. ● Refer to Table 11 for rotation crop restrictions. ● Tank mixing required for control of pigweed and lambsquarters. ● Preharvest interval is 85 days.
	+ clopyralid (<i>Hornet</i>)	+	+	
	+	+	+	
	surfactant	¼%	¼%	
	+	+	+	
	28% liquid nitrogen	2.5%	2.5%	
	dicamba (<i>Banvel, Clarity</i>)	½ lb	1 pt	<ul style="list-style-type: none"> ● Apply postemergence to corn from emergence up to the 5-leaf stage or 8 in. tall, whichever comes first. ● <i>Banvel</i> may be applied at ½ pt/A to corn up to 36 in. tall or 15 days before tassel emergence. Drop nozzles are recommended for corn over 8 in. tall. ● USE EXTREME CAUTION. DRIFT TO NEARBY SENSITIVE CROPS IS A HAZARD. ● Use pressure no greater than 20 psi. ● Do not apply if soybeans in the vicinity are over 10 in. tall or have begun to bloom. ● Drift control agents may be used to reduce drift danger. ● To reduce the risk of volatilization do not apply if the air temperature is expected to exceed 85° F on the day of application.
	dicamba (<i>Banvel</i>)	½	1 pt	<ul style="list-style-type: none"> ● Apply postemergence to corn from emergence up to the 5-leaf stage or 8 in. tall, whichever comes first. For larger corn, reduce <i>Banvel</i> rate to ½ pt/A. Do not apply to corn over 12 in. tall. Drop nozzles are recommended for corn over 8 in. tall. ● Treatment must follow a preplant-incorporated or pre-emergence herbicide application for grass control. ● Do not apply if soybeans in the vicinity are over 10 in. tall or have begun to bloom. ● Drift control agents may be used to reduce the risk of spray particle drift. ● Do not use with crop oil concentrate or other additives. ● See additional remarks and limitations for dicamba (<i>Banvel</i>). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ atrazine (commercial product)	+	+	
		1	1 qt 4L OR 1.1 lb 90% DG	

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CORN — POSTEMERGENCE — ORGANIC SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	bentazon (<i>Basagran</i>)	1	1 qt	<ul style="list-style-type: none"> ● Corn is tolerant to <i>Basagran</i> at all growth stages. However, best results are obtained with early applications to small weeds. See Table 1H. ● Use a minimum of 40 psi and 20 gal of water/A. ● Weak on pigweed, nightshade, and lambsquarters. ● Urea ammonium nitrate (28% liquid nitrogen) may be used at 1 gal/A instead of crop oil concentrate for improved velvetleaf control. Do not use urea ammonium nitrate if common lambsquarters is present.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	bentazon (<i>Basagran</i>)	¾	¾ qt	<ul style="list-style-type: none"> ● Do not apply to corn over 12 in. tall. ● Use a minimum of 40 psi and 20 gal of water/A. ● Gives better control of some broadleaf weeds, especially pigweed, than <i>Basagran</i> alone. ● Combination reduces risk of carryover from post-emergence application of atrazine alone. ● Urea ammonium nitrate (28% liquid nitrogen) may be used at 1 gal/A instead of crop oil concentrate. Do not use urea ammonium nitrate if common lambsquarters is present. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
+	+	+		
atrazine (commercial product)	¾	¾ qt 4L OR 0.8 lb 90% DG		
+	+	+		
	crop oil concentrate	1 qt	1 qt	
	bromoxynil (<i>Buctril</i>)	¾	1½ pt 2L OR ¾ pt Gel	<ul style="list-style-type: none"> ● Apply to corn between the 4-leaf stage (4 visible leaves) and prior to tassel emergence. ● For best results, weeds must be small (see label and Table 1H). ● Do not mix with spray additives or liquid fertilizers unless specified for tank mixes. ● For ground application, use minimum of 20 gal of water/A and 30 psi. ● Redroot pigweed and mustard must be controlled when very small (refer to label for details).
	bromoxynil (<i>Buctril</i>)	¾	1 pt 2L OR ½ pt Gel	<ul style="list-style-type: none"> ● Apply to corn after emergence but before corn is 12 in. tall. ● Apply to weeds less than 4 in. tall for effective control. See Table 1H. ● Do not mix with spray additives or liquid fertilizers. ● Better control of redroot pigweed and wild mustard than <i>Buctril</i> alone. ● Combination reduces risk of carryover from post-emergence application of atrazine alone. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
+	+	+		
atrazine (commercial product)	½	½ qt 4L OR 0.6 lb 90% DG		
+	+	+		
	2,4-D amine	¾	½ pt	<ul style="list-style-type: none"> ● DO NOT APPLY DURING OR SHORTLY AFTER PERIODS OF COOL, WET, OR CLOUDY WEATHER. ● For corn over 8 in. tall, use drop nozzles. ● Do not treat plants under stress. ● Do not use additives. ● Do not apply more than 5½ oz. <i>Sencor</i> 75% DF per acre per season. ● <i>Sencor</i> may also be tank mixed with atrazine, <i>Banvel</i>, <i>Clarity</i>, <i>Basagran</i>, <i>Buctril</i>, <i>Buctril Gel</i>, <i>Laddok</i>, <i>Marskman</i>, or <i>Pursuit</i> (IMI-Corn hybrids only). See label for rates, additives, application timing, and other restrictions. ● Do not graze or harvest for silage or grain for 60 days after treatment.
+	+	+		
metribuzin (<i>Sencor</i>)	0.09	2 oz 75% DF		

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CORN — POSTEMERGENCE — ORGANIC SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
ONLY ragweed, cocklebur, jimsonweed, and Jerusalem artichoke	clopyralid (<i>Stinger</i>)	0.094	¼ pt	<ul style="list-style-type: none"> ● Apply to field corn up to 24 in. tall. ● Apply in 10 gal. of water or more per acre. ● Treat ragweed, cocklebur, jimsonweed, and Jerusalem artichoke up to the 5-leaf stage. See Table 1H. ● Do not apply more than ¾ pt. per acre per year.
Perennial Sowthistle Canada thistle	clopyralid (<i>Stinger</i>)	0.188	½ pt	<ul style="list-style-type: none"> ● Apply to field corn up to 24 in. tall. ● Apply in 10 gal. of water or more per acre. ● Treat thistle plants at least 6 to 8 in. in diameter or height but before the bud stage. ● Do not cultivate before treatment. ● Cultivation may be used 14 to 20 days after treatment. ● Rate may be increased to ¾ pt per acre for dense infestations. ● Do not apply more than ¾ pt per acre per year.
Velvetleaf	flumiclorac (<i>Resource</i>) + crop oil concentrate	0.027 + 1 pt	4 oz .86L + 1 pt	<ul style="list-style-type: none"> ● Very effective on velvetleaf. ● Apply to corn between the 2-collar and 10-collar stage. ● Use drop nozzles when corn canopy will prevent complete spray coverage of the weeds. ● <i>Resource</i> may be tank mixed with atrazine, <i>Accent</i>, <i>Banvel</i>, and 2,4-D. See Table 11. ● There are no restrictions for <i>Resource</i> regarding organophosphate insecticides. ● There are no rotation crop restrictions.
Annual broadleaves Annual grasses (except fall panicum, green foxtail, giant foxtail, witchgrass, and crabgrass)	atrazine (commercial product) + crop oil concentrate	2 + 1 qt	2 qt 4L OR 2½ lb 90% DG + 1 qt	<ul style="list-style-type: none"> ● Do not apply to corn over 12 in. tall. ● Emergency use. ● Grasses should be less than 1½ in. tall. See Table 1H. ● Timing of application is critical to get best results. ● Surfactants at 1 pt/A may be used in place of crop oil concentrate but are less effective. ● Greater chance for carryover because treatment is later in the season. ● Do not add <i>Banvel</i> or 2,4-D or injury may occur. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	cyanazine (<i>Bladex</i>)	2	2.2 lb 90% DF	<ul style="list-style-type: none"> ● USE DRY FLOWABLE ONLY. ● Apply before weeds are 1½ in. tall. See Table 1H. ● Apply postemergence through the 4-leaf stage of corn (before 5th leaf is visible). ● Some temporary stunting of corn may occur. ● Do not use with crop oil concentrate or other additives or severe crop injury may occur. ● Application rate is lower if treatment follows a previous <i>Bladex</i> or <i>Extrazine II</i> application. See label. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	cyanazine (<i>Bladex</i>) + atrazine (commercial product)	1½ + ½	1.7 lb 90% DF + ¾ lb 90% DG	<ul style="list-style-type: none"> ● USE DRY FLOWABLE ONLY. ● Apply before weeds are 1½ in. tall. ● Apply postemergence through the 4-leaf stage of corn (before 5th leaf is visible). ● Application rate is lower if treatment follows a previous <i>Bladex</i> or <i>Extrazine II</i> application. See label. ● Some temporary stunting of corn may occur. ● Do not use with crop oil concentrate or other additives or severe crop injury may occur. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.

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CORN — POSTEMERGENCE — ORGANIC SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses (except crabgrass)	nicosulfuron (<i>Accent</i>)	0.03125	% oz 75% DF	<ul style="list-style-type: none"> ● Apply broadcast or with drop nozzles to corn up to 20 in. tall (free-standing) or that exhibits 6 or fewer collars, whichever is more restrictive. ● For corn 20–36 in. tall use drop nozzles. Do not apply to corn taller than 36 in. or exhibiting 10 collars, whichever is more restrictive. ● A second application may be made 2 to 4 weeks later. Do not apply more than 1½ oz. per acre in one season. ● Crop oil concentrate or surfactant must be added to obtain adequate control. Liquid nitrogen fertilizer (28% N) added at 4 qt/A in addition to crop oil concentrate or surfactant may improve control of certain species. ● Cultivation 7 to 14 days after treatment may improve control. ● <i>Accent</i> may be tank mixed with atrazine, <i>Buctril</i>, <i>Buctril Gel</i>, <i>Buctril + Atrazine</i>, <i>Banvel</i>, <i>Clarity</i>, or <i>Marksman</i> for control of a broader spectrum of weeds. See Table 11 for details on application timing and spray additives. ● Tank mixes containing dicamba (<i>Banvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). ● Control of green and yellow foxtail may be antagonized with tank mixes of <i>Accent</i> with <i>Buctril</i>, <i>Banvel</i>, <i>Clarity</i>, or <i>Marksman</i>. Timely cultivation or a second application may be required for complete control. ● Refer to Table 11 for rotation crop restrictions. ● Refer to label for special sprayer cleanup instructions. <p>INSECTICIDE INTERACTION</p> <p>Conventional and IT Corn:</p> <ul style="list-style-type: none"> ● See Table 1J. ● Do not apply <i>Accent</i> to corn previously treated with <i>Counter 15G</i> insecticide as severe corn injury may result. ● <i>Accent</i> may be applied to corn previously treated with a banded (surface band or T-band) application of <i>Counter 20CR</i>. However, planned programs which include both <i>Accent</i> and <i>Counter</i> are not recommended. The risk of crop injury is reduced, but not eliminated, by banded application of <i>Counter 20CR</i>. Risk of corn injury is greatest on soils with 4% or less organic matter. ● Applying <i>Accent</i> to corn previously treated with other soil-applied organophosphate insecticides (<i>Thimet</i>, <i>Dyfonate</i>, <i>Lorsban</i>, etc.) may result in temporary crop injury. ● Soil-applied insecticides other than organophosphates do not increase corn injury from <i>Accent</i>. ● Do not apply to corn that has been treated within seven days before with foliar-applied organophosphate insecticides such as <i>Lorsban</i> or malathion or with the herbicides <i>Basagran</i> or <i>Laddok</i> as severe injury may result. Do not apply these materials within three days after <i>Accent</i> application. <p>IR/IMR Corn:</p> <ul style="list-style-type: none"> ● There are no restrictions for <i>Accent</i> regarding organophosphate insecticides on IR/IMR corn. ● Treat IT corn as conventional non-resistant corn.
Pigweed, Smartweed, Jimsonweed	+	+	+	
	crop oil concentrate	1%	1%	
	OR	+	+	
	surfactant	¼%	¼%	

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CORN — POSTEMERGENCE — ORGANIC SOIL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Fall panicum	primisulfuron (<i>Beacon</i>)	0.0356	0.76 oz. 75% DG	<ul style="list-style-type: none"> • Apply to corn between 4 in. and 20 in. in height. • The recommended rate may be split into two applications. The second application of the split should be made when the new weed growth is at the optimum height. Use drop nozzles if corn is over 20 inches high but before tassel emergence. Do not treat corn after tassel emergence. Do not apply more than 0.76 oz. of <i>Beacon</i> per acre in one season. • Crop oil concentrate or surfactant must be added to obtain adequate results. Liquid nitrogen fertilizer (28% N) added at 4 qt/A in addition to crop oil concentrate or surfactant may improve control of certain species. • Cultivation 7 to 14 days after treatment may improve control. • A small number of corn hybrids are classified as "potentially susceptible." Use of <i>Beacon</i> on these hybrids is not recommended. Consult the chemical dealer, seed dealer, or manufacturer for the current list of potentially susceptible hybrids. • Inbred lines grown for hybrid seed production may be severely injured by <i>Beacon</i> application. Therefore inbred lines should be thoroughly tested for potential sensitivity to <i>Beacon</i> before treating large acreage. • <i>Beacon</i> may be tank mixed with <i>Barvel</i>, <i>Clarity</i>, <i>Buctril</i>, <i>Buctril Gel</i>, or 2,4-D for control of a broader spectrum of weeds. See Table 11 for details on application timing and spray additives. • Tank mixes containing dicamba (<i>Barvel</i>, <i>Clarity</i>, <i>Marksman</i>) applied to corn under stress may increase the risk of fused leaves in the whorl (rat tail). • Refer to Table 11 for rotation crop restrictions. • Refer to label for special sprayer cleanup instructions. <p>INSECTICIDE INTERACTION</p> <p>Conventional and IT Corn:</p> <ul style="list-style-type: none"> • See Table 1J. • Do not apply <i>Beacon</i> to corn previously treated with <i>Counter 15G</i> (any application method) or <i>Counter 20CR</i> applied in-furrow. • <i>Beacon</i> application to corn previously treated with <i>Counter 20CR</i> banded (surface band or T-band) is not recommended. • Applying <i>Beacon</i> to corn previously treated with other soil-applied organophosphate insecticides (<i>Thimet</i>, <i>Dyfonate</i>, <i>Lorsban</i>, etc.) may result in temporary crop injury. • Soil-applied insecticides other than organophosphates do not increase corn injury from <i>Beacon</i>. • Do not treat with a foliar-applied organophosphate insecticide such as <i>Lorsban</i> or malathion or with <i>Basagran</i> or <i>Laddok</i> within 10 days before or 7 days after <i>Beacon</i> application. <p>IR/IMR Corn:</p> <ul style="list-style-type: none"> • There are no restrictions for <i>Beacon</i> regarding organophosphate insecticides on IR/IMR corn. • Treat IT corn as conventional non-resistant corn.
	+	+	+	
	crop oil concentrate	1%	1%	
	OR	OR	OR	
	surfactant	¼%	¼%	

(Continued on next page)

CORN — POSTEMERGENCE DIRECTED — ALL SOILS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses	ametryne (<i>Evik</i>) + surfactant	1% + ½%	2 lb + ½%	<ul style="list-style-type: none"> ● CAUTION — KEEP OFF CORN FOLIAGE. ● Do not use before corn is 12 in. tall. ● Emergency use. ● Use drop nozzles or directed spray. ● Shields provide additional protection against corn injury. ● Apply in a minimum of 20 gal of water per acre. ● Do not exceed 20 psi nozzle pressure. ● Double outlet 150° nozzles or two nozzles mounted double swivel are preferred. ● Refer to label for rotation crop restrictions. ● Generally more effective on annual grasses than <i>Lorox</i> or <i>Linex</i>. ● See label and Table 1H for maximum weed size. Selectivity is based on tall corn and small weeds.
	linuron (<i>Lorox</i> or <i>Linex</i>) + surfactant	1½ + ½%	3 pt 4L OR 3 lb 50% DF + ½%	<ul style="list-style-type: none"> ● CAUTION — KEEP OFF CORN FOLIAGE. ● Do not use before corn is 15in. tall. ● Emergency use. ● Use drop nozzles or directed spray. ● Shields provide additional protection against corn injury. ● Apply in a minimum of 20 gal of water per acre. ● Do not exceed 20 psi nozzle pressure. ● Double outlet 150° nozzles or two nozzles mounted double swivel are preferred. ● Use lower rates on lighter soils or soils low in organic matter. ● For control of small weeds not over 2 in. tall. See Table 1H. Selectivity is based on tall corn and small weeds.
	paraquat (<i>Gramoxone Extra</i>) + surfactant	0.25 + ¼%	0.8 pt + ¼%	<ul style="list-style-type: none"> ● CAUTION — KEEP OFF CORN FOLIAGE. ● Do not use before corn is at least 10 in. tall. See Table 1H. ● Emergency use. ● Use drop nozzles or directed spray. ● Shields provide additional protection against corn injury. ● Apply in 20 gal or more of water per acre. ● Do not exceed 20 psi nozzle pressure. ● Arrange nozzles to spray no higher than the lower 3 in. of the corn stalks. ● Leaves exposed to the spray will be burned. ● Do not mix with liquid fertilizer. ● Use caution to avoid spray drift.

TABLE 1B – SPECIAL WEED PROBLEMS IN CORN

VELVETLEAF

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Preplant incorporated Velvetleaf	butylate (<i>Sutan Plus</i>)	4	4% pt	<ul style="list-style-type: none"> • Preplant incorporated to a depth of 2 to 3 in. • May require a postemergence application for complete velvetleaf control. • Do not use on corn seed stocks (Breeders, Foundation, or Increase). • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. • See Table 1F for prepackaged herbicide mixes.
	+ atrazine (commercial product)	+ 1	+ 1 qt 4L OR 1.1 lb 90% DG	
	EPTC with protectant (<i>Eradicane</i>)	4	4% pt	<ul style="list-style-type: none"> • Preplant incorporated to a depth of 2 to 3 in. • May require a postemergence application for complete velvetleaf control. • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ atrazine (commercial product)	+ 1	+ 1 qt 4L OR 1.1 lb 90% DG	
Postemergence Velvetleaf	atrazine (commercial product)	2	2 qt 4L OR 2½ lb 90% DG	<ul style="list-style-type: none"> • Timing of application is critical for best results. • For best results, treat when the largest velvetleaf plants in the field are 2 in. tall. • Do not apply to corn over 12 in. tall. • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+ crop oil concentrate	+ 1 qt	+ 1 qt	
	dicamba (<i>Banvel, Clarity</i>)	½	1 pt	<ul style="list-style-type: none"> • Apply postemergence to corn from emergence up to the 5-leaf stage or 8 in. tall, whichever comes first. • <i>Banvel</i> may be applied at ½ pt/A to corn up to 36 in. tall or 15 days before tassel emergence. Drop nozzles are recommended for corn over 8 in. tall. • For best results, treat when the largest velvetleaf plants in the field are 2 in. tall. • USE EXTREME CAUTION. DRIFT TO NEARBY SENSITIVE CROPS IS A HAZARD. • To reduce the risk of volatilization, do not apply if the air temperature is expected to exceed 85°F on the day of application. • Use pressure no greater than 20 psi. • See additional remarks and limitations for dicamba (<i>Banvel</i>) under "Corn— Postemergence" section.
	dicamba (<i>Banvel, Clarity</i>)	½	1 pt	<ul style="list-style-type: none"> • Apply postemergence to corn from emergence up to the 5-leaf stage or 8 in. tall, whichever comes first. For larger corn, reduce rate to ½ pt/A. • Do not apply to corn over 12 in. tall. Drop nozzles are recommended for corn over 8 in. tall. • For best results, treat when the largest velvetleaf plants in the field are 2 in. tall. • Do not use with crop oil concentrate or other additives. • See additional remarks and limitations for dicamba (<i>Banvel</i>) under "Corn — Postemergence" section. • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. • See Table 1F for prepackaged herbicide mixes.
	+ atrazine (commercial product)	+ 1	+ 1 qt 4L OR 1.1 lb 90% DG	

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VELVETLEAF (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Postemergence Velvetleaf	bentazon (<i>Basagran</i>)	%	% qt	<ul style="list-style-type: none"> ● For best results, treat when the largest velvetleaf plants in the field are 2 in. tall. ● Do not apply to corn over 12 in. tall. ● Combination reduces risk of carryover from post-emergence application of atrazine alone. ● Urea ammonium nitrate (28% liquid nitrogen) may be used at 1 gal/A instead of crop oil concentrate. Do not use urea ammonium nitrate if common lambsquarters is present. ● Rates may be reduced to ½ lb/A for each herbicide if weeds are small. See <i>Laddok</i> label for details. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+	+	+	
	atrazine (commercial product)	%	% qt 4L OR 0.8 lb 90% DG	
+	+	+		
	crop oil concentrate	1 qt	1 qt	
	bromoxynil (<i>Buctril</i>)	%	1½ pt 2L OR ¾ pt Gel	<ul style="list-style-type: none"> ● For best results, treat when the largest velvetleaf plants in the field are 2 in. tall. ● Apply to corn between the 4-leaf stage (4 leaves visible) and before corn is 12 in. tall. ● Do not mix with spray additives or liquid fertilizers. ● Combination reduces risk of carryover from post-emergence application of atrazine alone. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
+	+	+		
atrazine (commercial product)	%	¾ qt 4L OR 0.8 lb 90% DG		
	flumiclorac (<i>Resource</i>)	0.027	4 oz .86L	<ul style="list-style-type: none"> ● Very effective on velvetleaf. ● Apply to corn between the 2-collar and 10-collar stage. ● Use drop nozzles when corn canopy will prevent complete spray coverage of the weeds. ● <i>Resource</i> may be tank mixed with atrazine, <i>Accent</i>, <i>Banvel</i>, and 2,4-D. See Table 11. ● There are no restrictions for <i>Resource</i> regarding organophosphate insecticides. ● There are no rotation crop restrictions.
+	+	+		
	crop oil concentrate	1 pt	1 pt	

TRIAZINE-RESISTANT LAMBSQUARTERS

Triazine-resistant common lambsquarters look the same as triazine-susceptible common lambsquarters but are resistant to triazine herbicides such as atrazine, *Bladex*, and *Princep*. The appearance of uncontrolled common lambsquarters does not confirm triazine resistance because herbicide failures have several possible causes, especially related to weather. Triazine-resistant common lambsquarters will usually exist as the dominant species in the field. Resistance to triazine herbicides can be easily confirmed with the use of a triazine resistance kit. Contact the Cooperative Extension Service county office for details.

Prevention is the best approach to managing herbicide resistance. Crop and herbicide rotation will prevent the development of herbicide-resistant weeds. Where triazine resistance is suspected or confirmed, avoid spreading weed seed into other fields by cleaning tillage and harvest equipment after use and by harvesting infested fields last.

In fields where triazine-resistant lambsquarters has been identified, the following herbicides and herbicide combinations are recommended for control in corn. Postemergence treatments provide the most effective, consistent control.

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Postemergence Triazine-resistant Common Lambsquarters	dicamba (<i>Barvel</i> , <i>Clarity</i>)	½	1 pt	<ul style="list-style-type: none"> ● Apply postemergence. Treatment must follow a preplant-incorporated or preemergence herbicide application for control of other weed species. ● Apply postemergence to corn from emergence up to the 5-leaf stage or 8 in. tall, whichever comes first. ● <i>Barvel</i> may be applied at ½ pt/A to corn up to 36 in. tall or 15 days before tassel emergence. Drop nozzles are recommended for corn over 8 in. tall. ● Most effective when weeds are small (4 in. or less). ● For best results, treat when the largest lambsquarters plants in the field are 2 in. tall. ● See additional remarks and limitations for dicamba (<i>Barvel</i>) under "Corn — Postemergence."
	dicamba (<i>Barvel</i> , <i>Clarity</i>) + atrazine (commercial product)	½ + 1	1 pt + 1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● Apply postemergence. Treatment must follow a preplant-incorporated or preemergence herbicide application for grass control. ● Apply postemergence to corn from emergence up to the 5-leaf stage or 8 in. tall, whichever comes first. For larger corn, reduce <i>Barvel</i> rate to ½ pt/A. ● Do not apply to corn over 12 in. tall. Drop nozzles are recommended for corn over 8 tall. ● Most effective when weeds are small (4 in. or less). ● For best results, treat when the largest lambsquarters plants in the field are 2 in. tall. ● Do not use with crop oil concentrate or other additives. ● See additional remarks and limitations for dicamba (<i>Barvel</i>). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	bromoxynil (<i>Buctril</i>)	¾	1½ pt 2L OR ¾ pt Gel	<ul style="list-style-type: none"> ● Apply postemergence. Treatment must follow a preplant-incorporated or preemergence herbicide application for control of other weed species. ● Apply to corn between the 4-leaf stage (4 visible leaves) and prior to tassel emergence. ● Most effective when weeds are small (6 in. or less). ● For best results, treat when the largest lambsquarters plants in the field are 2 in. tall. ● Treatment will not provide residual control. ● Do not mix with spray additives or liquid fertilizers. ● For ground applications, use a minimum of 20 gal of water/A and 30 psi.

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TRIAZINE-RESISTANT LAMBSQUARTERS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Postemergence Triazine-resistant Common Lambsquarters	bromoxynil (<i>Buctril</i>)	%	1½ pt 2L OR ¾ pt Gel	<ul style="list-style-type: none"> ● Apply postemergence. Treatment must follow a preplant-incorporated or preemergence herbicide application for grass control. ● Apply to corn between the 4-leaf stage (4 visible leaves) and before corn is 12 in. tall. ● Most effective when weeds are small (6 in. or less). ● For best results, treat when the largest lambsquarters plants in the field are 2 in. tall. ● Treatment will not provide residual control. ● Do not mix with spray additives or liquid fertilizers. ● For ground applications, use a minimum of 20 gal of water/A and 30 psi. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
	+ atrazine (commercial product)	+	+ ¾ qt 4L OR 0.8 lb 90% DG	
	2,4-D amine	½	1 pt	<ul style="list-style-type: none"> ● Apply postemergence. Treatment must follow a preplant-incorporated or preemergence herbicide application for control of other weed species. ● For corn over 6 to 8 in., use drop nozzles. ● Most effective when weeds are small (4 in. or less). ● For best results, treat when the largest lambsquarters plants in the field are 2 in. tall. ● Treatment will not provide residual control. ● Often less effective than the other recommended herbicides. ● Ester formulations will cause more crop injury and are not recommended. ● Oil-soluble amines of 2,4-D (<i>Dacamine</i>, <i>Weedar E-3</i>) are available and are used at lower rates. ● Drift control additives can be used with some 2,4-D amine products to reduce danger of drift. Check the product label. ● Hybrids vary in tolerance.
Preemergence Triazine-resistant Common Lambsquarters	flumetsulam + metolachlor (<i>Broadstrike</i> + <i>Dual</i>)	.056 + 2.1	2¼ pt	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. SEE LABEL FOR DETAILS. ● See label or table 11 for crop rotation restrictions. ● Corn should be planted at least 1.5 in. deep. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not use if organic matter is >5% and soil pH <5.9 as poor weed control may result. ● Do not use on peat or muck soils. ● This product has a groundwater advisory statement. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent</i>, <i>Beacon</i>, <i>Basis</i>, <i>Exceed</i>, <i>Permit</i>) if plants are under stress. ● Do not apply to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury. ● Rotary hoe and cultivate if dry weather follows application. ● <i>Broadstrike</i> available in prepackaged mixes only. See Table 1F.

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TRIAZINE-RESISTANT LAMBSQUARTERS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Preemergence Triazine-resistant Common Lambsquarters	flumetsulam + metolachlor <i>(Broadstrike + Dual)</i> + atrazine <i>(commercial product)</i>	.056 + 2.1 +	2¼ pt + 1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. SEE LABEL FOR DETAILS. ● See label or table 11 for crop rotation restrictions. ● Corn should be planted at least 1.5 in. deep. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not use if organic matter is >5% and soil pH <5.9 as poor weed control may result. ● Do not use on peat or muck soils. ● This product has a groundwater advisory statement. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent, Beacon, Basis, Exceed, Permit</i>) if plants are under stress. ● Do not apply to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury. ● Rotary hoe and cultivate if dry weather follows application. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● <i>Broadstrike</i> available in prepackaged mixes only. See Table 1F.
	flumetsulam + clopyralid <i>(Hornet)</i>	.056 + .156	.25 lb 86% DG	<ul style="list-style-type: none"> ● MUST BE TANK MIXED WITH MICRO-TECH LASSO, PARTNER, DUAL, DUAL II, PROWL, FRONTIER, HARNESS, OR SURPASS FOR CONTROL OF GRASSES. ● Groundwater Advisory Statement. ● See label or Table 11 for crop rotation restrictions. ● Corn should be planted at least 1.5 in. deep. ● Application rate varies by soil type. See label for details. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not use if organic matter is >5% and soil pH <5.9 as poor weed control may result. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent, Beacon, Basis, Exceed, Permit</i>) if plants are under stress. ● Do not apply to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury.

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TRIAZINE-RESISTANT LAMBSQUARTERS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<p>(continued)</p> <p>Preemergence Triazine-resistant Common Lambsquarters</p>	<p>pendimethalin <i>(Prowl)</i></p>	<p>1½</p>	<p>1.8 qt 3.3 EC</p>	<ul style="list-style-type: none"> ● APPLY AFTER PLANTING. DO NOT INCORPORATE. ● Tank mix with atrazine or <i>Bladex</i> or follow with 2,4-D, <i>Banvel</i>, <i>Basagran</i>, <i>Buctril</i>, <i>Bladex</i>, or atrazine for control of other broadleaf weeds. ● This treatment will provide effective control of triazine-resistant common lambsquarters with timely rainfall following treatment. Without adequate rainfall, a post-emergence herbicide treatment or cultivation will be required for complete control. ● Adjust <i>Prowl</i> rate according to soil type (refer to <i>Prowl</i> label for details). ● Do not use on sandy soil with less than 1.5% organic matter. ● Plant at least 1½ in. deep.

TABLE 1C – CHEMICAL WEED CONTROL IN NO-TILL CORN

Effective weed control in no-tillage corn production requires complete control of all weeds, cover crops, and sod plants present at the time of planting. Alfalfa and quackgrass sods must be treated prior to planting. Burndown of annual weeds and cover crops can be accomplished with burndown herbicides such as paraquat (*Gramoxone Extra*) or glyphosate (*Roundup Ultra* or *Touchdown*) added to the tank mix. Either of these herbicides can be used alone prior to planting to avoid excessive cover crop growth. *Gramoxone Extra* provides faster kill. *Roundup Ultra/Touchdown* may provide better control if weed or cover crop growth is dense. It is preferred for perennial weeds or seedling grasses before completion of tillering. Use 1/2 pt non-ionic surfactant/100 gal of water with *Gramoxone Extra*. Double the surfactant rate if liquid fertilizer is used as the carrier. Do not use suspension fertilizers as carriers for *Gramoxone Extra*. The best carrier for *Roundup Ultra/Touchdown* is clean water. Reduced control may occur if *Roundup* is used in tank mixtures containing fluid fertilizer. Carefully follow the mixing instructions for *Gramoxone Extra* and *Roundup Ultra/Touchdown*. If weeds are small, herbicides such as *Bladex* and atrazine and/or 28% liquid nitrogen can be used for burndown. See specific recommendations in this section for details.

Many situations may require little or no adjustment in application rates. However, dense plant residue and the total reliance on herbicides for weed control may require that herbicides be used at the high end of the labelled rate range for the soil type. Postemergence herbicides listed in the "Corn — Postemergence" section may be used in no-till corn and may be needed to provide adequate control. Fields should be scouted routinely (weekly) for weed escapes.

NO-TILL CORN — LEGUME SOD

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>FALL application followed by preemergence</i>				
Alfalfa sod Quackgrass Annual broadleaves Annual grasses	glyphosate (<i>Roundup Ultra</i>)	1½	2 qt	<ul style="list-style-type: none"> • Apply <i>Roundup Ultra</i> in fall. • Best timing for treatment is 4 to 6 weeks after last alfalfa harvest. • Alfalfa should be at least 4 in. tall and actively growing. • Quackgrass, if present, should be at least 8 in. tall actively growing. • Air temperature should be at least 60°F. • Always add non-ionic surfactant with <i>Gramoxone Extra</i>. When the herbicide carrier is water, add ½ pt surfactant per 100 gal of spray solution. • Use 20 to 60 gal of water/A with paraquat and 20 to 30 gal of water/A with <i>Roundup Ultra</i>. • Postemergence <i>Banvel</i> or 2,4-D may be needed to control alfalfa escapes. • <i>Lasso</i>, <i>Micro-Tech</i>, <i>Arena</i>, <i>Partner</i>, <i>Frontier</i>, <i>Dual</i>, or <i>Dual II</i> may be included if annual grasses are expected to be a serious problem. • If weeds are small, the rate of <i>Gramoxone Extra</i> or <i>Roundup Ultra</i> may be reduced. See label for details. • <i>Bladex</i> rate varies, depending on surface residue and soil type (refer to <i>Bladex</i> label for details). • Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	FOLLOWED BY:			
	atrazine (commercial product)	2	2 qt 4L	
	OR	OR	OR	
	cyanazine (<i>Bladex</i>)	2½	2½ lb 90% DG	
	OR	OR	OR	
	atrazine + cyanazine (commercial product + <i>Bladex</i>)	1 + 2	1 + 2 qt 4L OR 1.1 + 2.2 lb 90% DG/DF	
	+			
	Burndown (See Table 1E)			

(Continued on next page)

NO-TILL — LEGUME SOD (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
FALL application followed by preemergence				
Alfalfa sod Annual broadleaves Annual grasses	2,4-D ester	1½	1¼ qt	<ul style="list-style-type: none"> ● Apply 2,4-D in fall. ● Alfalfa should be at least 4 in. tall and actively growing at treatment time. ● Air temperature should be at least 60°F. ● Apply atrazine + paraquat or <i>Roundup Ultra</i> at planting time. ● Always add non-ionic surfactant with <i>Gramoxone Extra</i>. When the herbicide carrier is water, add ½ pt surfactant per 100 gal of spray solution. ● Use 20 to 60 gal of water/A with paraquat and 20 to 30 gal of water/A with <i>Roundup Ultra</i>. ● Postemergence <i>Banvel</i> or 2,4-D may be needed to control alfalfa escapes. ● Quackgrass is usually not at the proper state of growth (8 in. tall) for maximum effectiveness from <i>Roundup Ultra</i> treatment at corn planting. (See "Quackgrass" section for notes on <i>Roundup Ultra</i> use.) ● <i>Lasso</i>, <i>Micro-Tech</i>, <i>Partner</i>, <i>Frontier</i>, <i>Dual</i>, or <i>Dual II</i> may be included if annual grasses are expected to be a serious problem. ● If weeds are small, the rate of <i>Gramoxone Extra</i> or <i>Roundup Ultra</i> may be reduced. See label for details. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	FOLLOWED BY:			
	atrazine (commercial product)	2	2 qt 4L OR 2½ lb 90% DG	
	+			
	Burndown (See Table 1E)			
SPRING application followed by preemergence				
Alfalfa sod Annual broadleaves Annual grasses	2,4-D ester	1½	1¼ qt	<ul style="list-style-type: none"> ● Apply 2,4-D 7 to 10 days before planting. ● Alfalfa should be at least 4 in. tall at treatment time. ● Apply atrazine and paraquat or <i>Roundup Ultra</i> at planting time. ● Always add non-ionic surfactant with <i>Gramoxone Extra</i>. When the herbicide carrier is water, add ½ pt surfactant per 100 gal of spray solution. ● Use 20 to 60 gal of water/A with paraquat and 20 to 30 gal of water/A with <i>Roundup Ultra</i>. ● Postemergence <i>Banvel</i> or 2,4-D may be needed to control alfalfa escapes. ● Quackgrass is usually not at the proper stage of growth (8 in. tall) for maximum effectiveness from <i>Roundup Ultra</i> treatment at corn planting. (See "Quackgrass" section for notes on <i>Roundup Ultra</i> use.) ● <i>Lasso</i>, <i>Micro-Tech</i>, <i>Partner</i>, <i>Frontier</i>, <i>Dual</i>, or <i>Dual II</i> may be included if annual grasses are expected to be a serious problem. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	FOLLOWED BY:			
	atrazine (commercial product)	2	2 qt 4L OR 2½ lb 90% DG	
	+			
	Burndown (See Table 1E)			

NO-TILL — QUACKGRASS SOD

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>FALL application followed by preemergence</i>				
Alfalfa Quackgrass Annual broadleaves Annual grasses	glyphosate (Roundup Ultra)	1½	2 qt	<ul style="list-style-type: none"> ● Apply <i>Roundup Ultra</i> in fall. ● Quackgrass should be at least 8 in. tall and actively growing. ● Air temperature should be at least 60°F. ● Always add non-ionic surfactant with <i>Gramoxone Extra</i>. When the herbicide carrier is water, add ½ pt surfactant per 100 gal of spray solution. ● Use 20 to 60 gal of water/A with paraquat and 20 to 30 gal of water/A with <i>Roundup Ultra</i>. ● <i>Lasso</i>, <i>Micro-Tech</i>, <i>Partner</i>, <i>Frontier</i>, <i>Dual</i> or <i>Dual II</i> may be included if annual grasses are expected to be a serious problem. ● <i>Bladex</i> rate varies, depending on surface residue and soil type (refer to <i>Bladex</i> label for details). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	FOLLOWED BY:			
	atrazine (commercial product)	2	2 qt 4L OR 2½ lb 90% DG	
	OR	OR	OR	
	cyanazine (Bladex)	2½	2½ qt 4L OR 2.8 lb 90% DG	
	OR	OR	OR	
	atrazine + cyanazine (commercial product)	1 + 2	1 + 2 qt 4L OR 1.1 + 2.2 lb 90% DG/DF	
	+			
	Burndown (See Table 1E)			

NO-TILL — GRAIN STUBBLE or ROW CROP RESIDUE

(With or 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	1½ qt 4L OR 1.7 lb 90% DG	<ul style="list-style-type: none"> ● Applied preemergence. ● Use 3 qt <i>Lasso</i> for heavy grass (especially fall panicum or crabgrass) infestations. ● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for four-way tank mixes). ● <i>Dual II</i> contains a safener which increases corn tolerance to metolachlor. ● Do not apply acetochlor to the following soils if ground water depth is 30 feet or less; sands with less than 3% organic matter, loamy sands with less than 2% organic matter, or sandy loams with less than 1% organic matter. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● <i>TopNotch</i> is a micro-encapsulated formulation of acetochlor. ● See Table 1F for prepackaged herbicide mixes.
	+		+	
	alachlor (Micro-Tech)	2½	2½ qt 4L OR	
	OR		OR	
	(Partner)		3.8 lb 65% DG	
	OR	OR	OR	
	metolachlor (Dual, Dual II)	2	1 qt	
	OR	OR	OR	
	dimethenamid (Frontier)	1.17	20 oz 7.5L OR 25 oz 6L	
	OR	OR	OR	
	acetochlor (Harness)	1.6	1.8 pt 7L OR	
	OR		OR	
	(Surpass)		2 pt 6.4L OR	
	OR		OR	
	(TopNotch)		4 pt 3.2L	
	+			
	Burndown (See Table 1E)			

(Continued on next page)

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

(With or without a cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
(continued) Annual broadleaves Annual grasses	atrazine (commercial product) + pendimethalin (<i>Prowl</i>) + Burndown (See Table 1E)	1½ + 1½	1½ qt 4L OR 1.7 LB 90% DG + 1.8 qt 3.3 EC	<ul style="list-style-type: none"> ● APPLY AFTER PLANTING. DO NOT INCORPORATE. ● Extreme care must be taken to assure complete closure of the seed furrow. If the seed furrow remains open (even partially open) severe injury will occur. ● Adjust <i>Prowl</i> rate according to soil type (refer to <i>Prowl</i> label for details). ● Do not use on sandy soil with less than 1.5% organic matter. ● Plant at least 1½ in. deep. ● <i>Bladex</i> may be included for more effective fall panicum control. (See remarks for four-way tank mixes). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	flumetsulam + metolachlor (<i>Broadstrike + Dual</i>) + Burndown (See Table 1E)	.056 + 2.1	2¼ pt	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. SEE LABEL FOR DETAILS. ● See label or Table 11 for crop rotation restrictions. ● Corn should be planted at least 1.5 inches deep. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not use if organic matter is >5% and soil pH <5.9 as poor weed control may result. ● Do not use on peat or muck soils. ● This product has a groundwater advisory statement. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent</i>, <i>Beacon</i>, <i>Basis</i>, <i>Exceed</i>, <i>Permit</i>) if plants are under stress. ● Do not apply <i>Broadstrike</i> to corn treated with any formulation of <i>Counter</i> insecticide. Other organophosphate insecticides should be applied if a band (surface or T-band) to reduce risk of crop injury. ● Refer to herbicide label for approved burndown herbicides. ● Control of only light to moderate common ragweed, cocklebur, and jimsonweed. Control may be improved by adding atrazine to the tank mix. ● <i>Broadstrike</i> available in prepackaged mixes only. See Table 1F.

(Continued on next page)

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

(With or without a cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses	flumetsulam + metolachlor <i>(Broadstrike + Dual)</i> + atrazine <i>(commercial product)</i> + Burndown <i>(See Table 1E)</i>	.056 + 2.1 + 1	2½ pt + 1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. SEE LABEL FOR DETAILS. ● See label or Table 11 for crop rotation restrictions. ● Corn should be planted at least 1.5 inches deep. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe corn injury may occur. ● Do not use if organic matter is >5% and soil pH <5.9 as poor weed control may result. ● Do not use on peat or muck soils. ● This product has a groundwater advisory statement. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent, Beacon, Basis, Exceed, Permit</i>) if plants are under stress. ● Do not apply <i>Broadstrike</i> to corn treated with any formulation of Counter insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury. ● Refer to herbicide label for approved burndown herbicides. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● <i>Broadstrike</i> available in prepackaged mixes only. See Table 1F. ● Reduced rates of <i>Broadstrike + Dual</i> may be tank mixed with reduced rates of <i>Bicep II</i> to reduce risk of crop injury. See supplemental label for details.
	flumetsulam + clopypalid <i>(Hornet)</i> + Burndown	.056 + .156	.25 lb 86% DG	<ul style="list-style-type: none"> ● MUST BE TANK MIXED WITH MICRO-TECH, LASSO, PARTNER, DUAL, DUAL II, PROWL, FRONTIER, HARNESS, OR SURPASS FOR CONTROL OF GRASSES. ● Groundwater advisory statement. ● See label or Table 11 for crop rotation restrictions. ● Corn should be planted at least 1.5 inches deep. ● Application rate varies by soil type, see label for details. ● Improved control of common ragweed and cocklebur compared to <i>Broadstrike + Dual</i>. ● Do not apply to sweet corn or popcorn. ● Do not apply within 85 days of harvest. ● Do not use if organic matter is >5% and soil pH <5.9 as poor weed control may result. ● Do not use if soil pH exceeds 7.8 as crop injury may occur. ● Risk of corn injury increases as soil pH increases. ● Do not apply to soils with less than 1.5% organic matter as severe cor injury may occur. ● Do not follow this treatment with a postemergence application of an ALS inhibitor herbicide (<i>Accent, Beacon, Basis, Exceed, Permit</i>) if plants are under stress. ● Do not apply <i>Broadstrike</i> to corn treated with any formulation of Counter insecticide. Other organophosphate insecticides should be applied in a band (surface or T-band) to reduce risk of crop injury.

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

(With or without a cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses	cyanazine (<i>Bladex</i>)	2	2 qt 4L OR 2.2 lb 90% DF	<ul style="list-style-type: none"> ● Applied preemergence. ● Use 3 qt <i>Lasso</i> for heavy grass (especially fall panicum or crabgrass) infestations. ● No carryover. ● <i>Bladex</i> rate varies, depending on surface residue and soil type (refer to <i>Bladex</i> label for details). ● <i>Dual II</i> contains a safener which increases corn tolerance to metolachlor. ● Do not apply acetochlor to the following soils if groundwater depth is 30 feet or less: sands with less than 3% organic matter, loamy sands with less than 2% organic matter, or sandy loams with less than 1% organic matter. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● <i>TopNotch</i> is a micro-encapsulated formulation of acetochlor. ● See Table 1F for prepackaged herbicide mixes.
	+	+	+	
	alachlor (<i>Micro-Tech</i>)	2½	2½ qt 4L OR	
	OR		3.8 lb 65% DG OR	
	(<i>Partner</i>)		20 oz 7.5L OR	
	OR	OR	25 oz 6L OR	
	dimethenamid (<i>Frontier</i>)	1.17	1 qt	
	OR	OR	OR	
	metolachlor (<i>Dual, Dual II</i>)	2	OR	
	OR	OR	OR	
	acetochlor (<i>Harness</i>)	1.6	1.8 pt 7L OR	
	OR		2 pt 6.4L OR	
	(<i>Surpass</i>)		4 pt 3.2 L	
OR				
(<i>TopNotch</i>)				
+				
Burndown (See Table 1E)				
<hr/>				
	cyanazine (<i>Bladex</i>)	2	2 qt 4L OR 2.2 lb 90% DF	<ul style="list-style-type: none"> ● APPLY AFTER PLANTING. DO NOT INCORPORATE. ● Extreme care must be taken to assure complete closure of the seed furrow. If the seed furrow remains open (even partially open) severe injury will occur. ● Adjust <i>Prowl</i> rate according to soil type (refer to <i>Prowl</i> label for details). ● Do not use on sandy soil with less than 1.5% organic matter. ● Plant at least 1½ in. deep. ● <i>Bladex</i> rate varies, depending on surface residue and soil type (refer to <i>Bladex</i> label for details). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details.
	+	+	+	
	pendimethalin (<i>Prowl</i>)	1½	1.8 qt 3.3 EC	
	+			
Burndown (See Table 1E)				

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

(With or 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	¾ qt 4L OR ½ lb 90% DG	<ul style="list-style-type: none"> ● Applied preemergence. ● Reduces potential atrazine carryover. ● May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem. ● <i>Bladex</i> rate varies, depending on surface residue and soil type (refer to <i>Bladex</i> label for details). ● <i>Dual II</i> contains a safener which increases corn tolerance to metolachlor. ● Do not apply acetochlor to the following soils if groundwater depth is 30 feet or less: sands with less than 3% organic matter, loamy sands with less than 2% organic matter, or sandy loams with less than 1% organic matter. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● <i>TopNotch</i> is a micro-encapsulated formulation of acetochlor. ● See Table 1F for prepackaged herbicide mixes.
	+	+	+	
	cyanazine (<i>Bladex</i>)	1½	1½ qt 4L OR 1.7 lb 90% DF	
	+	+	+	
	alachlor (<i>Micro-Tech</i>) OR (<i>Partner</i>) OR	2½	2½ qt 4L OR 3.8 lb 65% DG	
	dimethenamid (<i>Frontier</i>)	1.17	20 oz 7.5L OR 25 oz 6L	
	OR	OR	OR	
	metolachlor (<i>Dual, Dual II</i>)	2	1 qt	
	OR	OR	OR	
	acetochlor (<i>Harness</i>)	1.6	1.8 pt 7L OR	
	OR		OR	
	(<i>Surpass</i>)		2 pt 6.4L OR	
	(<i>TopNotch</i>)		4 pt 3.2L	
	+			
Burndown (See Table 1E)				
atrazine (commercial product)	¾	¾ qt 4L OR ½ lb 90% DG	<ul style="list-style-type: none"> ● APPLY AFTER PLANTING. DO NOT INCORPORATE. ● Extreme care must be taken to assure complete closure of the seed furrow. If the seed furrow remains open (even partially open) severe injury will occur. ● Adjust <i>Prowl</i> rate according to soil type (refer to <i>Prowl</i> label for details). ● Do not use on sandy soil with less than 1.5% organic matter. ● Plant at least 1½ in. deep. ● May substitute <i>Princep</i> for atrazine if fall panicum is a severe problem. ● <i>Bladex</i> rate varies, depending on surface residue and soil type (refer to <i>Bladex</i> label for details). ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes. 	
+	+	+		
cyanazine (<i>Bladex</i>)	1½	1½ qt 4L OR 1.7 lb 90% DF		
+	+	+		
pendimethalin (<i>Prowl</i>)	1½	1.8 qt 3.3 EC		
+				
Burndown (See Table 1E)				
cyanazine (<i>Bladex</i>)	2	2 qt 4L OR 2.2 lb 90% DF		
+	+	+		
atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG		
+				
Burndown (See Table 1E)				

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NO-TILL — 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	cyanazine (<i>Bladex</i>)	2.2	2.2 qt 4L OR 2.4 lb 90% DF	<ul style="list-style-type: none"> ● Applied preemergence. ● For small annual weeds no more than 3 in. tall. ● See Table 1D for details on burndown herbicides. ● Adjust <i>Bladex</i> rate according to surface residue and soil type. Refer to <i>Bladex</i> label for details. ● Use a minimum of 25 gal of spray/A. ● 28% liquid nitrogen used as the herbicide carrier will add to the effectiveness of the treatment for burn-down. When this carrier is used, substitute ½% surfactant for crop oil concentrate. ● 2,4-D ester (½ lb/A or 1 pt/A) may be included if perennial broadleaves are present. ● <i>Dual II</i> contains a safener which increases corn tolerance to metolachlor. ● Do not apply acetochlor to the following soils if ground-water depth is 30 feet or less: sands with less than 3% organic matter, or loamy sands with less than 2% organic matter, or sandy loams with less than 1% organic matter. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● <i>TopNotch</i> is a micro-encapsulated formulation of acetochlor. ● See Table 1F for prepackaged herbicide mixes.
	+	+	+	
alachlor (<i>Micro-Tech</i>)	2½	2½ qt 4L		
OR (<i>Partner</i>)		3.8 lb 65% DG		
OR	OR	OR		
metolachlor (<i>Dual, Dual II</i>)	2	1 qt		
OR	OR	OR		
dimethenamid (<i>Frontier</i>)	1.17	20 oz 7.5L OR 25 oz 6L		
OR	OR	OR		
acetochlor (<i>Harness</i>)	1.6	1.8 pt 7L		
OR (<i>Surpass</i>)		OR		
OR (<i>TopNotch</i>)		2 pt 6.4L OR 4 pt 3.2L		
+	+	+		
crop oil concentrate	1 qt	1 qt		
	cyanazine (<i>Bladex</i>)	1½	1½ qt 4L OR 1.7 lb 90% DF	<ul style="list-style-type: none"> ● Applied preemergence. ● For small annuals no more than 3 in. tall. ● See Table 1D for details on burndown herbicides. ● Adjust <i>Bladex</i> rate according to surface residue and soil type. Refer to <i>Bladex</i> label for details. ● Use a minimum of 25 gal of spray/A. ● 28% liquid nitrogen used as the herbicide carrier will add to the effectiveness of the treatment for burn-down. When this carrier is used, substitute ½% surfactant for crop oil concentrate. ● 2,4-D ester (½ lb/A or 1 pt/A) may be included if perennial broadleaves are present. ● <i>Dual II</i> contains a safener which increases corn tolerance to metolachlor. ● Do not apply acetochlor to the following soils if ground-water depth is 30 feet or less: sands with less than 3% organic matter, loamy sands with less than 2% organic matter, or sandy loams with less than 1% organic matter. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● <i>TopNotch</i> is a micro-encapsulated formulation of acetochlor. ● See Table 1F for prepackaged herbicide mixes.
	+	+	+	
	atrazine (commercial product)	¾	¾ qt 4L	
	+	+	+	
	alachlor (<i>Micro-Tech</i>)	2½	2½ qt 4L	
	OR (<i>Partner</i>)		3.8 lb 65% DG	
	OR	OR	OR	
	metolachlor (<i>Dual, Dual II</i>)	2	1 qt	
	OR	OR	OR	
	dimethenamid (<i>Frontier</i>)	1.17	20 oz 7.5L OR 25 oz 6L	
	OR	OR	OR	
	acetochlor (<i>Harness</i>)	1.6	1.8 pt 7L	
	OR (<i>Surpass</i>)		OR	
	OR (<i>TopNotch</i>)		2 pt 6.4L OR 4 pt 3.2L	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	

(Continued on next page)

NO-TILL — 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	cyanazine	2	2 qt 4L	<ul style="list-style-type: none"> ● Applied preemergence. ● For small annuals no more than 3 in. tall. ● See Table 1D for details on burndown herbicides. ● Adjust <i>Bladex</i> rate according to surface residue and soil type. Refer to <i>Bladex</i> label for details. ● Use a minimum of 25 gal of spray/A. ● 28% liquid nitrogen used as the herbicide carrier will add to the effectiveness of the treatment for burn-down. When this carrier is used, substitute ½% surfactant for crop oil concentrate. ● 2,4-D ester (½ lb/A or 1 pt/A) may be included if perennial broadleaves are present. ● Will not control yellow nutsedge. ● Mixing, loading, and application setbacks are required for atrazine and cyanazine. See label and pg. 12–13 for details. ● See Table 1F for prepackaged herbicide mixes.
Annual grasses	<i>(Bladex)</i>		OR 2.2 lb 90% DF	
	+	+	+	
	atrazine	1	1 qt 4L	
	(commercial product)			
	+	+	+	
	crop oil concentrate	1 qt	1 qt	

TABLE 1D. CROP AND WEED RESPONSE TO BURNDOWN HERBICIDES IN SOD

	Alfalfa	Red Clover	Hairy Vetch	Dandelion	Curled Dock	Bromegrass	Timothy	Bluegrass	Orchardgrass	Quackgrass
Fall Application^a										
Roundup Ultra (1 qt/A) ^{cd}	F-G	F-G	F-G	F	–	G	G	G	G	G-E
Roundup Ultra (2 qt/A) ^{cd}	G-E	G-E	G-E	G	–	E	E	E	E	E
2,4-D Ester (1 qt/A)	F-G	F	F	G	–	N	N	N	N	N
Roundup Ultra + 2,4-D Ester (1 qt/A + 1 qt/A) ^{cd}	G	G	G	G	–	G	G	G	G	G-E
Roundup Ultra + 2,4-D Ester (2 qt/A + 1 qt/A) ^{cd}	G-E	G-E	G-E	G	–	E	E	E	E	E
Spring Application^b										
Roundup Ultra (1 qt/A) ^{cd}	F	F	F	P	P	F	F	G	P	G
Roundup Ultra (2 qt/A) ^{cd}	F-G	F-G	F-G	P	F	G	G	G	F	E
2,4-D Ester (1 qt/A)	F-G	F-G	F-G	G	P	N	N	N	N	N
Roundup Ultra + 2,4-D Ester (1 qt/A + 1 qt/A) ^{cd}	F-G	F-G	F-G	G	P-F	F	F	G	P	G
Roundup Ultra + 2,4-D Ester (2 qt/A + 1 qt/A) ^{cd}	G	G	G	G	F	G	G	G	F	E

P = Poor; F = Fair; G = Good; E = Excellent; N = None; – = Not enough information to rank

a. Ideal timing is 4 to 6 weeks after mowing. Mow in late August–early September and treat in early–mid October in central or southern Michigan.

b. Treat when plants reach at least 6 inches tall.

c. Addition of ammonium sulfate (AMS) at 17 lbs/100 gal of water often improves control.

d. *Touchdown* may be used in place of *Roundup Ultra*. *Touchdown* application rate should be *Roundup Ultra* rate x .72. Always add non-ionic surfactant at ½% with *Touchdown*.

TABLE 1E. EFFECTIVENESS OF TANK-MIXED BURNDOWN HERBICIDES IN CORN*,**

	ANNUAL BROADLEAVES										ANNUAL GRASSES							WINTER ANNUALS/PERENNIALS					COVER CROPS						
	Cocklebur	Jimsonweed	Lambsquarters	Nightshade	Pigweed	Ragweed (Common)	Ragweed (Giant)	Smartweed	Velvetleaf	Wild Mustard	Barnyardgrass	Crabgrass	Giant Foxtail	Green Foxtail	Yellow Foxtail	Fall Panicum	Witchgrass	Sandbur	Chickweed (common)	Yellow Rocket	Shepards' purse	Pennycress	Marestail (Horseweed)	Dandelion	Quackgrass	Rye	Wheat	Clover	Hairy Vetch
	Maximum Weed Height (inches)																	Herbicide Effectiveness											
Atrazine (1 lb ai/A) ^{ae}	2	2	2	2	2	2	2	2	2	2	NR	NR	NR	NR	NR	NR	NR	NR	-	G	E	G	G	P	P	P	P	P	P
Atrazine (2 lb ai/A) ^{ae}	3	3	3	3	3	3	3	3	3	3	NR	NR	NR	1½	1½	NR	NR	NR	-	E	E	E	E	F	F	F	F	F	F
Bladex 4L (2 qt/A) ^{ae}	3	3	3	3	3	3	NR	3	3	3	3	NR	3	3	3	NR	3	NR	-	E	E	E	G	F	P	P	P	P	F
2,4-D Ester (1 pt/A)	3	NR	3	3	3	3	3	NR	2	3	NR	NR	NR	NR	NR	NR	NR	NR	P	F	G	F	E	F	N	N	N	F	F
2,4-D Ester (1 qt/A)	6	3	6	6	6	6	6	3	5	6	NR	NR	NR	NR	NR	NR	NR	NR	F	G	E	G	E	G	N	N	N	G	G
Roundup Ultra (1 pt/A) ^{bc}	5	2	2	2	5	2	NR	NR	NR	5	NR	-	5	5	5	-	-	-	E	G	E	G	G	P	P	G	G	P	P
Roundup Ultra (1 qt/A) ^{bc}	16	10	10	10	16	10	5	5	5	16	5	-	16	16	16	-	-	-	E	E	E	E	E	P	F	E	E	F	F
Gramoxone Extra (1½pt/A) ^d	3	3	3	3	3	3	3	NR	3	3	3	3	3	3	3	3	3	3	E	G	G	G	P	P	P	F	F	P	P
Gramoxone Extra (2½ pt/A) ^d	6	6	6	6	6	6	6	NR	6	6	6	6	6	6	6	6	6	6	E	E	E	E	P	P	P	G	G	F	F

P = Poor; F = Fair; G = Good; E = Excellent; N = None; NR = Not Recommended; - = Not enough information to rank
 *Burndown effectiveness varies depending on several factors. This table is intended as a guide to relative effectiveness of burndown herbicide options. This table assumes tank mix applications with residual herbicides.

**To avoid excessive cover crop growth, 2,4-D, Gramoxone Extra, or Roundup Ultra may be applied prior to planting.

- Always add crop oil concentrate at 1 qt/A to maximize foliar activity.
- Addition of ammonium sulfate at 17 lbs/100 gal of water often improves control.
- Touchdown may be used in place of Roundup Ultra. Touchdown application rate should be Roundup Ultra rate x .72. Always add non-ionic surfactant at ½% with Touchdown.
- Always add surfactant with Gramoxone Extra. Use 1/2 pt/100 gal of water. Double surfactant in liquid nitrogen fertilizer. Regrowth of rye or wheat may occur if plants are not fully tillered when treated.
- Use of liquid nitrogen fertilizer as the herbicide carrier will improve burndown.

TABLE 1F –

HERBICIDE PREMIXES IN CORN

TRADE NAME	COMPANY	FORMULATION	FORMULATION EQUIVALENTS*	TYPICAL USE RATE = EQUIVALENT RATES
Basis	DuPont	75% DG	rimsulfuron + 1 lb Pinnacle	.33 oz/A = .165 oz a.i. rimsulfuron + .33 oz Pinnacle
Basis Gold	DuPont	89.5% DG	0.28 oz Accent + rimsulfuron + .96 lb Atrazine 90 DF	14 oz/A = 0.25 oz Accent + .188 oz a.i. rimsulfuron + .84 lb Atrazine 90 DF
Bicep Lite II	Ciba	4.9L	3.3 pt Dual II + 1.7 qt Atrazine 4L	2.4 qt/A = 2 pt Dual II + 1 qt Atrazine 4L
Bicep II	Ciba	5.9L	3.3 pt Dual II + 2.68 qt Atrazine 4L	2.4 qt/A = 2 pt Dual II + 1.6 qt Atrazine 4L
Broadstrike + Dual	DowElanco/Ciba	7.67L	Broadstrike + 7.5 pt Dual	2.25 pt/A = 0.056 lb a.i. Broadstrike + 2.1 pt Dual
Bronco	Monsanto	4L	2.6 qt Lasso + 1.4 qt Roundup	4 qt/A = 2.6 qt Lasso + 1.4 qt Roundup
Buctril + Atrazine	Rhone-Poulenc	3L	2 qt Buctril 2E + 2 qt Atrazine 4L	3 pt/A = 0.75 qt Buctril 2E + 0.75 qt Atrazine 4L
Bullet	Monsanto	4L	2.5 qt Micro-Tech + 1.5 qt Atrazine 4L	3 qt/A = 1.88 qt Micro-Tech + 1.13 qt Atrazine 4L
Contour	American Cyanamid	3.38 L	8.4 oz Pursuit DG+ 3 qt Atrazine 4L	1.33 pt/A = 1.4 oz Pursuit DG + 0.5 qt Atrazine 4L
Double Play	Zeneca	7L	6.7 pt Eradicane + 1.75 pt Surpass	5.7 pt/A = 4.75 pt Eradicane + 1.25 pt Surpass
Exceed	Ciba	57% DG	prosulfuron + .38 lb Beacon	1.0 oz/A = .28 oz a.i. prosulfuron + .38 oz Beacon
Extrazine II DF	DuPont	90% DF	.75 lb Bladex 90 DF + .25 lb Atrazine 90	2.2 lb/A = 1.65 lb Bladex 90 DF + 0.55 lb Atrazine 90
Fultime	Zeneca	4L	3.0 qt TopNotch + 3.2 pt Atrazine 4L	2.7 qt/A = 2 qt TopNotch + 1 qt Atrazine 4L
Guardzman	Sandoz	5L	2.5 pt Frontier + 2.7 qt Atrazine 4L	2 qt/A = 1.25 pt Frontier + 1.35 qt Atrazine 4L
Harness Xtra	Monsanto	6L	2.5 qt Harness + 1.7 qt Atrazine 4L	2 qt/A = 2.5 pt Harness + 0.8 qt Atrazine 4L
Harness Xtra 5.6L	Monsanto	5.6L	1.75 qt Harness + 2.5 qt Atrazine 4L	2 qt/A = 1.8 pt Harness + 1.25 qt Atrazine 4L
Headline	BASF	5L + 1L (co-pack)	Laddok 5L + Poast Plus 1L	
Hornet	DowElanco	86% DG	Broadstrike + 1.7 pt Stinger	.25 lb/A = .056 lb a.i. Broadstrike + .42 pt Stinger
Laddok	BASF	5L	2.5 qt Basagran + 2.5 qt Atrazine 4L	2.4 pt/A = 0.75 qt Basagran + 0.75 qt Atrazine 4L
Lariat	Monsanto	4L	2.5 qt Lasso + 1.5 qt Atrazine 4L	3 qt/A = 1.88 qt Lasso + 1.13 qt Atrazine 4L
Marksman	Sandoz	3.2L	1.12 qt Banvel + 2.12 qt Atrazine 4L	3.5 pt/A = 1 pt Banvel + 1 qt Atrazine 4L
Resolve	American Cyanamid	75% SG	1.13 pt Banvel + .26 lb Pursuit DG	5.33 oz/A = 6 fl oz Banvel + 1.4 oz. Pursuit DG
Scorpion III	DowElanco	84% DG	Broadstrike + .67 pt Stinger + 1 pt 2,4-D 4L	.25 lb/A = .02 lb a.i. Broadstrike + .17 pt Stinger + .25 pt 2,4-D
Shotgun	United Agri Products	3.25L	2.25 qt Atrazine 4L + 1 qt 2,4-D Ester	1 qt/A = 0.56 qt Atrazine 4L + 0.5 pt 2,4-D Ester
Surpass 100	Zeneca	4.9L	3.6 pt Surpass + 2 qt Atrazine 4L	2.2 qt/A = 2 pt Surpass + 1.1 qt Atrazine 4L

*Formulation equivalents are per lb of dry formulations or per gallon of liquid formulations.

TABLE 1G—WEED RESPONSE TO HERBICIDES IN CORN*

	MODE OF ACTION	CORN TOLERANCE**	ANNUAL BROADLEAVES										ANNUAL GRASSES							PERENNIALS							
			COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	T-R LAMBSQUARTERS ^a	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEEED (COMMON)	RAGWEEED (GIANT)	SMARTWEEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	SANDBUR	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEDGE	JOHNSONGRASS (seedling)	JOHNSONGRASS (Rhizome)	
Preplant Incorporated																											
ATRAZINE	C	1	F	F	E	N	E	G	E	G	G	F	E	G	P	F	F	G	P	P	P	F	F	F	N	N	
BLADEX	C	2	F	P	E	N	G	F	E	F	G	P	G	G	G	G	G	G	G	G	F	N	N	N	N	N	
BROADSTRIKE + DUAL	A/O	3	F	F	E	E	G	E	F	P	G	G	E	E	E	E	E	E	E	E	F	N	N	G	P	N	
DUAL II	O	1	N	N	P	P	F	G	P	N	P	N	P	E	E	E	E	E	E	E	F	N	N	G	P	N	
ERADICANE	O	2	P	P	F	F	P	F	F	P	F	F	F	E	E	E	E	E	E	E	G	N	F	G	F	P	
FRONTIER	O	2	N	N	P	P	G	G	P	N	P	N	-	E	E	E	E	E	E	E	F	N	N	F	P	N	
HARNESS/SURPASS	O	2	P	N	F	F	-	G	F	N	P	P	-	E	E	E	E	E	E	E	-	N	P	G	P	N	
HORNET	A/O	3	G	F	E	E	-	E	E	G	G	G	E	N	N	N	N	N	N	N	N	F	N	N	N	N	
LASSO/PARTNER/MICRO-TECH	O	2	N	N	P	P	G	G	P	N	P	N	P	E	E	E	E	E	E	E	F	N	N	F	P	N	
PRINCEP	C	1	F	F	E	N	E	G	E	F	G	F	E	G	F	F	F	G	P	P	P	P	F	F	N	N	
SUTAN PLUS	O	2	P	P	P	P	N	P	P	P	P	F	P	E	E	E	E	E	E	E	G	N	P	G	F	P	
Preemergence																											
ATRAZINE	C	1	F	F	E	N	E	G	E	G	G	F	E	G	P	F	F	G	P	P	P	F	F	F	N	N	
BLADEX	C	2	F	P	E	N	G	F	E	F	G	P	G	G	G	G	G	G	G	G	F	N	N	N	N	N	
BROADSTRIKE + DUAL	A/O	3	F	F	E	E	E	E	F	P	G	G	E	E	E	E	E	E	E	E	F	N	N	F	P	N	
DUAL II	O	1	N	N	P	P	F	G	P	N	P	N	P	E	E	E	E	E	E	E	F	N	N	F	P	N	
FRONTIER	O	2	N	N	P	P	G	G	P	N	P	N	-	E	E	E	E	E	E	E	F	N	N	F	P	N	
HARNESS/SURPASS	O	2	P	N	F	F	-	G	F	N	P	P	-	E	E	E	E	E	E	E	-	N	P	F	P	N	
HORNET	A/O	3	G	F	E	E	-	E	E	G	G	G	E	N	N	N	N	N	N	N	N	F	N	N	N	N	
LASSO/PARTNER/MICRO-TECH	O	2	N	N	P	P	G	G	P	N	P	N	P	E	E	E	E	E	E	E	F	N	N	P	P	N	
PRINCEP	C	1	F	F	E	N	E	G	E	F	G	F	E	G	F	F	F	G	P	P	P	P	F	F	N	N	
PROWL	O	3	N	N	E	E	P	F	P	N	P	F	P	G	G	G	G	G	G	G	F	N	N	N	P	N	
RAMROD	O	2	N	P	P	P	N	F	P	-	P	P	P	G	E	E	E	E	G	G	F	N	N	N	P	N	

Herbicide Mode of Action: A = ALS Inhibitor; B = ACCase Inhibitor; C = Photosynthesis Inhibitor; O = Other

Herbicide Effectiveness: P = Poor; F = Fair; G = Good; E = Excellent; N = None; - = Not enough information to rank

*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.

**Crop Tolerance: 1=Minimal risk of crop injury; 2=Crop injury can occur under certain conditions (soil applied—cold, wet; foliar applied—hot, humid); 3=Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4=Risk of severe crop injury is high. Recommended only in rescue situations.

^a Triazine-resistant lambsquarters

**TABLE 1H – WEED AND CROP HEIGHTS FOR
POSTEMERGENCE HERBICIDE APPLICATIONS IN CORN***

<i>Herbicide^b</i>	RATE/A	MAXIMUM HEIGHT^a																				Minimum height	Maximum height
		COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	T-R LAMBSQUARTERS ^c	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEED (COMMON)	RAGWEED (GIANT)	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	SANDBUR	CORN		
Broadcast																							
Accent	¾ oz	NR	3"	NR	NR	NR	4"	NR	NR	4"	NR	NR	4"	NR	4"	4"	4"	4"	4"	4"	3"	None	20" or 6 collars
Atrazine 4L	2 qt	4"	4"	6"	NR	4"	6"	4"	4"	4"	2"	4"	NR	NR	NR	1½"	1½"	NR	NR	NR	None	12"	
Banvel/Clarity	1 pt	4"	4"	4"	4"	4"	4"	4"	4"	6"	2"	2"	NR	NR	NR	NR	NR	NR	NR	NR	None	8" or 5 lf	
Banvel + Atrazine 4L	1 pt + 2 pt	6"	6"	6"	4"	6"	6"	6"	6"	8"	6"	6"	NR	NR	NR	NR	NR	NR	NR	NR	None	8" or 5 lf	
Basagran	2 pt	10"	10"	NR	NR	NR	NR	3"	NR	10"	5"	8"	NR	NR	NR	NR	NR	NR	NR	NR	None	–	
Basagran + Atrazine 4L	14 pt + 14 pt	8"	8"	8"	NR	NR	6"	5"	6"	12"	10"	8"	NR	NR	NR	NR	NR	NR	NR	NR	None	12"	
Basis	½ oz	NR	NR	3"	3"	NR	3"	NR	NR	3"	3"	3"	2"	NR	2"	2"	2"	2"	2"	NR	None	2 collars or 6"	
Basis Gold	14 oz	NR	NR	3"	NR	NR	4"	3"	3"	4"	3"	NR	3"	NR	3"	3"	2"	3"	3"	2"	None	12" or 6 collars	
Beacon	.76 oz	4"	4"	NR	NR	4"	4"	9"	9"	4"	4"	NR	NR	NR	NR	NR	NR	2"	2"	NR	4"	20"	
Bladex 90DF	2 lb	NR	NR	1½"	NR	1½"	NR	1½"	NR	1½"	NR	1½"	1½"	NR	1"	1½"	1½"	NR	NR	NR	None	4 lf	
Buctril	1½ pt	10"	6"	8"	8"	6"	NR	6"	6"	6"	5"	NR	NR	NR	NR	NR	NR	NR	NR	NR	None	d	
Buctril + Atrazine	1½ pt + 1½ pt	12"	6"	12"	8"	6"	6"	6"	10"	8"	6"	4"	NR	NR	NR	NR	NR	NR	NR	NR	None	12"	
Exceed	0.88 oz	12"	6"	2"	2"	4"	5"	12"	6"	6"	6"	NR	NR	NR	NR	NR	NR	NR	NR	NR	4"	20" or 6 collars	
Hornet	2.4 oz	6"	NR	NR	NR	NR	NR	6"	6"	6"	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	None	24"	
Permit	¾ oz	9"	6"	NR	NR	NR	3"	9"	3"	NR	6"	NR	NR	NR	NR	NR	NR	NR	NR	NR	None	canopy closure	
Poast Plus (SR Corn only)	1.5 oz	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	8"	6"	8"	8"	8"	8"	8"	4"	None	pollen shed	
Pursuit (IMI Corn only)	4 oz	8"	NR	NR	NR	2"	6"	NR	3"	3"	2"	3"	NR	NR	6"	3"	3"	NR	NR	NR	None	45 DBH ^e	
Resource	4 oz	NR	NR	NR	NR	NR	NR	NR	NR	NR	5 lf	NR	NR	NR	NR	NR	NR	NR	NR	NR	2 lf	10 collars or canopy closure	
Scorpion III	.25 lb	4"	NR	4"	4"	NR	4"	4"	4"	4"	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	None	8"	
Sencor + 2,4-D amine	2 oz + ½ pt	8"	5"	6"	NR	NR	6"	NR	NR	4"	4"	4"	NR	NR	NR	NR	NR	NR	NR	NR	None	8"	
Stinger	¼ pt	5 lf	5 lf	NR	NR	NR	NR	5 lf	5 lf	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	None	24"	
2,4-D amine	1 pt	4"	NR	4"	4"	4"	4"	4"	4"	NR	2"	4"	NR	NR	NR	NR	NR	NR	NR	NR	None	8"	
Directed																							
Evik	2 lb	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	4"	12"	3 wk before tasseling	
Gramoxone Extra	0.8 pt	3"	3"	3"	3"	3"	3"	3"	3"	NR	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	10"	3 wk before tasseling	
Lorox (50% DF)	3 lb	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	3"	NR	NR	NR	NR	NR	NR	NR	NR	15"	3 wk before tasseling	

^a NR = not recommended; – = no restrictions on crop growth stage; lf = leaf stage.

^b Consult label for recommended additives.

^c Triazine-resistant lambsquarters.

^d Before tassel emergence

^e Days before harvest

*The weed heights and growth stages listed in this table are estimates of the maximum size where consistent control is expected. The maximum height for effective control in any specific situation is dependent on environment conditions including soil moisture, temperature, and relative humidity.

TABLE 1I – TANK-MIX COMBINATIONS, ADDITIVES AND APPLICATION TIMING FOR SELECTED HERBICIDES

Herbicides	Additives					Maximum Corn Height
	None	Surfactant ^a	COC ^b	Surfactant + 28% N ^c	COC + 28%N	
Accent						
Alone	no	¼%	1%	¼% + 4 qt/A ^g	1% + 4 qt/A ^g	20 in. or 6 collar
+ Atrazine	no	no	1%	no	1% + 4 qt/A ^g	12 in.
+ Banvel/Clarity	no	¼%	no	¼% + 4 qt/A ^g	no	8 in. or 5 leaf
+ Buctril/Buctril Gel ^d	no	¼%	no	¼% + 4 qt/A ^g	no	24 in. or 6 collar
+ Buctril + atrazine ^d	no	¼%	no	¼% + 4 qt/A ^g	no	12 in.
+ Marksman	no	¼%	no	¼% + 4 qt/A ^g	no	8 in. or 5 leaf
+ Scorpion III	no	¼%	no	¼% + 4 qt/A ^g	no	8 in.
Beacon						
Alone	no	¼%	1%	¼% + 4 qt/A ^g	1% + 4 qt/A ^g	20 in.
+ Buctril/Buctril Gel ^d	no	¼%	no	no	no	20 in.
+ Banvel/Clarity	no	¼%	no	no	no	8 in. or 5 leaf
+ 2,4-D	no	¼%	no	no	no	8 in.
+ Atrazine	no	no	1%	no	1% + 4 qt/A ^g	12 in.
+ Buctril + atrazine ^d	no	¼%	no	no	no	12 in.
+ Marksman	no	¼%	no	no	no	8 in. or 5 leaf
+ Accent	no	¼%	1%	¼% + 4 qt/A ^g	1% + 4 qt/A ^g	20 in.
Exceed						
Alone	no	¼%	1%	¼% + 4 qt/A ^g	1% + 4 qt/A ^g	20 in. or 6 collar
+ Banvel/Clarity	no	¼%	no	no	no	8 in. or 5 leaf
+ 2,4-D	no	¼%	no	no	no	8 in.
+ Beacon	no	¼%	1%	¼% + 4 qt/A ^g	1% + 4 qt/A ^g	20 in.
+ Atrazine ^e	no	no	1%	no	1% + 4 qt/A ^g	12 in.
+ Buctril ^d	no	¼%	no	no	no	20 in.
+ Buctril + atrazine ^d	no	¼%	no	no	no	12 in.
+ Marksman	no	¼%	no	no	no	8 in. or 5 leaf
+ Accent	no	¼%	1%	¼% + 4 qt/A ^g	1% + 4 qt/A ^g	20 in.
Permit						
Alone	no	¼%	1%	¼% + 4 qt/A ^g	1% + 4 qt/A ^g	canopy closure
+ Banvel/Clarity	no	¼%	no	no	no	8 in. or 5 leaf
+ 2,4-D	no	¼%	no	no	no	8 in.
+ Buctril ^d	no	¼%	no	no	no	before tassel emergence
+ Buctril + atrazine ^d	no	¼%	no	no	no	12 in.
+ Atrazine ^f	no	no	1%	no	no	12 in.
+ Accent	no	¼%	1%	¼% + 4 qt/A ^g	1% + 4 qt/A ^g	24 in. or 6 collar
+ Beacon	no	¼%	1%	¼% + 4 qt/A ^g	1% + 4 qt/A ^g	20 in.
+ Marksman	no	¼%	no	no	no	8 in. or 5 leaf
Resource						
Alone	no	no	1 pt/A	no	1 pt/A + 2%	10 collar or canopy closure
+ Atrazine	no	no	1 pt/A	no	no	12 in.
+ Accent	no	no	no	no	1% + 4 qt/A ^g	24 in. or 6 collar
+ Banvel	yes	no	no	no	no	8 in. or 5 leaf
+ 2,4-D Ester	yes	no	no	no	no	8 in.
+ 2,4-D Amine	no	¼%	no	no	no	8 in.

^a Non-ionic surfactant

^b Crop oil concentrate

^c 28% liquid nitrogen fertilizer (urea-ammonium nitrate)

^d Severe leaf burn can occur if application is made under high temperature/high humidity conditions or if treatment follows several days of cool, cloudy weather.

^e Atrazine may cause antagonism (reduced control) on quackgrass, cocklebur, and velvetleaf.

^f Atrazine may cause antagonism (reduced control) on large broadleaved weeds.

^g Or spray grade ammonium sulfate (AMS) at 2 lbs/A.

TABLE 1J – HERBICIDE: INSECTICIDE COMPATIBILITY CHART FOR CONVENTIONAL AND IT CORN

Herbicide	Soil applied OPs ¹						Foliar applied OPs ⁴	
	Counter 15G	Counter 20CR (in furrow)	Counter 20CR (banded)	Thimet/phorate	Dyfonate, Lorsban	Other ²	Days before herbicide ⁵	Days after herbicide ⁶
Accent	Do not use	Do not use	NR	T	T	T	7	3
Beacon	Do not use	Do not use	NR	T	T	T	10	7
Basis	Do not use	Do not use	NR	NR	NR	T	7	3
Basis Gold	Do not use	Do not use	NR	NR	NR	T	7	3
Broadstrike Dual	Do not use	Do not use	NR	T ³	T ³	T ³	—	—
Exceed	Do not use	Do not use	NR	T	T	T	10	7
Hornet (Broadstrike Plus), soil applied	Do not use	Do not use	Do not use	T ³	T ³	T ³	—	—
Hornet, foliar applied	Do not use	Do not use	Do not use	T	T	T	7	7
Scorpion III	—	—	—	—	—	—	7	7

¹ Do not use=do not apply herbicide to corn previously treated with soil applied OP insecticide, as severe injury may result; NR=application of herbicide to corn previously treated with soil applied OP is not recommended; T=application of herbicide to corn previously treated with soil applied OP may result in temporary injury; —=no information or not applicable.

² Includes diazinon and *Mocap*. *Aztec* and *Fortress* do not appear to interact with the herbicides listed and can be used without risk of injury.

³ OP insecticides should be applied in a band treatment to reduce risk of crop injury.

⁴ Includes dimethoate (*Cygon*), diazinon, *Disyston*, *Imidan*, *Lorsban*, malathion, and *Penncap-2FM*. Also includes the herbicides *Basagran* and *Laddok*.

⁵ Foliar applied OP may be safely applied this many days *before* herbicide treatment.

⁶ Foliar applied OP may be safely applied this many days *after* herbicide treatment.

TABLE 1K—CHEMICAL WEED CONTROL IN PURSUIT RESISTANT/TOLERANT CORN (IMI Corn)

In addition to the herbicide options in Tables 1A, 1B, and 1C, the following herbicides and herbicide combinations may be applied to corn hybrids warranted by the seed company to possess **resistance/tolerance** to direct application of *Pursuit* herbicide. These hybrids are designated as IR, IT, IMR, IPRO, or IMI-CORN. These hybrids vary in cross-resistance to other herbicide families (ie. sulfonylureas), however they all appear to possess adequate resistance to *Pursuit*. *Pursuit* may be applied preplant incorporated, preemergence, or postemergence. The following table describes recommended postemergence treatments with *Pursuit*. These treatments should follow *Sutan Plus*, *Eradicane*, *Lasso*, *Micro-Tech*, *Partner*, *Dual*, *Dual II*, *Harness*, *Surpass*, *TopNotch*, or *Frontier* as listed under "Corn-Preplant — Mineral Soil" section, or *Lasso*, *Micro-Tech*, *Partner*, *Prowl*, *Dual*, *Dual II*, *Harness*, *Surpass*, *TopNotch* or *Frontier* as listed under "Corn-Preemergence — Mineral Soil" section.

PURSUIT RESISTANT/TOLERANT CORN

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (except lambsquarters)	imazethapyr (<i>Pursuit</i>)	0.063	4 oz 2L OR 1.4 oz 70% DG	<ul style="list-style-type: none"> ● USE ONLY ON PURSUIT RESISTANT/TOLERANT CORN HYBRIDS. ● Do not apply <i>Pursuit</i> alone to both corn and soybeans in rotation. ● See practices to prevent/delay herbicide resistant weeds, pg. 15–16. ● See <i>Pursuit</i> label or Table 11 for Crop Rotation Restrictions. ● Use a minimum of 20 psi and 10 gal. of water/A. ● Apply with BOTH surfactant and fertilizer or control will be reduced. ● Excellent control of cocklebur and pigweed. Good control of nightshade, smartweed, velvetleaf, wild mustard, and foxtail species. Fair to poor control of jimsonweed, lambsquarters, common ragweed, and grasses other than foxtail. ● Do not harvest treated corn for 45 days after treatment. ● Any labelled soil insecticides may be used prior to treatment with <i>Pursuit</i> on IR type corn hybrids (e.g. Pioneer IR). ● Do not use <i>Counter</i> 15G insecticide in-furrow on IT type hybrids (e.g. ICI seeds). ● Contact the seed company for additional details on specific hybrids. ● Apply when weeds are small (<3 inches). ● See Soybean—Postemergence section for weed response (2F) and maximum broadleaf weed heights (2G).
	+	+	+	
	28% liquid nitrogen OR	1 qt OR	1 qt OR	
	ammonium sulfate +	2.5 lb +	2.5 lb +	
	surfactant	¼%	¼%	

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PURSUIT RESISTANT/TOLERANT CORN (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	imazethapyr (<i>Pursuit</i>)	0.063	4 oz 2L OR 1.4 oz 70% DG	<ul style="list-style-type: none"> ● USE ONLY ON PURSUIT RESISTANT/TOLERANT CORN HYBRIDS. ● Do not apply <i>Pursuit</i> alone to both corn and soybeans in rotation. ● See practices to prevent/delay herbicide resistant weeds, pg. 15–16. ● See <i>Pursuit</i> label or Table 11 for Crop Rotation Restrictions. ● Apply with BOTH surfactant and fertilizer or control will be reduced. ● Do not harvest treated corn for 45 days after treatment. ● Any labelled soil insecticides may be used prior to treatment with <i>Pursuit</i> on IR type corn hybrids (e.g. Pioneer IR). ● Do not use <i>Counter</i> 15G insecticide in-furrow on IT type hybrids (e.g. ICI seeds). ● Contact the seed company for additional details on specific hybrids. ● Apply when weeds are small (<3 inches). ● Grass activity of <i>Pursuit</i> may be reduced when tank mixed with <i>Buctril</i>. ● Application of <i>Buctril</i> in combination with <i>Pursuit</i> (and additives) will result in temporary leaf burn. ● See additional remarks and limitations for bromoxynil (<i>Buctril</i>).
	+	+	+	
	bromoxynil (<i>Buctril</i>)	¼	1 pt	
	+	+	+	
	28% liquid nitrogen	1 qt	1 qt	
	OR	OR	OR	
	ammonium sulfate	2.5 lb	2.5 lb	
+	+	+		
surfactant	¼%	¼%		

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PURSUIT RESISTANT/TOLERANT CORN (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	imazethapyr (<i>Pursuit</i>)	0.063	4 oz 2L OR 1.4 oz 70% DG	<ul style="list-style-type: none"> ● USE ONLY ON PURSUIT RESISTANT/TOLERANT CORN HYBRIDS. ● Do not apply <i>Pursuit</i> alone to both corn and soybeans in rotation. ● See practices to prevent/delay herbicide resistant weeds, pg. 15–16. ● See <i>Pursuit</i> label or Table 11 for Crop Rotation Restrictions. ● Apply with BOTH surfactant and fertilizer or control will be reduced. ● Do not harvest treated corn for 45 days after treatment. ● Any labelled soil insecticides may be used prior to treatment with <i>Pursuit</i> on IR type corn hybrids (e.g. Pioneer IR). ● Do not use <i>Counter</i> 15G insecticide in-furrow on IT type hybrids (e.g. ICI seeds). ● Contact the seed company for additional details on specific hybrids. ● Do not apply to corn over 8 inches tall. ● Apply when weeds are small (<3 inches). ● Grass activity of <i>Pursuit</i> may be reduced when tank mixed with <i>Banvel</i> or <i>Clarity</i>. ● Application of <i>Banvel</i> or <i>Clarity</i> in combination with <i>Pursuit</i> (and additives) increases risk of injury from dicamba (leaning, rolled leaves, brace root fusion). ● See additional remarks and limitations for dicamba (<i>Banvel</i>, <i>Clarity</i>). ● See Table 1F for prepackaged herbicide mixes.
	+	+	+	
	dicamba (<i>Banvel</i> , <i>Clarity</i>)	¼	½ pt	
	+	+	+	
	28% liquid nitrogen OR	1 qt OR	1 qt OR	
	ammonium sulfate	2.5 lb	2.5 lb	
	+	+	+	
surfactant	¼%	¼%		

TABLE 1L – CHEMICAL WEED CONTROL IN SETHOXYDIM RESISTANT CORN (SR Corn)

In addition to the herbicide options in Tables 1A, 1B, and 1C, the following herbicides and herbicide combinations may be applied to corn hybrids warranted by the seed company to possess **resistance** to direct application of *Poast Plus* herbicide. These hybrids are designated as SR Corn. The following table describes recommended postemergence treatments with *Poast Plus*.

SETHOXYDIM RESISTANT CORN

Weed Controlled	Herbicide	Rate lb/A		Formulation/A	Remarks and Limitations
		a.i.			
Annual grasses	sethoxydim (<i>Poast Plus</i>)	.19		24 oz	<ul style="list-style-type: none"> ● APPLY ONLY TO SR CORN ● Avoid drift to non-resistant corn. ● Treat actively growing grasses between 2 and 4 inches tall for optimum control. ● Increase application rate to 30 oz for sandbur. ● Application rate may be reduced to 18 oz for 1- to 4-inch barnyardgrass, green and giant foxtail, and fall panicum. ● Best option for postemergence crabgrass control in corn. ● Treat corn before pollen shed, at least 60 days before harvest of corn grain or fodder, and at least 45 days before harvest of corn forage/silage. ● <i>Poast Plus</i> can be tank mixed with <i>Basagran</i>, atrazine or <i>Laddok</i> for control of broadleaved weeds ● Tank-mixing may reduce activity of <i>Post Plus</i> (antagonism), especially on barnyardgrass and yellow foxtail. For these species, increase <i>Poast Plus</i> rate to 36 oz/A when tank-mixing.
	+	+	+		
	crop oil concentrate	1 qt		1 qt	
	OR	OR		OR	
	DASH HC	1 qt		1 qt	

TABLE 2A—CHEMICAL WEED CONTROL IN SOYBEANS

PREPLANT

Weed Controlled	Herbicide	Rate lb/A		Formulation/A	Remarks and Limitations
		a.i.			
Annual grasses Annual broadleaves Yellow Nutsedge	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	%		¾ pt 4L OR ½ lb 75% DF OR ½ lb <i>Sencor Solupak</i>	<ul style="list-style-type: none"> Alachlor is a restricted use pesticide. Good control of velvetleaf. Fair control of jimsonweed and cocklebur. Additional velvetleaf and other broadleaf weed control if preplant incorporated metribuzin is followed with a preemergence metribuzin application. See metribuzin label. DO NOT use on sands or soils with less than ½% organic matter. DO NOT use on loamy sand or sandy loam soils with less than 1% organic matter. Reduce metribuzin rate if soil pH is above 7.0. See label. If soil pH is above 7.4, DO NOT apply metribuzin. Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. Alachlor rate should be increased to 3 qt/A and <i>Dual</i> to 2½ pt/A for effective nutsedge control. See Table 2F for prepackaged herbicide mixes.
	+	+	+		
	alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>)	2.5		2.5 qt OR 3.8 lb 65% DG	
	OR	OR		OR	
	metolachlor (<i>Dual</i> , <i>Dual II</i>)	2		2 pt	
	OR	OR		OR	
	dimethenamid (<i>Frontier</i>)	1.17		20 oz 7.5L OR 25 oz 6.0L	
	metribuzin + chlorimuron-ethyl (<i>Canopy</i>)	0.19 +		4 oz 75% DG +	
	+	0.1		2 oz 75% DG	
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)				
+	+		+		
alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>)	2.5		2.5 qt OR 3.8 lb 65% DG		
OR	OR		OR		
metolachlor (<i>Dual</i> , <i>Dual II</i>)	2		2 pt		
OR	OR		OR		
dimethenamid (<i>Frontier</i>)	1.17		20 oz 7.5L OR 25 oz 6.0L		

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SOYBEANS — PREPLANT (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses Annual broadleaves (except yellow nutsedge)	flumetsulam + trifluralin (<i>Broadstrike</i> + <i>Treflan</i>)	0.062 + 0.88	2 pt	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. See label for details. ● Broadstrike available in a prepackaged mix only. See Table 2F. ● SEE LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● DO NOT USE IF SOIL pH EXCEEDS 7.8 AS INCREASED CROP INJURY MAY OCCUR. ● DO NOT USE IF ORGANIC MATTER IS >5% AND SOIL pH IS < 5.9 AS POOR WEED CONTROL MAY RESULT. ● DO NOT USE ON PEAT OR MUCK SOILS. ● THIS PRODUCT HAS A GROUNDWATER ADVISORY STATEMENT. ● Incorporate within 24 hours of application to the top 2 to 3 inches of soil. ● Control of only light to moderate common ragweed, cocklebur, and jimsonweed infestation.
Annual grasses Annual broadleaves (including nightshade) Yellow Nutsedge	imazaquin (<i>Scepter</i>) + alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>) OR metolachlor (<i>Dual</i> , <i>Dual II</i>) OR dimethenamid (<i>Frontier</i>)	0.125 + 2.5 OR 2 OR 1.17	¼ pt OR 2.8 oz 70% DG + 2.5 qt OR 3.8 lb 65% DG OR 2 pt OR 20 oz 7.5L OR 25 oz 6.0L	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● CORN CANNOT BE PLANTED THE YEAR FOLLOWING <i>SCEPTER</i> APPLICATION EXCEPT IN THE SOUTHERN TWO TIERS OF COUNTIES IN MICHIGAN AND IF 15" OF RAIN FALLS AFTER APPLICATION. SEE <i>SCEPTER</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Imidazolinone resistant (IR or IMR) and imidazolinone tolerant (IT) corn hybrids can be planted the year following <i>Scepter</i> application. ● Use caution to avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Soybean stunting (shortening of internodes) may occur on sandy soils. ● Increase alachlor rate to 3 qt/A and <i>Dual</i> to 2½ pt/A for effective nutsedge control. ● Velvetleaf and black nightshade control are best when <i>Scepter</i> is incorporated. Common ragweed control is better when <i>Scepter</i> is applied preemergence. ● See Table 2F for prepackaged herbicide mixes.
	imazethapyr (<i>Pursuit</i>) + alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>) OR metolachlor (<i>Dual</i> , <i>Dual II</i>) OR dimethenamid (<i>Frontier</i>)	0.063 + 2.5 OR 2 OR 1.17	4 oz 2L OR 1.4 oz 70% DG + 2.5 qt OR 3.8 lb 65% DG OR 2 pt OR 20 oz 7.5L OR 25 oz 6.0L	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● SEE <i>PURSUIT</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Use caution to avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Two pass incorporation is suggested for weed control. ● COMMON RAGWEED may only be suppressed, and an additional preplant-incorporated herbicide such as metribuzin or <i>Scepter</i> a postemergence herbicide application for common ragweed control may be necessary. ● Alachlor rate should be increased to 3 qt/A and <i>Dual</i> to 2½ pt/A for effective nutsedge control. ● Velvetleaf and black nightshade control are best when <i>Pursuit</i> is incorporated.

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SOYBEANS — PREPLANT (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual grasses Annual broadleaves (including nightshade) Yellow Nutsedge	flumetsulam + metolachlor (<i>Broadstrike + Dual</i>)	0.056 + 2.1	2½ pt	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. See label for details. ● <i>Broadstrike</i> available in a prepackaged mix only. See Table 2F. ● SEE LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● DO NOT USE IF SOIL pH EXCEEDS 7.8 AS INCREASED CROP INJURY MAY OCCUR. ● DO NOT USE IF ORGANIC MATTER IS >5% AND SOIL pH IS <5.9 AS POOR WEED CONTROL MAY RESULT. ● DO NOT USE ON PEAT OR MUCK SOILS. ● THIS PRODUCT HAS A GROUNDWATER ADVISORY STATEMENT. ● Control of only light to moderate common ragweed, cocklebur, and jimsonweed infestation. Increase application rate to 2½ pt/A to improve control. See label.
Annual grasses	trifluralin (<i>Treflan</i>)	¾	1½ pt	<ul style="list-style-type: none"> ● Incorporate in top 2 or 3 in. of soil within 24 hr. after application. ● On sandy and sandy loam soils low in organic matter, use ½ lb a.i./A (1 pt/A). ● Most effective control if application is made 10 days to 2 weeks ahead of planting and field is reworked just prior to planting.
	pendimethalin (<i>Prowl, Pentagon</i>)	1	2.4 pt 3.3 EC OR 1.6 lb 60 DG	<ul style="list-style-type: none"> ● Incorporate in top 2 to 3 in. of soil. ● Incorporate within 7 days of application unless rainfall occurs.
	ethalfluralin (<i>Sonalan</i>)	0.9	2½ pt	<ul style="list-style-type: none"> ● Incorporate in top 2 to 3 in. of soil. ● Incorporate within 2 days of application.
Annual grasses Annual broadleaves (except nightshade)	Combine any of the above dinitroanilines (<i>Treflan, Sonalan,</i> or <i>Prowl</i>) with metribuzin (<i>Lexone</i> or <i>Sencor</i>)	¾	¾ pt 4L OR ½ lb 75% DF OR ½ lb <i>Sencor Solupak</i>	<ul style="list-style-type: none"> ● Good control of velvetleaf. Fair control of jimsonweed and cocklebur. Additional velvetleaf and other broadleaf weed control if preplant-incorporated metribuzin is followed with a preemergence metribuzin application. See metribuzin label. ● This tank mix will NOT control yellow nutsedge. ● See specific remarks for each dinitroaniline herbicide. ● Reduce rate if soil pH is above 7.0. See label. ● If soil pH is above 7.4, DO NOT apply metribuzin. ● Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. ● See Table 2F for prepackaged herbicide mixes.

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SOYBEANS — PREPLANT (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual grasses Annual broadleaves (except nightshade)	Combine any of the above dinitroanilines (<i>Treflan, Sonalan, or Prowl</i>) with metribuzin + chlorimuron-ethyl (<i>Canopy</i>) + metribuzin (<i>Lexone or Sencor</i>)	0.19	4 oz 75% DG	<ul style="list-style-type: none"> ● SEE <i>CANOPY</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● DO NOT USE IF SOIL pH IS GREATER THAN 6.8. Soil pH may be quite variable in a field. Soybean stunting and INJURY TO LABELED ROTATION CROPS CAN OCCUR IF SOIL pH EXCEEDS 6.8. ● DO NOT use on sands. DO NOT use on soils with less than ½% organic matter. ● APPLICATION RATES OF <i>CANOPY</i> GREATER THAN 4 oz/A MAY CAUSE UNACCEPTABLE SOYBEAN INJURY. ● Use on soils with organic matter from ½ to 5%. ● Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. ● Better control of velvetleaf, cocklebur, and jimsonweed than metribuzin. ● This tank mix will not control yellow nutsedge. ● See specific remarks for each dinitroaniline herbicide. ● Special precaution: A special sprayer clean-out procedure is required for <i>Canopy</i>. See label for special instructions.
		+	+	
Annual grasses Annual broadleaves (including nightshade)	Combine any of the above dinitroanilines (<i>Treflan, Sonalan, or Prowl</i>) with metribuzin (<i>Sencor</i> or <i>Lexone</i>) + imazethapyr (<i>Pursuit</i>)	¾	¾ pt 4L OR ½ lb 75% DF	<ul style="list-style-type: none"> ● SEE <i>PURSUIT</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Good control of velvetleaf. Fair control of jimsonweed and cocklebur. ● Pursuit provides black nightshade and redroot pigweed control. ● Reduce metribuzin rate if soil pH is above 7.0 See label. ● If soil pH is above 7.4, DO NOT apply metribuzin. ● See specific remarks for each dinitroaniline herbicide. ● Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. ● See Table 2F for prepackaged herbicide mixes.
		+	+	
	Combine any of the above dinitroanilines (<i>Treflan, Sonalan, or Prowl</i>) with imazaquin (<i>Scepter</i>)	0.125	¾ pt 1.5L OR 2.8 oz 70% DG	<ul style="list-style-type: none"> ● CORN CANNOT BE PLANTED THE YEAR FOLLOWING <i>SCEPTER</i> APPLICATION EXCEPT IN THE SOUTHERN TWO TIERS OF COUNTIES IN MICHIGAN AND IF 15" OF RAIN FALLS AFTER APPLICATION. SEE <i>SCEPTER</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Imidazolinone resistant (IR or IMR) and imidazolinone tolerant (IT) corn hybrids can be planted the year following <i>Scepter</i> application. ● Use caution to avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Soybean stunting (shortening of internodes) may occur on sandy soils. ● See specific remarks for each dinitroaniline herbicide. ● <i>Scepter</i> will suppress nutsedge. ● Velvetleaf and black nightshade control are good when <i>Scepter</i> is incorporated. Common ragweed control is better when <i>Scepter</i> is applied preemergence. ● See Table 2F for prepackaged herbicide mixes.

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SOYBEANS — PREPLANT (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses Annual broadleaves (including nightshade, except common ragweed)	Combine any of the above dinitroanilines (<i>Treflan, Sonalan,</i> or <i>Prowl</i>) with imazethapyr (<i>Pursuit</i>)	0.063	4 oz 2L OR 1.4 oz 70% DG	<ul style="list-style-type: none"> ● SEE <i>PURSUIT</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Use caution to avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Two-pass incorporation is suggested for weed control. ● COMMON RAGWEED WILL ONLY BE SUPPRESSED. An additional preplant-incorporated herbicide such as metribuzin or <i>Scepter</i> or a postemergence herbicide application for common ragweed control may be necessary. The prepackaged mixture <i>STEEL</i> contains <i>Prowl + Pursuit + Scepter</i>. See Table 2F. ● See specific remarks for each dinitroaniline herbicide. ● <i>Pursuit</i> will suppress nutsedge. ● Cocklebur and velvetleaf control are better when <i>Pursuit</i> is incorporated. ● See Table 2F for prepackaged herbicide mixes.
Annual grasses Annual broadleaves (except yellow nutsedge and black nightshade)	clomazone (<i>Command</i>) + metribuzin (<i>Sencor</i> or <i>Lexone</i>)	$\frac{3}{4}$ + $\frac{1}{4}$	1½ pt 4EC + ½ pt 4L OR ½ lb 75% DF OR ½ lb <i>Sencor Solupak</i>	<ul style="list-style-type: none"> ● SEE <i>COMMAND</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Excellent control of velvetleaf. Fair control of cocklebur and jimsonweed. Poor control of yellow nutsedge. ● Use a drift additive to reduce spray drift. ● Consult <i>Command</i> label for buffer zones to prevent off-site drift to sensitive areas. ● DO NOT apply to very moist soils. Preplant incorporate immediately on moist soils and within 8 hours on dry soils. ● If soil pH is above 7.4, DO NOT apply metribuzin. ● DO NOT use on soils with less than ½% organic matter or on sands or loamy sands with less than 1% organic matter. ● Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. ● Avoid misapplication or overlap or carryover may occur to labeled rotation crops. ● Special precaution: A special sprayer clean-out procedure is required for <i>Command</i>. See label for specific instructions.

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SOYBEANS — PREPLANT (continued)

Weed Controlled	Herbicide	Rate lb/A		Remarks and Limitations
		a.i.	Formulation/A	
Annual grasses Annual broadleaves (except black nightshade)	clomazone (<i>Command</i>) + metribuzin + chlorimuron-ethyl (<i>Canopy</i>) + metribuzin (<i>Lexone, Sencor</i>)	$\frac{3}{4}$ + 0.19 + 0.1	1½ pt 4EC + 4 oz 75% DG + 2 oz 75% DF	<ul style="list-style-type: none"> ● SEE BOTH <i>COMMAND</i> AND <i>CANOPY</i> LABELS OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● DO NOT USE IF SOIL pH IS GREATER THAN 6.8. Soil pH may be quite variable in a field. Soybean stunting and INJURY TO LABELED ROTATION CROPS CAN OCCUR IF SOIL pH EXCEEDS 6.8. ● APPLICATION RATES OF <i>CANOPY</i> GREATER THAN 4 oz/A MAY CAUSE UNACCEPTABLE SOYBEAN INJURY. ● Use on soils with organic matter from ½ to 5%. ● Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. ● Avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Excellent control of velvetleaf and cocklebur. Good control of jimsonweed. Poor control of yellow nutsedge. ● Use a drift additive to reduce spray drift. ● Consult label for buffer zones to prevent off-site drift to sensitive areas. ● DO NOT apply to very moist soils. Preplant incorporate immediately on moist soils and within 8 hours on dry soils. ● Special precaution: A special sprayer clean-out procedure is required for <i>Command</i> and <i>Canopy</i>. See labels for specific instructions.
Annual grasses Annual broadleaves (including black nightshade) Yellow Nutsedge	clomazone (<i>Command</i>) + alachlor (<i>Arena,</i> <i>Micro-Tech,</i> or <i>Partner</i>) OR metolachlor (<i>Dual, Dual II</i>) OR dimethenamid (<i>Frontier</i>)	0.75 + 2.5 OR 2 OR 1.17	1½ pt 4EC + 2.5 qt OR 3.8 lb 65% WG OR 2 pt OR 20 oz 7.5L OR 25 oz 6.0L	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● SEE <i>COMMAND</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Increase <i>Lasso</i> rate to 3 qt/A and <i>Dual</i> to 2½ pt/A for effective nutsedge control. ● Excellent control of velvetleaf. Fair control of cocklebur and jimsonweed. ● Do not reduce <i>Command</i> rate below 1½ pt/A or poor control of common ragweed can occur. ● Do not reduce <i>Lasso</i> rate below 2 qt or <i>Dual</i> rate below 2 pt or <i>Frontier</i> rate below 20 oz (7.5L) or poor control of redroot pigweed will occur. ● Avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Do not apply <i>Command</i> to very moist soils. Preplant incorporate immediately on moist soils and within 8 hours on dry soils. ● Consult <i>Command</i> label for buffer zones to prevent off-site drift to sensitive areas. ● Special precaution: A special sprayer clean-out procedure is required for <i>Command</i>. See label for specific instructions.

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SOYBEANS — PREPLANT (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual grasses	clomazone	¾	1½ pt 4EC	<ul style="list-style-type: none"> ● CORN CANNOT BE PLANTED THE YEAR FOLLOWING <i>SCEPTER</i> APPLICATION EXCEPT IN THE SOUTHERN TWO TIERS OF COUNTIES IN MICHIGAN OR IF 15" OF RAIN FALLS AFTER APPLICATION. SEE BOTH <i>COMMAND</i> AND <i>SCEPTER</i> LABELS OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Imidazolinone resultant (IR or IMR) and imidazolinone tolerant (IT) corn hybrids can be planted the year following <i>Scepter</i> application. ● DO NOT use on soils with less than ½% organic matter. ● Avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Excellent control of velvetleaf and cocklebur. Good control of jimsonweed. ● Use a drift additive to reduce spray drift. ● Consult label for buffer zones to prevent off-site drift to sensitive areas. ● DO NOT apply to very moist soils. Preplant incorporate immediately on moist soils and within 8 hours on dry soils. ● Soybean stunting (shortening of internodes) may occur on sandy soils. ● Common ragweed control is best when <i>Scepter</i> is applied preemergence. However, black nightshade control is better when <i>Scepter</i> is preplant incorporated. ● Special precaution: A special sprayer clean-out procedure is required for <i>Command</i>. See label for specific instructions.
Annual broadleaves (including black nightshade)	<i>(Command)</i>	+	+	
	+			
Yellow Nutsedge	imazaquin <i>(Scepter)</i>	0.125	¾ pt 1.5L OR 2.8 oz 70% DG	

SOYBEANS — PREPLANT FOLLOWED BY PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses Annual broadleaves (including nightshade) Yellow Nutsedge	<i>Command</i> , as listed above, preplant incorporated FOLLOWED BY: alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>) OR metolachlor (<i>Dual</i> , <i>Dual II</i>) OR dimethenamid (<i>Frontier</i>)	2 OR 2 OR 1.17	2 qt OR 3 lb 65% DG OR 2 pt OR 20 oz 7.5L OR 25 oz 6.0L	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● SEE <i>COMMAND</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● See remarks for <i>Command</i> plus alachlor, <i>Frontier</i>, or <i>Dual</i> above. ● Alachlor, <i>Frontier</i>, or metolachlor applied preemergence. DO NOT APPLY <i>COMMAND 4 EC</i> PREEMERGENCE. ● Nutsedge control is improved when alachlor, <i>Frontier</i>, or <i>Dual</i> are incorporated. ● Excellent control of velvetleaf. Fair control of cocklebur and jimsonweed.
Annual broadleaves Annual grasses	<i>Command</i> , <i>Treflan</i> , <i>Sonalan</i> , <i>Prowl</i> , <i>Pentagon</i> , <i>Lasso</i> , <i>Micro-tech</i> , <i>Partner</i> , <i>Frontier</i> , or <i>Dual</i> as listed above, preplant incorporated FOLLOWED BY: linuron (<i>Lorox</i> or <i>Linex</i>)	¾	¾ qt 4L OR 1½ lb 50% DF	<ul style="list-style-type: none"> ● Applied preemergence. ● If heavy rainfall occurs soon after application, injury to crop may result. ● DO NOT use on coarse-textured sandy or loamy sand soils or on soils with less than 1% organic matter. ● Plant soybeans at least 1¾ in. deep. ● Fair control of velvetleaf, jimsonweed, nightshade, and cocklebur. ● For yellow nutsedge control, preplant incorporate <i>Dual</i>, <i>Frontier</i>, or alachlor. ● For improved black nightshade control, apply linuron with alachlor, or <i>Frontier</i>.
	<i>Command</i> , <i>Treflan</i> , <i>Sonalan</i> , <i>Prowl</i> , <i>Pentagon</i> , <i>Lasso</i> , <i>Micro-tech</i> , <i>Partner</i> , <i>Frontier</i> , or <i>Dual</i> as listed above, preplant incorporated FOLLOWED BY: metribuzin (<i>Lexone</i> or <i>Sencor</i>)	¾	¾ pt 4L OR ½ lb 75% DF OR ½ lb <i>Sencor Solupak</i>	<ul style="list-style-type: none"> ● Applied preemergence. ● Good control of velvetleaf. Fair control of jimsonweed and cocklebur. Additional velvetleaf and other broadleaf weed control if preplant incorporated metribuzin is followed with a preemergence metribuzin application. See metribuzin label. ● For yellow nutsedge control, preplant incorporate <i>Dual</i>, <i>Frontier</i>, or alachlor. ● For black nightshade control, apply with alachlor or <i>Frontier</i>. ● Reduce rate if soil pH is above 7.0. See label. ● If soil pH is above 7.4, DO NOT apply metribuzin. ● DO NOT use on sands. DO NOT use on soil with less than ½% organic matter. DO NOT use on loamy sand or sandy loam soils with less than 1% organic matter. ● Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties.

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SOYBEANS — PREPLANT FOLLOWED BY PREEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	metribuzin +	0.19	4 oz 75% DG	<ul style="list-style-type: none"> ● Applied preemergence. ● SEE LABELS OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● DO NOT USE OF SOIL pH IS GREATER THAN 6.8. Soil pH may be quite variable in a field. Soybean stunting and INJURY TO LABELED RORATION CROPS CAN OCCUR IF SOIL pH EXCEEDS 6.8. ● 8 to 10 oz/A of <i>Lorox</i> can be substituted for 2 oz/A of metribuzin. ● APPLICATION RATES OF <i>CANOPY</i> GREATER THAN 4 oz/A MAY CAUSE UNACCEPTABLE SOYBEAN INJURY. ● Use caution to avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● DO NOT use on sands. DO NOT use on soils with less than 1/2% organic matter. ● Use on soils with organic matter from 1/2 to 5%. ● Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. ● Better control of velvetleaf, cocklebur, and jimsonweed than metribuzin. ● For yellow nutsedge control, preplant incorporate <i>Dual</i> or <i>alachlor</i>. ● For black nightshade control, apply with <i>alachlor</i> or <i>Frontier</i>. ● Special precaution: A special sprayer clean-out procedure is required for <i>Canopy</i>. See label for specific instructions.
Annual grasses	chlorimuron-ethyl (<i>Canopy</i>)	+	+	
	+ metribuzin (<i>Lexone</i> or <i>Sencor</i>)	0.1	2 oz 75% DF	
	imazaquin (<i>Scepter</i>)	0.125	1/2 pt 1.5 L OR 2.8 oz 70% DG	<ul style="list-style-type: none"> ● Applied preemergence. ● CORN CANNOT BE PLANTED THE YEAR FOLLOWING <i>SCEPTER</i> APPLICATION EXCEPT IN THE SOUTHERN TWO TIERS OF COUNTIES IN MICHIGAN AND IF 15" OF RAIN FALLS AFTER APPLICATION. SEE <i>SCEPTER</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Imidazolinone resistant (IR or IMR) and imidazolinone tolerant (IT) corn hybrids can be planted the year following <i>Scepter</i> application. ● Use caution to avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Soybean stunting (shortening or internodes) may occur on sandy soils. ● Common ragweed control is best when <i>Scepter</i> is applied preemergence. However, velvetleaf and black nightshade control are better when <i>Scepter</i> is preplant incorporated. ● For yellow nutsedge control, preplant incorporate <i>Dual</i>, <i>Frontier</i>, or <i>alachlor</i>.

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SOYBEANS — PREPLANT FOLLOWED BY PREEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses	imazethapyr (<i>Pursuit</i>)	0.063	4 oz 2L OR 1.4 oz 70% DG	<ul style="list-style-type: none"> • DO NOT apply <i>Command</i> followed by <i>Pursuit</i>. • Applied preemergence. Rotary hoe if no rainfall occurs within 7 days. • SEE <i>PURSUIT</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. • Use caution to avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. • <i>Pursuit</i> will ONLY SUPPRESS COMMON RAGWEED. An additional soil-applied herbicide such as metribuzin or linuron or <i>Scepter</i> or a postemergence herbicide may be necessary for common ragweed control. • <i>Pursuit</i> will suppress nutsedge. Incorporate alachlor, <i>Frontier</i>, or <i>Dual</i> for nutsedge control. • <i>Pursuit</i> alone will control nightshade.

SOYBEANS — PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses Yellow Nutsedge	linuron (<i>Lorox</i> or <i>Linex</i>)	¾	¾ qt 4L OR 1½ lb 50% DF	<ul style="list-style-type: none"> • Alachlor is a restricted use pesticide. • If heavy rainfall occurs soon after application, injury to the crop may result. • DO NOT use on coarse-textured sandy or loamy sand soils or on soils with less than 1% organic matter. • Plant soybeans at least 1¼ in. deep. • Fair control of velvetleaf. Poor control of jimsonweed and cocklebur. • For black nightshade control, apply with alachlor, or <i>Frontier</i>. • A reduced rate of both linuron plus metribuzin can be applied. See labels. • Nutsedge control is improved when alachlor, <i>Dual</i> or <i>Frontier</i> are incorporated.
	+ alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>)	+	+	
	OR metolachlor (<i>Dual</i> , <i>Dual II</i>)	2	2 qt OR 3 lb 56% DG	
	OR dimethenamid (<i>Frontier</i>)	OR	OR	
		2	2 pt	
		OR	OR	
		1.17	20 oz 7.5L OR 25 oz 6.0L	
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	¾	¾ pt 4L OR ½ lb 75% DF OR ½ lb Sencor Solupak	<ul style="list-style-type: none"> • Alachlor is a restricted use pesticide. • Good control of velvetleaf. Fair control of jimsonweed and cocklebur. Additional velvetleaf and other broadleaf weed control if metribuzin is preplant incorporated, followed by a preemergence metribuzin application. See metribuzin label. • Reduce metribuzin rate if soil pH is above 7.0. See label. • If soil pH is above 7.4, DO NOT apply metribuzin. • DO NOT use on sands or soils with less than ½% organic matter. DO NOT use on loamy sand or sandy loam soils with less than 1% organic matter. • Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. • A reduced rate of both metribuzin plus <i>Lorox</i> may be applied. See labels. • Nutsedge control is improved when alachlor, <i>Dual</i> or <i>Frontier</i> are incorporated. • See Table 2F for prepackaged herbicide mixes.
	+ alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>)	+	+	
	OR metolachlor (<i>Dual</i> , <i>Dual II</i>)	2	2 qt OR 3 lb 65% DG	
	OR dimethenamid (<i>Frontier</i>)	OR	OR	
		2	2 pt	
		OR	OR	
		1.17	20 oz 7.5L OR 25 oz 6.0L	

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SOYBEANS — PREEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses Yellow Nutsedge	imazaquin <i>(Scepter)</i>	0.125	¾ pt 1.5L OR 2.8 oz 70% DG	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● CORN CANNOT BE PLANTED THE YEARS FOLLOWING <i>SCEPTER</i> APPLICATION EXCEPT IN THE SOUTHERN TWO TIERS OF COUNTIES IN MICHIGAN AND IF 15" OF RAIN FALLS AFTER APPLICATION. SEE <i>SCEPTER</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Imidazolinone resistant (IR or IMR) and imidazolinone tolerant (IT) corn hybrids can be planted the year following <i>Scepter</i> application. ● Good control of cocklebur and jimsonweed. Fair control of velvetleaf. ● Use caution to avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Soybean stunting (shortening of internodes) may occur on sandy soils. ● Common ragweed control is best when <i>Scepter</i> is applied preemergence. However, black nightshade and velvetleaf control are better when <i>Scepter</i> is preplant incorporated. ● Nutsedge control is improved when alachlor, <i>Frontier</i> or <i>Dual</i> are incorporated. ● See Table 2F for prepackaged herbicide mixes.
	+	+	+	
	alachlor <i>(Lasso, Micro-Tech, or Partner)</i>	2	2 qt OR 3 lb 65% DG	
	OR	OR	OR	
	metolachlor <i>(Dual, Dual II)</i>	2	2 pt	
	OR	OR	OR	
	dimethenamid <i>(Frontier)</i>	1.17	20 oz 7.5L OR 25 oz 6.0L	
	imazethapyr <i>(Pursuit)</i>	0.063	4 oz 2L OR 1.4 oz 70% DG	
	+	+	+	
	alachlor <i>(Lasso, Micro-Tech, or Partner)</i>	2	2 qt OR 3 lb 65% DG	
	OR	OR	OR	
	metolachlor <i>(Dual, Dual II)</i>	2	2 pt	
	OR	OR	OR	
	dimethenamid <i>(Frontier)</i>	1.17	20 oz 7.5L OR 25 oz 6.0L	

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SOYBEANS — PREEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves Annual grasses Yellow Nutsedge	metribuzin + chlorimuron-ethyl (<i>Canopy</i>)	0.19	4 oz 75% DG	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● Applied preemergence. ● SEE <i>CANOPY</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS ● DO NOT USE IF SOIL pH IS GREATER THAN 6.8. Soil pH may be quite variable in a field. Soybean stunting and INJURY TO LABELED ROTATION CROPS CAN OCCUR IF SOIL pH EXCEEDS 6.8. ● 8 to 10 oz/A of <i>Lorox</i> can be substituted for 2 oz/A of metribuzin. ● APPLICATION RATES OF <i>CANOPY</i> GREATER THAN 4 oz/A MAY CAUSE UNACCEPTABLE SOYBEAN INJURY. ● Use caution to avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● DO NOT use on sands. DO NOT use on soils with less than ½% organic matter. ● Use on soils with organic matter from ½ to 5%. ● Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. ● Better control of velvetleaf, cocklebur, and jimsonweed than metribuzin. ● Special precaution: A special sprayer clean-out procedure is required for <i>Canopy</i>. See label.
	+	+	+	
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	0.1	2 oz 75% DF	
	+	+	+	
	alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>)	2	2 qt OR 3 of 65% DG	
OR	OR	OR		
metolachlor (<i>Dual</i> , <i>Dual II</i>)	2	2 pt		
OR	OR	OR		
dimethenamid (<i>Frontier</i>)	1.17	20 oz 7.5L OR 25 oz 6.0L		
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	flumetsulam + metolachlor (<i>Broadstrike</i> + <i>Dual</i>)	0.056 + 2.1	2½ pt	<ul style="list-style-type: none"> ● ADJUST APPLICATION RATE ACCORDING TO SOIL TYPE AND % ORGANIC MATTER. See label for details. ● <i>Broadstrike</i> available in a prepackaged mix only. See Table 2F. ● SEE LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● DO NOT USE IF SOIL pH EXCEEDS 7.8. AS INCREASED CROP INJURY MAY OCCUR. ● DO NOT USE IF ORGANIC MATTER IS >5% AND SOIL pH IS < 5.9 AS POOR WEED CONTROL MAY RESULT. ● DO NOT USE ON PEAT OR MUCK SOILS. ● THIS PRODUCT HAS A GROUNDWATER ADVISORY STATEMENT. ● Control of only light to moderate common ragweed, cocklebur, and jimsonweed infestation. Increase application rate to 2½ pt/A to improve control. See label. ● Rotary hoe and cultivate if dry weather follows pre-emergence application.
<hr/>				
Annual broadleaves Annual grasses	linuron (<i>Lorox</i> or <i>Linex</i>)	¾	¾ qt 4L OR 1½ lb 50% DF	<ul style="list-style-type: none"> ● DO NOT use on coarse textured sandy or loamy sand soils or on soils with less than 1% organic matter. ● NOT RECOMMENDED on sandy loam soils. Brittleness of soybean stems at the soil line may occur. ● Fair control of velvetleaf and black nightshade. Poor control of cocklebur, jimsonweed, and yellow nutsedge. ● Preemergence following and up until 2 days after soybean planting. DO NOT apply POSTemergence. ● Plant soybeans 1¼ in. deep.
	+	+	+	
	pendimethalin (<i>Prowl</i> , <i>Pentagon</i>)	1	24 pt 3.3 EC OR 1.6 lb 60 DG	

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SOYBEANS — PREEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves (except nightshade) Annual grasses	metribuzin (<i>Lexone</i> or <i>Sencor</i>) + pendimethalin (<i>Prowl</i> , <i>Pentagon</i>)	¾ +	¾ pt 4L OR ½ lb 75% DF + 2.4 pt 3.3 EC OR 1.6 lb 60 DG	<ul style="list-style-type: none"> • DO NOT use on sands or soils with less than ¼% organic matter. DO NOT use on loamy sand or sandy loam soils with less than 1% organic matter. • NOT RECOMMENDED on sandy loam soils. Brittleness of soybean stems at the soil line may occur. • Fair control of jimsonweed and cocklebur. Poor control of yellow nutsedge. No control of black nightshade. • Preemergence following and up until 2 days after soybean planting. DO NOT apply POSTemergence. • Reduce metribuzin rate if soil pH is above 7.0. See label. • If soil pH is above 7.4, DO NOT apply metribuzin. • Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties.
Annual broadleaves (including nightshade) Annual grasses	imazethapyr + pendimethalin (<i>Pursuit Plus</i>)	0.94	2½ pt	<ul style="list-style-type: none"> • Label for prepackaged mix of <i>Pursuit Plus</i> only. • SEE <i>PURSUIT PLUS</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. • NOT RECOMMENDED on sandy loam or loamy sand soils. Brittleness of soybean stems at the soil line may occur. • Fair control of yellow nutsedge, cocklebur, jimsonweed and velvetleaf. • COMMON RAGWEED will only be suppressed. An additional preemergence herbicide such as metribuzin or <i>Scepter</i>, or a postemergence herbicide may be needed. The prepackaged mixture <i>STEEL</i> contains <i>Pursuit Plus</i> + <i>Scepter</i>. See Table 2F. • Preemergence following and up until 2 days after soybean planting. Do NOT apply POSTemergence.
Annual grasses Annual broadleaves (except yellow nutsedge and black nightshade)	clomazone (<i>Command 3ME</i>) + metribuzin (<i>Sencor</i> or <i>Lexone</i>)	¾ +	2 pt 3ME + ½ pt 4L OR ½ lb 75% DF OR ½ lb <i>Sencor Solupak</i>	<ul style="list-style-type: none"> • ONLY APPLY THE 3ME FORMULATION OF <i>COMMAND</i>. • SEE <i>COMMAND</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. • Excellent control of velvetleaf. Fair control of cocklebur and jimsonweed. Poor control of yellow nutsedge. • Use a drift additive to reduce spray drift. • Consult <i>Command 3ME</i> label for buffer zones to prevent off-site drift to sensitive areas. • If soil pH is above 7.4, DO NOT apply metribuzin. • DO NOT use on soils with less than ½% organic matter or on sands or loamy sands with less than 1% organic matter. • Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. • Avoid misapplication or overlap or carryover may occur to labeled rotation crops. • Special precaution: A special sprayer clean-out procedure is required for <i>Command 3ME</i>. See label for specific instructions.

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SOYBEANS — PREEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual grasses Annual broadleaves (except yellow nutsedge and black nightshade)	clomazone (<i>Command 3ME</i>)	¾	2 pt 3ME	<ul style="list-style-type: none"> ● ONLY APPLY THE 3ME FORMULATION OF <i>COMMAND</i>. ● DO NOT use on coarse textured sandy or loamy sand soils or on soils with less than 1% organic matter. ● Excellent control of velvetleaf. Fair control of black nightshade, cocklebur, and jimsonweed. ● Use a drift additive to reduce spray drift. ● Consult <i>Command 3ME</i> label for buffer zones to prevent off-site drift to sensitive areas. ● Avoid misapplication or overlap or carryover may occur to labeled rotation crops. ● Special precaution: A special sprayer clean-out procedure is required for <i>Command 3ME</i>. See label for specific instructions.
	+	¾	¾ qt 4L OR 1½ lb 50% DF	
Annual grasses Annual broadleaves (except black nightshade)	clomazone (<i>Command 3ME</i>)	¾	2 pt 3ME	<ul style="list-style-type: none"> ● SEE BOTH <i>COMMAND 3ME</i> AND <i>CANOPY</i> LABELS OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● DO NOT USE IF SOIL pH IS GREATER THAN 6.8. Soil pH may be quite variable in a field. Soybean stunting and INJURY TO LABELED ROTATION CROPS CAN OCCUR IF SOIL pH EXCEEDS 6.8. ● APPLICATION RATES OF <i>CANOPY</i> GREATER THAN 4 oz/A MAY CAUSE UNACCEPTABLE SOYBEAN INJURY. ● Use on soils with organic matter from ½ to 5%. ● Some soybean varieties have low tolerance to metribuzin and should not be planted. Consult CES or agribusiness for a listing of these varieties. ● Avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Excellent control of velvetleaf. Good control of jimsonweed and cocklebur. Fair control of yellow nutsedge. ● Use a drift additive to reduce spray drift. ● Consult <i>Command 3ME</i> label for buffer zones to prevent off-site drift to sensitive areas. ● Special precaution: A special sprayer clean-out procedure is required for <i>Command 3ME</i> and <i>Canopy</i>. See labels for specific instructions.
	+	+	+	
	metribuzin + chlorimuron-ethyl (<i>Canopy</i>)	0.19	4 oz 75% DG	
	+	0.1	2 oz 75% DF	
	metribuzin (<i>Lexone, Sencor</i>)			
Annual grasses Annual broadleaves (including black nightshade) Yellow Nutsedge	clomazone (<i>Command 3ME</i>)	0.75	2 pt 3ME	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● SEE <i>COMMAND</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Increase <i>Lasso</i> rate to 3 qt/A and <i>Dual</i> to 2½ pt/A for effective nutsedge control. ● Excellent control of velvetleaf. Fair control of cocklebur and jimsonweed. ● Do not reduce <i>Command 3ME</i> rate below 2 pt/A, or poor control of common ragweed can occur. ● Do not reduce <i>Lasso</i> rate below 2 qt or <i>Dual</i> rate below 2 pt or <i>Frontier</i> rate below 20 oz (7.5L) or poor control of redroot pigweed will occur. ● Avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Consult <i>Command 3ME</i> label for buffer zones to prevent off-site drift to sensitive areas. ● Special precaution: A special sprayer clean-out procedure is required for <i>Command 3ME</i>. See label for specific instructions.
	+	+	+	
	alachlor (<i>Arena, Micro-Tech, or Partner</i>)	2.5	2 qt OR 3 lb 65% WG	
	OR	OR	OR	
	metolachlor (<i>Dual, Dual II</i>)	2	2 pt	
	OR	OR	OR	
dimethenamid (<i>Frontier</i>)	1.17	20 oz 7.5L OR 25 oz 6.0L		

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SOYBEANS — PREEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual grasses	clomazone	¾	2pt 3ME	<ul style="list-style-type: none"> ● CORN CANNOT BE PLANTED THE YEAR FOLLOWING <i>SCEPTER</i> APPLICATION EXCEPT IN THE SOUTHERN TWO TIERS OF COUNTIES IN MICHIGAN OR IF 15" OF RAIN FALLS AFTER APPLICATION. SEE BOTH <i>COMMAND</i> AND <i>SCEPTER</i> LABELS OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Imidazolinone resultant (IR or IMR) and imidazolinone tolerant (IT) corn hybrids can be planted the year following <i>Scepter</i> application. ● DO NOT use on soils with less than ½% organic matter. ● Avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Excellent control of velvetleaf and cocklebur. Good control of jimsonweed. ● Use a drift additive to reduce spray drift. ● Consult label for buffer zones to prevent off-site drift to sensitive areas. ● Soybean stunting (shortening of internodes) may occur on sandy soils. ● Common ragweed control is best when <i>Scepter</i> is applied preemergence. However, black nightshade control is better when <i>Scepter</i> is preplant incorporated. ● Special precaution: A special sprayer clean-out procedure is required for <i>Command 3ME</i>. See label for specific instructions.
Annual broadleaves (including black nightshade)	<i>(Command 3ME)</i>	+	+	
Yellow Nutsedge	+ imazaquin <i>(Scepter)</i>	0.125	¾ pt 1.5L OR 2.8 oz 70% DG	

SOYBEANS — PREPLANT OR PREEMERGENCE, FOLLOWED BY POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	<p><i>Treflan, Sonalan, Prowl, Pentagon, Lasso, Micro-Tech, Partner, Dual, Dual II, Frontier, or Command, as listed above, preplant incorporated, or Prowl, Pentagon, Lasso, Micro-Tech, Partner, Frontier, or Dual preemergence.</i></p> <p>FOLLOWED BY:</p> <p><i>Blazer, Basagran, Classic, Cobra, Galaxy, Scepter, Pursuit, Reflex, Flexstar, and/or Pinnacle. For specific broadleaf weed control, see "Soybean—Postemergence" section.</i></p> <hr/> <p><i>Pursuit, Scepter, Canopy, or metribuzin as listed above, preplant incorporated, or linuron, metribuzin, Canopy, Pursuit or Scepter preemergence.</i></p> <p>FOLLOWED BY:</p> <p><i>Assure II, Poast, Poast Plus, Fusion, Fusilade DX, Select, or Option II. For annual grass control, see "Soybean—Postemergence" section.</i></p>			

SOYBEANS — POSTEMERGENCE FOR BROADLEAF WEEDS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (EXCEPT pigweed and nightshade) Yellow Nutsedge	bentazon (Basagran)	1	2 pt	<ul style="list-style-type: none"> ● Most effective on small weeds. Apply 1½ pt/A if weeds are smaller than maximum growth stage on the label. See Table 2H and label. ● Use a minimum of 40 psi and 20 gal of water/A. Do not use flood nozzles. ● Do not apply if soybeans are under stress from herbicide injury, cold or dry weather, or hail damage. ● 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 is present. ● Apply both 28% liquid nitrogen and crop oil concentrate if velvetleaf and lambsquarters are present. See Table 2I. ● Poor control of pigweed and black nightshade. Fair to good control of common ragweed and lambsquarters. ● <i>Basagran</i> can be tank mixed with <i>Blazer</i>, <i>Cobra</i>, <i>Flexstar</i>, <i>Reflex</i>, <i>Pursuit</i>, <i>Pinnacle</i>, and <i>Scepter</i> for red-root pigweed control. <i>Basagran</i> can be tank mixed with <i>Blazer</i>, <i>Cobra</i>, <i>Pursuit</i>, <i>Flexstar</i>, or <i>Reflex</i> for black nightshade control. See Tables 2G and 2J. ● A prepackaged mix of <i>Basagran</i> plus <i>Blazer</i> (<i>Galaxy</i> or <i>Storm</i>) is available. See remarks for <i>Galaxy</i> or <i>Storm</i> and Table 2F. ● <i>Basagran</i> can be tank mixed for postemergence grass control. See Table 2L.
	+ crop oil concentrate	+	1 qt	
Annual broadleaves	bentazon + acifluorfen (<i>Storm</i>)	0.75	1½ pt	<ul style="list-style-type: none"> ● <i>Storm</i> is a prepackaged mix of <i>Basagran</i> plus <i>Blazer</i>. ● 1½ pt/A of <i>Storm</i> is equal to 1 pt/A of <i>Basagran</i> + 1 pt/A of <i>Blazer</i>. ● Most effective on small weeds. See Table 2H and label. ● Common lambsquarters and velvetleaf control may be inconsistent. ● Use a minimum of 40 psi and 20 gal of water/A. Do not use flood nozzles. ● Replace COC with ½-1 gal/A of 28% liquid nitrogen for improved pigweed and velvetleaf control. ● <i>Storm</i> can be tank mixed with <i>Classic</i> for improved velvetleaf control. ● <i>Storm</i> can be tank mixed with postemergence grass herbicides. See Table 2L.
	+ crop oil concentrate	+	1 qt	
Annual broadleaves Yellow Nutsedge	bentazon + acifluorfen (<i>Galaxy</i>)	0.92	2 pt	<ul style="list-style-type: none"> ● <i>Galaxy</i> is a prepackaged mix of <i>Basagran</i> plus <i>Blazer</i>. 2 pt/A of <i>Galaxy</i> is equal to 1.5 pt/A of <i>Basagran</i> + 0.66 pt/A of <i>Blazer</i>. ● Most effective on small weeds. See Table 2H and label. ● A later application of <i>Basagran</i> may be needed for yellow nutsedge control. ● Use a minimum of 40 psi and 20 gal of water/A. Do not use flood nozzles. ● Do not apply if soybeans are under stress from herbicide injury, cold or dry weather, or hail damage. ● Replace COC with ½-1 gal/A of 28% liquid nitrogen OR 2.5 lb ammonium sulfate if velvetleaf is the target weed and NOT common ragweed or lambsquarters. ● <i>Galaxy</i> can be tankmixed with <i>Pinnacle</i> for improved lambsquarters control OR <i>Classic</i> for improved nutsedge and pigweed control OR <i>Pursuit</i> for improved pigweed control. See Tables 2G and 2J. ● <i>Galaxy</i> can be tankmixed with postemergence grass herbicides. See Table 2L.
	+ crop oil concentrate	+	1 qt	

(Continued on next page)

SOYBEANS — POSTEMERGENCE FOR BROADLEAF WEEDS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (EXCEPT black nightshade and lambsquarters)	chlorimuron-ethyl (<i>Classic</i>)	0.0106	% oz. 25% DF	<ul style="list-style-type: none"> ● DO NOT APPLY TO SOILS WITH A pH GREATER THAN 7.0 IF <i>CLASSIC</i> IS APPLIED AT 1/2 oz/A OR GREATER. ● <i>Classic</i> can be applied at 1/4 oz/A or 1/2 oz/A when tank mixed with <i>Pinnacle</i>. This tank mix is not limited by soil pH. HOWEVER, crop rotation restrictions remain the same. ● SEE LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● Most effective on small weeds. Labeled rates of 1/2 to 3/4 oz/A, depending on weed size. See Table 2H and label. ● 3/4 oz/A required for Jerusalem artichoke. ● Apply after the first trifoliate leaf of soybeans has fully expanded. ● DO NOT apply to soybeans or weeds under stress from herbicide injury or cold or dry weather—crop injury or poor weed control may result. ● Under hot, dry conditions, surfactant may be replaced with crop oil concentrate at 1%. However, increased crop injury may result. See Table 2I. ● Addition of 1 gal/A of 28% liquid nitrogen (urea ammonium nitrate) or 1 qt/A of 10-34-0 (diammonium phosphate) IN ADDITION TO crop oil concentrate OR surfactant IS REQUIRED for control of velvetleaf. ● Use a minimum of 25 psi and 10 gal of water/A. For heavy weed pressure, increase volume to 15 gal/A. Do not use flood nozzles. ● Cultivation 14 days after treatment will improve weed control. ● Allow 60 days between <i>Classic</i> application and soybean harvest. ● <i>Classic</i> can be tank mixed with <i>Pinnacle</i> for lambsquarters control. <i>Classic</i> can be tank mixed with <i>Galaxy, Blazer, Resource, Flexstar, Reflex</i> or <i>Cobra</i>. See labels and Tables 2G and 2J. ● <i>Classic</i> can be tank mixed with some postemergence herbicides for control of some grasses. See Table 2L.
	+	+	+	
	surfactant	1/4%	1/4%	
Yellow Nutsedge	OR	+	+	
Jerusalem Artichoke	crop oil concentrate	1%	1%	
Annual broadleaves (ONLY lambsquarters, smartweed, pigweed, wild mustard and velvetleaf)	thifensulfuron methyl (<i>Pinnacle</i>)	0.004	1/4 oz 25% DF	<ul style="list-style-type: none"> ● No soil pH or crop rotation restrictions. ● For velvetleaf control, add 2-4 qt/A of 28% liquid nitrogen/A or 2-4 lb of ammonium sulfate in addition to surfactant. See Table 2I. ● Use a minimum of 25 psi and 10 gal of water/A. For heavy weed pressure, increase volume to 15 gal/A. Do not use flood nozzles. ● Apply after the first trifoliate leaf of soybeans has fully expanded. ● Allow a minimum of 60 days between <i>Pinnacle</i> application and soybean harvest. ● DO NOT tank mix with the surfactant <i>Dash</i>. ● DO NOT exceed 1/8% of nonionic surfactant. ● <i>Pinnacle</i> can be tank mixed with <i>Blazer, Cobra, Reflex, Flexstar, Galaxy, Basagran, Pursuit</i> or <i>Classic</i> for additional weed control. See Tables 2G and 2J. ● <i>Pinnacle</i> can be tank mixed with <i>Assure II</i> for annual grass control. See Table 2L. ● Special precaution: A special sprayer clean-out procedure is required. See label.
	+	+	+	
	surfactant	1/8%	1/8%	

(Continued on next page)

SOYBEANS — POSTEMERGENCE FOR BROADLEAF WEEDS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (EXCEPT black nightshade and common ragweed)	chlorimuron-ethyl (<i>Classic</i>)	0.004	¼ oz 25% DF	<ul style="list-style-type: none"> ● <i>Classic</i> can be applied to soils with a pH greater than 7.0 if the <i>Classic</i> rate is ¼ to ½ oz/A. ● SEE LABEL OR TABLE 11 FOR CROP ROTATION ● <i>Classic</i> must be applied at ½ oz/A for common ragweed control. ● Black nightshade will NOT BE controlled. ● For black nightshade control add 4 to 6 oz/A of <i>Cobra</i> OR 1 pt/A of <i>Reflex</i> OR <i>Blazer</i>. ● Addition of 1 gal/A of 28% liquid nitrogen (urea ammonium nitrate) or 1 qt/A of 10-34-0 (diammonium phosphate) IN ADDITION TO crop oil concentrate OR surfactant IS REQUIRED for control of velvetleaf. ● Apply after the first trifoliolate leaf of soybeans has fully expanded. ● DO NOT apply to soybeans or weeds under stress from herbicide injury or cold or dry weather—crop injury or poor weed control may result. ● Under hot, dry conditions, surfactant may be replaced with crop oil concentrate at 1%. However, increased crop injury may result. See Table 21. ● Use a minimum of 25 psi and 10 gal of water/A. For heavy weed pressure, increase volume to 15 gal/A. Do not use flood nozzles. ● Cultivation 14 days after treatment will improve weed control. ● An additional ¼ oz/A of <i>Classic</i> must be added for yellow nutsedge control. DO NOT APPLY TO SOILS WITH A pH GREATER THAN 7.0 ● An additional ½ oz/A of <i>Classic</i> must be added for Jerusalem Artichoke control. DO NOT APPLY TO SOILS WITH A pH GREATER THAN 7.0.
	+	+	+	
	thifensulfuron methyl (<i>Pinnacle</i>)	0.004	¼ oz 25% DF	
	+	+	+	
	surfactant	¼%	¼%	
Annual broadleaves (EXCEPT black nightshade) Yellow Nutsedge Jerusalem Artichoke Common Milkweed	chlorimuron-ethyl + thifensulfuron methyl (<i>Synchrony STS</i>)	0.0136	½ oz 42% DF	<ul style="list-style-type: none"> ● ONLY APPLY <i>SYNCHRONY STS</i> TO <i>STS</i> SOYBEANS. ● One 2 oz soluble pack of <i>Synchrony</i> treats 4 acres. ● DO NOT APPLY TO SOILS WITH A pH GREATER THAN 7.0 IF FIELD IS NORTH OF I-96.. ● SEE LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● BLACK NIGHTSHADE WILL NOT BE CONTROLLED. ● <i>Synchrony STS</i> can be tank mixed with 4 to 6 oz/A of <i>Cobra</i> for control of black nightshade. Reduce crop oil concentrate to ½% if tank mixed with <i>Cobra</i>. ● <i>Synchrony STS</i> can be tank mixed with 1 pt/A of <i>Reflex</i> for black nightshade control. Keep crop oil concentrate at 1%. <i>Synchrony STS</i> can be tank mixed with 1 pt/A of <i>Blazer</i> for black nightshade control. Use ¼% nonionic surfactant INSTEAD of crop oil concentrate. ● Apply after the first trifoliolate leaf of soybeans has fully expanded. ● Use a minimum of 25 psi and 15 gpa. Do not use flood nozzles. ● Cultivation 14 days after treatment will improve weed control. ● Allow 60 days between application and harvest. ● <i>Synchrony STS</i> can be tank mixed with <i>Assure II</i> for control of some grasses. See label.
	+	+	+	
	28% liquid nitrogen	2 qt	2 qt	
	OR	OR	OR	
	ammonium sulfate	2 lb	2 lb	
+	+	+		
crop oil concentrate	1%	1%		

(Continued on next page)

SOYBEANS — POSTEMERGENCE FOR BROADLEAF WEEDS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (EXCEPT lambs- quarters)	imazethapyr (<i>Pursuit</i>)	0.063	4 oz 2L OR 1.4 oz 70% DG	<ul style="list-style-type: none"> ● SEE <i>PURSUIT</i> LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● DO NOT apply without both surfactant AND fertilizer or control will be reduced. See Table 2I. ● Will control yellow and green foxtails, barnyardgrass, and crabgrass up to 3 inches tall, and giant foxtail up to 6 inches tall. ● Use a minimum of 20 psi and 10 gal of water/A. ● Apply after the first trifoliate leaf of soybeans has fully expanded. ● For maximum effectiveness, cultivate 7-10 days following postemergence herbicide application. ● Allow a minimum of 85 days between <i>Pursuit</i> application and soybean harvest. ● <i>Pursuit</i> can be tank mixed with <i>Basagran</i>, <i>Blazer</i>, <i>Reflex</i>, <i>Resource</i>, <i>Cobra</i>, <i>Pinnacle</i> and <i>Galaxy</i> for additional weed control. See Tables 2G and 2J. ● <i>Pursuit</i> may be tank mixed with postemergence grass herbicides for volunteer corn control only. See Table 2L.
	Jerusalem artichoke	+	+	
	28% liquid nitrogen	1 qt	1 qt	
	OR	OR	OR	
	ammonium sulfate	2.5 lb	2.5 lb	
	+	+	+	
	surfactant	¼%	¼%	
Annual broadleaves (EXCEPT velvetleaf and lambsquarters)	acifluorfen (<i>Blazer</i> , <i>Status</i>)	0.38	1.5 pt	<ul style="list-style-type: none"> ● Most effective on small weeds. See label and Table 2H. ● Use a minimum of 40 psi and 20 gal of water/A. Do not use flood nozzles. ● Do not apply if soybeans are under stress from herbicide injury, cold or dry weather, or hail damage. ● ½ to 1 gal/A of 28% liquid nitrogen may be added INSTEAD OF surfactant for improved weed control. ● Allow 50 days between <i>Blazer</i> application and soybean harvest. ● <i>Blazer</i> can be tank mixed with <i>Scepter</i> or <i>Pursuit</i> for additional cocklebur control, with <i>Basagran</i> for additional cocklebur, velvetleaf, and lambsquarters control, and with <i>Pinnacle</i> for additional lambsquarters and pigweed control. See Tables 2G and 2J. ● A prepackaged mix of <i>Basagran</i> plus <i>Blazer</i> (<i>Galaxy</i> or <i>Storm</i>) is available. See remarks for <i>Galaxy</i> or <i>Storm</i>. ● <i>Blazer</i> can be tank mixed for postemergence grass control. See Table 2L.
	+	+	+	
	surfactant	⅛%	⅛%	
Annual broadleaves (EXCEPT velvetleaf, smartweed, lambs- quarters and cocklebur)	fomesafen (<i>Reflex</i>)	0.25	1 pt 2L	<ul style="list-style-type: none"> ● <i>REFLEX</i> MAY BE APPLIED IN COUNTIES SOUTH OF HWY 55. ● <i>REFLEX</i> CANNOT BE APPLIED TO THE SAME FIELD TWO CONSECUTIVE YEARS. ● Small grains can be planted 4 months following application; corn, alfalfa, and dry beans 10 months. DO NOT PLANT SUGAR BEETS FOR 18 MONTHS FOLLOWING APPLICATION. ● <i>Reflex</i> can be reduced to ¾ pt/A for smaller jimsonweed, mustard, nightshade, pigweed, and ragweed. See label and Table 2H. ● Apply before soybeans bloom. ● <i>Reflex</i> can be tank mixed with <i>Basagran</i> or <i>Pinnacle</i> for velvetleaf, smartweed, lambsquarters and cocklebur control. <i>Reflex</i> can be tank mixed with <i>Scepter</i> or <i>Pursuit</i> for cocklebur control, and with <i>Classic</i> for cocklebur and smartweed control. See Tables 2G and 2J. ● <i>Reflex</i> can be tank mixed for postemergence grass control. See Table 2L.
	+	+	+	
	surfactant	¼%	¼%	
	OR	OR	OR	
	crop oil concentrate	1%	1%	

(Continued on next page)

SOYBEANS — POSTEMERGENCE FOR BROADLEAF WEEDS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (EXCEPT velvetleaf, smartweed, lambs- quarters and cocklebur)	fomesafen (<i>Flexstar HL</i>)	0.25	1 pt 1.88L	<ul style="list-style-type: none"> ● <i>FLEXSTAR</i> MAY BE APPLIED IN COUNTIES SOUTH OF HWY 55. ● <i>FLEXSTAR</i> CANNOT BE APPLIED TO THE SAME FIELD TWO CONSECUTIVE YEARS. ● Small grains can be planted 4 months following application; corn, alfalfa, and dry beans 10 months. DO NOT PLANT SUGAR BEETS FOR 18 MONTHS FOLLOWING APPLICATION. ● <i>Flexstar</i> is <i>Reflex</i> formulated with additional surfactants. ● Apply before soybeans bloom. ● Apply at 10 to 20 gpa and 30 to 60 psi. ● Add crop oil concentrate at 1/2% or nonionic surfactant at 1/4% if weeds are large or under drought stress. ● <i>Flexstar</i> can be tank mixed with <i>Scepter</i>, <i>Basagran</i>, or <i>Classic</i> to improve cocklebur control; <i>Basagran</i> or <i>Pinnacle</i> to improve lambsquarters and velvetleaf control. See Tables 2G and 2H. ● <i>Flexstar</i> can be tank mixed for postemergence grass control. See Table 2L.
	+ 28% liquid nitrogen OR ammonium sulfate	+ 2.5% OR 10 lb/100 gal	+ 2.5% OR 10 lb/100 gal	
Annual broadleaves (EXCEPT velvetleaf, smartweed, and lambsquarters)	lactofen (<i>Cobra</i>)	0.195	12.5 oz	<ul style="list-style-type: none"> ● Poor on smartweed and lambsquarters. Fair on velvetleaf. ● <i>Cobra</i> is applied at 6 oz/A when tank mixed with other herbicides. 6 oz/A of <i>Cobra</i> will control 2 leaf nightshade, 2 leaf pigweed, and 4 leaf common ragweed. ● Most effective on small weeds. See label and Table 2H. ● DO NOT apply to soybeans in the cotyledon stage. ● DO NOT apply if soybeans are under stress from herbicide injury, cold or dry weather, or hail damage. ● When weather conditions are good and weeds growing vigorously, a surfactant at 1/4% or 28% liquid nitrogen at 1 gal/A may be substituted for crop oil concentrate. See Table 2I. ● Use a minimum of 40 psi and 20 gal of water/A. Do not use flood nozzles. ● A timely cultivation one week following application will assist in weed control. ● Allow 45 days between <i>Cobra</i> application and soybean harvest. ● <i>Cobra</i> can be tank mixed with <i>Resource</i> to control velvetleaf. This prepackaged mixture is <i>Stellar</i>. ● <i>Cobra</i> can be tank mixed with <i>Pinnacle</i> or <i>Basagran</i> to control velvetleaf, smartweed, and lambsquarters. <i>Cobra</i> can be tank mixed with <i>Classic</i> or <i>Pursuit</i> for control of smartweed and cocklebur or with <i>Scepter</i> for cocklebur control. See Tables 2G and 2J. ● <i>Cobra</i> can be tank mixed for postemergence grass control. See Table 2L.
	+ crop oil concentrate	+ 1 pt	+ 1 pt	

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SOYBEANS — POSTEMERGENCE FOR BROADLEAF WEEDS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (ONLY redroot pigweed and cocklebur)	imazaquin (<i>Scepter</i>)	0.063	½ pt OR 1.4 oz 70% DG	<ul style="list-style-type: none"> ● SEE LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. ● For redroot pigweed and cocklebur control ONLY. See Table 2H. ● Apply ⅔ pt/A (2.8 oz/A 70% DG) if soil activity to stop germinating weed seeds is desired or to control redroot pigweed from 4 to 12 in. tall. CORN CANNOT BE PLANTED THE YEAR FOLLOWING A ⅔ PT/A APPLICATION EXCEPT IN THE SOUTHERN TWO TIERS OF COUNTIES IN MICHIGAN. ● Imidazolinone resistant (IR or IMR) and imidazolinone tolerant (IT) corn hybrids can be planted the year following <i>Scepter</i> application. ● Avoid misapplication or spray overlap or carryover may occur to labeled rotation crops. ● Use a minimum of 40 psi and 20 gal of water/A. Do not use flood nozzles. ● Allow 90 days between <i>Scepter</i> application and soybean harvest. ● <i>Scepter</i> can be tank mixed with <i>Basagran</i>, <i>Blazer</i>, <i>Resource</i>, <i>Flexstar</i>, <i>Reflex</i>, or <i>Cobra</i> for control of additional broadleaf weeds. See Tables 2G and 2J. ● <i>Scepter</i> cannot be tank mixed with postemergence grass herbicides. See Table 2L.
	+	+	+	
	crop oil concentrate OR surfactant	1 qt OR ¼%	1 qt OR ¼%	
Annual broadleaves (ONLY velvetleaf)	flumiclorac (<i>Resource</i>)	0.041	6 oz 0.86L	<ul style="list-style-type: none"> ● Very effective on velvetleaf up to 10 leaf. ● Some pigweed, lambsquarters, and common ragweed suppression. ● <i>Resource</i> at 4 oz/A may be tank mixed with <i>Select</i> for annual grass control and <i>Basagran</i>, <i>Classic</i>, <i>Cobra</i>, or <i>Pursuit</i> for broadleaf control. See Table 2J. ● A prepackaged mix of <i>Resource</i> plus <i>Cobra</i> is available as <i>Stellar</i>. See Table 2F. ● There are no crop rotation restrictions. ● Allow 80 days between <i>Resource</i> application and soybean harvest.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
Canada thistle Yellow nutsedge	bentazon (<i>Basagran</i>)	¾ + ¾	1½ pt + 1½ pt	<ul style="list-style-type: none"> ● Increase <i>Basagran</i> rate to 1 qt/A for each application for more effective Canada thistle control. ● Treat when nutsedge is 4 to 6 in. and again 10 days later. ● See nutsedge remarks under "Special Weed Problems." ● Use a minimum of 40 psi and 20 gal of water/A. Do not use flood nozzles. ● Delay 7 days between <i>Basagran</i> application and <i>Assure</i>, <i>Assure II</i>, <i>Fusilade DX</i>, <i>Fusion</i>, <i>Poast</i>, <i>Poast Plus</i>, <i>Select</i>, or <i>Option</i> treatments.
	+	+	+	
	crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt	

SOYBEANS — POSTEMERGENCE GRASS CONTROL

Weed Controlled	Herbicide	Rate lb/A		Remarks and Limitations
		a.i.	Formulation/A	
Annual grasses	sethoxydim (<i>Poast</i>)	0.19	16 oz	<ul style="list-style-type: none"> ● No soil activity. Controls only grasses present when sprayed. ● Treat actively growing grasses. See Table 2K. ● <i>Poast</i> can be reduced to 12 oz/A and <i>Poast Plus/Prestige</i> can be reduced to 16 oz/A for 1- to 4-in. barnyardgrass, green and giant foxtail, and fall panicum. ● Use 5 to 20 gal of water/A and a minimum of 40 psi. ● Addition of 2.5 lb ammonium sulfate/A in <i>Poast</i> or <i>Poast Plus/Prestige</i> applications increases large crabgrass control. ● <i>Poast Plus</i> can be tank mixed with <i>Basagran</i>. <i>Poast</i> can be mixed with <i>Basagran</i> and/or <i>Blazer</i>. Increase <i>Poast</i> to 24 oz/A for yellow foxtail, barnyardgrass, and crabgrass when tank mixing. See <i>Poast</i> or <i>Poast Plus/Prestige</i> label for additional information and Table 2L. ● Wait 1 day after <i>Poast</i> or <i>Poast Plus</i> application before applying <i>Basagran</i> or <i>Blazer</i>. Wait 7 days after <i>Basagran</i> or <i>Blazer</i> application before applying <i>Poast</i> or <i>Poast Plus/Prestige</i>. ● Avoid drift onto corn, small grains, and turf.
	OR	OR	OR	
	sethoxydim (<i>Poast Plus, Prestige</i>)	0.19	24 oz	
	+	+	+	
	crop oil concentrate OR <i>Dash</i>	1 qt OR 1 qt	1 qt OR 1 qt	
	fluazifop-P-butyl (<i>Fusilade DX</i>)	0.188	12 oz	<ul style="list-style-type: none"> ● No soil activity. Controls only grasses present when sprayed. ● Treat actively growing grasses. See Table 2K. ● Use 5 to 40 gal of water/A and 40 to 60 psi. ● <i>Fusilade DX</i> can be reduced to 10 oz/A for certain conditions. See label. ● <i>Fusilade</i> can be tank mixed with <i>Basagran, Reflex, Flexstar, Cobra, and Blazer</i>. However, the minimum rate for <i>Fusilade DX</i> would be 12 oz/A. See label and Table 2L. ● Wait 3 days after <i>Fusilade</i> application before applying <i>Basagran</i> or <i>Blazer</i>. Wait 7 days after <i>Basagran</i> or <i>Blazer</i> application before applying <i>Fusilade DX</i>. ● Avoid drift onto corn, small grains, and turf.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	fluazifop-P-butyl + fenoxaprop (<i>Fusion</i>)	0.166	8 oz	<ul style="list-style-type: none"> ● No soil activity. Controls only grasses present when sprayed. ● Treat actively growing grasses. See Table 2K. ● Use 5 to 40 gal of water/A and 40 to 60 psi. ● <i>Fusion</i> can be tank mixed with <i>Basagran, Reflex, Flexstar, Blazer, Classic, Pinnacle, and Pursuit</i>. See Table 2L. ● Avoid drift onto corn, small grains, and turf.
	+	+	+	
	crop oil concentrate OR surfactant	1/2-1% OR 1/4-1/2%	1/2-1% OR 1/4-1/2%	
	clethodim (<i>Select</i>)	0.125	8 oz	<ul style="list-style-type: none"> ● No soil activity. Controls only grasses present when sprayed. ● Treat actively growing grasses. See Table 2K. ● Use 10 to 40 gal of water/A and 20 to 60 psi. ● <i>Select</i> can be applied at 6 oz/A under favorable soil moisture and humidity and when some grass species are small. See label and Table 2J. ● DO NOT cultivate for 7 days before or 7 days after treatment. ● Avoid drift onto corn, small grains, or turf. ● Allow 60 days between <i>Select</i> application and soybean harvest. ● <i>Select</i> can be tank mixed with <i>Basagran, Blazer, Stellar, Resource, Reflex, Cobra, or Classic</i>. See Table 2L.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	

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SOYBEANS — POSTEMERGENCE GRASS CONTROL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(Continued)</i>				
Annual grasses	quizalofop-P-ethyl (<i>Assure II</i>)	0.044	7 oz	<ul style="list-style-type: none"> ● No soil activity. Controls only grasses present when sprayed. ● Treat actively growing grasses. See Table 2K. ● Use 10 to 40 gal of water/A and a minimum of 40 psi. ● 8 oz/A required for barnyardgrass and crabgrass control. ● DO NOT cultivate for 7 days before or 7 days after treatment. ● Wait 1 day after <i>Assure II</i> application before applying <i>Basagran</i> or <i>Blazer</i>. Wait 7 days after <i>Basagran</i> or <i>Blazer</i> before applying <i>Assure II</i>. ● Avoid drift onto corn, small grains, or turf. ● Allow 80 days between <i>Assure II</i> application and soybean harvest. ● <i>Assure II</i> can be tank mixed with <i>Basagran</i>, <i>Pinnacle</i> or <i>Classic</i>, but should NOT be tank mixed when the target grass is barnyardgrass, crabgrass, or quackgrass. If tank mixing for other grasses except giant foxtail and broadleaf weeds, increase the rate of <i>Assure II</i> by 2 oz/A and reduce the surfactant rate to 1/8%. See Table 2L.
	+ crop oil concentrate OR surfactant	+ 1% OR 1/4%	+ 1% OR 1/4%	
	fenoxaprop (<i>Option II</i>)	0.074	12 oz .79EC	<ul style="list-style-type: none"> ● <i>Option II</i> is a restricted use pesticide. ● No soil activity. Controls only grasses present when sprayed. ● Treat actively growing yellow foxtail, witchgrass, fall panicum, and barnyardgrass 3 to 6 in., and crabgrass 1 to 2 in. tall. See Table 2K. ● <i>Option</i> can be reduced to 8 oz/A for green and giant foxtail 3 to 6 in. tall. ● Apply in a minimum of 10 gal of water/A at 40 psi. Increase spray pressure for dense canopies. ● Do NOT cultivate for 4 days following application. ● Apply a minimum of 90 days before soybean harvest. ● <i>Option II</i> can be tank mixed with <i>Pursuit</i>, <i>Basagran</i> and/or <i>Blazer</i> for broad spectrum weed control. However <i>Option</i> should be increased to 16 oz/A with <i>Blazer</i> and 12 to 16 oz/A with <i>Basagran</i>. See <i>Option II</i> label.
	+ crop oil concentrate	+ 1 qt	+ 1 qt	
Volunteer corn	fluazifop-P-butyl (<i>Fusilade DX</i>)	0.094	6 oz	<ul style="list-style-type: none"> ● Refer to above remarks on annual grass control. ● Treat volunteer corn up to 24 in. See Table 2K.
	+ crop oil concentrate	+ 1 qt	+ 1 qt	
	sethoxydim (<i>Poast</i>)	0.19	16 oz	<ul style="list-style-type: none"> ● Refer to remarks on annual grass control. ● Treat volunteer corn up to 20 in. See Table 2K. ● <i>Poast</i> can be reduced to 12 oz/A or <i>Poast Plus</i> to 18 oz/A if volunteer corn is less than 12 in. tall. ● <i>Poast</i> is not as effective on volunteer corn as <i>Select</i>, <i>Fusilade DX</i>, <i>Fusion</i>, or <i>Assure II</i>.
	OR sethoxydim (<i>Poast Plus, Prestige</i>)	OR 0.19	OR 24 oz	
	+ crop oil concentrate OR <i>Dash</i>	+ 1 qt OR 1 qt	+ 1 qt OR 1 qt	
	+ 28% liquid nitrogen OR ammonium sulfate	+ 1 gal OR 2 1/2 lb	+ 1 gal OR 2 1/2 lb	
	clethodim (<i>Select</i>)	0.094	6 oz	<ul style="list-style-type: none"> ● Refer to remarks on annual grass control. ● Treat volunteer corn up to 18 in. See Table 2K. ● Reduce rate to 4 oz/A on 4-12 in. corn.
	+ crop oil concentrate	+ 1 qt	+ 1 qt	

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SOYBEANS — POSTEMERGENCE GRASS CONTROL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>Continued</i>				
Volunteer corn	quizalofop-P-ethyl (Assure II)	0.031	5 oz	<ul style="list-style-type: none"> ● Refer to remarks on annual grass control. ● Treat volunteer corn up to 18 in. See Table 2K.
	+	+	+	
	crop oil concentrate OR surfactant	1% OR 1/4%	1% OR 1/4%	
	fluazifop-P-butyl + fenoxaprop (Fusion)	0.126	6 oz	<ul style="list-style-type: none"> ● Refer to remarks on annual grass control. ● Treat volunteer corn from 12-24 in. See Table 2K.
	+	+	+	
	crop oil concentrate OR surfactant	1/2-1% OR 1/4-1/2%	1/2-1% OR 1/4-1/2%	
	fenoxaprop (Option II)	0.05	8 oz	<ul style="list-style-type: none"> ● <i>Option II</i> is a restricted use pesticide. ● Refer to remarks on annual grass control. ● Treat volunteer corn from 10 to 16 in. See Table 2K.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
Volunteer corn Weed escapes Perennials	glyphosate (Roundup Ultra)	Rate varies	See label	<ul style="list-style-type: none"> ● Use with ropewick applicator, wipe-on applicator, or recirculating sprayer.
Quackgrass	quizalofop-P-ethyl (Assure II)	0.0625	10 oz	<ul style="list-style-type: none"> ● Make application when quackgrass is 6 to 10 in. tall. See Table 2K. ● Two applications may be needed for best quackgrass control. Make second application of 7 oz/A 14 to 21 days later when quackgrass has reached 4 to 8 in. Cultivation may replace second application. ● Use 10 to 40 gal of water/A and a minimum of 40 psi.
	+	+	+	
	crop oil concentrate OR surfactant	1% OR 1/4%	1% OR 1/4%	
	fluazifop-P-butyl (Fusilade DX)	0.188	12 oz	<ul style="list-style-type: none"> ● Make application when quackgrass is 6 to 10 in. tall. See Table 2K. ● Two applications may be needed for best quackgrass control. Make a second application of 8 oz/A 14 to 21 days later before quackgrass reaches 10 in. Cultivation may replace second application. ● Use 5 to 40 gal of water/A and 40 to 60 psi.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	sethoxydim (Poast) OR sethoxydim (Poast Plus, Prestige)	0.29 + 0.19	24 oz + 16 oz OR 36 oz + 24 oz	<ul style="list-style-type: none"> ● Make application when quackgrass is 6 to 8 in. tall. See Table 2K. ● Two applications will be needed for best quackgrass control. Make the second application 14 to 21 days later when quackgrass has regrown. Cultivation may replace second application. ● Use 5 to 20 gal of water/A and a minimum of 40 psi.
	+	+	+	
	crop oil concentrate OR Dash	1 qt + 1 qt OR 1 qt + 1 qt	1 qt + 1 qt OR 1 qt + 1 qt	
	28% liquid nitrogen OR ammonium sulfate	1 gal + 1 gal OR 2 1/2 lb + 2 1/2 lb	1 gal + 1 gal OR 2 1/2 lb + 2 1/2 lb	
	fluazifop-P-butyl + fenoxaprop (Fusion)	0.25	12 oz	<ul style="list-style-type: none"> ● Make application when quackgrass is 6 to 10 in. tall. See Table 2K. ● Two applications may be needed for best quackgrass control. Make a second application of 8 oz/A 14 to 21 days later before quackgrass reaches 10 in. Cultivation may replace second application. ● Use 5 to 40 gal of water/A and 40 to 60 psi.
	+	+	+	
	crop oil concentrate	1%	1%	

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SOYBEANS — POSTEMERGENCE GRASS CONTROL (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Quackgrass	clethodim (<i>Select</i>)	0.25	16 oz	<ul style="list-style-type: none"> ● Make application when quackgrass is 6 to 8 in. tall See Table 2K. ● Two applications may be needed for best quackgrass control. Make a second application of 8 oz/A 14 to 21 days later when quackgrass has regrown. Cultivation may replace second application. ● Use 10 to 40 gal of water/A and 20 to 60 psi.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
Postemergence Johnsongrass	quizalofop (<i>Assure II</i>)	0.0625	10 oz	<ul style="list-style-type: none"> ● Reduce rate to 5 oz/A for seedling johnsongrass up to 8 in. tall. ● Apply 10 oz/A to rhizome johnsongrass up to 24 in. tall. ● A second application at 6 oz/A to 6 to 10 in. johnsongrass may be needed. ● DO NOT tank mix.
	+	+	+	
	crop oil concentrate	1%	1%	
	OR	OR	OR	
	surfactant	¼%	¼%	
	fluazifop-P-butyl (<i>Fusilade DX</i>)	0.188	12 oz	<ul style="list-style-type: none"> ● Reduce rate to 8 oz/A for seedling johnsongrass up to 8 in. tall. ● Apply 12 oz/A to rhizome johnsongrass up to 18 in. tall. ● A second application at 8 oz/A to 6 to 12 in. johnsongrass may be needed. ● DO NOT tank mix.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR			
	clethodim (<i>Select</i>)	0.25	16 oz	<ul style="list-style-type: none"> ● Reduce rate to 8 oz/A for seedling johnsongrass up to 10 in. tall. ● Apply 16 oz to rhizome johnsongrass up to 18 in. tall. ● A second application at 8 oz/A to 6 to 18 in. johnsongrass may be needed. ● DO NOT tank mix.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	

TABLE 2B – WEED CONTROL IN ROUNDUP READY SOYBEANS

Soybeans that are resistant to *Roundup Ultra* are designated *Roundup Ready* soybeans. *Roundup Ultra* can be broadcast applied postemergence over *Roundup Ready* soybeans only. Read carefully all remarks and limitations written below and on the *Roundup Ready* label.

WEED CONTROL IN ROUNDUP READY SOYBEANS

Weed Controlled	Herbicide	Rate lb/A a.e.	Formulation/A	Remarks and Limitations
Annual grasses	glyphosate	0.56	24 oz	<ul style="list-style-type: none"> ● APPLY TO <i>ROUNDUP READY</i> SOYBEANS ONLY. ● USE EXTREME CAUTION TO AVOID SPRAY DRIFT. CORN IS VERY SENSITIVE TO <i>ROUNDUP</i>. ● APPLY WHEN WIND SPEEDS ARE LOW (BELOW 5 MPH). ● AVOID EXCESSIVE SPRAY PRESSURE. ● Apply to annual weeds up to 5 in. in height. DO NOT let weeds compete in soybeans for longer than 5 weeks after planting or soybean yield will be reduced. ● Increase <i>Roundup Ultra</i> rate to 32 oz/A for consistent velvetleaf, common lambsquarters and giant ragweed control. ● DO NOT let barnyardgrass, crabgrass, or nightshade exceed 4 in. in height. ● Adding 28% liquid nitrogen or ammonium sulfate will improve weed control if weeds are larger or drought stressed or if water source is 'hard.' ● <i>Roundup Ultra</i> does not have soil activity. MAKE A SECOND <i>ROUNDUP ULTRA</i> APPLICATION IF NEW WEEDS EMERGE. Drilled soybeans will reduce the chance of later weed emergence. ● DO NOT EXCEED 2 QT/A TOTAL OF <i>ROUNDUP ULTRA</i> FROM SOYBEAN CRACKING THROUGH FULL FLOWER. ● FOR QUACKGRASS OR NUTSEDGE CONTROL, apply 32 oz/A when quackgrass or nutsedge is 6 to 8 in. tall. ● FOR PERENNIAL BROADLEAF WEED CONTROL, apply 24 oz/A for control of annual weeds before they exceed 5 in. in height. MAKE A SECOND APPLICATION OF <i>ROUNDUP ULTRA</i> AT 2 to 2½ pt/A for perennial weed control before soybeans reach full flower.
Annual broadleaves	(<i>Roundup Ultra</i>)			
Nutsedge	+	+	+	
Other perennials	28% liquid nitrogen	4%	4%	
	OR ammonium sulfate	OR 2.5 lb	OR 2.5 lb	

TABLE 2C—CHEMICAL WEED CONTROL IN NO-TILL SOYBEANS

Effective weed control in no-tillage soybean production requires complete control of all weeds and cover crops present at the time of planting. This is usually accomplished with a burndown herbicide such as paraquat (*Gramoxone Extra*) or glyphosate (*Roundup Ultra* or *Touchdown*) added to the tank mix for control of existing plants. Either of these herbicides can be used alone before planting to avoid excessive cover crop growth. *Gramoxone Extra* provides a faster kill. *Roundup Ultra/Touchdown* may provide better control if weed or cover crop growth is dense and is preferred for perennial weeds or seedling grasses prior to completion of tillering. Use ½ pt non-ionic surfactant/100 gal of water with paraquat. Double the surfactant rate if liquid fertilizer is used as the carrier. Do not use suspension fertilizers as carriers for *Gramoxone Extra*. The best carrier for *Roundup Ultra/Touchdown* is water. Reduced control may occur if *Roundup Ultra/Touchdown* is used in tank mixtures containing fluid fertilizer. Carefully follow the mixing instructions for *Gramoxone Extra* and *Roundup Ultra/Touchdown*.

Many situations may require little or no adjustment in application rates. However, dense plant residue and the total reliance on herbicides for weed control may require that herbicides be used at the high end of the labelled rate range for the soil type. Postemergence herbicides listed in the "Soybean—Postemergence" section (p. 86) may be used in no-till soybeans and may be needed to provide adequate control. Fields should be scouted routinely (weekly) for weed escapes.

SOYBEANS — NO-TILL — MARESTAIL (HORSEWEED) CONTROL

(Following corn, soybeans, or small grains without a cover crop)

Weed Controlled	Herbicide	Rate lb/A		Remarks and Limitations
		a.i.	Formulation/A	
<i>Early preplant</i>				
Annual grasses	2,4-D ester	0.5	1 pt	<ul style="list-style-type: none"> ● Apply 10 to 14 days before planting. ● Delay planting at least 7 days following 2,4-D ester application at 1 pt/A. Do not apply 2,4-D amine before planting soybeans. ● If marestail plants exceed 2 in., increase <i>Roundup</i> rate to 1 qt/A. ● Must be followed by a sequential application preemergence. ● Do not treat when plants are under stress. ● Apply when air temperature is at least 60°F. ● Control will be maximized with spray volume of 5 to 10 gal/A. ● Use flat fan nozzles.
Annual broadleaves	OR	OR	OR	
Marestail	glyphosate (<i>Roundup Ultra</i>)	0.56	1½ pt	

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SOYBEANS — NO-TILL — MARESTAIL (HORSEWEED) CONTROL

(Following corn, soybeans, or small grains without a cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
FOLLOWED BY: Preemergence	metribuzin (Lexone or Sencor)	¾	¾ pt 4L OR ½ lb 75% DF OR ½ lb Sencor Solupak	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● Apply preemergence. ● Refer to herbicide labels for approved burndown herbicides.
	OR metribuzin + chlorimuron ethyl (Canopy)	OR 0.19	OR 4 oz 75% DG	
	+ metribuzin (Lexone or Sencor)	+ 0.10	+ 2 oz 75% DG	
	OR linuron (Lorox or Linex)	OR ¾	OR ¾ qt 4L OR 1½ lb 50% DF	
	+ alachlor (Lasso, Micro-Tech, or Partner)	+ 2½	+ 2½ qt OR 3.8 lb 65% DG	
	OR metolachlor (Dual, Dual II)	OR 2	OR 2 pt	
	OR dimethenamid (Frontier)	OR 1.17	OR 20 oz 7.5L OR 25 oz 6.0L	
	+ Burndown (See Table 2D)			

(Continued on next page)

SOYBEANS — NO-TILL — MARESTAIL (HORSEWEED) CONTROL

(Following corn, soybeans, or small grains without a cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Early preplant				
Annual grasses	metribuzin	¼	½ pt 4L	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● Apply 10 to 14 days before planting. ● Apply before marestalk plants exceed 3 in. ● Must be followed by a sequential application preemergence.
Annual broadleaves	(Lexone or Sencor)		OR	
Marestail			¾ lb 75% DF	
			OR	
			¾ lb Sencor Solupak	
	+	+	+	
	alachlor	1½	1½ qt	
	(Lasso,		OR	
	Micro-Tech, or		2.3 lb 65% DG	
	Partner)			
	OR	OR	OR	
	metolachlor	1½	1½ pt	
	(Dual, Dual II)			
	OR	OR	OR	
	dimethenamid	0.7	12 oz 7.5L	
	(Frontier)		OR	
			15 oz 6.0L	

FOLLOWED BY:				
Preemergence	metribuzin	¼	¼ pt 4L	<ul style="list-style-type: none"> ● Apply preemergence. ● Refer to herbicide labels for approved burndown herbicides.
	(Lexone or Sencor)		OR	
			¾ lb 75% DF	
			OR	
			¾ lb Sencor Solupak	
	+	+	+	
	alachlor	1	1 qt	
	(Lasso,		OR	
	Micro-Tech, or		1.5 lb 65% DG	
	Partner)			
	OR	OR	OR	
	metolachlor	½	½ pt	
	(Dual, Dual II)			
	OR	OR	OR	
	dimethenamid	0.47	8 oz 7.5L	
	(Frontier)		OR	
	+		10 oz 6.0L	
	Burndown			
	(See Table 2D)			

(Continued on next page)

SOYBEANS — NO-TILL — MARESTAIL (HORSEWEED) CONTROL

(Following corn, soybeans, or small grains without a cover crop)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Early preplant				
	metribuzin + chlorimuron-ethyl (<i>Canopy</i>)	0.14	3 oz 75% DG	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● Apply 10 to 14 days before planting. ● Apply before marestail plants exceed 3 in. ● Must be followed by a sequential application preemergence.
	+	+	+	
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	0.08	1.5 oz 75% DG	
	+	+	+	
	alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>)	1½	1½ qt OR 2.3 lb 65% DG	
	OR	OR	OR	
	metolachlor (<i>Dual</i> , <i>Dual II</i>)	1½	1½ pt	
	OR	OR	OR	
	dimethenamid (<i>Frontier</i>)	0.7	12 oz 7.5L OR 15 oz 6.0L	

FOLLOWED BY: Preemergence	metribuzin + chlorimuron-ethyl (<i>Canopy</i>)	0.05	1 oz 75% DG	<ul style="list-style-type: none"> ● Apply preemergence. ● Refer to herbicide labels for approved burndown herbicides.
	+	+	+	
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	0.03	0.5 oz 75% DG	
	+	+	+	
	alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>)	1	1 qt OR 1.5 lb 65% DG	
	OR	OR	OR	
	metolachlor (<i>Dual</i> , <i>Dual II</i>)	½	½ pt	
	OR	OR	OR	
	dimethenamid (<i>Frontier</i>)	0.47	8 oz 7.5L OR 10 oz 6.0L	
	+			
	Burndown (See Table 2D)			

(Continued on next page)

SOYBEANS — NO-TILL — MARESTAIL (HORSEWEED) CONTROL

(Following corn, soybeans, or small grains without a cover crop)

Weed Controlled	Herbicide	Rate lb/A		Formulation/A	Remarks and Limitations
		a.i.			
Preemergence	glyphosate (<i>Roundup Ultra</i>)	¾		2 pt	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● Apply preemergence. ● Apply before marestail plants exceed 3 in. ● <i>Roundup Ultra</i> rate must be at least 2 pt/A for effective control of marestail. ● Do not treat when plants are under stress. ● Apply when air temperature is at least 60°F. ● Use a maximum of 40 gal of water/A. ● Requires rainfall following application for adequate control.
	+	+	+		
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	¾		¾ pt 4L OR ½ lb 75% DF OR ½ lb <i>Sencor Solupak</i>	
	OR	OR		OR	
	metribuzin + chlorimuron ethyl (<i>Canopy</i>)	0.19		4 oz 75% DG	
	+	+	+		
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	0.10		2 oz 75% DG	
	+	+	+		
	alachlor (<i>Lasso</i> , <i>Micro-Tech</i> , or <i>Partner</i>)	2½		2½ qt OR 3.8 lb 65% DG	
	OR	OR		OR	
metolachlor (<i>Dual</i> , <i>Dual II</i>)	2		2 pt		
OR	OR		OR		
dimethenamid (<i>Frontier</i>)	1.17		20 oz 7.5L OR 25 oz 6.0L		

TABLE 2D. EFFECTIVENESS OF TANK-MIXED BURNDOWN HERBICIDES IN SOYBEANS^{*,}**

	ANNUAL BROADLEAVES										ANNUAL GRASSES								WINTER ANNUALS/PERENNIALS					COVER CROPS					
	Cocklebur	Jimsonweed	Lambsquarters	Nightshade	Pigweed	Ragweed (Common)	Ragweed (Giant)	Smartweed	Velvetleaf	Wild Mustard	Barnyardgrass	Crabgrass	Giant Foxtail	Green Foxtail	Yellow Foxtail	Fall Panicum	Witchgrass	Wild Proso Millet Sandbur	Chickweed (common)	Yellow Rocket	Shepard's' purse	Pennycress	Marestail (Horseweed)	Dandelion ^h	Quackgrass	Rye	Wheat	Clover	Hairy Vetch
	Maximum Weed Height (inches)																		Herbicide Effectiveness										
Lexone/Sencor (¼ pt/A) ^{ab}	2	2	2	NR	2	2	NR	2	2	2	-	-	-	-	-	-	-	-	G	-	-	-	F	P	P	P	P	P	P
Lorox (¼ qt/A) ^{ab}	NR	NR	2	-	2	2	NR	2	2	2	-	-	-	-	-	-	-	-	G	-	-	-	P	P	P	P	P	P	P
Canopy (4 oz/A)+ Lexone or Sencor (2 oz/A) ^{ab}	2	2	2	-	2	2	2	2	2	2	-	-	-	-	-	-	-	-	G	G	G	G	F	F	P	P	P	P	P
Pursuit (¼ pt/A or 1.4 oz 70% DG) ^{ac}	8	3	NR	2	6	NR	NR	3	2	3	3	3	6	3	3	NR	NR	NR	F	-	-	-	P	P	N	P	P	P	P
2,4-D Ester (1 pt/A) ^d	3	NR	3	3	3	3	3	NR	2	3	NR	NR	NR	NR	NR	NR	NR	NR	P	F	G	F	E	F	N	N	N	F	F
2,4-D Ester (1 qt/A) ^d	6	3	6	6	6	6	6	3	5	6	NR	NR	NR	NR	NR	NR	NR	NR	F	G	E	G	E	G	N	N	N	G	G
Roundup Ultra (1 pt/A) ^{ef}	5	2	2	2	5	2	NR	NR	NR	5	NR	-	5	5	5	-	-	-	E	G	E	G	G	P	P	G	G	P	P
Roundup Ultra (1 qt/A) ^{ef}	16	10	10	10	16	10	5	5	5	16	5	-	16	16	16	-	-	-	E	E	E	E	E	P	F	E	E	F	F
Gramoxone Extra (1½ pt/A) ^g	3	3	3	3	3	3	3	NR	3	3	3	3	3	3	3	3	3	3	E	G	G	G	P	P	P	F	F	P	P
Gramoxone Extra (2½ pt/A) ^g	6	6	6	6	6	6	6	NR	6	6	6	6	6	6	6	6	6	6	E	E	E	E	P	P	P	G	G	F	F

P = Poor; F = Fair; G = Good; E = Excellent; N = None; NR = Not Recommended; - = Not enough information to rank

*Burndown effectiveness varies depending on several factors. This table is intended as a guide to relative effectiveness of burndown herbicide options. This table assumes tank mix application with residual herbicides.

**To avoid excessive cover crop growth, *Gramoxone Extra* or *Roundup Ultra* may be applied prior to planting.

a. Burndown effectiveness of these herbicides is highly dependent on environment. Maximum effectiveness will occur under high temperature, high humidity conditions. Under cool, cloudy conditions burndown effectiveness will be inadequate.

b. Always add crop oil concentrate at 1 qt/A to maximize foliar activity.

c. Always add either 28% liquid nitrogen at 1 qt/A or ammonium sulfate at 2.5 lb/A PLUS surfactant at 1/4% to maximize foliar activity.

d. Delay planting at least 7 and 30 days following 2,4-D ester application at 1 pt/A and 1 qt/A, respectively. Do not apply 2,4-D amine before planting soybeans. Refer to 2,4-D label for approval for preplant application in soybeans.

e. Addition of ammonium sulfate at 17 lbs/100 gal of water often improves control.

f. *Touchdown* may be used in place of *Roundup Ultra*. *Touchdown* application rate should be *Roundup Ultra* rate x .72. Always add non-ionic surfactant at ½% with *Touchdown*.

g. Always add surfactant (1/2 pt/100 gal of water) with *Gramoxone Extra*. Regrowth of rye or wheat may occur if plants are not fully tillered when treated.

h. Dandelion control with *Gramoxone Extra* will be improved when treatment is tank mixed with *Canopy*.

TABLE 2E—SOYBEANS— PREHARVEST APPLICATION

SOYBEANS — PREHARVEST APPLICATION

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses Annual broadleaves Perennial Weeds	glyphosate (<i>Roundup Ultra</i>)	¾-3	1-4 qt	<ul style="list-style-type: none"> • DO NOT apply to soybeans grown for seed. • Apply up until 7 days before harvest. • Pods must NOT be green. • DO NOT graze or harvest the treated crop for livestock feed within 25 days of application. • Apply in 10-40 gal of water. • Apply 1 qt/A for annual weeds. • Apply rate needed for perennial weeds.
Annual grasses Annual broadleaves	paraquat (<i>Gramoxone Extra</i>) + surfactant	0.25 + ¼%	12.8 oz + ¼%	<ul style="list-style-type: none"> • <i>Gramoxone Extra</i> is a restricted use pesticide. • Indeterminate varieties: Apply when at least 65% of pods are mature brown (seed moisture less than 30%). • Determinate varieties: Apply when ½ of leaves have dropped. • Immature soybeans will be injured. • Do not pasture for 15 days. • Apply in 10 gal. of water (ground); 5 gal. of water (air).

TABLE 2F— HERBICIDE PREMIXES IN SOYBEANS

TRADE NAME	COMPANY	FORMULATION	FORMULATION EQUIVALENTS*	TYPICAL USE RATE = EQUIVALENT RATES
Bronco	Monsanto	4L	2.6 qt Lasso + 1.4 qt Roundup	4 qt/Acre = 2.6 qt Lasso + 1.4 qt Roundup
Broadstrike + Dual	DowElanco/Ciba	7.67	Broadstrike + 7.5 pt Dual	2¼ pt/Acre = 0.056 lb ai of Broadstrike + 2.1 pt Dual
Broadstrike + Treflan	DowElanco	3.65	Broadstrike + 7 pt Treflan	2 pt/Acre = 0.062 lb ai of Broadstrike + 1¾ pt Treflan
Commence	FMC/DowElanco	5.25	6 pt Treflan + 4.4 pt Command	2 pt/Acre = 1½ pt Treflan + 1.1 pt Command
Conclude	BASF	co-pack	1 pt/A Basagran + 1 pt/A Blazer + 1 pt/A Poast	1.5 pt/Acre of Storm (Conclude B) + 1.5 pt/Acre of Poast (Conclude G)
Detail	American Cyanamid	4.1	3.6 lb Frontier + 0.5 lb Scepter	32 oz/Acre = 15 oz/Acre Frontier + 2.8 oz Scepter DG
Fusion	Zeneca	2.66	16 pt Fusilade 2000 + 6.7 pt Option	½ pt/Acre = 1 pt Fusilade 2000 + 0.4 pt Option II
Galaxy	BASF	3.67	6 pt Basagran + 2.6 pt Blazer	2 pt/Acre = 1½ pt Basagran + 2/3 pt Blazer
Manifest B:G	BASF	co-pack	1.5 pt/A Basagran 0.6 pt/A Blazer 1.5 pt/A Poast	2 pt/Acre of Galaxy (B) 1.5 pt/Acre of Poast (G)
Steel	American Cyanamid	2.59	5.6 pt Prowl 0.66 pt Pursuit 0.88 pt Scepter	3 pt/Acre = 2.1 pt Prowl 3.3 EC + 1/4 pt Pursuit + 0.33 pt Scepter
Stellar	Valent	3.1	9.6 pt Cobra 6.4 pt Resource	5 oz/Acre = 6 oz Cobra + 4 oz Resource
Storm	BASF	4.0	5.3 pt Basagran + 5.3 pt Blazer	1½ pt/Acre = 1 pt Basagran + 1 pt Blazer
Squadron	American Cyanamid	2.33	4.8 pt Prowl 3.3EC + 1.75 pt Scepter	3 pt/Acre = 1.8 pt Prowl 3.3EC + ¾ pt Scepter
Synchrony STS	DuPont	42% DF	5 oz Classic + 2 oz Pinnacle	1/2 oz/Acre = ¾ oz Classic + ¼ oz Pinnacle
Pursuit Plus	American Cyanamid	3.0	6.7 pt Prowl 3.3EC + 0.8 pt Pursuit	2½ pt/Acre = 2.1 pt Prowl 3.3EC + ¼ pt Pursuit
Tri-Scept	American Cyanamid	3.0	5.2 pt Treflan + 2.3 pt Scepter	2½ pt/Acre = 1½ pt Treflan + ¾ pt Scepter
Turbo	Miles Inc.	8.0	6.6 pt Dual + 3 pt Sencor	2 pt/Acre = 1½ pt Dual + ¾ pt Sencor

*For formulation equivalents, dry flowable formulations are given in lb or pt per lb of premix, and liquid formulations are given in pt or qt per gal of premix.

**TABLE 2H – MAXIMUM BROADLEAF WEED HEIGHTS
FOR POSTEMERGENCE CONTROL IN SOYBEANS***

Herbicide	RATE/A	COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)**	PIGWEED (REDROOT)	RAGWEED (COMMON)	GIANT RAGWEED	SMARTWEED	VELVETLEAF	WILD MUSTARD (DIAMETER OF ROSETTE)	HORSEWEED (MARESTAIL)
		WEED HEIGHT ^a (Inches)										
Basagran	2 pt	10 ^e	10	2	NO	NO	3	6	10	6 ^{b,e}	8	6
Blazer/Status	1.5 pt	2	6	<1	2	4	3	3	6	NO	4	4
Classic	¾ oz	12	6	NO	NO	4	4	6	4	6 ^c	6	6
Cobra	12.5 oz	6	4	NO	2	4	4	6	SUP	2	4	4
Galaxy	2 pt	6	6	2	<2	2	3	6	6	5	4	5
Pinnacle	¼ oz	SUP	SUP	4	NO	12	NO	NO	6	6 ^d	4	NO
Pursuit	¼ pt	8	3	<1	2	6	2	3	3	2	3	NO
Reflex	1 pt	NO	4	SUP	2	2	3	3	4	NO	4	NO
Flexstar HL	1 pt	SUP	4	SUP	2	2	3	3	4	SUP	4	NO
Resource	6 oz	NO	NO	SUP	NO	SUP	SUP	SUP	NO	10	NO	NO
Roundup Ultra-- Roundup Ready ^f	24 oz	6	6	3 ^f	4 ^f	4	4	8 ^f	4 ^f	4 ^f	6	6
Scepter	½ pt	8	NO	NO	NO	4	NO	NO	NO	NO	NO	NO
Storm	1½ pt	6	6	INC	2	2	3	3	6	INC	4	NO
Synchrony STS	½ oz	8	5	4	NO	8	4	4	8	8	5	5

^a NO = no control; SUP = suppression only; INC = inconsistent

^b Add 1 gal/A of 28% liquid ammonium nitrate for velvetleaf control with *Basagran*.

^c Add 28% liquid urea ammonium nitrate (UAN) to *Classic* + nonionic surfactant for velvetleaf control.

^d Add 28% liquid urea ammonium nitrate (UAN) to *Pinnacle* + nonionic surfactant for velvetleaf control.

^e Cocklebur up to 24 in. and velvetleaf up to 12 in. can be suppressed by 3 pt/A *Basagran* or 1.5 pt/A applied twice.

^f Increase *Roundup Ultra* to 32 oz/A for more consistent control.

***The weed heights listed in this table are estimates of the maximum size where consistent control is expected. The maximum height for effective control in any specific situation is dependent on environment conditions including soil moisture, temperature, and relative humidity.**

****If application rates are reduced, control of black nightshade is Good with 2 oz/A of *Pursuit*, Fair with 6 oz/A of *Cobra* and Poor with ½ pt/A of *Blazer*.**

**TABLE 2I – SUGGESTED ADDITIVES FOR
POSTEMERGENCE HERBICIDE APPLICATIONS IN SOYBEANS***

Herbicide	Crop Oil Concentrate (COC)	OR	Nonionic Surfactant (NIS)	AND/OR	28% N or AMS or 10-34-0^a
Assure II	1% (2% if drought stress)		¼%		No
Fusilade DX	½ – 1%		¼ – ½%		28% N at 1 gal/A may be added
Fusion	½ – 1%		¼ – ½%		28% N may be added up to 4%
Option II	1 qt/A		No		No
Poast ^b or Poast Plus or Prestige	1 qt/A (or DASH 1 qt/A)		No		28% N at ½ – 1 gal/A or AMS at 2.5 lb/A + COC or DASH
Select	1 qt/A		No		No
Basagran ^c	1 qt/A		No		28% N at 1 gal/A + COC
Blazer ^d /Status	No		¼%		Replace NIS w/2 – 4 qt/A of 28% N
Classic ^e	1% if hot, dry only		¼%		28% N at 1 gal/A or 10-34-0 at 1 qt/A + NIS
Cobra ^f	½ – 2 pt/A		¼% if high RH		28% N at 1 gal/A or AMS at 2.5 lb/A + NIS or COC
Flexstar	½% if hot, dry only		¼% if hot, dry only		Always add 28% N at 2.5% OR AMS at 10 lb/100 gal of water
Galaxy ^g	2 pt/A		No		28% N at ½ – 1 gal/A OR AMS at 2.5 lb/A INSTEAD OF COC
Pinnacle ^h	½% if hot, dry only		¼%		28% N at 2 – 4 qt/A + NIS
Pursuit ⁱ	1.5 pt if hot, dry only		¼%		Always add 28% N or 10-34-0 at 1-2 qt/A or AMS at 2.5 lb/A
Reflex	½–1%		¼–½%		28% N at 1 gal/A or 10-34-0 at 1 qt/A may be added
Resource	1 qt/A		No		28% N at 1 gal/A may be added
Roundup Ultra– Roundup Ready	No		No		Add 28% N at 4% v/v or AMS at 2.5 lb/A
Scepter	1 qt/A		¼%		No
Storm	1-2 pt/A		¼%		28% N at ½-1 gal/A instead of COC or NIS
Synchrony STS	1%		No		Always add 28% N at 2 qt or AMS at 2 lb/A

* ¼% = 1 pt in 100 gal of spray solution; ½% = 1 qt in 100 gal; 1% = 1 gal in 100 gal; 4% = 4 gal in 100 gal.

^a 28% N = 28% urea ammonium nitrate; AMS = ammonium sulfate; 10-34-0 = diammonium phosphate.

^b AMS improves control of large crabgrass, quackgrass, and volunteer corn and cereals.

^c 28% N may be added for improved velvetleaf control. Leave COC in for consistent common ragweed and lambsquarters control. DASH at 1 qt/A may be applied instead of 1 qt/A of COC.

^d Increase NIS to ¼% for lambsquarters.

^e 28% N or 10-34-0 must be added for velvetleaf control.

^f RH = relative humidity. See Table 1s on the Cobra label for adjuvant recommendations based on relative humidity.

^g Replace COC with 28% N or AMS for velvetleaf control when common ragweed and lambsquarters are not target weeds.

^h 28% N must be added for velvetleaf control. Only under hot, dry conditions should NIS be increased to ¼% or NIS replaced by COC at ½%.

ⁱ Pursuit can be applied with Sun-it II at 1 qt/A instead of NIS. Do not tank mix. MSU does not recommend use of COC at 1.5 pt/A with Pursuit instead of NIS except under hot, dry conditions.

TABLE 2J – LABELED TANKMIXES AND REQUIRED ADDITIVES FOR POSTEMERGENCE BROADLEAF WEED CONTROL IN SOYBEANS*

Find the box where additive information is printed by finding one herbicide in the names printed across the top of the chart, and then the second herbicide on the verticle side of the chart.

	BASAGRAN	CLASSIC	PINNACLE	PURSUIT	BLAZER, STATUS	REFLEX	COBRA	SCEPTER	GALAXY ^g	STORM ^g	SYNCHRONY STS	FLEXSTAR	RESOURCE ⁱ
Basagran	-	NL	¼% NIS ^{a,b}	¼% NIS + 1 qt UAN	1 pt COC ^c	1 qt COC	1 pt COC ^d	1 qt COC	NL	NL	NL	2 qt UAN + ½% COC	1 qt COC
Classic	NL	-	¼% NIS ^b OR 1% COC	NL	¼% NIS	¼% NIS	¼% NIS ^e	NL	¼% NIS + 2 qt UAN	¼% NIS + 2 qt UAN	NL	2 qt UAN + ¼% NIS	1 qt COC
Pinnacle	¼% NIS ^{a,b}	¼% NIS ^b OR 1% COC	-	¼% NIS ^h + 1 qt UAN	¼% NIS ^e	¼% NIS ^h + 1 qt UAN	¼% NIS ^e	NL	¼% NIS + 2 qt UAN	¼% NIS + 2 qt UAN	NL	2 qt UAN	NL
Pursuit	¼% NIS + 1 qt UAN	NL	¼% NIS ^h + 1 qt UAN	-	¼% NIS ^f + 1 qt UAN	¼% NIS ^f + 1 qt UAN	¼% NIS ^f + 1 qt UAN	NL	¼% NIS ^f + 1 qt UAN	NL	NL	NL	1 qt COC + 1 qt UAN
Blazer, Status	1 pt COC ^c	¼% NIS	¼% NIS ^e	¼% NIS ^f + 1 qt UAN	-	NL	NL	¼% NIS	NL	NL	¼% NIS + 2 qt UAN	NL	NL
Reflex	1 qt COC	¼% NIS	¼% NIS ^h + 1 qt UAN	¼% NIS ^f + 1 qt UAN	NL	-	NL	½% NIS OR 1% COC	NL	NL	1% COC + 2 qt UAN	NL	NL
Cobra	1 pt COC ^d	¼% NIS ^e	¼% NIS ^e	¼% NIS ^f + 1 qt UAN	NL	NL	-	¼% NIS	NL	NL	¼% COC + 2 qt UAN	NL	1 qt COC
Scepter	1 qt COC	NL	NL	NL	¼% NIS	½% NIS OR 1% COC	¼% NIS	-	NL	NL	NL	2 qt UAN + ½% COC	1 qt COC
Galaxy ^g	NL	¼% NIS + 2 qt UAN	¼% NIS + 2 qt UAN	¼% NIS + 1 qt UAN	¼% NIS OR 1% COC	NL	NL	NL	-	NL	NL	NL	NL
Storm ^g	NL	¼% NIS + 2 qt UAN	¼% NIS + 2 qt UAN	NL	¼% NIS	NL	NL	NL	NL	-	NL	NL	NL
Synchrony STS	NL	NL	NL	NL	¼% NIS + 2 qt UAN	1% COC + 2 qt UAN	½% COC + 2 qt UAN	NL	NL	NL	-	NL	NL
Flexstar	2 qt UAN + ½% COC	2 qt UAN + ¼% NIS	2 qt UAN	NL	NL	NL	NL	2 qt UAN + ½% COC	NL	NL	NL	NL	NL
Resource ⁱ	1 qt COC	1 qt COC	NL	1 qt COC + 1 qt UAN	NL	NL	1 qt COC	1 qt COC	NL	NL	NL	NL	NL

* **NL – not labeled**; NIS – nonionic surfactant; COC – crop oil concentrate; UAN – 28% urea ammonium nitrate; AMS – ammonium sulfate; ¼% = 1 pt in 100 gal of spray solution; ½% = 1 qt in 100 gal. *DASH* is NOT RECOMMENDED with ANY TANK MIXTURES.

^a Increase NIS to ¼% OR use COC at ¼% if dry conditions exist.

^b Add UAN at 2-4 qt/A, 10-34-0 at 1-2 qt/A, or 2-4 lb/A of AMS IN ADDITION TO NIS for velvetleaf control.

^c *Blazer* applied at 1 pt/A. Substitute UAN for COC only if velvetleaf is the target weed and lambsquarters and common ragweed are not.

^d *Cobra* applied at 6 to 8 oz/A.

^e Add 4 qt/A of UAN for velvetleaf control. Crop injury will increase.

^f Tank mix either *Blazer* at 1 pt/A, *Reflex* at 1 pt/A, or *Cobra* at ¼ pt/A with *Pursuit* for common ragweed control.

^g *Galaxy* is a prepackaged mix of *Basagran* + *Blazer*, 2 pt/A of *Galaxy* = 1½ pt/A of *Basagran* and ½ pt/A of *Blazer*. *Storm* is a prepackaged mix of *Basagran* + *Blazer*; 1½ pt/A of *Storm* = 1 pt of *Basagran* + 1 pt of *Blazer*.

^h Reduce *Pinnacle* to ½ oz/A to avoid crop injury.

ⁱ Reduce *Resource* to 4 oz/A. Reduce *Basagran* to 1 pt/A; *Classic* to ½ oz/A. when tank-mixed with *Resource*.

^j *Cobra* applied at 4 to 6 oz/A for nightshade.

**TABLE 2K – APPLICATION RATES OF
POSTEMERGENCE GRASS HERBICIDES FOR CONTROL OF
GRASS SPECIES AT VARIOUS HEIGHTS***

	Poast Plus, Prestige		Select	Assure II	Fusilade		Option II
	Poast	Prestige			DX	Fusion ^a	
oz/A							
Barnyardgrass							
1–2"	12	18	–	–	10	–	–
2–3"	12	18	6	8	12	8	–
3–4"	12	18	6	8	–	8	12
4–6"	16	24	8	8	–	–	12
6–8"	16	24	–	–	–	–	–
Crabgrass							
<1"	–	–	–	–	10	–	–
1–2"	16	24	6	8	12	8	12
2–6"	16	24	8	8	–	–	–
Giant Foxtail							
1–2"	12	18	–	–	10	–	–
2–4"	12	18	6	7	12	8	8
4–6"	16	24	6	7	12	8	8
6–8"	16	24	8	7	–	8	–
8–12"	–	–	8	–	–	–	–
Green Foxtail							
1–2"	12	18	–	–	10	–	–
2–4"	12	18	6	7	12	8	8
4–6"	16	24	8	–	–	–	8
6–8"	16	24	–	–	–	–	–
Yellow Foxtail							
1–2"	16	24	–	–	10	–	–
2–4"	16	24	6	7	12	8	12
4–6"	16	24	8	–	–	–	12
6–8"	16	24	–	–	–	–	–
Fall Panicum							
1–2"	12	18	–	–	10	–	–
2–4"	12	18	6	7	12	8	12
4–6"	16	24	8	7	12	8	12
6–8"	16	24	–	–	–	–	–
Witchgrass							
1–2"	16	24	–	–	10	–	–
2–4"	16	24	6	7	12	8	12
4–6"	16	24	8	7	–	8	12
6–8"	16	24	–	–	–	–	–
V. Corn							
1–4"	12	18	–	–	–	–	–
4–6"	12	18	4	–	–	–	–
6–12"	12	18	4	5	–	–	–
12–18"	16	24	6	5	6	6	8
18–20"	16	24	–	–	6	6	8
20–24"	–	–	–	–	6	6	8
Quackgrass							
4–6"	–	–	16+8	–	10	–	–
6–8"	24+16	36+24	16+8	10+7	12+8	12+8	–
8–10"	–	–	–	10+7	12+8	12+8	–

^a If grasses are small and not drought stressed, the *Fusion* rate can be reduced to 6 oz/A on barnyardgrass and all foxtails and 4 oz on volunteer corn.

^b Not labeled.

**TABLE 2L – LABELED TANK MIXES
WITH POSTEMERGENCE GRASS HERBICIDES IN SOYBEANS***

	Poast	Poast Plus; Prestige	Assure II	Fusilade DX	Fusion	Select
Basagran	Y ¹	Y ²	Y ³	Y	Y	Y ⁶
Classic	*	*	Y ³	*	Y	Y ⁶
Pinnacle	*	*	Y ^{3.8}	*	Y	*
Pursuit	*	Y ⁷	Y ⁷	Y ⁷	Y ⁴	Y ⁷
Blazer/Status	Y ¹	*	*	Y	Y	Y ⁶
Reflex	*	*	*	Y	Y	Y ⁶
Flexstar	*	*	*	Y	Y	Y ⁶
Cobra	*	*	Y ⁵	Y ⁵	*	Y ⁶
Scepter	*	*	*	*	*	*
Galaxy	Y ¹⁰	Y ⁹	*	*	Y	*
Resource	*	*	*	*	*	Y ⁶
Storm	Y ¹⁰	*	*	*	*	*
Synchrony STS	*	*	Y ^{3.8}	*	Y ⁴	Y ⁶
Basagran + Pinnacle	*	*	*	*	*	*
Basagran + Blazer	Y ¹	*	*	*	Y	*
Basagran + Reflex	*	*	*	Y	Y	*
Basagran + Cobra	*	*	*	*	*	*
Basagran + Scepter	*	*	*	*	*	*
Classic + Pinnacle	*	*	Y ³	*	Y	*
Classic + Blazer	*	*	*	*	*	*
Classic + Reflex	*	*	*	*	Y	*
Reflex + Pinnacle	*	*	*	*	Y	*

If a decision is made to make a sequential application, i.e., two trips over the field, the basic rule is that a postemergence grass herbicide should be applied 1 day prior to postemergence broadleaf herbicide(s) application. If a broadleaf herbicide is applied first, delay the application of *Poast*, *Poast Plus Prestige*, *Assure II*, *Fusilade DX*, *Fusion*, or *Select* until the grasses are actively growing again, which may be 7 days or more. Sequential applications require additional time and application costs.

Tankmixing saves time but is only labeled for some herbicides and for a limited number of grass species. Consult the pesticide labels for further information and always read and follow label directions.

Y = Yes, can be tankmixed; * = not labeled. No "grass" herbicides are labeled for tankmixing with: Classic + Cobra, Classic + Galaxy, Pinnacle + Blazer, Pinnacle + Cobra, Pinnacle + Galaxy, Pursuit + Blazer, Pursuit + Reflex, Pursuit + Cobra, Pursuit + Galaxy, Scepter + Blazer, Scepter + Reflex, and Scepter + Cobra.

- 1 Apply *Poast* at 24 oz/A when tankmixing with *Basagran*. Do not tank mix if target grass is quackgrass. Do not tank mix with *Blazer* if target grass is volunteer corn.
- 2 Apply *Poast Plus* or *Prestige* at 36 oz/A when target grass is barnyard grass or yellow foxtail. Do not tank mix if target grass is quackgrass.
- 3 Do not tank mix if target grass is baryardgrass, yellow foxtail, or quackgrass.
- 4 Tank mix only if volunteer corn or shattercane are target grass species.
- 5 Tank mix on *Cobra* label only (not on *Assure II* or *Fusilade DX*).
- 6 Grass antagonism may occur.
- 7 TANK MIX ON *PURSUIT* LABEL ONLY. GRASS ANTAGONISM WILL OCCUR.
- 8 Increase *Assure II* rate to 8 oz/A if target grass is fall panicum, green foxtail, or volunteer cereals. Reduce *Assure II* rate to 5 oz/A if 4" giant foxtail is the target grass.
- 9 Apply with Sylgard 309 or another silicone based adjuvant at 1/8 to 1/4% v/v.
- 10 Available in prepackaged mixtures of *Conclude* (*Storm* + *Poast*) and *Manifest* (*Galaxy* + *Poast*).

TABLE 3A—CHEMICAL WEED CONTROL IN SMALL GRAINS

DIRECT-DRILLED SMALL GRAINS (NO-TILL)

(fall or spring seedings following soybeans, corn or dry edible beans)

In general, complete control of all plants present at the time of planting is required for successful weed control. With direct drilling (no-till), vegetation control is accomplished before planting with burndown herbicides such as paraquat (*Gramoxone Extra*) or glyphosate (*Roundup*). The required application rate varies depending on weed species and size. Refer to the product labels for details. *Gramoxone Extra* provides faster kill. *Roundup* is preferred if perennial weeds are present, but fields with serious perennial weed problems should not be direct drilled with a small grain until the perennial weeds have been controlled.

The need for a burndown herbicide depends on the species of weeds present. If no weeds are present, a burndown herbicide is not needed. For fall-seeded small grains, fields with small seedlings of species that do not overwinter (summer annuals only) and are present at low densities do not need a burndown herbicide. If the weeds are large, however, or capable of overwintering (winter annuals, biennials, or perennials) or if identification of the weeds cannot be confirmed, a burndown herbicide should be used. For spring-seeded small grains, a burndown herbicide should be used if any weeds are present at planting time, regardless of species or size.

Herbicides applied after small grain emergence are not affected by the tillage system used. All of the herbicides listed below can be used in all tillage systems including direct drilling. No weed problems are unique to no-till small grain production. Therefore, no-till small grain production does not present any special weed control concerns.

BARLEY AND WHEAT WITHOUT LEGUME SEEDINGS — ALL TILLAGE SYSTEMS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	2,4-D amine	½	1 pt	<ul style="list-style-type: none"> • Apply in the spring to actively growing grain following tillering (usually about 6- to 8-in. high) but prior to jointing (between 3 and 6 on Feeke's scale). DO NOT TREAT GRAIN IN BOOT TO DOUGH STAGE. The boot stage is when the upper sheath is beginning to swell with the enlarging head. • Do not apply in the fall. • Most effective when weeds are small (less than 4 in.). • Not effective on smartweed and wild buckwheat. • If 2,4-D ester is used, an application rate no higher than 0.38 lbs ai/A is advised. 2,4-D ester mixes easier with 28% liquid nitrogen.
	bromoxynil (<i>Buctril</i>)	¾	1½ pt 2L OR ¾ pt Gel	<ul style="list-style-type: none"> • May be applied from emergence up to boot stage (between 1 and 9 on Feeke's scale). • Good coverage is essential. • Bromoxynil must be applied to small weeds for effective control (see label). • Redroot pigweed and mustard must be controlled when very small (refer to label for details). • Very good crop safety.

(Continued on next page)

BARLEY AND WHEAT WITHOUT LEGUME SEEDINGS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	dicamba (<i>Banvel</i>)	$\frac{1}{8}$	$\frac{1}{4}$ pt	<ul style="list-style-type: none"> ● Apply in spring to actively growing grain with a well established secondary root system or following tillering but prior to jointing (between 3 and 6 on Feeke's scale). ● Some wheat varieties are sensitive to <i>Banvel</i>. ● DO NOT APPLY <i>BANVEL</i> TO WHEAT VARIETIES WAKEFIELD OR MADISON AS SEVERE INJURY AND YIELD LOSS WILL LIKELY OCCUR. ● Do not apply to spring-seeded barley. ● Most effective when weeds are small (less than 4 in.) ● See remarks and limitations for dicamba (<i>Banvel</i>) in "Corn — Postemergence" section. ● More effective than 2,4-D on smartweed, wild buckwheat, and perennials.
	thifensulfuron methyl + tribenuron methyl (<i>Harmony Extra</i>) + surfactant	0.023 + $\frac{1}{4}\%$	$\frac{1}{2}$ oz. + $\frac{1}{4}\%$	<ul style="list-style-type: none"> ● Apply to winter wheat and barley after the crop is in the 2-leaf stage but before the flag leaf is visible (between 1.2 and 7.9). ● Most effective if weeds are small (4 in. or less). ● Addition of surfactant is essential for adequate results. ● <i>Harmony Extra</i> may be tank mixed with 2,4-D Amine, MCPA, or <i>Buctril</i> for more rapid weed kill and improved control of ragweed. Tank mixes with 2,4-D may improve thistle control but also carry a greater risk of crop injury. To reduce this risk apply 2,4-D at no more than $\frac{1}{2}$ pt/A ($\frac{1}{4}$ lb ai/A) and reduce surfactant concentration to $\frac{1}{8}\%$. The lower surfactant concentration may reduce velvetleaf control. Observe the timing restrictions for 2,4-D, MCPA, and <i>Buctril</i> when tank mixing with <i>Harmony Extra</i>. Do not tank mix with <i>Banvel</i>, as reduced control (antagonism) may occur. ● Tank mixes with <i>Buctril</i> may reduce Canada thistle control. ● For severe infestation, increase <i>Harmony Extra</i> rate to 0.6 oz. per acre. ● For mayweed (dogfennel) control, <i>Harmony Extra</i> rate may be reduced to 0.3 oz. per acre. ● Control of common ragweed is inconsistent. ● Do not exceed 1 oz. product per acre to any one crop during one growing season. ● Do not graze or feed forage or hay from treated areas to livestock. (Dry-harvested straw may be used for bedding and/or feed.) ● Do not plant treated area to any crop other than wheat, barley or oats for 60 days after application. ● Do not apply to wheat or barley underseeded with another crop. ● Injury symptoms will appear on weeds in 1 to 3 weeks after application. ● Very good crop safety. ● Special sprayer clean-out procedure required (see <i>Harmony Extra</i> label). ● Caution: If liquid nitrogen fertilizer is used as the herbicide carrier, leaf burn, yellowing, and stunting are likely. With favorable growing conditions the symptoms are temporary, but this practice is not recommended.

(Continued on next page)

BARLEY AND WHEAT WITHOUT LEGUME SEEDINGS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
ONLY ragweed, cocklebur, jimsonweed, and mayweed	clopyralid (<i>Stinger</i>)	0.094	¼ pt	<ul style="list-style-type: none"> ● Apply to wheat or barley from the 3-leaf stage to boot stage (between 1.3 and 9 on Feeke's scale). See label for details. ● Do not graze dairy or meat animals within 1 week after treatment. ● Do not harvest hay from treated grain fields. ● Do not apply to small grains underseeded with a legume. ● May be tank mixed with 2,4-D, <i>Banvel</i>, <i>Buctril</i>, <i>Harmony Extra</i>, or <i>Express</i> for control of additional weeds. See label for details on rates.
Perennials (bindweed, thistles)	2,4-D ester	¾	1½ pt	<ul style="list-style-type: none"> ● Apply in the spring to actively growing grain following tillering (usually about 6- to 8-in. high) but prior to jointing (between 3 and 6 on Feeke's scale). DO NOT TREAT GRAIN IN BOOT TO DOUGH STAGE. The boot stage is when the upper sheath is beginning to swell with the enlarging head. ● Will provide suppression only. ● Injury may occur. ● Some control of wild onion and wild garlic.
	dicamba (<i>Banvel</i>)	¾	¼ pt	<ul style="list-style-type: none"> ● Apply in spring to actively growing grain with a well established secondary root system or following tillering but prior to jointing (between 3 and 6 on Feeke's scale). ● Some wheat varieties are sensitive to <i>Banvel</i>. ● DO NOT APPLY BANVEL TO WHEAT VARIETIES WAKEFIELD OR MADISON AS SEVERE INJURY AND YIELD LOSS WILL LIKELY OCCUR. ● Do not apply to spring-seeded barley. ● Will provide suppression only. ● See remarks and limitations for <i>Banvel</i> in "Corn — Postemergence" section. ● Some control of wild onion and wild garlic.

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BARLEY AND WHEAT WITHOUT LEGUME SEEDINGS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Perennials (Canada thistle, sowthistle)	tribenuron methyl (<i>Express</i>)	0.016	½ oz.	<ul style="list-style-type: none"> ● Apply after the crop has reached the 2-leaf stage but before the flag leaf is visible (between 1.2 and 7.9 on Feeke's scale). ● Apply when thistles are actively growing and 4 to 8 in. tall with 2 to 6 in. of new growth. ● Addition of surfactant is essential for adequate results. ● <i>Express</i> may be tank mixed with 2,4-D Amine, MCPA, or <i>Buctril</i> for more rapid weed kill and improved control of ragweed. Tank mixes with 2,4-D may improve thistle control but also carry a greater risk of crop injury. To reduce this risk apply 2,4-D at no more than ½ pt/A (½ lb ai/A) and reduce surfactant concentration to ¼%. The lower surfactant concentration may reduce velvetleaf control. Observe the timing restrictions for 2,4-D, MCPA, and <i>Buctril</i> when tank mixing with <i>Express</i>. Do not tank mix with <i>Banvel</i> as reduced control (antagonism) may occur. ● Tank mixes with <i>Buctril</i> may reduce Canada thistle control. ● Spectrum of annual weeds controlled is narrower than with <i>Harmony Extra</i>. ● Do not harvest sooner than 45 days after application. ● Do not graze or feed forage or hay from treated areas to livestock (dry-harvested straw may be used for bedding and/or feed). ● Do not exceed ½ oz. product per acre to any one crop during one growing season. ● Do not plant treated area to any crop other than wheat or barley for 60 days after application. ● Do not apply to wheat or barley underseeded with another crop. ● Injury symptoms will appear on weeds in 1 to 3 weeks after application. ● Very good crop safety. ● Special sprayer clean-out procedure required (see <i>Express</i> label). ● Caution: If liquid nitrogen fertilizer is used as the herbicide carrier, leaf burn, yellowing, and stunting are likely. With favorable growing conditions the symptoms are temporary, but this practice is not recommended.
	+	+	+	
	surfactant	¼%	¼%	
<hr/>				
	thifensulfuron methyl + tribenuron methyl (<i>Harmony Extra</i>)	0.028	0.6 oz.	<ul style="list-style-type: none"> ● See remarks and limitations on <i>Harmony Extra</i> for control of annual broadleaves. ● Apply when thistles are actively growing and 4 to 8 in. tall with 2 to 6 in. of new growth. ● <i>Harmony Extra</i> controls a wider spectrum of annual weeds than <i>Express</i>. ● <i>Harmony Extra</i> may be tank mixed with 2,4-D Amine, MCPA, or <i>Buctril</i> for more rapid weed kill and improved control of ragweed. Tank mixes with 2,4-D may improve thistle control but also carry a greater risk of crop injury. To reduce this risk apply 2,4-D at no more than ½ pt. per acre and reduce surfactant concentration to ¼%. The lower surfactant concentration may reduce velvetleaf control. Observe the timing restrictions for 2,4-D, MCPA, and <i>Buctril</i> when tank mixing with <i>Harmony Extra</i>. Do not tank mix with <i>Banvel</i> as reduced control (antagonism) may occur. ● Tank mixes with <i>Buctril</i> may reduce Canada thistle control.
	+	+	+	
	surfactant	¼%	¼%	

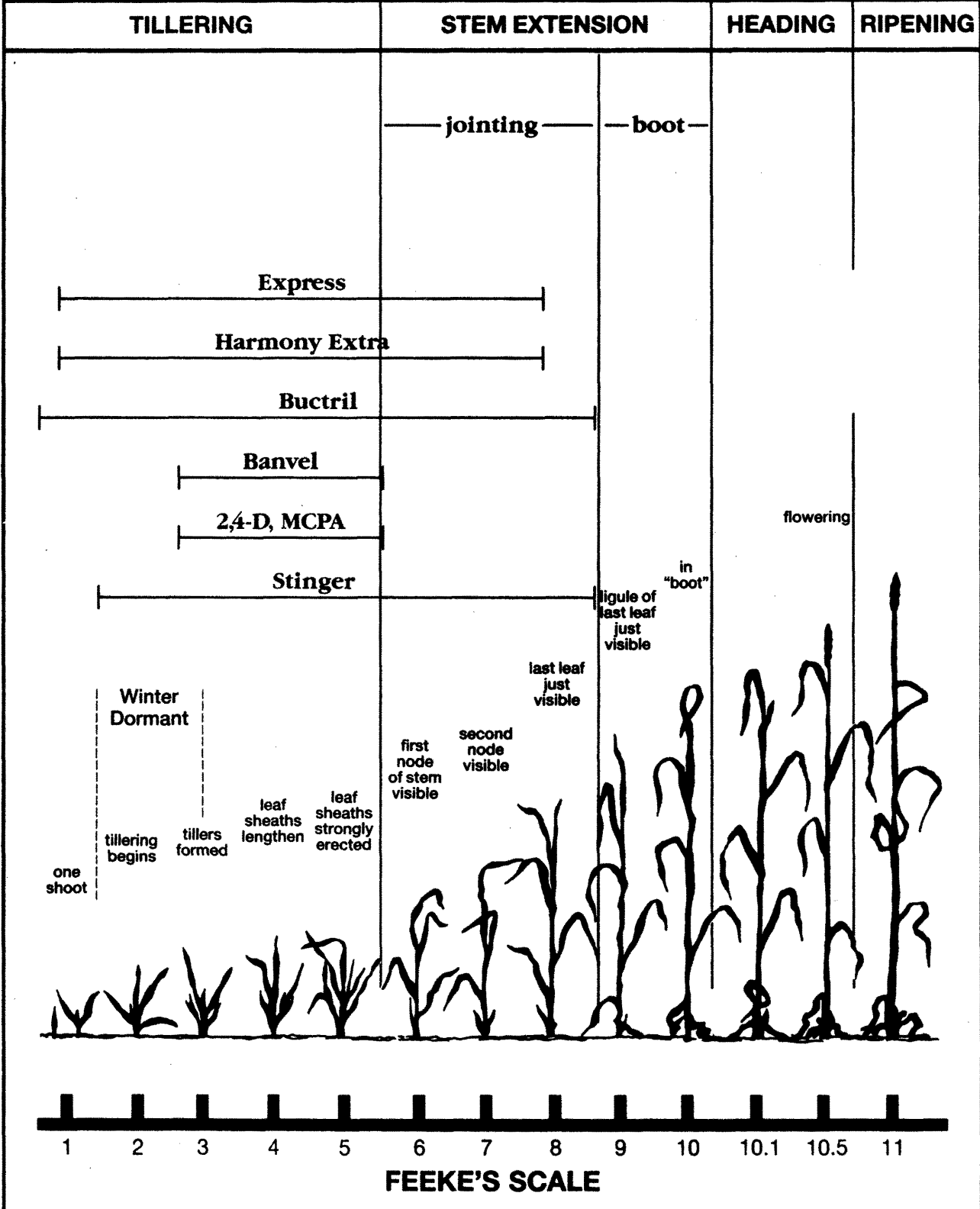
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BARLEY AND WHEAT WITHOUT LEGUME SEEDINGS (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Perennials (Canada thistle, sowthistle)	clopyralid (<i>Stinger</i>)	0.125	¼ pt	<ul style="list-style-type: none"> ● Treat thistle plants between rosette stage and bud stage for suppression. ● Apply to wheat and barley from the 3-leaf stage to boot stage (between 1.3 and 9 on Feeke's scale). See label for details. ● See remarks and limitations for <i>Stinger</i> for annual broadleaves.
Wild garlic Wild onion	thifensulfuron methyl + tribenuron methyl (<i>Harmony Extra</i>) + surfactant	0.028 + ¼%	0.6 oz + ¼%	<ul style="list-style-type: none"> ● See remarks and limitations of <i>Harmony Extra</i> for control of annual broadleaves. ● Apply when wild garlic plants are less than 12 in. tall with 2 to 4 in. of new growth. ● For best results, treat actively growing wild garlic when air temperature is at least 60°F. ● Less effective for wild onion control.
	dicamba (<i>Banvel</i>) + 2,4-D	¼ + ½	¼ pt + 1 pt	<ul style="list-style-type: none"> ● Apply in the spring to actively growing grain following tillering (usually about 6- to 8-in. high) but prior to jointing. DO NOT TREAT GRAIN IN BOOT TO DOUGH STAGE. The boot stage is when the upper sheath is beginning to swell with the enlarging head. ● Some wheat varieties are sensitive to <i>Banvel</i>. ● DO NOT APPLY <i>BANVEL</i> TO WHEAT VARIETIES WAKEFIELD OR MADISON AS SEVERE INJURY AND YIELD LOSS WILL LIKELY OCCUR. ● Do not apply to spring-seeded barley. ● May use either ester or amine 2,4-D. ● Provides suppression only. ● See remarks and limitations for <i>Banvel</i> in "Corn — Postemergence" section.

FIGURE 1

Wheat growth stages according to Zadoks' decimal code and Feeke's scale. Management inputs are indicated.



OATS WITHOUT LEGUME SEEDINGS — ALL TILLAGE SYSTEMS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	2,4-D amine	%	¼ pt	<ul style="list-style-type: none"> ● Apply in the spring to actively growing grain following tillering (usually about 6- to 8-in. high) but prior to jointing. DO NOT TREAT GRAIN IN BOOT TO DOUGH STAGE. The boot stage is when the upper sheath is beginning to swell with the enlarging head. ● Most effective when weeds are small (less than 4 in.). ● Some yield reduction may occur but generally less than that caused by weeds.
	MCPA	%	¼ pt 4L	<ul style="list-style-type: none"> ● Less injurious and less effective than 2,4-D. ● Most effective when weeds are small (less than 4 in.). ● Apply at or after full tillering but before the boot stage (the first node is detectable and the grain is usually 6 to 8 in. tall at full tillering; the boot stage is when the upper sheath is beginning to swell with the enlarging head).
	bromoxynil (<i>Buctril</i>)	%	1½ pt OR ¾ pt Gel	<ul style="list-style-type: none"> ● May be applied from emergence up to boot stage. ● Good coverage essential. ● Bromoxynil must be applied to small weeds for effective control (see label). ● Redroot pigweed and mustard must be controlled when very small (refer to label for details). ● Very good crop safety.
	thifensulfuron methyl + tribenuron methyl (<i>Harmony Extra</i>) + surfactant	0.018 + ¼%	0.4 oz. + ¼%	<ul style="list-style-type: none"> ● Apply to oats in the 3–5 leaf stage, but before jointing. ● Do not exceed 0.4 oz. product per acre to any one crop during one growing season. ● Do not apply to Ogle, Porter, or Premier varieties. ● Most effective if weeds are small (4 in. or less). ● Addition of surfactant is essential for adequate results. ● Control of common ragweed is inconsistent. ● Do not graze or feed forage or hay from treated areas to livestock. (Dry-harvested straw may be used for bedding and/or feed.) ● Do not plant treated area to any crop other than wheat, barley or oats for 60 days after application. ● Do not apply to oats underseeded with another crop. ● Injury symptoms will appear on weeds in 1 to 3 weeks after application. ● Special sprayer clean-out procedure required (see <i>Harmony Extra</i> label).
ONLY ragweed, cocklebur, and jimsonweed	clopyralid (<i>Stinger</i>)	0.094	¼ pt	<ul style="list-style-type: none"> ● Apply to oats from the 3-leaf stage to boot stage. See label for details. ● Do not graze dairy or meat animals within 1 week after treatment. ● Do not harvest hay from treated grain fields. ● Do not apply to oats underseeded with a legume. ● May be tank mixed with <i>Buctril</i> for control of additional weeds.

SMALL GRAINS SEEDED TO LEGUMES — ALL TILLAGE SYSTEMS

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	MCPA	$\frac{3}{16}$	$\frac{3}{4}$ pt 4L	<ul style="list-style-type: none"> ● Apply in the spring to actively growing grain following tillering (usually about 6- to 8-in. high) but prior to jointing. DO NOT TREAT GRAIN IN BOOT TO DOUGH STAGE. The boot stage is when the upper sheath is beginning to swell with the enlarging head. ● A canopy of grain and weeds over the seeding will reduce the possibility of injury to the legume. ● Apply in 5 to 6 gal of water/A to minimize crop injury. ● Sweet clover is very sensitive to MCPA.
	bromoxynil (Buctril)	$\frac{3}{4}$	1½ pt 2L OR $\frac{3}{4}$ pt Gel	<ul style="list-style-type: none"> ● SMALL GRAINS SEEDED WITH ALFALFA ONLY. ● Apply after alfalfa has reached at least the 4 trifoliolate stage and between emergence and boot stage of wheat or barley. ● Do not treat when air temperatures exceed 70°F at and for 3 days following application or unacceptable alfalfa injury may occur. ● Do not use any spray additives or increased injury may occur. ● Alfalfa leaf burn following application is likely, but plants recover rapidly in favorable growing conditions. ● Warm, humid conditions enhance leaf burn. ● Less injurious than MCPA. ● Do not treat when plants are under stress. ● Rate may be reduced to 1 pt per acre for greater crop safety (see label for weed sizes). ● With ground application, use a minimum of 20 gal of water/A and 30 psi. ● For best results, weeds must be small (see label for details). ● Redroot pigweed and wild mustard must be controlled when very small (refer to label for details). ● Weak on common chickweed. ● Do not graze or cut for feed for 30 days after application.

**TABLE 3B—
HARVEST RESTRICTIONS FOR SMALL GRAIN HERBICIDES
(as indicated on the product labels)**

Herbicide	Restrictions
<i>Banvel</i>	Do not graze or harvest for livestock feed prior to crop maturity.
<i>Buctril</i>	Do not graze treated fields for 30 days following application.
<i>Express</i>	Do not graze or feed forage or hay from treated areas to livestock (dry-harvested straw may be used for bedding and/or feed).
<i>Harmony Extra</i>	Do not graze or feed forage or hay from treated areas to livestock (dry-harvested straw may be used for bedding and/or feed).
<i>MCPA</i>	Do not allow livestock to forage or graze treated areas within 7 days of slaughter.
<i>Stinger</i>	Do not permit dairy animals or meat animals being finished for slaughter to forage or graze treated grain fields within 1 week after treatment. Do not harvest hay from treated fields.
<i>2,4-D</i>	Do not permit dairy animals or meat animals being finished for slaughter to forage treated grain fields within 2 weeks after treatment. Do not feed treated straw to livestock if a preharvest or emergency treatment is used. See label.

TABLE 3C—WEED RESPONSE TO HERBICIDES IN SMALL GRAINS*

	MODE OF ACTION	CROP TOLERANCE**	ANNUAL BROADLEAVES											ANNUAL GRASSES	PERENNIALS								
			COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEED	SMARTWEED	VELVETLEAF	WILD MUSTARD	HOARY ALYSSUM	YELLOW ROCKET		CHICKWEED (COMMON)	MAYWEED (DOGFENNEL)	BINDWEED (FIELD)	CANADA THISTLE	SOWTHISTLE	QUACKGRASS	YELLOW NUTSEDGE	WILD GARLIC	WILD ONION
BANVEL	O	3	G	G	G	G	G	G	E	G	F	G	G	F	F	N	F	F	P	N	NF	F	
BUCTRIL	O	1	G	G	E	G	F	G	G	G	F	F	F	P	F	N	P	P	N	N	N	N	N
EXPRESS	A	1	F	-	E	P	F	P	F	P	E	-	G	G	E	N	P	F	F	N	N	F	P
HARMONY EXTRA	A	1	G	-	E	P	E	F	E	G	E	-	G	G	E	N	P	F	F	N	N	G	F
MCPA	O	2	F	F	G	G	G	G	P	F	G	G	G	P	P	N	P	P	P	N	N	P	P
STINGER	O	2	E	G	P	P	P	G	F	P	P	P	P	P	G	N	P	G	F	N	N	N	N
2,4-D AMINE	O	3	F	F	G	G	G	G	P	F	G	G	G	P	P	N	P	P	P	N	N	P	P
2,4-D ESTER	O	3	F	F	G	G	G	G	P	G	G	G	G	P	P	N	F	F	P	N	N	F	F

Herbicide Mode of Action: A = ALS Inhibitor; B = ACCase Inhibitor; C = Photosynthesis Inhibitor; O = Other

Herbicide Effectiveness: P = Poor; F = Fair; G = Good; E = Excellent; N = None; - = Not enough information to rank

*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.

**Crop Tolerance: 1=Minimal risk of crop injury; 2=Crop injury can occur under certain conditions (soil applied—cold, wet; foliar applied—hot, humid); 3=Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4=Risk of severe crop injury is high. Recommended only in rescue situations.

TABLE 4A—CHEMICAL WEED CONTROL IN FORAGE ESTABLISHMENT

DIRECT-DRILLED FORAGE LEGUMES (NO-TILL) (spring seedings following soybeans, corn or dry edible beans)

In general, the major benefits of weed control in new alfalfa seedings are improved forage quality in the first harvest and insurance against stand loss from intense weed competition. In conventional tillage, weeds present at planting are killed by tillage during final seedbed preparation. With direct seeding (no-till), vegetation control is accomplished before planting with burndown herbicides such as paraquat (*Gramoxone Extra*) or glyphosate (*Roundup*). The required application rate varies depending on weed species and size. Refer to the product labels for details. *Gramoxone Extra* provides faster kill. *Roundup* is preferred if perennial weeds are present, however, fields with serious perennial weed problems should not be direct drilled with a forage legume. Perennial weeds should be controlled in the previous crop or in the fall prior to a spring seeding. Herbicide options in the fall include *Roundup*, 2,4-D ester, or a combination of *Roundup* plus 2,4-D amine. Do not apply 2,4-D in the spring prior to spring planting.

The need for a burndown herbicide depends on the presence of weeds at planting time. If no weeds are present, a burndown herbicide is not needed. However, a burndown herbicide will improve first-harvest forage quality weeds are present at planting time, regardless of species or size.

Herbicides applied after crop emergence are not affected by the tillage system used. All of the herbicides listed for post-emergence application can be used in all tillage systems including direct drilling.

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
Preplant Incorporated				
Annual broadleaves	EPTC (<i>Eptam</i>)	3	3½ pt	<ul style="list-style-type: none"> • Incorporate into soil immediately after application. • Seed may be planted immediately after this operation. • Do not use when grass is seeded with legumes.
Annual grasses	benefin (<i>Balan</i>)	1½	3 qt	<ul style="list-style-type: none"> • See remarks above for EPTC.
Postemergence— all tillage systems				
Annual broadleaves	2,4-DB amine (<i>Butoxone 200</i> or <i>Butyrac 200</i>)	1	2 qt	<ul style="list-style-type: none"> • Apply postemergence when legume seedlings are at or beyond the 1 to 2 trifoliate leaf stage. • Can be used if an annual broadleaf problem develops after using <i>Eptam</i>, or <i>Balan</i>. • This treatment is not labeled for use with small grain companion crops. • Do not apply to sweet clover or established clovers grown for seed. • Do not graze or feed hay from forage for 60 days after application. • Do not apply when crop is under stress. • 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.

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ALFALFA, TREFOIL AND CLOVER SEEDINGS (continued)

(clear seedings without small grain companion crops)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>Postemergence — all tillage systems</i>				
Common Chickweed	Pronamide	%	1½ lb 50W	<ul style="list-style-type: none"> ● Apply in the fall following spring or summer seeding. ● Apply after soil temperature has dropped below 55°F. ● Do not graze for 120 days after application.
Volunteer Cereals	(Kerb)			

BIRDSFOOT TREFOIL (Only) – POSTEMERGENCE – ALL TILLAGE SYSTEMS

(clear seedings without small grain companion crops)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses	sethoxydim (Poast)	0.19	1 pt	<ul style="list-style-type: none"> ● Apply postemergence prior to first cutting. ● Treat small, actively growing grasses (crabgrass up to 4 in.; foxtail, fall panicum, witchgrass, barnyardgrass up to 8 in.). ● Use 5 to 20 gal of water/A and 40 to 60 psi. ● Avoid spray drift onto corn, sorghum, small grains, and turf. ● Rainfall within 1 hr of application will reduce control. ● Does not control nutsedge or broadleaved weeds. ● Do not apply within 7 days of feeding, grazing, or harvesting forage, or within 20 days of feeding or harvesting for hay. ● Do not apply more than 5 pt/A in one season. ● Poast rate can be reduced to ¾ pt/A for 1- to 4-in. barnyardgrass, green and giant foxtail, and fall panicum. ● Addition of liquid nitrogen fertilizer (28% N) at 1 gal/A or ammonium sulfate at 2½ lb/A will improve large crabgrass control.
		+	+	
	crop oil concentrate	1 qt	1 qt	
Volunteer corn	sethoxydim (Poast)	0.19	1 pt	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	+	+	+	
	28% liquid nitrogen OR ammonium sulfate	1 gal OR 2½ lb	1 gal OR 2½ lb	
Volunteer cereals (wheat, barley, oats, rye)	sethoxydim (Poast)	0.29	1½ pt	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	+	+	+	
	28% liquid nitrogen OR ammonium sulfate	1 gal OR 2½ lb	1 gal OR 2½ lb	

ALFALFA (Only) – POSTEMERGENCE – ALL TILLAGE SYSTEMS

(clear seedings without small grain companion crops)

Weed Controlled	Herbicide	Rate lb/A		Remarks and Limitations
		a.i.	Formulation/A	
Annual grasses	sethoxydim (<i>Poast</i>)	0.19	1 pt	<ul style="list-style-type: none"> ● Use on spring seedings. ● Apply postemergence prior to first cutting. ● Treat small, actively growing grasses (crabgrass up to 4 in.; foxtail, fall panicum, witchgrass, barnyardgrass up to 8 in.). ● Use 5 to 20 gal of water/A and 40 to 60 psi. ● Avoid spray drift onto corn, sorghum, small grains, and turf. ● Rainfall within 1 hr of application will reduce control. ● Does not control nutsedge or broadleaved weeds. ● 2,4-DB amine may be tank mixed with <i>Poast</i> or <i>Poast Plus</i> for broadleaf weed control. Temporary leaf burning may occur. Do not apply more than 0.5 lb a.i./A (1 qt/A) of 2,4-DB. Do not add fertilizer to this tank mix. See Remarks and Limitations for 2,4-DB. ● Do not apply within 7 days of feeding, grazing, or harvesting forage, or within 20 days of feeding or harvesting for hay. ● Do not apply more than 5 pt/A in one season. ● <i>Poast</i> rate can be reduced to 3/4 pt/A for 1- to 4-in. barnyardgrass, green and giant foxtail, and fall panicum. ● Addition of liquid nitrogen fertilizer (28% N) at 1 gal/A or ammonium sulfate at 2 1/2 lb/A will improve large crabgrass control.
	OR	OR	OR	
	sethoxydim (<i>Poast Plus</i>)	0.19	1.5 pt	
	+ crop oil concentrate	+ 1 qt	+ 1 qt	
Volunteer corn	sethoxydim (<i>Poast</i>)	0.19	1 pt	<ul style="list-style-type: none"> ● Use on spring seedings. ● Apply postemergence prior to first cutting. ● Treat actively growing corn up to a maximum of 20 in. tall. ● Use 5 to 20 gal of water/A and 40 to 60 psi. ● Avoid spray drift onto corn, sorghum, small grains, and turf. ● Rainfall within 1 hr of application will reduce control. ● Does not control nutsedge or broadleaved weeds. ● Do not apply within 7 days of feeding, grazing, or harvesting forage, or within 20 days of feeding or harvesting for hay. ● Do not apply more than 5 pt/A in one season.
	OR	OR	OR	
	sethoxydim (<i>Poast Plus</i>)	0.19	1.5 pt	
	+ crop oil concentrate	+ 1 qt	+ 1 qt	
	+ 28% liquid nitrogen	+ 1 gal	+ 1 gal	
	OR ammonium sulfate	OR 2 1/2 lb	OR 2 1/2 lb	
Volunteer cereals (wheat, barley, oats, rye)	sethoxydim (<i>Poast</i>)	0.29	1 1/2 pt	<ul style="list-style-type: none"> ● Use on spring or summer seedings. ● Apply postemergence prior to first cutting. ● Treat actively growing grass up to a maximum of 4 in. tall. ● Use 5 to 20 gal of water/A and 40 to 60 psi. ● Avoid spray drift onto corn, sorghum, small grains, and turf. ● Rainfall within 1 hr of application will reduce control. ● Does not control nutsedge or broadleaved weeds. ● Do not apply within 7 days of feeding, grazing, or harvesting forage, or within 20 days of feeding or harvesting for hay. ● Do not apply more than 5 pt/A in one season.
	OR	OR	OR	
	sethoxydim (<i>Poast Plus</i>)	0.25	2 pt	
	+ crop oil concentrate	+ 1 qt	+ 1 qt	
	+ 28% liquid nitrogen	+ 1 gal	+ 1 gal	
	OR ammonium sulfate	OR 2 1/2 lb	OR 2 1/2 lb	

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ALFALFA (Only) – POSTEMERGENCE – ALL TILLAGE SYSTEMS (continued)
(clear seedings without small grain companion crops)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	imazethapyr (<i>Pursuit</i>)	0.063	4 oz 2L OR 1.4 oz 70% DG	<ul style="list-style-type: none"> ● Apply after alfalfa has 2 fully expanded trifoliolate leaves. ● May be applied to spring or summer seedings. ● May be applied in spring or fall. ● Always add surfactant plus either 28% liquid nitrogen or spray grade ammonium sulfate (AMS). ● Treat when weeds are less than 3 in. in height. ● Will control several broadleaved weeds in new alfalfa seedings, including common chickweed. See Table 4D for details. ● Will suppress volunteer cereals. ● <i>Pursuit</i> is labeled for tank mixing with <i>2,4-DB</i>, <i>Poast Plus</i>, or <i>Buctril</i>. ● Tank mixing <i>Pursuit</i> with <i>Buctril</i> is not recommended due to increased risk of crop injury. ● Tank mixing <i>Pursuit</i> with <i>Poast Plus</i> may result in reduced grass control (grass antagonism).
	+ 28% liquid nitrogen OR ammonium sulfate + surfactant	+ 1 qt OR 2.5 lb + ¼%	+ 1 qt OR 2.5 lb + ¼%	
	bromoxynil (<i>Buctril</i>)	¼	1 pt 2L OR ½ pt Gel	<ul style="list-style-type: none"> ● Apply postemergence to spring or summer seedings. ● Apply after alfalfa has reached at least the 4 trifoliolate leaf stage. ● Do not treat when air temperatures exceed 70°F at the time of application or for 3 days following application or unacceptable crop injury may occur. ● Do not use any spray additives or increased injury will occur. ● Leaf burn following application is likely, but plants recover rapidly in favorable growing conditions. ● Warm, humid conditions enhance leaf burn. ● Do not treat when plants are under stress. ● Rate may be reduced to 1 pt per acre for greater crop safety (see label for weed sizes). ● With ground application, use a minimum of 20 gal of water/A and 30 psi. ● For best results, weeds must be small; see label for details. ● Redroot pigweed and wild mustard must be controlled when very small (refer to label for details). ● Weak on common chickweed. ● Do not graze or cut for feed for 30 days after application.

TABLE 4B – CHEMICAL WEED CONTROL IN ESTABLISHED FORAGES

ALFALFA (ESTABLISHED STAND – AT LEAST 1 YEAR OLD)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Yellow rocket and broadleaved winter annuals	metribuzin (Lexone or Sencor)	½	1 pt 4L OR ½ lb 75% DF	<ul style="list-style-type: none"> Apply to alfalfa established for one year or more. Apply to <i>dormant</i> alfalfa in late fall or early spring. Non-dormant alfalfa may be severely injured. Application rate varies, depending on soil type (see label). Sencor rate may be reduced to ½ pt per acre for common chickweed control.
	terbacil (Sinbar)	1	1¼ 80W	<ul style="list-style-type: none"> Apply to alfalfa established for one year or more. Apply to <i>dormant</i> alfalfa in late fall or early spring. See label for crop rotation restrictions. Early spring applications will control other broadleaf weeds and suppress quackgrass infestations. Application rate varies, depending on soil type (see label).
	hexazinone (Velpar)	½	0.6 lb 90W OR 1 qt 2L	<ul style="list-style-type: none"> Apply to alfalfa established for one year or more. Alfalfa plants should be healthy, vigorous, and not under stress by weather, insects, diseases, or extreme weed competition. The crop root system should be well established. Apply in late fall or early spring before alfalfa growth exceeds 2 in. Applications to <i>dormant</i> alfalfa provide the greatest crop safety. Application can be made between cuttings before regrowth exceeds 2 in. in height, but alfalfa injury may result if plants are under stress. Do not make more than one application in one growing season. Do not apply to seedling alfalfa or alfalfa-forage grass mixtures. Do not apply to snow-covered or frozen ground. Use at least 20 gal water/A for ground application. Do not graze or feed treated forage to livestock for 30 days following application. Rotational restriction: Corn may be planted 12 mo. following the last application, provided the soil is mold-board plowed prior to planting. Do not plant any other crop for 2 years after application. Application rate varies, depending on soil type (see label).
Dandelions	metribuzin (Lexone or Sencor)	1	1 qt 4L OR 1½ lb 75% DF	<ul style="list-style-type: none"> Apply to alfalfa established for one year or more. Apply in spring before alfalfa breaks dormancy. Non-dormant alfalfa may be severely injured. Perennial grasses may also be suppressed. Early spring applications will control other broadleaf weeds and suppress quackgrass infestations. Application rate varies, depending on soil type (see label).

(Continued on next page)

ALFALFA (ESTABLISHED STAND – AT LEAST 1 YEAR OLD) (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Dandelions	hexazinone (<i>Velpar</i>)	1	1.1 lb 90W OR 2 qt 2L	<ul style="list-style-type: none"> ● Apply to alfalfa established for one year or more. ● Alfalfa plants should be healthy, vigorous, and not under stress by weather, insects, diseases, or extreme weed competition. The crop root system should be well established. ● Apply in spring before alfalfa growth exceeds 2 in. Spring applications to <i>dormant</i> alfalfa provide the greatest crop safety. ● Application can be made between cuttings before regrowth exceeds 2 in. in height, but alfalfa injury may result if plants are under stress. Do not make more than one application in one growing season. ● Do not apply to seedling alfalfa or alfalfa-forage grass mixtures. ● Do not apply to snow-covered or frozen ground. ● Use at least 20 gal of water/A for ground application. ● Do not graze or feed treated forage to livestock for 30 days following application. ● Rotational restriction: Corn may be planted 12 mo. following the last application, provided the soil is mold-board plowed prior to planting. Do not plant any other crop for 2 years after application. ● Will also provide partial control of quackgrass. ● Application rate varies, depending on soil type (see label).
Hoary alyssum Annual broadleaves	2,4-DB amine (<i>Butoxone 200</i> or <i>Butyrac 200</i>)	1	2 qt	<ul style="list-style-type: none"> ● Apply in early April. ● Spray when hoary alyssum seedlings are in the 2- to 4-leaf stage. ● Do not graze or feed hay from forage for 30 days after application. ● Do not apply when crop is under stress. ● Do not apply when the daytime temperature is expected to exceed 90°F within the next 3 days. Do not apply if the temperature is expected to fall below 40°F shortly after treatment.
Quackgrass	pronamide (<i>Kerb</i>)	1½	3 lb	<ul style="list-style-type: none"> ● Apply in late fall when soil temperatures are below 55°F. ● For light to moderate quackgrass infestations, rate can be reduced to 1 lb a.i./A (2 lb/A of formulated product).

BIRDSFOOT TREFOIL (ESTABLISHED STAND)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Quackgrass	pronamide (<i>Kerb</i>)	1½	3 lb	<ul style="list-style-type: none"> ● Apply in late fall when soil temperatures are below 55°F. ● For light to moderate quackgrass infestations, rate can be reduced to 1 lb a.i./A (2 lb/A of formulated product).

GRASS PASTURE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Perennial broadleaves	2,4-D ester	1	1 qt	<ul style="list-style-type: none"> ● Apply in fall or spring to actively growing weeds. ● Legumes will be injured or killed. ● Do not graze animals on treated areas within 7 days after treatment.
	dicamba (Banvel)	1	1 qt	<ul style="list-style-type: none"> ● Legumes will be injured or killed. ● Apply in fall or spring to actively growing weeds. ● Treat when biennials are in the rosette stage. ● Remove meat animals from treated areas 30 days prior to slaughter. ● See label for timing restrictions for lactating dairy animals following treatment.
	2,4-D ester + dicamba (Banvel)	¾ + ¼	1½ pt + ½ pt	<ul style="list-style-type: none"> ● Legumes will be injured or killed. ● Apply in fall or spring to actively growing weeds. ● Observe harvest and grazing restrictions for both herbicides (see remarks and limitations above).

PREHARVEST APPLICATION — ALFALFA

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Quackgrass	Roundup Ultra	¾	1 qt	<ul style="list-style-type: none"> ● May be applied prior to the last harvest before reestablishment of the site. ● Fits fall application best. ● Alfalfa will be injured but not killed. ● Deep tillage following harvest will be required for complete kill of alfalfa and quackgrass. ● Does not fit no-tillage systems. ● Treat actively growing quackgrass at least 8 inches tall. ● Addition of ammonium sulfate (AMS) at 17 lbs/100 gal of water often improves control. ● Allow a minimum of 36 hours between application and harvest. ● A time interval of 3 days between application and harvest is recommended to allow maximum quackgrass control. ● Treated crop and weeds can be fed to livestock. ● Do not use on alfalfa grown for seed. ● See supplemental label for further details.

**TABLE 4C—
HARVEST RESTRICTIONS FOR FORAGE LEGUME HERBICIDES
(as indicated on the product labels)**

Herbicide	Restrictions
<i>Balan</i>	None.
<i>Buctril</i>	Do not cut for feed or graze spring-treated alfalfa within 30 days following treatment.
<i>Eptam</i>	None for preplant application.
<i>Kerb</i>	Do not graze or harvest for forage or dehydration within 120 days of application.
<i>Lexone/Sencor</i>	Do not graze or harvest within 28 days after application.
MCPA	Do not allow livestock to forage or graze treated areas within 7 days of slaughter.
<i>Poast</i>	Do not apply within 7 days of feeding, grazing, or harvesting forage, or within 20 days of feeding or harvesting for hay.
<i>Pursuit</i>	Do not feed, graze or harvest alfalfa for 30 days following application.
<i>Sinbar</i>	None.
2,4-DB	Do not graze established alfalfa or feed straw or hay from treated crops to livestock within 30 days after application. Do not graze or feed seedling alfalfa, clover or birdsfoot trefoil within 60 days after application.
<i>Velpar</i>	Do not graze or feed forage or hay to livestock within 30 days after application.
<i>Roundup Ultra</i>	Allow a minimum of 36 hours between application and harvest (alfalfa only).

TABLE 4D—WEED RESPONSE TO HERBICIDES IN FORAGES*

	MODE OF ACTION	CROP TOLERANCE**	ANNUAL BROADLEAVES											ANNUAL GRASSES						PERENNIALS							
			COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEEED (COMMON)	SMARTWEEED	VELVETLEAF	WILD MUSTARD	HOARY ALYSSUM	YELLOW ROCKET	CHICKWEEED (COMMON)	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	BINDWEEED (FIELD)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEDGE	DANDELION	CURLED DOCK
BALAN	O	2	N	N	G	N	G	N	P	N	P	P	P	P	E	E	E	E	E	E	G	N	N	N	P	N	N
BUCTRIL	O	3	G	G	E	G	F	G	G	G	F	F	F	P	N	N	N	N	N	N	N	P	P	N	N	P	P
EPTAM	O	2	P	P	G	P	F	F	F	F	F	F	F	F	E	E	E	E	E	E	E	N	N	F	P	N	P
KERB	O	1	P	P	P	P	P	P	P	P	P	P	P	G	F	F	P	F	P	P	P	N	N	G	N	N	P
LEXONE/SENCOR	C	3	E	G	E	N	E	E	E	E	E	E	E	E	G	G	G	E	E	G	G	N	N	P	P	G	P
MCPA	O	4	F	F	G	G	G	G	G	F	G	G	F	P	N	N	N	N	N	N	N	P	P	N	N	P	P
POAST or POAST PLUS	B	1	N	N	N	N	N	N	N	N	N	N	N	N	E	G	E	E	E	E	E	N	N	F	N	N	N
PURSUIT	A	2	E	F	P	G	E	F	G	G	G	-	G	G	F	F	G	G	G	F	F	P	P	N	F	P	P
SINBAR	C	3	G	G	G	G	G	G	G	G	G	E	E	E	G	G	G	G	G	G	G	P	F	F	P	F	P
2,4-DB	O	2	P	P	G	F	G	F	P	F	F	F	F	P	N	N	N	N	N	N	N	P	P	N	N	N	F
VELPAR	C	3	G	G	E	F	E	E	E	G	E	E	E	E	G	G	E	E	E	E	E	F	F	F	F	E	P

Herbicide Mode of Action: A = ALS Inhibitor; B = ACCase Inhibitor; C = Photosynthesis Inhibitor; O = Other

Herbicide Effectiveness: P = Poor; F = Fair; G = Good; E = Excellent; N = None; - = Not enough information to rank

*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.

**Crop Tolerance: 1=Minimal risk of crop injury; 2=Crop injury can occur under certain conditions (soil applied—cold, wet; foliar applied—hot, humid); 3=Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4=Risk of severe crop injury is high. Recommended only in rescue situations.

TABLE 5A—CHEMICAL WEED CONTROL IN DRY EDIBLE BEANS

DRY EDIBLE BEANS – PREPLANT

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses Yellow nutsedge Redroot pigweed Black nightshade	alachlor (<i>Lasso, Micro-Tech,</i> or <i>Partner</i>) OR metolachlor (<i>Dual, Dual II</i>) OR dimethenamid (<i>Frontier</i>)	2 OR 2 OR 1.17	2 qt OR 3 lb 65% DG OR 2 pt OR 20 oz 7.5 L OR 25 oz 6.0 L	<ul style="list-style-type: none"> Alachlor is a restricted use pesticide. Incorporate to 2-in. depth. DO NOT use alachlor on sands or loamy sands — injury can occur. REDUCE <i>Frontier</i> rate to 16 oz. (7.5L) and <i>Dual</i> rate to 1½ pt/A on coarse-textured soils low in organic matter (see labels). Navy and black beans have greater tolerance to <i>Dual</i> than to <i>Frontier</i>. This treatment is used for black nightshade control. Alachlor or <i>Dual</i> should be preplant incorporated to minimize danger of bean injury. Alachlor and <i>Frontier</i> will provide better nightshade and pigweed control than <i>Dual</i>. <i>Dual</i> will provide better yellow nutsedge control than alachlor. <i>Prowl, Treflan, or Sonalan</i> can be tankmixed for lambsquarters control. A postemergence application of <i>Basagran</i> or an application of <i>Pursuit</i> may be necessary for broadleaf weed control. See remarks for these herbicides.
Annual grasses Annual broadleaves (except nightshade, cocklebur, jimsonweed)	EPTC (<i>Eptam</i>) + trifluralin (<i>Treflan</i>) OR pendimethalin (<i>Prowl</i>) OR ethalfuralin (<i>Sonalan</i>)	2¼ + ½ OR ¾ OR ¾	1¼ qt + 1 pt OR 1.8 pt 3.3 EC OR 2 pt	<ul style="list-style-type: none"> Incorporate immediately after application. <i>Eptam</i> suppresses common ragweed and wild mustard. <i>Prowl</i> provides better velvetleaf control than <i>Treflan</i> or <i>Sonalan</i>. <i>Treflan</i> provides better pigweed control than <i>Prowl</i> or <i>Sonalan</i>. A postemergence application of <i>Basagran</i> or an application of <i>Pursuit</i> may be necessary for broadleaf weed control. See remarks for these herbicides.;

(Continued on next page)

DRY EDIBLE BEANS – PREPLANT (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations	
Annual broadleaves (except common ragweed, lambsquarters, smartweed, cocklebur, jimsonweed, and velvetleaf)	alachlor	2	2 qt	<ul style="list-style-type: none"> ● Alachlor is a restricted use pesticide. ● SEE PURSUIT SUPPLEMENTAL LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. DO NOT USE IF SUGAR BEETS ARE PLANNED IN THE CROP ROTATION. 	
	(Lasso, Micro-Tech, or Partner)		3 lb 65% DG		
Annual grasses	OR	OR	OR	<ul style="list-style-type: none"> ● Increase Pursuit to 3 oz/A (1.08 oz/A 70 DG) on heavy soils if organic matter is greater than 2% and weed pressure is high. ● DO NOT apply <i>Pursuit</i> if cold and/or wet conditions are present or predicted to occur within one week of application. ● Delayed maturity may result from <i>Pursuit</i> application. ● DO NOT apply if planting is delayed and chance of frost prior to maturity is likely to occur. ● Incorporate to a 2-in. depth. ● DO NOT use on sands or loamy sands — injury can occur. ● Reduce <i>Frontier</i> rate to 16 oz (7.5 L) and <i>Dual</i> rate to 1½ pt/A on coarse-textured soils low in organic matter (see labels). ● Navy and black beans have greater tolerance to <i>Dual</i> than to <i>Frontier</i>. ● For use on navy, black turtle, kidney, and cranberry beans ONLY. DO NOT apply to Domino black turtle beans. ● Bean varieties vary in sensitivity to <i>Pursuit</i>. ● Apply BEFORE JUNE 20. ● AVOID DRIFT AND SPRAY OVERLAP. ● This treatment is used for black nightshade control. ● <i>Pursuit</i> will only suppress common ragweed. ● <i>Dual</i> will provide better yellow nutsedge suppression than alachlor. 	
	metolachlor	2	2 pt		
	(Dual, Dual II)				
	OR	OR	OR		
	dimethenamid	1.17	20 oz 7.5 L		
	(Frontier)	OR	25 oz 6.0 L		
+	+	+			
imazethapyr	0.031	2 oz 2 L			
(Pursuit)		OR	0.72 oz 70 DG		
Annual broadleaves (including nightshade)	imazethapyr+ pendimethalin	0.47	20 oz	<ul style="list-style-type: none"> ● SEE PURSUIT PLUS SUPPLEMENTAL LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. DO NOT USE IF SUGAR BEETS ARE PLANNED IN THE CROP ROTATION. ● 20 oz of <i>Pursuit Plus</i> contains 1.1 pt of <i>Prowl</i> 3.3 EC. Under heavy annual grass pressure, control may not be adequate. ● Use 30 oz/A of <i>Pursuit Plus</i> on heavy soils if organic matter is greater than 2% and weed pressure is heavy. ● DO NOT apply <i>Pursuit Plus</i> if cold and/or wet conditions are present or predicted to occur within one week of application. ● Delayed maturity may result from <i>Pursuit Plus</i> application. ● DO NOT apply if planting is delayed and chance of frost prior to maturity is likely to occur. ● Incorporate immediately after application. ● DO NOT use on sands or loamy sands. ● For use on navy, black turtle, kidney, and cranberry beans ONLY. DO NOT apply to Domino black turtle beans. ● Bean varieties vary in sensitivity to <i>Pursuit Plus</i>. ● Apply BEFORE JUNE 20. ● Avoid DRIFT AND SPRAY OVERLAP. ● Yellow nutsedge will be suppressed by this treatment. ● Common ragweed will not be controlled by this treatment. 	
Annual grasses	(Pursuit Plus)				

(Continued on next page)

DRY EDIBLE BEANS – PREPLANT (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
	EPTC (<i>Eptam</i>)	2¼	1¼ qt	<ul style="list-style-type: none"> ● SEE <i>PURSUIT</i> SUPPLEMENTAL LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. DO NOT USE IF SUGARBEETS ARE PLANNED IN THE CROP ROTATION. ● Increase <i>Pursuit</i> to 3 oz/A (1.08 oz/A 70 DG) on heavy soils if organic matter is greater than 2% and weed pressure is high. ● DO NOT apply <i>Pursuit</i> if cold and/or wet conditions are present or predicted to occur within one week of application. ● Delayed maturity may result from <i>Pursuit</i> application. ● DO NOT apply if planting is delayed and chance of frost prior to maturity is likely to occur. ● Incorporate immediately after application. ● DO NOT use on sands or loamy sands. ● For use on navy, black turtle, kidney, and cranberry beans ONLY. DO NOT apply to Domino black turtle beans. ● Bean varieties vary in sensitivity to <i>Pursuit</i>. ● Apply BEFORE JUNE 20. ● Avoid DRIFT AND SPRAY OVERLAP. ● If <i>Eptam</i> is NOT applied, common ragweed control will be reduced. ● If <i>Treflan</i>, <i>Sonalan</i>, or <i>Prowl</i> is NOT applied, lambs-quarters control will be reduced. ● Yellow nutsedge will be suppressed by this treatment. ● A prepackaged mix of <i>Prowl</i> plus <i>Pursuit</i> is registered for use in dry beans (<i>Pursuit Plus</i>). See supplemental label.
	+	+	+	
	imazethapyr (<i>Pursuit</i>)	0.031	2 oz 2 L OR 0.72 oz 70 DG	
	+	+	+	
	trifluralin (<i>Treflan</i>)	½	1 pt	
	OR	OR	OR	
	pendimethalin (<i>Prowl</i>)	¾	1.8 pt 3.3 EC	
	OR	OR	OR	
	ethalfuralin (<i>Sonalan</i>)	¾	2 pt	

DRY EDIBLE BEANS – PREPLANT FOLLOWED BY PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Preplant incorporated				
Annual broadleaves (including nightshade)	EPTC (<i>Eptam</i>)	2¼	1¼ qt	<ul style="list-style-type: none"> ● Incorporate immediately after application. ● Follow with preemergence <i>Pursuit</i> for additional broad-leaf weed control IF CROP ROTATION PERMITS.
Annual grasses	+	+	+	
	trifluralin (<i>Treflan</i>)	½	1 pt	
	OR	OR	OR	
	pendimethalin (<i>Prowl</i>)	¾	1.8 pt 3.3 EC	
	OR	OR	OR	
	ethalfuralin (<i>Sonalan</i>)	¾	2 pt	

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DRY EDIBLE BEANS – PREPLANT FOLLOWED BY PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
FOLLOWED BY Preemergence	imazethapyr (<i>Pursuit</i>)	0.031	2 oz 2 L OR 0.72 OZ 70 DG	<ul style="list-style-type: none"> ● SEE <i>PURSUIT</i> SUPPLEMENTAL LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. DO NOT USE IF SUGARBEETS ARE PLANNED IN THE CROP ROTATION. ● Increase <i>Pursuit</i> to 3 oz/A (1.08 oz/A 70 DG) on heavy soils if organic matter is greater than 2% and weed pressure is high. ● DO NOT apply <i>Pursuit</i> if cold and/or wet conditions are present or predicted to occur within one week of application. ● Delayed maturity may result from <i>Pursuit</i> application. ● DO NOT apply if planting is delayed and chance of frost prior to maturity is likely to occur. ● Requires rainfall for activation. Rotary hoe if no rainfall occurs within 7 days. ● DO NOT use on sands or loamy sands. ● For use on navy, black turtle, kidney, and cranberry beans ONLY. DO NOT apply to Domino black turtle beans. ● Bean varieties vary in sensitivity to <i>Pursuit</i>. ● Apply BEFORE JUNE 20. ● Avoid DRIFT AND SPRAY OVERLAP. ● Yellow nutsedge will be suppressed by this treatment.

DRY EDIBLE BEANS – PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses Yellow Nutsedge Redroot Pigweed Black Nightshade	metolachlor (<i>Dual, Dual II</i>) OR dimethenamid (<i>Frontier</i>)	2 OR 1.17	2 pt OR 20 oz 7.5 L OR 25 oz 6.0 L	<ul style="list-style-type: none"> ● Reduce <i>Dual</i> rate to 1.5 pt/A and <i>Frontier</i> rate to 16 oz/A (7.5 L) on coarse textured soils low in organic matter (see labels). ● Navy and black beans have greater tolerance to <i>Dual</i> than to <i>Frontier</i>. ● Danger of bean injury is greater when <i>Dual</i> is applied preemergence. ● <i>Frontier</i> will provide better black nightshade control than <i>Dual</i>. <i>Dual</i> will provide better yellow nutsedge control than <i>Frontier</i>. ● Requires rainfall for activation. Rotary hoe if no rainfall occurs within 7 days. ● A postemergence application of <i>Basagran</i> or <i>Pursuit</i> may be necessary for broadleaf weed control. See remarks for these herbicides.

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DRY EDIBLE BEANS – PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (except common ragweed, lambsquarters, smartweed, cocklebur, jimsonweed, and velvetleaf)	metolachlor (<i>Dual, Dual II</i>)	2	2 pt	<ul style="list-style-type: none"> ● SEE <i>PURSUIT</i> SUPPLEMENTAL LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. DO NOT USE IF SUGARBEETS ARE PLANNED IN THE CROP ROTATION. ● Increase <i>Pursuit</i> to 3 oz/A (1.08 oz/A of 70 DG) on heavy soils if soil organic matter is greater than 2% and weed pressure is high. ● DO NOT apply <i>Pursuit</i> if cold and/or wet conditions are present or predicted to occur within one week of application. ● Delayed maturity may result from <i>Pursuit</i> application. ● DO NOT apply if planting is delayed and chance of frost prior to maturity is likely to occur. ● Reduce <i>Frontier</i> rate to 16 oz/A (7.5 L) and <i>Dual</i> rate to 1½ pt/A on coarse-textured soils low in organic matter (see labels). ● Navy and black beans have greater tolerance to <i>Dual</i> than to <i>Frontier</i>. ● Danger of bean injury is greater when <i>Dual</i> is applied preemergence. ● Requires rainfall for activation. Rotary hoe if no rainfall occurs within 7 days. ● For use on navy, black turtle, kidney, and cranberry beans ONLY. DO NOT apply to Domino black turtle beans. ● Bean varieties vary in sensitivity to <i>Pursuit</i>. ● DO NOT USE on sands and loamy sands. ● AVOID DRIFT, AVOID SPRAY OVERLAP. Sensitive crops may be injured. ● Apply BEFORE JUNE 20.
	OR	OR	OR	
Annual grasses	dimethenamid (<i>Frontier</i>)	1.17	20 oz 7.5 L OR 25 oz 6.0 L	
	+	+	+	
	imazethapyr (<i>Pursuit</i>)	0.031	2 oz 2 L OR 0.72 oz 70 DG	

DRY EDIBLE BEANS – POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves (including cocklebur, velvetleaf, and jimsonweed)	bentazon (<i>Basagran</i>)	¾	1½ pt	<ul style="list-style-type: none"> ● Controls only certain broadleaves. POOR CONTROL OF REDROOT PIGWEED AND BLACK NIGHTSHADE. Fair control of common ragweed and common lambsquarters. ● Check the <i>Basagran</i> drybean label for specific rate and proper weed growth stage. ● Beans MUST HAVE 1 to 2 trifoliolate leaves before application. ● Use a minimum of 40 psi and 20 gal of water/A. Do not use flood nozzles. ● Use 1 gal of 28% liquid nitrogen (urea ammonium nitrate)/A INSTEAD OF crop oil concentrate for improved velvetleaf control. Do not use 28% liquid nitrogen if lambsquarters is present. ● Do not apply if dry beans are under stress from herbicide injury, cold or dry weather, or hail damage. ● Split applications of <i>Basagran</i> provide more consistent control of common ragweed and lambsquarters than a single application. Redroot pigweed control will be fair; black nightshade control poor. ● Time application for weed size. Make the first application when weeds are less than 1 in. tall (pigweed less than ½ in. tall). Make a second application 10 days later. ● Use a minimum of 40 psi and 20 gal of water/A. Do not use flood nozzles. ● For application to navy, pinto, kidney, and great Northern beans.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	bentazon (<i>Basagran</i>)	0.5 + 0.5	1 pt + 1 pt	
	+	+	+	
	crop oil concentrate	1 pt + 1 pt	1 pt + 1 pt	

DRY EDIBLE BEANS – POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Redroot Pigweed Black Nightshade Wild Mustard	imazethapyr (<i>Pursuit</i>)	0.031	2 oz 2 L OR	<ul style="list-style-type: none"> ● SEE <i>PURSUIT</i> SUPPLEMENTAL LABEL OR TABLE 11 FOR CROP ROTATION RESTRICTIONS. DO NOT USE IF SUGARBEETS ARE PLANNED IN THE CROP ROTATION. ● DO NOT apply to pinto beans. ● DO NOT add 28% liquid nitrogen or ammonium sulfate. ● DO NOT apply if chance of frost prior to maturity is likely. ● Apply before July 10. ● Apply when broadleaf weeds are less than 2 inches tall.
	+	+	+	
	surfactant	¼%	0.72 oz 70 DG ¼%	
Annual grasses	sethoxydim (<i>Poast</i>)	0.19	1 pt	<ul style="list-style-type: none"> ● Apply to annual grasses up to 8 in. (crabgrass up to 6 in.) ● Poast can be reduced to ¾ pt/A for 1- to 4-in. barnyard grass, green and giant foxtails, and fall panicum. ● Do not apply to grasses under stress or poor weed control may result. ● Use a minimum of 5 gal of water/A and a maximum of 20 gal of water/A, and 40 to 60 psi. ● No soil activity. ● Do not cultivate within 5 days prior to and 7 days following application. ● Do not apply within 30 days of harvest. ● DO NOT tank mix with <i>Pursuit</i> as poor grass control will result.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	sethoxydim (<i>Ultima 160</i>)	0.20	20 oz	<ul style="list-style-type: none"> ● Apply to annual grasses up to 8 in. (crabgrass up to 6 in.) ● Do not apply to grasses under stress or poor weed control may result. ● Use a minimum of 5 gal of water/A and a maximum of 20 gal of water/A, and 40 to 60 psi. ● No soil activity. ● Do not cultivate within 5 days prior to and 7 days following application. ● Do not apply within 30 days of harvest. ● DO NOT tank mix with <i>Pursuit</i> as poor grass control will result.
	+	+	+	
	<i>Dash HC</i> OR	1 pt OR	1 pt OR	
	methylated seed oil	24 oz	24 oz	
	quizalofop-P-ethyl (<i>Assure II</i>)	0.044	7 oz	<ul style="list-style-type: none"> ● Apply to annual grasses up to 4 in. ● DO NOT apply to grasses under stress or poor weed control may result. ● Apply in 10 to 20 gal. of water/A using standard fan or hollow cone nozzle. ● No soil activity. ● DO NOT cultivate within 5 days prior to and 7 days following application. ● Allow 30 days between <i>Assure II</i> application and dry bean harvest. ● <i>Assure II</i> can be tank mixed with <i>Basagran</i> for control of foxtails and barnyardgrass only. Increase the recommended rate of <i>Assure II</i> by 2 oz. ● DO NOT tank mix with <i>Pursuit</i> as poor grass control will result.
	+	+	+	
	crop oil concentrate OR	1% OR	1% OR	
	surfactant	¼%	¼%	
Quackgrass	quizalofop-P-ethyl (<i>Assure II</i>)	0.0625	10 oz	<ul style="list-style-type: none"> ● Make application when quackgrass is 6 to 10 in. tall. ● Two applications may be needed for best quackgrass control. Make second application of 7 oz/A 14 to 21 days later when quackgrass has reached 4 to 8 in. Cultivation may replace second application. ● Use 10 to 20 gal. of water /A and standard fan or hollow cone nozzles. ● DO NOT apply to quackgrass under stress or poor control may result. ● DO NOT apply within 30 days of harvest. ● DO NOT tank mix with <i>Pursuit</i> as poor grass control will result.
	+	+	+	
	crop oil concentrate OR	1% OR	1% OR	
	surfactant	¼%	¼%	

(Continued on next page)

DRY EDIBLE BEANS – POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Quackgrass	sethoxydim (Poast)	0.29 + 0.19	1½ pt + 1 pt	<ul style="list-style-type: none"> ● TWO APPLICATIONS MAY BE NECESSARY FOR QUACKGRASS CONTROL. Make a second application of 1 pt/A 14 to 21 days following initial treatment. Cultivation may replace second application. ● Do not cultivate within 5 days prior to and 14 to 21 days following application. ● Use a minimum of 5 gal of water/A and a maximum of 20 gal of water/A, and 40 to 60 psi. ● Treat actively growing quackgrass 6- to 8-in. tall. ● Do not apply to quackgrass under stress or poor control may result. ● Do not apply within 30 days of harvest.
	+ crop oil concentrate	+ 1 qt + 1 qt	+ 1 qt + 1 qt	
	+ 28% liquid nitrogen OR ammonium sulfate	+ 1 gal + 1 gal OR 2½ lb+2½ lb	+ 1 gal + 1 gal OR 2½ lb+2½ lb	
	sethoxydim (Ultima 160)	0.3 + 0.2	30 oz + 20 oz	<ul style="list-style-type: none"> ● TWO APPLICATIONS MAY BE NECESSARY FOR QUACKGRASS CONTROL. Make a second application of 20 oz/A 14 to 21 days following initial treatment. Cultivation may replace second application. ● Do not cultivate within 5 days prior to and 14 to 21 days following application. ● Use a minimum of 5 gal of water/A and a maximum of 20 gal of water/A, and 40 to 60 psi. ● Treat actively growing quackgrass 6- to 8-in. tall. ● Do not apply to quackgrass under stress or poor control may result. ● Do not apply within 30 days of harvest.
	+ Dash HC OR methylated seed oil	+ 1 pt + 1 pt OR 24 oz+24 oz	+ 1 pt + 1 pt OR 24 oz+24 oz	
Nutsedge Canada thistle	bentazon (Basagran)	¾ + ¾	1½ pt + 1½ pt	<ul style="list-style-type: none"> ● See remarks for nutsedge control in "Soybeans – Post-emergence." ● Beans must have 1 to 2 trifoliolate leaves before application.
	+ crop oil concentrate	+ 1 qt + 1 qt	+ 1 qt + 1 qt	

TABLE 5B—VINE DESICCATION IN DRY EDIBLE BEANS

Dry Bean Vine Desiccation	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
	sodium chlorate (Defol 6)	6	1 gal 6L	<ul style="list-style-type: none"> • Crop should be fully mature at the time of application. • Add non-ionic surfactant (½%) or crop oil concentrate (1%) to enhance results. • DO NOT add any other chemicals to the spray tank – a fire or explosion may result. • Apply 1 gal/A by air in 5 to 10 gal of water/A or 1 gal/A by ground in 10 to 20 gal of water/A. • Apply on a clear, sunny day with high temperatures and humidity for best results. • Harvest 7 to 10 days following application or regrowth may occur.
	paraquat (Gramoxone Extra) + non-ionic surfactant	0.31-0.47 + ¼%	1-1½ pt + ¼%	<ul style="list-style-type: none"> • Gramoxone Extra is a restricted use pesticide. • Apply when crop is mature and at least 80% of the pods are yellowing and mostly ripe. No more than 40% (bush-type beans) or 30% (vine-type beans) of the leaves still green in color. • Apply by air in 5 gal of water/A or by ground in 20 to 40 gal of water/A. • If growth is lush and vigorous, make either a single application of 1½ pt/A or a split application of ¾ pt/A followed by ¾ pt/A. Do not exceed 1½ pt/A. • Do not harvest within 7 days of application.
	urea sulfuric acid (Enquik) + non-ionic surfactant	– + ¼%	5 to 10 gal + ¼%	<ul style="list-style-type: none"> • DANGER – CORROSIVE. Protective clothing and eyewear required. • Special spray equipment required. SEE LABEL. • Apply at 50 to 60 psi in 5 to 20 gal of water/A with ground equipment ONLY. • Application effect will be evident within 24 hours. • Make a second application two days later, if necessary. Do not exceed a total of 10 gal of Enquik per season. • Will desiccate some broadleaf weeds.

**TABLE 5C – WEED RESPONSE TO HERBICIDES
IN DRY EDIBLE BEANS***

	MODE OF ACTION	CROP TOLERANCE	ANNUAL BROADLEAVES										ANNUAL GRASSES								PERENNIALS				
			COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	FRAGWEED (COMMON)	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	SANDBUR	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEDGE	
Preplant Incorporated																									
DUAL	O	2	N	N	P	F	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	G	
EPTAM	O	2	P	P	G	P	F	F	F	F	F	E	E	E	E	E	E	E	G	N	N	N	F	F	
FRONTIER	O	3 ^a	N	N	P	G	G	P	P	N	P	E	E	E	E	E	G	G	P	N	N	N	N	F	
LASSO	O	3	N	N	P	G	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	F	
PROWL	O	1	N	N	G	P	F	P	P	F	P	E	E	E	E	E	E	E	G	N	N	N	N	N	
PURSUIT	A	3	F	F	P	E	E	P	F	F	G	P	P	F	F	F	P	P	P	N	N	N	N	F	
SONALAN	O	1	N	N	G	F	G	P	P	N	P	E	E	E	E	E	E	E	G	N	N	N	N	N	
TREFLAN	O	1	N	N	G	N	G	N	P	N	P	E	E	E	E	E	E	E	G	N	N	N	N	N	
PURSUIT PLUS	O/A	3	F	F	G	E	E	P	F	F	G	E	E	E	E	E	E	E	G	N	N	N	N	F	
Preemergence																									
FRONTIER	O	3 ^a	N	N	P	G	G	P	P	N	P	E	E	E	E	E	G	G	P	N	N	N	N	F	
DUAL	O	2	N	N	P	F	G	P	P	N	P	E	E	E	E	E	G	G	F	N	N	N	N	F	
PURSUIT	A	3	P	P	P	E	E	P	F	P	G	P	P	F	F	F	P	P	P	N	N	P	N	F	
Postemergence																									
BASAGRAN	O	2	E	G	F	P	P	F	G	G	E	N	N	N	N	N	N	N	N	N	N	G	N	G	
POAST/ULTIMA 160	B	1	N	N	N	N	N	N	N	N	N	E	G	E	E	E	E	E	E	N	N	N	F	N	
ASSURE II	B	1	N	N	N	N	N	N	N	N	N	G	G	E	E	E	E	E	E	N	N	N	E	N	
PURSUIT**	A	3	F	P	P	E	E	P	P	P	G	P	P	F	P	P	P	P	P	N	N	P	N	P	
BASAGRAN+PURSUIT**	O/A	2	E	G	F	E	E	F	G	G	E	P	P	F	P	P	P	P	P	N	N	G	N	G	

Herbicide mode of Action: A = ALS inhibitor; B = ACCase inhibitor; C = Photosynthesis inhibitor; O = Other.
P = Poor; F = Fair; **G** = Good; **E** = Excellent; N = None

Crop Tolerance: 1 = Minimal risk of crop injury; 2 = Crop injury can occur under certain conditions (soil applied — cold, wet; foliar applied — hot, humid);
3 = Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4 = Risk of severe crop injury is high. Recommended only in rescue situations.

*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.

**See 1996 Supplemental Label.

^a Crop tolerance for navy and black beans = 3. For other bean classes crop tolerance = 2.

TABLE 6A—CHEMICAL WEED CONTROL IN POTATOES

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Quackgrass	glyphosate (Roundup Ultra)	1½	2 qt	<ul style="list-style-type: none"> • Apply to actively growing quackgrass at least 8 in. tall. • Use 15 to 20 gal of water/A. • No soil residue. • Can plow or till and plant crop 3 days after application. • Do not plow or till prior to treatment. • Emerged potatoes are very sensitive to Roundup Ultra damage. Do not use near growing potato plants. • Heavy stand of rye cover may reduce quackgrass control. • Roundup Ultra rate of 1 qt may be used for single season quackgrass control. Apply 1 qt in 5 to 10 gal of water/A.

POTATO – PREPLANT FOLLOWED BY DELAYED PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses Annual broadleaves Preplant incorporated	EPTC (Eptam)	4	4½ pt	<ul style="list-style-type: none"> • Work into soil immediately after application. • Use 6¾ pt/A if nutsedge is a problem. • Preplant incorporated.
FOLLOWED BY:				
Delayed preemergence	linuron (Lorox or Linex)	1	1 qt 4L OR 2 lb 50% DF	<ul style="list-style-type: none"> • Delayed preemergence. • Treatment should be made prior to potato emergence and to germinating weeds or weeds that have emerged but are very small.
	OR metribuzin (Lexone or Sencor)	OR ½	OR 1 pt 4L OR ¾ lb 75% DF OR ¾ lb Sencor Solupak	<ul style="list-style-type: none"> • A preemergence application of metribuzin to Atlantic and and Shepody varieties is not recommended because injury can occur, especially under adverse weather conditions and when high metribuzin rates are used. • DO NOT use Matrix on potatoes grown for seed. • DO NOT use Matrix preemergence on soils with greater than 6% organic matter. • Adding Matrix will provide additional annual grass and redroot pigweed control and will suppress cocklebur. • If small weeds have emerged, add nonionic surfactant at ¼% (1 pt/100 gal. water).
	OR metribuzin (Lexone or Sencor)	OR ½	OR 1 pt 4 L OR ¾ lb 75% DF OR ¾ lb Sencor Solupak	
	+ rimsulfuron (Matrix)	+ 0.024	+ 1.5 oz	

POTATOES – EARLY PREEMERGENCE FOLLOWED BY DELAYED PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses (especially barnyard grass)	metolachlor (Dual, Dual II)	2	2 pt	<ul style="list-style-type: none"> • If field leveling is necessary, it should be done soon after planting.
Annual broadleaves Early preemergence	OR pendimethalin (Prowl)	OR ¾	OR 1.8 pt 3.3 EC	<ul style="list-style-type: none"> • Apply early preemergence – make application soon after planting. • Most effective on germinating grasses that have not emerged. • Do not use Prowl on muck soils or loamy sands with less than 1½% organic matter. • Follow with Lexone or Sencor, or Lorox or Linex, or Lexone/Sencor plus Matrix.

(Continued on next page)

POTATOES – EARLY PREEMERGENCE FOLLOWED BY DELAYED PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
FOLLOWED BY: Delayed Preemergence				
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	½	1 pt 4L OR ¾ lb 75% DF OR ¾ lb <i>Sencor Solupak</i>	<ul style="list-style-type: none"> • These treatments follow <i>Prowl</i> or <i>Dual</i> preemergence. • Delayed preemergence. • Apply before potato emergence. • Most effective on germinating and small emerged weeds. • A preemergence application of metribuzin to Atlantic or Shepody varieties is not recommended because injury can occur, especially under adverse weather conditions and where high metribuzin rates are used. • DO NOT use <i>Matrix</i> on potatoes grown for seed. • DO NOT use <i>Matrix</i> preemergence on soils with greater than 6% organic matter. • Adding <i>Matrix</i> will provide additional annual grass and redroot pigweed control and will suppress cocklebur. • If small weeds have emerged, add nonionic surfactant at ¼% (1 pt/100 gal. water).
	OR linuron (<i>Lorox</i> or <i>Linex</i>)	OR 1	OR 1 qt 4L OR 2 lb 50% DF	
	OR metribuzin (<i>Lexone</i> or <i>Sencor</i>)	OR ½	OR 1 pt 4 L OR ¾ lb 75% DF OR ¾ lb <i>Sencor Solupak</i>	
	+ rimsulfuron (<i>Matrix</i>)	+ 0.024	+ 1.5 oz	

POTATOES – DELAYED PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses Yellow nutsedge	linuron (<i>Lorox</i> or <i>Linex</i>)	1½	1½ qt 4L OR 3 lb 50% DF	<ul style="list-style-type: none"> • If field leveling is necessary, it should be done soon after planting to allow weed emergence before spraying. • Apply delayed preemergence before grasses are 2 in. and broadleaves are 4 in., but BEFORE POTATOES EMERGE. • On soils with greater than 5% organic matter, apply 2 lb a.i./A to emerged weeds.
	+ metolachlor (<i>Dual</i> , <i>Dual II</i>)	+ 2	+ 2 pt	
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	½	1 pt 4L OR ¾ lb 75% DF OR ¾ lb <i>Sencor Solupak</i>	<ul style="list-style-type: none"> • Use up to 1 lb a.i. metribuzin/A on high organic (muck) soil. • If field leveling is necessary, it should be done soon after planting to allow weed emergence before spraying. • Apply delayed preemergence before weeds are 1 in. and before potatoes emerge. • A preemergence application of metribuzin to Atlantic or Shepody varieties is not recommended because injury can occur, especially under adverse weather conditions and where high metribuzin rates are used.
	+ metolachlor (<i>Dual</i> , <i>Dual II</i>)	+ 2	+ 2 pt	
	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	½	1 pt 4 L OR ¾ lb 75% DF OR ¾ lb <i>Sencor Solupak</i>	<ul style="list-style-type: none"> • If field leveling is necessary, it should be done soon after planting to allow weed emergence before spraying. • Apply delayed preemergence before weeds are 1 in. and before potatoes emerge. • A preemergence application of metribuzin to Atlantic or Shepody varieties is not recommended because injury can occur, especially under adverse weather conditions and where high metribuzin rates are used. • DO NOT use <i>Matrix</i> on potatoes grown for seed. • DO NOT use <i>Matrix</i> preemergence on soils with greater than 6% organic matter. • Adding <i>Matrix</i> will provide additional annual grass and redroot pigweed control and will suppress cocklebur.
	+ rimsulfuron (<i>Matrix</i>)	+ 0.024	+ 1.5 oz	
	+ metolachlor (<i>Dual</i> , <i>Dual II</i>)	+ 2	+ 2 pt	

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POTATOES – POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses	metribuzin (<i>Lexone</i> or <i>Sencor</i>)	¼	½ pt 4L OR ½ lb 75% DF OR ½ lb <i>Sencor Solupak</i>	<ul style="list-style-type: none"> ● Do not apply postemergence within 3 days after periods of cool, wet or cloudy weather or crop injury may occur. ● Treat when weeds are less than 1 in. tall. ● Greater possibility of injury to potatoes when sprayed at 12- to 15-in. stages. ● Not recommended on Atlantic, Shepody, Chip Belle, Bell Chip, or Centennial varieties. ● Not recommended for early-maturing varieties such as Superior. ● Not recommended for red skinned varieties. ● Do not apply postemergence within 60 days of harvest. ● Metribuzin at ½ lb DF/A can be tank mixed with <i>Poast</i> or <i>Ultima 160</i> for annual grass and broadleaf weed control on russet or white-skinned potatoes that are NOT early maturing. See <i>Poast/Ultima 160</i> remarks for the recommendation rate. Add crop oil concentrate at 2 pt/A. Crop injury may occur.
Redroot pigweed Wild mustard Annual grasses	rimsulfuron (<i>Matrix</i>) + nonionic surfactant	0.0156 + ¼%	1 oz + ¼%	<ul style="list-style-type: none"> ● DO NOT use <i>Matrix</i> on potatoes grown for seed. ● DO NOT apply postemergence within 60 days of harvest. ● DO NOT apply by air. ● Apply to small weeds less than 1 inch in height (quackgrass 4–6') that are actively growing. ● For control of redroot pigweed, mustard, and annual grasses. ● Suppression of wild buckwheat, yellow nutsedge, quackgrass, and volunteer cereals.
Annual broadleaves Annual grasses	metribuzin (<i>Lexone</i> or <i>Sencor</i>) + rimsulfuron (<i>Matrix</i>) + nonionic surfactant	¼ + 0.0156 + ¼%	1/3 lb 75% DF OR ½ lb <i>Sencor Solupak</i> + 1 oz + ¼%	<ul style="list-style-type: none"> ● DO NOT use <i>Matrix</i> on potatoes grown for seed. ● Do not apply postemergence within 3 days after periods of cool, wet or cloudy weather or crop injury may occur. ● Treat when weeds are less than 1 in. tall. ● Greater possibility of injury to potatoes when sprayed at 12 to 15-in stages. ● Not recommended on Atlantic, Shepody, Chip Belle, Bell Chip, or Centennial varieties. ● Not recommended for early maturing varieties such as Superior. ● Not recommended for red skinned varieties. ● Do not apply postemergence within 60 days of harvest. ● Add nonionic surfactant at ¼% (1 pint per 100 gal. water). ● <i>Matrix</i> will improve control of annual grasses, redroot pigweed, triazine resistant lambsquarters, wild buckwheat, and yellow nutsedge and quackgrass.
Annual grasses Redroot pigweed	metolachlor (<i>Dual</i> , <i>Dual II</i>)	2	2 pt	<ul style="list-style-type: none"> ● Will not control emerged weeds. ● Do not apply within 40 days of harvest. ● Do not apply to potatoes at green tip (cracking).

(Continued on next page)

POTATOES – POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A	Formulation/A	Remarks and Limitations
		a.i.		
<i>(continued)</i>				
Annual broadleaves	metolachlor	2	2 pt	<ul style="list-style-type: none"> ● Refer to remarks for metribuzin postemergence. ● APPLICATION should be made ONLY as a directed or semi-DIRECTED spray to avoid chlorosis, minor necrosis, and leaf distortion.
Annual grasses	(Dual, Dual II)			
	+	+	+	
	metribuzin	¼	½ pt 4L	
	(Lexone or Sencor)		OR	
			½ lb 75% DF	
			OR	
			½ lb Sencor Solupak	
Annual grasses	sethoxydim	0.19	1 pt	<ul style="list-style-type: none"> ● Apply to annual grasses up to 8 in. (crabgrass up to 6 in.). ● <i>Poast/Ultima 160</i> can be reduced to ¼ pt/A for 1- to 4-in. barnyard-grass, green and giant foxtails, and fall panicum. ● Do not apply to grasses under stress or poor weed control may result. ● Use a minimum of 5 gal of water/A and a maximum of 20 gal of water/A, and 40 to 60 psi. ● No soil activity. ● Do not cultivate within 5 days prior to and 7 days following application. ● Metribuzin at ½ lb DF/A can be tank mixed with <i>Poast/Ultima 160</i> for annual grass and broadleaf weed control on russet or white-skinned potatoes that are NOT early maturing. ● Add crop oil concentrate at 2 pt/A. Crop injury may occur. ● Wait 1 day after <i>Poast/Ultima 160</i> application before applying metribuzin. Wait a minimum of 7 days after metribuzin before applying <i>Poast/Ultima 160</i>. ● Do not apply within 30 days of harvest.
	(Poast)			
	OR	OR	OR	
	(Ultima 160)	0.2	20 oz	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
Quackgrass	sethoxydim	0.29 + 0.19	1½ pt + 1 pt	<ul style="list-style-type: none"> ● TWO APPLICATIONS MAY BE NECESSARY FOR QUACKGRASS CONTROL. Make a second application of 1 pt/A 14 to 21 days following initial treatment. Cultivation may replace second application. ● Do not cultivate within 5 days prior to and 14 to 21 days following application. ● Use a minimum of 5 gal of water/A and a maximum of 20 gal of water/A, and 40 to 60 psi. ● Treat actively growing quackgrass 6 to 8 in. tall. ● Do not apply to quackgrass under stress or poor control may result. ● Wait 1 day after <i>Poast/Ultima 160</i> application before applying metribuzin. Wait a minimum of 7 days after metribuzin before applying <i>Poast/Ultima 160</i>. ● Do not apply within 30 days of harvest.
	(Poast)			
	OR	OR	OR	
	(Ultima 160)	0.3 + 0.2	30 oz + 20 oz	
	+	+	+	
	crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt	
	+	+	+	
	28% liquid nitrogen	1 gal + 1 gal	1 gal + 1 gal	
	OR	OR	OR	
	ammonium sulfate	2.5 lb + 2.5 lb	2.5 lb + 2.5 lb	
Volunteer cereals	sethoxydim	0.29	1½ pt	<ul style="list-style-type: none"> ● Apply before tillering (up to 4 in.). ● See remarks for annual grass control with <i>Poast/Ultima 160</i>. ● <i>Poast/Ultima 160</i> is NOT recommended for spring control of cereals that emerged the previous fall.
	(Poast)			
	OR	OR	OR	
	(Ultima 160)	0.3	30 oz	
	+	+	+	
	crop oil concentrate	1 qt	1 qt	

TABLE 6B—VINE DESICCATION IN POTATOES

Potato Vine Desiccation	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
	diquat (<i>Diquat</i>) + surfactant	¼ + ¼%	1 pt + ¼%	<ul style="list-style-type: none"> • Add a non-ionic surfactant (1/4%). • Make a second application of 1 pt/A a minimum of 5 days later if vine growth is dense. • For Russet Burbank ONLY, a total of 3 pt/A may be applied, with not more than 2 pt/A at a single application. Allow 5 days between applications. You must have a 24C label for this application in your possession. • Apply at 50 psi or less in 20 to 100 gal of clean water/A. Greater water volumes will provide more thorough coverage of heavy vine growth. • Apply at least 7 days before harvest. • No soil persistence. A cover crop can be planted immediately.
	endothall (<i>Des-i-cate</i>) + crop oil concentrate	0.78 + ¼%	1½ gal + ¼%	<ul style="list-style-type: none"> • DO NOT add crop oil concentrate if temperatures are high and/or the field is moisture stressed. • Increase application rate to 2 gal/A if vine growth is lush and dense, or if weather conditions are cool and cloudy. • Apply at 50 psi or less in 20 to 100 gal of water/A. • Apply at least 10 days before harvest.
	paraquat (<i>Gramoxone Extra</i>) + surfactant	0.31-0.47 + ¼%	1-1.5 pt + ¼%	<ul style="list-style-type: none"> • <i>Gramoxone Extra</i> is a restricted use pesticide. • DO NOT USE to desiccate potato vines when potatoes are to be stored or used for seed. • DO NOT USE on muck soils. • Apply at 50 psi or less in 50 gal of clean water/A. • Split applications of 0.75 pt/A for the first application and repeated 5 to 7 days later is suggested for dense vine canopies.
	urea sulfuric acid (<i>Enquik</i>)	—	20 gal	<ul style="list-style-type: none"> • DANGER – CORROSIVE. Protective clothing and eyewear required. • Special spray equipment required. SEE LABEL. • Apply in 20 gal of water/A (total spray volume of 40 gal/A) at 50 psi. • Split applications of 15 gal of <i>Enquik</i>/A in 25 gal of water/A for the first application and repeated 2 days later is suggested for dense vine canopies.

TABLE 6C – WEED RESPONSE TO HERBICIDES IN POTATOES*

	MODE OF ACTION	CROP TOLERANCE	ANNUAL BROADLEAVES										ANNUAL GRASSES							PERENNIALS													
			COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEEED (COMMON)	SMARTWEEED	VELVETLEAF	WILD MUSTARD	WILD BUCKWHEAT	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	SANDBUR	BINDWEEED (FIELD)	BINDWEEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEEDGE								
Preplant Incorporated																																	
EPTAM	O	1	P	P	G	P	F	F	F	F	F	F	F	P	E	E	E	E	E	E	E	E	E	E	E	E	G	N	N	N	N	F	F
Preemergence																																	
DUAL	O	2	N	N	P	F	G	P	P	N	P	P	E	E	E	E	E	G	G	F	N	N	N	N	N	G							
LEXONE/SENCOR	C	2	F	F	E	N	E	G	E	G	E	G	P	F	G	G	G	F	F	P	N	N	N	N	N	N							
LINEX/LOROX	C	1	P	P	G	F	G	G	G	F	G	F	F	F	F	F	F	F	F	P	N	N	N	N	N	N							
PROWL	O	1	N	N	G	P	F	P	P	F	P	P	E	E	E	E	E	E	E	E	G	N	N	N	N	N	N						
Delayed Preemergence																																	
LEXONE/SENCOR	C	2	F	F	E	N	E	E	E	G	E	G	P	F	G	G	G	F	F	P	N	N	N	N	N	N							
LINEX/LOROX	C	1	P	P	G	F	E	G	G	F	G	F**	F	F	F	F	F	F	F	P	N	N	N	N	N	N							
MATRIX + LEXONE@	A/C	2	G	F	E	P	E	E	E	G	E	G	G	F	G	G	G	F	F	-	N	N	P	P	P	P							
MATRIX@	A	1	G	F	F	P	E	F	F	F	E	F	G	F	G	G	G	F	F	-	N	N	P	P	P	P							
Postemergence																																	
LEXONE/SENCOR	C	2	G	F	E	N	G	E	E	G	E	F	P	P	F	F	F	F	F	P	N	N	N	N	N	N							
MATRIX + LEXONE@	A/C	2	G	F	E	F	E	E	E	G	E	G	G	G	G	G	G	G	G	P	N	N	N	F	N	N							
MATRIX@	A	1	G	P	F	F	E	F	F	F	E	G	G	G	G	G	G	G	G	P	N	N	F	G	F	F							
POAST/ULTIMA 160	B	1	N	N	N	N	N	N	N	N	N	N	E	G	E	E	E	E	E	E	N	N	F	G	F	F							

Herbicide mode of Action: A = ALS inhibitor; B = ACCase inhibitor; C = Photosynthesis inhibitor; O = Other.

P = Poor; F = Fair; **G** = Good; **E** = Excellent; N = None

Crop Tolerance: 1 = Minimal risk of crop injury; 2 = Crop injury can occur under certain conditions (soil applied — cold, wet; foliar applied — hot, humid); 3 = Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4 = Risk of severe crop injury is high. Recommended only in rescue situations.

* 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.

** Lorox/Linex provides good control of emerged wild buckwheat.

@ will suppress triazine resistant lambsquarters.

TABLE 7A—CHEMICAL WEED CONTROL IN SUGAR BEETS

SUGAR BEETS – PREPLANT

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual grasses	cycloate (<i>Ro-Neet</i>)	3	2 qt	<ul style="list-style-type: none"> • Incorporate immediately to 2 to 3 in. • May be followed preemergence by <i>Pyramin</i>. • DO NOT apply <i>Nortron</i> preemergence. • Injury may occur when <i>Betamix</i> or <i>Betanex</i> or <i>Progress</i> is applied postemergence before the 6 true leaf stage. • <i>Ro-Neet</i> provides good velvetleaf suppression.

SUGAR BEETS – PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	pyrazon (<i>Pyramin</i>)	4	6.2 lb OR 7.4 pt SC	<ul style="list-style-type: none"> • DO NOT use <i>Pyramin</i> on sands or loamy sands or crop injury may occur. • Reduce the <i>Pyramin</i> rate to 4.65 lb/A of DF OR 5.6 pt/A SC on a sandy loam soil and/or if soil organic matter is less than 3%. • If soils are high in clay and/or organic matter and velvetleaf is a problem, apply 7.8 lb/A of DF OR 9.3 pt/A SC of <i>Pyramin</i>. • To control annual grasses, preplant incorporate <i>Ro-Neet</i> OR apply <i>Poast</i> or <i>Assure II</i> postemergence OR apply <i>Nortron</i> preemergence. • <i>Pyramin</i> plus <i>Nortron</i> provides better velvetleaf suppression than either herbicide alone. These herbicides are not as effective as <i>Ro-Neet</i> preplant incorporated followed by <i>Pyramin</i> preemergence or <i>UpBeet</i> postemergence. • To approach 100% weed control, it will in most cases be necessary to follow with a postemergence application.
	pyrazon (<i>Pyramin</i>)	3	4.7 lb OR 5.6 pt SC	<ul style="list-style-type: none"> • See all remarks for <i>Pyramin</i>. • <i>Nortron</i> will provide some suppression of annual grasses, such as foxtail. • <i>Pyramin</i> plus <i>Nortron</i> provides better velvetleaf suppression than either herbicide alone. These herbicides are not as effective as <i>Ro-Neet</i> preplant incorporated followed by <i>Pyramin</i> preemergence or <i>UpBeet</i> postemergence.
	+ ethofumesate (<i>Nortron</i>)	+ 1.5	+ 3 pt SC	<ul style="list-style-type: none"> • Increase <i>Nortron</i> rate to 4 pt/A of SC on clay soils if weed pressure is heavy.

EARLY POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	desmedipham + phenmedipham (<i>Betamix</i>) +	0.5	3 pt	<ul style="list-style-type: none"> ● Split (low rate) applications of <i>Betamix</i> + <i>Stinger</i> may be applied to sugarbeets at early growth stages (less than 4 true leaf stage) to control germinating weed seedlings at the cotyledon stage. Weeds not completely controlled by the first treatment will be checked and controlled by the second application. ● Second application should be made AT LEAST 7 days later and when another flush of weeds germinate. ● The rate of <i>Betamix</i> in the second application can be increased to 4.6 pt/A. ● <i>Stinger</i> controls cocklebur, common and giant ragweed and volunteer alfalfa and sweet clover. ● Adding <i>Stinger</i> improves smartweed, buckwheat, nightshade, and lambsquarters compared to <i>Betamix</i> alone. ● DO NOT add <i>Stinger</i> on sandy soils where water tables are shallow because of potential groundwater contamination. ● DO NOT plant dry beans for 18 months. ● Allow 105 days between application and sugarbeet harvest.
	clopyralid (<i>Stinger</i>)	+ 0.094	+ ¼ pt	
FOLLOWED BY:				
	desmedipham + phenmedipham (<i>Betamix</i>) +	0.5	3 pt	<ul style="list-style-type: none"> ● Split low rate applications of <i>Betamix</i> + <i>UpBeet</i> may be applied to sugarbeets at early growth stages (less than 4 true leaf stage) to control germinating weed seedlings at the cotyledon stage. Weeds not completely controlled by the first treatment will be checked and controlled by the second application. ● A second application MUST BE MADE AT LEAST 7 days but not more than 10 days AFTER the first application. ● The rate of <i>Betamix</i> in the second application can be increased to 4.6 pt/A. ● ONLY add surfactant at 1/4% v/v (2 pt in 100 gal. of water) to the SECOND APPLICATION. ● DISPERSE <i>UpBeet</i> thoroughly in the tank before adding other herbicides. ● Apply in 10 gal. of water/A at 20 to 40 psi. ● The maximum amount of <i>UpBeet</i> that can be applied in one year is 1.5 oz/A. ● Rainfall within 6 hr. of application may reduce control. ● Adding <i>UpBeet</i> to <i>Betamix</i> results in velvetleaf control, and more consistent lambsquarter, pigweed, smartweed, and buckwheat control.
	triflusalufuron methyl (<i>UpBeet</i>)	+ 0.0156	+ ½ oz	
FOLLOWED BY:				
	desmedipham + phenmedipham (<i>Betamix</i>) +	0.5	3 pt	<ul style="list-style-type: none"> ● Split (low rate) applications of <i>Betamix</i> may be applied to sugar beets at early growth stages (less than 4 true leaf stage) to control early germinating weed seedlings at the cotyledon stage. Weeds not completely controlled by the first treatment will be checked and controlled by the second application. ● Second application should be made AT LEAST 7 days later and when another flush of weeds germinate. ● The rate of <i>Betamix</i> in the second application can be increased to 4.6 pt/A. ● For second application, see remarks under <i>Betamix</i> plus <i>H-273</i>. ● DO NOT add crop oil concentrate in first application.
	triflusalufuron methyl (<i>UpBeet</i>)	+ 0.0156	+ ½ oz	
	desmedipham + phenmedipham (<i>Betamix</i>) +	0.5	3 pt	<ul style="list-style-type: none"> ● Split (low rate) applications of <i>Betamix</i> may be applied to sugar beets at early growth stages (less than 4 true leaf stage) to control early germinating weed seedlings at the cotyledon stage. Weeds not completely controlled by the first treatment will be checked and controlled by the second application. ● Second application should be made AT LEAST 7 days later and when another flush of weeds germinate. ● The rate of <i>Betamix</i> in the second application can be increased to 4.6 pt/A. ● For second application, see remarks under <i>Betamix</i> plus <i>H-273</i>. ● DO NOT add crop oil concentrate in first application.
	endothall (<i>H-273</i>)	+ ½	+ 1½ pt	

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EARLY POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	desmedipham + phenmedipham + ethofumesate <i>(Betamix Progress)</i>	0.25	1.13 pt	<ul style="list-style-type: none"> ● Split (low rate) applications of <i>Betamix Progress</i> may be applied to sugar beets at early growth stages (cotyledon to 4 true leaf stage) to control early germinating weed seedlings at the cotyledon stage. Weeds not completely controlled by the first treatment will be checked and controlled by the second application. ● Second application should be made AT LEAST 7 days AFTER the first application. ● The rate of <i>Betamix Progress</i> in the second application can be increased to 2 pt/A if sugar beets are at 2-leaf pair or larger. ● DO NOT add crop oil concentrate. ● Use caution if <i>Ro-Neet</i> was preplant incorporated and cold and wet conditions are present.
	FOLLOWED BY:			
	desmedipham + phenmedipham + ethofumesate <i>(Betamix Progress)</i>	0.33	1.5 pt	<ul style="list-style-type: none"> ● DISPERSE <i>UpBeet</i> thoroughly in the tank before adding other herbicides. ● DO NOT add crop oil concentrate or surfactant. ● Split (low rate) applications of <i>Betamix Progress</i> plus <i>UpBeet</i> may be applied to sugarbeets at early growth stages (cotyledon to 4 true leaf stage) to control early germinating weed seedlings at the cotyledon stage. ● A second application MUST BE MADE AT LEAST 7 days but not more than 10 days AFTER the first application. ● The rate of <i>Betamix Progress</i> in the second application can be increased to 2 pt/A if sugarbeets are 2-leaf pair or larger. ● Adding <i>UpBeet</i> to <i>Betamix Progress</i> results in velvetleaf control and provides more consistent control of mustard, smartweed, and wild buckwheat. ● Apply in a minimum of 10 gal. of water/A at 20 to 40 psi. ● The maximum amount of <i>UpBeet</i> that can be applied in 1 year is 1.5 oz/Acre. ● Allow at least 60 days between <i>UpBeet</i> application and sugarbeet harvest. ● Rainfall within 6 hr. of application may reduce control.
	desmedipham + phenmedipham + ethofumesate <i>(Betamix Progress)</i>	0.25	1.13 pt	
	+ triflurosulfuron methyl <i>(UpBeet)</i>	+	+	
	FOLLOWED BY:			
	desmedipham + phenmedipham + ethofumesate <i>(Betamix Progress)</i>	0.33	1.5 pt	
	+ triflurosulfuron methyl <i>(UpBeet)</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"> ● Apply when the beets are in the 2 to 4 true leaf stage, (6 true leaf stage if <i>Ro-Neet</i> was applied) and weeds have 4 leaves or less. ● 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. ● When temperature is 75°F or greater, apply in late afternoon or early evening. ● DO NOT apply when plants are under stress, such as from temperatures above 85°F, or when climate changes rapidly from cool, overcast days to hot, sunny days, or crop injury can occur. ● Add 1 qt/A crop oil concentrate for hard to control large weeds or if plants are not vigorously growing. <i>Betamix</i> rate should then be reduced 25% to reduce injury. ● Reduce <i>Betamix</i> rate 25% and do not add crop oil if high temperature and/or high humidity conditions have been prevalent.
		+ endothall <i>(H-273)</i>	+	
		½	1½ pt	

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SUGAR BEETS – POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
<i>(continued)</i>				
Annual broadleaves	desmedipham (<i>Betanex</i>)	1	6.2 pt	<ul style="list-style-type: none"> ● Refer to remarks under <i>Betamix</i> plus <i>H-273</i>. ● More effective pigweed control than <i>Betamix</i>. ● Does not control green or yellow foxtail. ● Less effective than <i>Betamix</i> on lambsquarters and common ragweed, and wild buckwheat.
	+	+	+	
	endothall (<i>H-273</i>)	½	1½ pt	
	+	+	+	
	pyrazon (<i>Pyramin</i>)	2	3.1 lb OR 3.7 pt SC	
	+	+	+	
	desmedipham + phenmedipham (<i>Betamix</i>)	1	6.2 pt	
	+	+	+	
	endothall (<i>H-273</i>)	½	1½ pt	
	+	+	+	
pyrazon (<i>Pyramin</i>)	2	3.1 lb OR 3.7 pt SC	<ul style="list-style-type: none"> ● <i>Pyramin</i> will provide residual weed control (stop germinating weed seeds). ● Apply when the beets are in the 2 to 4 true leaf stage, (6 true leaf stage if <i>Ro-Neet</i> was applied) and weeds have 4 leaves or less. ● 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. ● Maximum total amount of pyrazon that can be used for beets grown and processed in Michigan is 13.4 pt of SC OR 11 lb DF. ● When temperature is 75°F or greater, apply in late afternoon or early evening. ● Do not apply when plants are under stress, such as from temperatures above 85°F or when climate changes rapidly from cool, overcast days to hot, sunny days, or crop injury can occur. ● Add 1 qt/A of crop oil concentrate for hard to control weeds or if plants aren't vigorously growing. <i>Betamix</i> rate should then be reduced 25% to reduce injury. ● Reduce <i>Betamix</i> rate 25% and do not add crop oil concentrate if high temperature, and/or high humidity conditions have been prevalent. 	
+	+	+		
desmedipham (<i>Betanex</i>)	1	6.2 pt		
+	+	+		
endothall (<i>H-273</i>)	½	1½ pt	<ul style="list-style-type: none"> ● Refer to remarks under <i>Pyramin</i> plus <i>Betamix</i> plus <i>H-273</i>. ● More effective pigweed control than <i>Betamix</i>. ● Does not control green or yellow foxtail. ● Less effective than <i>Betamix</i> on lambsquarters and common ragweed, and wild buckwheat. 	
+	+	+		

(Continued on next page)

SUGAR BEETS – POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Smartweed and buckwheat	endothall (H-273)	1	2% pt	<ul style="list-style-type: none"> ● Refer to remarks under <i>Betamix</i> and <i>H-273</i>. ● Will control large smartweed and buckwheat.
Velvetleaf	triflusalufuron methyl (UpBeet) + surfactant	0.0156 + ¼%	½ oz + ¼%	<ul style="list-style-type: none"> ● <i>UpBeet</i> provides better velvetleaf control than <i>Pyramin</i> postemergence. ● DISPERSE <i>UpBeet</i> thoroughly in the tank before adding surfactant. ● TWO APPLICATIONS ARE NEEDED FOR VELVETLEAF CONTROL. ● Apply to velvetleaf at cotyledon to 1st true leaf. REPEAT application 5 to 10 days later. ● Add 2 qt/A 28% liquid nitrogen in addition to surfactant, if velvetleaf are 1 to 2 true leaves. ● A third application of ½ oz/A of <i>UpBeet</i> + surfactant can be made. ● The maximum amount of <i>UpBeet</i> that can be applied in 1 year is 1.5 oz/Acre. ● <i>UpBeet</i> can be tank mixed with <i>Betamix</i> or <i>Progress</i>. Never add surfactant with <i>Progress</i>. Add surfactant with <i>UpBeet</i> + <i>Betamix</i> if beets are at 2 leaf pair or larger. ● Apply <i>UpBeet</i> in a minimum of 10 gal. of water/A at 20 to 40 psi. ● Rainfall within 6 hr. of application may reduce control. ● Allow at least 60 days between <i>UpBeet</i> application and sugarbeet harvest.
		and repeat		
	pyrazon (Pyramin) + Dash HC	1 + 1 pt	1.85 pt SC + 1 pt	<ul style="list-style-type: none"> ● TWO APPLICATIONS ARE NEEDED FOR BEST VELVETLEAF CONTROL. MAKE SECOND APPLICATION 5 TO 7 DAYS FOLLOWING INITIAL TREATMENT. ● Make first application when velvetleaf has cotyledonary leaves and one true leaf. ● Application to velvetleaf at two true leaves will NOT provide consistent control. ● If only one application can be made, apply 3.7 to 5.5 pt SC <i>Pyramin</i> plus 1 pt/A of <i>Dash HC</i>. ● DO NOT TANK MIX with <i>Betamix</i>, <i>Betanex</i>, or <i>H-273</i> as crop injury may occur. ● <i>Pyramin SC</i> may provide better control than <i>Pyramin DF</i>.
Cocklebur Giant ragweed Common ragweed Jimsonweed Volunteer sweetclover Volunteer alfalfa	clopyralid (Stinger) + crop oil concentrate	0.094 + 1 qt	¼ pt + 1 qt	<ul style="list-style-type: none"> ● DO NOT use on sands or loamy sands, or permeable soils where water tables are shallow because of potential groundwater contamination. ● Increase rate to ½ pt under drought conditions or dense weed infestations. ● Controls cocklebur, giant ragweed and volunteer alfalfa and sweet clover up to 6-leaf, common ragweed up to 5-leaf. ● ¼ pt/A will suppress smartweed, wild buckwheat and nightshade if less than 3-leaf. ● DO NOT cultivate for 7 days following application. ● Tank mix with other postemergence herbicides such as <i>Betamix</i>, <i>Betanex</i> or <i>H-273</i> to control other broadleaf weeds. ● DO NOT plant dry beans or other broadleaf crops (except soybeans) for 18 months. ● Allow 105 days between application and sugar beet harvest.

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SUGAR BEETS – POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Perennial sowthistle	clopyralid (<i>Stinger</i>)	0.188	½ pt	<ul style="list-style-type: none"> ● DO NOT use on sands or loamy sands or permeable soils where water tables are shallow because of potential groundwater contamination. ● Increase rate to ¾ pt under drought conditions. ● Apply after sugar beets have reached the third leaf pair AND before thistles have reached the flowering stage. ● DO NOT cultivate before OR for a minimum of 14 days after application. ● DO NOT tank mix with other herbicides when applying for perennial sowthistle control. ● Banded applications are NOT recommended. Instead make a broadcast application over the thistle-infested area. ● DO NOT plant dry beans or other broadleaf seed crops (except soybeans) for 18 months. ● Allow 105 days between application and sugar beet harvest.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	
	ammonium sulfate	2½ lb	2½ lb	
Canada thistle	clopyralid (<i>Stinger</i>)	0.125	½ pt	<ul style="list-style-type: none"> ● DO NOT use on sands or loamy sands or permeable soils where water tables are shallow because of potential groundwater contamination. ● Increase rate to ¾ pt under drought conditions. ● Apply after sugar beets have reached the third leaf pair AND before thistles have reached the flowering stage. ● DO NOT cultivate before OR for a minimum of 14 days after application. ● Add COC when tankmixing ½ pt of <i>Stinger</i> with <i>Betamix</i> and/or <i>H-273</i>. COC is not necessary when ½ pt/A of <i>Stinger</i> is applied. ● Banded applications are NOT recommended. Instead make a broadcast application over the thistle-infested area. ● DO NOT plant dry beans or other broadleaf seed crops (except soybeans) for 18 months. ● Allow 105 days between application and sugar beet harvest.
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	
	ammonium sulfate	2½ lb	2½ lb	
Annual grasses	sethoxydim (<i>Poast</i>)	0.19	1 pt	<ul style="list-style-type: none"> ● Treat actively growing grass. Treat foxtails, fall panicum, and barnyardgrass up to 8 in. and crabgrass up to 4 in. ● <i>Poast</i> can be reduced to ¾ pt/A for 1- to 4-in. barnyardgrass, green and giant foxtails, and fall panicum. ● Ammonium sulfate or 28% liquid nitrogen (urea ammonium nitrate) can be added at 2½ lb/A to enhance crabgrass control. ● DO NOT apply <i>Betamix</i> or <i>Progress</i> or <i>UpBeet</i> within five days prior to applying <i>Poast</i> or <i>Ultima 160</i> or reduced grass control may occur. ● No soil activity from <i>Poast</i> or <i>Ultima 160</i>. Controls only grasses present when sprayed. ● Use a minimum of 5 gal of water/A and 40 psi. ● Does not control yellow nutsedge. ● Rainfall within 1 hr of application will reduce control.
	OR	OR	OR	
	OR	0.2	20 oz	
	(<i>Ultima 160</i>)			
	+	+	+	
	crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	
	<i>Dash HC</i>	1 pt	1 pt	
	OR	OR	OR	
	methylated seed oil	24 oz	24 oz	
	clethodim (<i>Prism</i>)	0.125	17 oz	<ul style="list-style-type: none"> ● Treat actively growing foxtails, fall panicum, and barnyardgrass up to 8 in. and crabgrass up to 4 in. ● <i>Prism</i> can be reduced to 13 oz/A for 1- to 4-in grasses. ● DO NOT apply <i>Betamix</i> or <i>Progress</i> or <i>UpBeet</i> within five days prior to applying <i>Prism</i> or reduced grass control may occur. ● No soil activity from <i>Prism</i>. Controls only grasses present when sprayed. ● Apply in 5 to 40 gal of water/A and 30 to 60 psi. ● Does not control yellow nutsedge. ● Rainfall within 1 hr will reduce control.
+	+	+		
crop oil concentrate	1%	1%		

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SUGAR BEETS – POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations	
<i>(continued)</i>					
Annual grasses	quizalofop-P-methyl (<i>Assure II</i>)	0.044	7 oz	<ul style="list-style-type: none"> ● Treat actively growing grasses up to 4 in. tall. ● 8 oz/A required for barnyardgrass and crabgrass control. ● DO NOT apply <i>Betamix</i> or <i>Progress</i> or <i>UpBeet</i> within 5 days prior to applying <i>Assure II</i> or reduced grass control may occur. ● DO NOT cultivate for 7 days before or 7 days after treatment. ● No soil activity from <i>Assure II</i>. Controls only grasses present when sprayed. ● Apply in 10 to 20 gal. of water/A with standard flat fan or hollow cone nozzles. ● Does not control yellow nutsedge. ● Rainfall within 1 hr. will reduce control. ● Avoid drift onto corn, small grains, turf. 	
	+	+	+		
	crop oil concentrate	1%	1%		
	OR	OR	OR		
	surfactant	¼%	¼%		
Annual grasses Annual broadleaves	sethoxydim (<i>Poast</i>)	0.29	1.5 pt	<ul style="list-style-type: none"> ● Treat actively growing barnyardgrass or foxtails up to 2 in. ● DO NOT ADD CROP OIL CONCENTRATE OR OTHER ADDITIVES. ● Adjust <i>Betamix</i> rate to size of broadleaf weeds. ● No soil activity. Controls only grasses present when sprayed. 	
	OR	OR	OR		
	(<i>Ultima 160</i>)	0.2	20 oz		
	+	+	+		
	desmedipham + phenmedipham (<i>Betamix</i>)	½-1	3-6 pt		
Volunteer corn	quizalofop-P-ethyl (<i>Assure II</i>)	0.031	5 oz	<ul style="list-style-type: none"> ● For volunteer corn up to 18 in. tall. ● Rainfall within 1 hr. of application will reduce control. ● <i>Assure II</i> is more effective than <i>Poast/Ultima 160</i>. 	
	+	+	+		
	crop oil concentrate	1%	1%		
	OR	OR	OR		
		surfactant	¼%	¼%	
		sethoxydim (<i>Poast</i>)	0.19	1 pt	<ul style="list-style-type: none"> ● For volunteer corn up to 20 in. tall. ● If the volunteer corn is less than 12 in, the application rate may be reduced. ● Rainfall within 1 hr of application will reduce control.
	OR	OR	OR		
	(<i>Ultima 160</i>)	0.2	20 oz		
	+	+	+		
		crop oil concentrate	1 qt	1 qt	
	OR	OR	OR	OR	
		<i>Dash HC</i>	1 pt	1 pt	
	OR	OR	OR	OR	
		methylated seed oil	24 oz	24 oz	
+	+	+	+		
	ammonium sulfate	2½ lb	2½ lb		
OR	OR	OR	OR		
	28% liquid nitrogen	1 gal	1 gal		
	clethodim (<i>Prism</i>)	0.096	13 oz	<ul style="list-style-type: none"> ● For volunteer corn up to 12 in. tall. ● Use 8 oz/A if volunteer corn is 6 in. or less. ● Rainfall within 1 hr of application will reduce control. ● <i>Prism</i> is more effective than <i>Poast/Ultima 160</i>. 	
+	+	+			
	crop oil concentrate	1%	1%		
Small grains	quizalofop-P-ethyl (<i>Assure II</i>)	0.0625	10 oz	<ul style="list-style-type: none"> ● Apply at 8 oz/A if cereals are less than 4 in. in height. ● Spring seeded cereals only. ● <i>Assure II</i> is more effective than <i>Poast/Ultima 160</i>. 	
	+	+	+		
	crop oil concentrate	1%	1%		
	OR	OR	OR		
	surfactant	¼%	¼%		

(Continued on next page)

SUGAR BEETS – POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations		
<i>(continued)</i>						
Small grains	sethoxydim (<i>Poast</i>)	0.29	1½ pt	<ul style="list-style-type: none"> ● Apply before tillering (up to 4 in. tall). ● Spring-seeded cereals only. 		
	OR	OR	OR			
	(<i>Ultima 160</i>)	0.30	30 oz			
	+	+	+			
	crop oil concentrate	1 qt	1 qt			
	OR	OR	OR			
	<i>Dash HC</i>	1 pt	1 pt			
	OR	OR	OR			
	methylated seed oil	24 oz	24 oz			
	+	+	+			
	ammonium sulfate	2½ lb	2½ lb			
	OR	OR	OR			
	28% liquid nitrogen	1 gal	1 gal			
	<hr/>					
	clethodim (<i>Prism</i>)	0.25	34 oz	<ul style="list-style-type: none"> ● Oats can be controlled with 17 oz/A. ● Spring seeded cereals are labeled for control at 17 oz/A. However, 34 oz/A will provide better control. ● Apply before cereals exceed 6 in. ● <i>Prism</i> is more effective than <i>Poast/Ultima 160</i>. 		
	+	+	+			
	ammonium sulfate	2½ lb	2½ lb			
	OR	OR	OR			
	28% liquid nitrogen	2.5%	2.5%			
	+	+	+			
	crop oil concentrate	1%	1%			
<hr/>						
Quackgrass	quizalofop-P-ethyl (<i>Assure II</i>)	0.0625	10 oz	<ul style="list-style-type: none"> ● Make application when quackgrass is 6 to 8 in. tall. ● Two applications may be needed for best quackgrass control. Make a second application of 7 oz/A 14 to 21 days later when quackgrass has reached 4 to 8 in. Cultivation may replace second application. ● DO NOT TANK MIX. Reduced quackgrass control and/or crop injury may occur. ● Use 10 to 20 gal/A of water using standard flat fan or hollow cone nozzles. ● Avoid drift onto corn, small grains, or turf. 		
		+	+		+	
		crop oil concentrate	1%		1%	
		OR	OR		OR	
		surfactant	¼%		¼%	
	<hr/>					
		sethoxydim (<i>Poast</i>)	0.29 + 0.19		1½ pt + 1 pt	<ul style="list-style-type: none"> ● TWO APPLICATIONS ARE NEEDED FOR BEST QUACKGRASS CONTROL. MAKE SECOND APPLICATION 14 TO 21 DAYS FOLLOWING INITIAL TREATMENT. CULTIVATION MAY REPLACE SECOND APPLICATION. ● DO NOT TANK MIX with <i>Betamix</i>, <i>Progress</i>, <i>Betanex</i>, <i>Pyramin</i>, or <i>H-273</i> – crop injury or reduced quackgrass control may occur, especially with nitrogen additives. ● Addition of ammonium sulfate or liquid nitrogen is required. ● Treat actively growing quackgrass 6- to 8-in. tall. ● Use a minimum of 5 gal of water/A and 40 psi. ● Avoid drift onto corn, small grains or turf. ● Rainfall within 1 hr of application will reduce control.
		OR	OR		OR	
		(<i>Ultima 160</i>)	0.3 + 0.2		30 oz + 20 oz	
		+	+		+	
		ammonium sulfate	2½ lb+2½ lb		2½ lb+2½ lb	
		OR	OR		OR	
		28% liquid nitrogen	1 gal + 1 gal		1 gal + 1 gal	
		+	+		+	
	crop oil concentrate	1 qt + 1 qt	1 qt + 1 qt			
	OR	OR	OR			
	<i>Dash HC</i>	1 pt + 1 pt	1 pt + 1 pt			
	OR	OR	OR			
	methylated seed oil	24 oz+24 oz	24 oz+24 oz			
<hr/>						
	clethodim (<i>Prism</i>)	0.25 + 0.125	34 oz+17 oz	<ul style="list-style-type: none"> ● Make application when quackgrass is 4- to 8-in. tall. ● Two applications may be needed for control. Make a second application of 17 oz/A 14 to 21 days later. ● Cultivation may replace the second application. ● DO NOT TANK MIX. Crop injury or reduced quackgrass control may occur. ● Use 5 to 40 gal of water/A and 30 to 60 psi. ● Avoid drift onto corn, small grains or turf. 		
	+	+	+			
	ammonium sulfate	2½ lb+2½ lb	2½ lb+2½ lb			
	OR	OR	OR			
	28% liquid nitrogen	2.5%+2.5%	2.5%+2.5%			
	+	+	+			
	crop oil concentrate	1% + 1%	1% + 1%			

TABLE 7B—WEED RESPONSE TO HERBICIDES IN SUGAR BEETS*

	MODE OF ACTION	CROP TOLERANCE	ANNUAL BROADLEAVES										ANNUAL GRASSES						PERENNIALS						
			COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEEED (REDROOT)	RAGWEEED (COMMON)	SMARTWEEED	VELVETLEAF	WILD MUSTARD	WILD BUCKWHEAT	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	BINDWEEED (FIELD)	BINDWEEED (HEDGE)	CANADA THISTLE	PERENNIAL SOWTHISTLE	QUACKGRASS	YELLOW NUTSEEDGE
Preplant Incorporated																									
RO-NEET	O	2	P	P	F	F	G	F	P	G	P	F	G	G	G	G	G	G	G	N	N	N	N	F	G
Preemergence																									
NORTRON	O	2	F	F	G	G	G	P	G	F	G	G	P	F	F	F	F	P	P	N	N	N	N	N	P
PYRAMIN	O	2	P	P	E	G	G	G	G	F	G	G	P	P	P	P	P	P	P	N	N	N	N	N	N
Postemergence																									
BETAMIX	O	2	F	F	E	F	G	G	F	P	G	F	P	P	F	F	F	P	P	N	N	N	N	N	N
BETANEX	O	2	F	F	G	F	E	F	F	P	G	P	P	P	P	P	P	P	P	N	N	N	N	N	N
H-273**	O	3	P	P	P	P	P	P	E	P	P	E	N	N	N	N	N	N	N	N	N	P	N	N	N
NORTRON	O	2	P	P	F	F	F	P	G	P	G	G	P	P	F	F	F	P	P	N	N	N	N	N	P
UPBEET	A	2	F	-	P	F	F	-	F	E	E	F	P	P	F	F	F	P	P	N	N	N	N	N	N
BETAMIX PROGRESS	O/O	2	F	F	E	G	E	G	G	P	G	G	P	P	F	F	F	P	P	N	N	N	N	N	P
PROGRESS + UPBEET	O/A	3	F	F	E	G	E	G	G	E	E	E	P	P	G	F	F	P	P	N	N	N	N	N	P
BETAMIX + H-273**	O/O	3	F	F	E	F	G	G	E	P	G	E	P	P	F	F	F	P	P	N	N	N	N	N	N
BETAMIX + STINGER	O/O	2	E	G	E	F	G	E	G	P	G	G	P	P	F	F	F	P	P	N	N	N	N	N	N
BETAMIX + UPBEET	O/A	2	F	F	E	F	E	G	G	E	E	G	P	P	G	F	F	P	P	N	N	N	N	N	N
POAST/ULTIMA 160	B	1	N	N	N	N	N	N	N	N	N	N	N	E	G	E	E	E	E	N	N	N	N	F	N
PRISM	B	1	N	N	N	N	N	N	N	N	N	N	N	E	G	E	E	E	G	N	N	N	N	G	N
ASSURE II	B	1	N	N	N	N	N	N	N	N	N	N	N	G	G	E	E	E	E	N	N	N	N	E	N
PYRAMIN	O	1	P	P	F	P	F	P	F	F	F	F	P	P	P	P	P	P	P	N	N	N	N	N	N
STINGER	O	1	E	G	P	P	P	E	F	P	P	F	N	N	N	N	N	N	N	P	P	G	G	N	N

Herbicide mode of Action: A = ALS inhibitor; B = ACCase inhibitor; C = Photosynthesis inhibitor; O = Other.
P = Poor; F = Fair; G = Good; E = Excellent; N = None

Crop Tolerance: 1 = Minimal risk of crop injury; 2 = Crop injury can occur under certain conditions (soil applied — cold, wet; foliar applied — hot, humid);
3 = Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4 = Risk of severe crop injury is high. Recommended only in rescue situations.

* 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.

**H-273 is better than *Betamix + Stinger*, *Betamix + UpBeet*, and *Progress + UpBeet* on larger (greater than 1.5 inch) smartweed and buckwheat.

TABLE 8—CHEMICAL WEED CONTROL IN FORAGE SORGHUM

FORAGE SORGHUM, SORGHUM/SUDANGRASS HYBRIDS – PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses (EXCEPT fall panicum, green foxtail, giant foxtail, witchgrass, and crabgrass)	atrazine (commercial product)	2	2 qt 4L OR 2.2 lb 50% DG	<ul style="list-style-type: none"> Do not use on sands, loamy sands, sandy clay loams, or any soil with less than 1% organic matter. Heavy rains following application may cause injury. May be applied preplant incorporated. Do not apply to sudangrass. See label for details.

FORAGE SORGHUM – PREEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves Annual grasses	atrazine (commercial product)	1	1 qt 4L OR 1.1 lb 90% DG	<ul style="list-style-type: none"> CAUTION; Seed must be treated with CGA-92194 (<i>Concept II</i>) herbicide antidote. See label for additional restrictions. Commercial prepackaged mix (<i>Bicep</i>) is available. See Table 1F. May be applied preplant incorporated. Do not apply to sudangrass or sorghum-sudangrass hybrids.
	+ metolachlor (Dual)	+ 1½	+ 1½ pt	

FORAGE SORGHUM, SORGHUM/SUDANGRASS HYBRIDS – POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	atrazine (commercial product)	1.2	1.2 qt 4L OR 1.3 lb 90% DG	<ul style="list-style-type: none"> Apply after sorghum has reached the 3-leaf stage but before it exceeds 12 in. in height. Apply before common lambsquarters and redroot pigweed reach 6 in. and other broadleaf weeds 4 in. Heavy rainfall following application may cause injury. Do not apply on sands or loamy sands. Do not graze or cut for feed for 21 days following application. Do not apply to sudangrass.
	+ crop oil concentrate	+ 1 qt	+ 1 qt	

FORAGE SORGHUM – POSTEMERGENCE

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
Annual broadleaves	2,4-D amine	½	1 pt	<ul style="list-style-type: none"> Apply when sorghum is 6- to 8-in. tall. If sorghum is planted in rows, drop nozzles can be used when the crop is 8- to 15-in. tall. Do not graze or harvest for forage for 14 days after treatment. See remarks and limitations for 2,4-D under "Corn – Postemergence." Do not apply to sudangrass or sorghum-sudangrass hybrids. Consult the 2,4-D label for clearance on forage sorghum.

(Continued on next page)

FORAGE SORGHUM – POSTEMERGENCE (continued)

Weed Controlled	Herbicide	Rate lb/A a.i.	Formulation/A	Remarks and Limitations
(continued) Annual broadleaves	bromoxynil (Buctril)	%	1½ pt 2L OR ¾ pt Gel	<ul style="list-style-type: none"> • Apply to weeds less than 4 in. tall for effective control. • Do not mix with spray additives or liquid fertilizers. • Redroot pigweed and mustard must be controlled when very small (see label for details). • Some leaf burn may occur, especially under cool and cloudy or hot and humid conditions. • Do not cut for feed or graze for 30 days after application. • Do not apply to sudangrass or sorghum-sudangrass hybrids. • Do not apply to sorghum that is headed out. • Do not graze treated area or feed treated forage to livestock for 21 days following application. • Do not make more than one application per season. • Do not treat when plants are under stress. • Gives better control of some broadleaf weeds, especially pigweed, than <i>Basagran</i> alone. • Combination reduces risk of carryover from post-emergence application of atrazine alone. • Urea ammonium nitrate (28% liquid nitrogen) may be used at 1 gal/A instead of crop oil concentrate. Do not use urea ammonium nitrate if common lambsquarters is present. • Commercial prepackaged mix of <i>Basagran</i> plus atrazine (<i>Laddok</i>) is available. See Table 1F. • Rates may be reduced to ½ lb a.i. for each herbicide if weeds are small. See <i>Laddok</i> label for details. • Do not apply to sudangrass or sorghum-sudangrass hybrids.
	bentazon (Basagran)	%	¾ qt	
	+ atrazine (commercial product)	+ %	+ ¾ qt 4L OR 0.8 lb 90% DG	
	+ crop oil concentrate	+ 1 qt	+ 1 qt	

TABLE 9 – WEED RESPONSE TO NON-SELECTIVE HERBICIDES*

MODE OF ACTION	ANNUAL BROADLEAVES									ANNUAL GRASSES							PERENNIALS					
	COCKLEBUR	JIMSONWEED	LAMBSQUARTERS	NIGHTSHADE (BLACK)	PIGWEED (REDROOT)	RAGWEED (COMMON)	SMARTWEED	VELVETLEAF	WILD MUSTARD	BARNYARDGRASS	CRABGRASS	GIANT FOXTAIL	GREEN FOXTAIL	YELLOW FOXTAIL	FALL PANICUM	WITCHGRASS	WILD PROSSO MILLET (SANDBUR)	BINDWEED (FIELD)	BINDWEED (HEDGE)	CANADA THISTLE	QUACKGRASS	YELLOW NUTSEDGE
GRAMOXONE EXTRA	O	E	E	E	E	E	F	E	E	E	E	E	E	E	E	E	E	P	P	P	P	P
RANGER	O	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	F	F	F	E	P
ROUNDUP	O	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	G	G	G	E	P

Herbicide mode of Action: A = ALS inhibitor; B = ACCase inhibitor; C = Photosynthesis inhibitor; O = Other.

Herbicide Effectiveness: P = Poor; F = Fair; G = Good; E = Excellent; N = None; - = Not enough information to rank.

* 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 10 – RAINFREE PERIOD FOR
POSTEMERGENCE HERBICIDE APPLICATIONS***

HERBICIDE	RAINFREE PERIOD (in hours)	HERBICIDE	RAINFREE PERIOD (in hours)
Accent	4	Flexstar	4
Assure	1	Fusilade 2000; DX	1
Assure II	1	Fusion	1
Atrazine	1–2**	Galaxy	NL*
Banvel/Clarity	6–8	Gramoxone Extra	0.5
Basagran	NL*	Harmony Extra	Several
Basis	4	Herbicide 273	NL
Basis Gold	4	Hornet	6
Beacon	4	Laddok	NL*
Betamix	6	Marksman	4
Betanex	6	MCPA	4
Bladex	1–2**	Option II	1
Blazer	NL*	Permit	4
Bronco	6	Pinnacle	1
Buctril	1	Poast/Ultima 160	1
Buctril/Atrazine	1	Poast Plus	1
Butoxone (2,4-DB)	NL	Prism	1
Butyrac (2,4-DB)	NL	Pursuit	1
Canopy	1	Reflex	4
Classic	1	Resolve	6–8
Cobra	0.5	Resource	1
Conclude	1	Roundup Ultra	6
Concert	1	Scepter	NL
2,4-D Amine	6–8	Scorpion III	6
2,4-D Ester	1	Select	1
Diquat	NL	Stinger	6–8
Evik	NL	Storm	NL*
Exceed	4	Synchrony	1
Express	Several	Touchdown	6

NL – not listed on label.

*Old labels were 8 hr. for Basagran, Laddok, Galaxy, and Storm; 6 hr. for Blazer.

**Rainfall will improve control from root uptake.

**TABLE 12 – TOXICITY, SOLUBILITY, ADSORPTIVITY,
AND PERSISTENCE OF HERBICIDES**

HERBICIDE	TOXICITY ¹		WATER SOLUBILITY (ppm at 25°C)	ADSORPTIVITY TO SOIL	SOIL PERSISTENCE AT STANDARD RATE (months)	RUNOFF/ ² LEACHING POTENTIAL	RESTRICTED ³ ENTRY INTERVAL
	LD ₅₀ mg/kg Oral	Dermal					
Accent	>5000	>2000	70 (pH 7.0)	weak-moderate	1-10	3/1	4-12 hrs
Assure	4100-5900	>2000	<1	moderate	½	1/2	12 hrs
Atrazine	672-3800	7500	33	strong	2-8	2/1	12 hrs
Balan	>10,000	–	1	v. strong	4-5	1/3	SL
Banvel/Clarity	2629	>2000	4500	weak	1-6	3/1	24 hrs
Basagran	2063	6050	500	weak	½	3/1	12-48 hrs
Basis	>5000	>2000	–	–	–	–/–	4 hrs
Basis Gold	>10,000	>10,000	–	–	–	–/–	12 hrs
Beacon	>5050	>2010	18,000 (pH 7.2)	weak	1-5	2/1	12 hrs
Betamix	4100	>2000	1	moderate	1	1/3	24 hrs
Betanex	>3960	>2000	7	moderate	1	1/3	24 hrs
Bladex	271-510	>2000	171	strong	2-3	2/2	12 hrs
Blazer	1540	>3680	infinite	strong	1	2/2	48 hrs
Broadstrike + Treflan	>5000	>2000	49	moderate	2-8	1/1	12 hrs
Broadstrike + Dual	>5000	>2000	49	moderate	2-8	2/1	12 hrs
Bucril	260	3660	50	moderate	0.5	2/3	12 hrs
Canopy	1500-1600	2000	***	v. strong	1-10	2/1	12 hrs
Classic	>5000	>2000	300	strong	1-10	2/1	12 hrs
Cobra	>5000	2000	0.1	strong	0.5	2/3	12 hrs
Command	2077	2000	1100	v. strong	3-6	2/2	12 hrs
2,4-D	699	–	900	weak	1	2/2	12-48 hrs
2,4-DB	1960	–	insoluble	weak	1	2/3	48 hrs
Defol 6	1200	–	–	–	–	3/1	12 hrs
Des-i-cate	1174	362	100,000	moderate	¼	3/2	48 hrs
Diquat	235	433	infinite	v. strong	–	1/3	24 hrs
Dual	2780	>10,000	530	strong	1-3	2/1	12 hrs
Enquik	1200	>2	–	–	–	–	24 hrs
Eptam	1630	1460	370	strong	1.5-2	2/3	12 hrs
Eradicane	2000	–	370	strong	1.5-2	2/3	12 hrs
Evik	1750	8160	185	v. strong	1-3	2/2	12 hrs
Express	>5000	>2000	286	–	½	2/2	12 hrs
Frontier	2400	>2000	1174	moderate	1-2	2/1	12 hrs
Fusilade DX	2451-3680	2420	2	moderate	¼	1/3	12 hrs
Fusion	–	–	2 to 0.9	moderate	½	1/3	24 hrs
Gramoxone Extra	150	236	infinite	v. strong	1	1/3	12-48 hrs
Harmony Extra	>5000	>5000	*	*	½	2/2	12 hrs
Harness	1249-7940	>5000	223	moderate	1-2	–	12 hrs
Herbicide 273	51	>2000	100,000	moderate	0.25	3/2	48 hrs
Hornet	–	–	–	moderate	2-8	3/1	48 hrs
Kerb	8350	>3160	15	strong	2-9	2/1	24 hrs
Lasso/Microtech/ Partner	2000-5000	5000-7800	242	strong	1-2	2/2	12 hrs
Lexone/Sencor	2,300	>20,000	1200	moderate	2-4	2/1	12 hrs
Lorox/Linex	2489-4742	>2000	75	v. strong	2-4	1/2	24 hrs
Lorox Plus	2300	–	**	v. strong	1-10	1/1	12 hrs
Matrix	>5000	>2000	–	–	–	–/–	4 hrs
MCPA	1160	–	insoluble	v. weak	1-4	1/1	12-48 hrs
Nortron	6400	1400	110	strong	1-4	2/2	12 hrs
Option II	>2565	>2000	0.9	moderate	1	1/3	24 hrs
Pinnacle	>5000	>2000	2400	–	¼	2/2	12 hrs
Poast/Ultima 160	2676-3125	–	48	moderate	¼	2/3	12 hrs
Princep	>5000	>3100	5	strong	2-8	2/1	12 hrs
Prowl	3956	>2200	<1	v. strong	3-6	1/3	12 hrs
Pursuit	>5000	>5000	1,400	weak	2-8	2/1	12 hrs
Pyramin	3030	>2500	1	strong	1-2	2/2	12 hrs
Ramrod	3269-4000	4194-20,000	380	moderate	1-1.5	2/3	48 hrs
Reflex/Flexstar	1858	–	600,000	weak	6	2/1	24 hrs

(Continued on next page)

**TABLE 12 – TOXICITY, SOLUBILITY, ADSORPTIVITY,
AND PERSISTENCE OF HERBICIDES (continued)**

HERBICIDE	TOXICITY ¹		WATER SOLUBILITY (ppm at 25°C)	ADSORPTIVITY TO SOIL	SOIL PERSISTENCE AT STANDARD RATE (months)	RUNOFF/ ² LEACHING POTENTIAL	RESTRICTED ENTRY INTERVAL
	LD ₅₀ mg/kg Oral	Dermal					
Resource	3600	>2000	.189	strong		–/–	12 hrs
Ro-Neet	4000	3000	85	strong	1-3	2/2	12 hrs
Roundup Ultra	>5000	>20,000	900,000 (pH 7.0)	v. strong	1	1/3	4 hrs
Scepter	>5000	2000	60	moderate	2-8	3/1	12 hrs
Select/Prism	2920	>5000	infinite	moderate	¼	2/3	12 hrs
Sinbar	5000-7500	>5000	710	moderate	5-6	2/1	12 hrs
Sonalan	>10,000	–	1	v. strong	3-5	1/3	12 hrs
Stinger	>5000	>2000	1000	moderate	1-10	3/1	12 hrs
Surpass	–	–	223	moderate	1-2	–	12 hrs
Sutan +	3500	>4640	45	v. strong	1.5-2	2/3	12 hrs
Touchdown	750	>200	infinite	v. strong	1	1/3	4 hrs
Treflan	>10,000	–	<1	v. strong	3-6	1/3	12 hrs
Upbeet	>5000	>2000	110 (pH 7.0)	weak		–/–	12 hrs
Velpar	1100-4120	5000	33,000	strong	4-6	2/1	24 hrs
(Table Salt)	3320		360,000	–	–	–	
(Aspirin)	1200		2,500	–	–	–	

— No information available.

Sources: numerous, including *Herbicide Handbook, 1989 Herbicide Manual for Ag Chem. Dealers*, Iowa State; *U of Illinois Custom Spray Operation Training Manual, 1979*; *1987 Illinois Pest Control*; *Farm Chemical Handbook*.

¹The LD50 is a standard toxicological term which indicates the number of milligrams (mg) of pesticide per kilogram (kg) of test animal body weight required to kill 50% of a test animal population. Values less than 10 indicate extremely high toxicity to mammals. The LD50 data have been obtained from the Material Data Safety Sheets or Farm Chemical Handbook.

²The runoff/leaching potential ratings are from the ARS/NRCS pesticide properties database and were developed for use with the NRCS soils ratings for water quality in the NRCS "Soil-Pesticide Interaction Ratings." 1=high, 2=medium, 3=low.

³Read and follow label directions. Post areas or give oral warnings that areas have been treated to warn workers not to enter until the REI has elapsed as required by the label. SL=See Label.

* Combination of *Express* and the active ingredient in *Pinnacle*

** Combination of *Lorox* plus chlorimuron

*** Combination of *Lexone* plus chlorimuron

TABLE 13 – GLOSSARY OF CHEMICAL NAMES

TRADE NAME** AND (MANUFACTURER)	COMMON NAME	CONCENTRATION COMMERCIAL FORMULATION†
ACCENT (DuPont)	NICOSULFURON	75% DF, SP
ASSURE II (DuPont)	QUIZALOFOP-P-ETHYL	0.88 lb/gal L
* ATRAZINE Several (various)	ATRAZINE	4 lb/gal L; 90% DG
BALAN (DowElanco)	BENEFIN	1½ lb/gal L, 60% DF
BANVEL (Sandoz)	DICAMBA	4 lb/gal L
BASAGRAN (BASF)	BENTAZON	4 lb/gal L
BASIS (DuPont)	RIMSULFURON+THIFENSULFURON	75% DG (50 + 25)
BASIS GOLD (DuPont)	NICOSULFURON+RIMSULFURON+ATRAZINE	89.5% DG (1.34 + 1.34 + 86.78)
BEACON (Ciba)	PRIMISULFURON	75% DG (in pouches)
BETAMIX (AgrEvo)	DESMEDIPHAM+PHENMEDIPHAM	1.3 lb/gal L (0.65 + 0.65)
* BETAMIX PROGRESS (AgrEvo)	DESMEDIPHAM+PHENMEDIPHAM+ ETHOFUMESATE	1.8 lb/gal L (0.6 + 0.6 + 0.6)
BETANEX (AgrEvo)	DESMEDIPHAM	1.3 lb/gal L
* BICEP (Ciba)	ATRAZINE+METOLACHLOR	6.0 lb/gal L (2.7 + 3.3)
* BICEP LITE II (Ciba)	ATRAZINE+METOLACHLOR (+SAFENER)	4.9 lb/gal L (1.7 + 3.2)
* BICEP II (Ciba)	ATRAZINE+METOLACHLOR (+SAFENER)	5.9 lb/gal L (2.7 + 3.2)
* BLADEX (DuPont)	CYANAZINE	4L; 90% DF
BLAZER 2L (BASF)	ACIFLUORFEN	2 lb/gal L
BROADSTRIKE+TRIFLAN (DowElanco)	FLUMETSULAM+TRIFLURALIN	3.65 lb/gal L (0.25 + 3.4)
BROADSTRIKE+DUAL (DowElanco/Ciba)	FLUMETSULAM+METOLACHLOR	7.67 lb/gal L (0.2 + 7.47)
* BRONCO (Monsanto)	ALACHLOR+GLYPHOSATE	3.6 lb/gal L (2.6 + 1)
* BUCTRIL (Rhone-Poulenc)	BROMOXYNIL	2 lb/gal L; 4 lb/gal GEL
* BUCTRIL-ATRAZINE (Rhone-Poulenc)	ATRAZINE+BROMOXYNIL	3 lb/gal L (2 + 1)
* BULLET (Monsanto)	ATRAZINE+ALACHLOR	4 lb/gal L (1.5 + 2.5)
BUTOXONE (Cedar)	2,4-DB	2 lb/gal L
BUTYRAC (Rhone-Poulenc)	2,4-DB	2 lb/gal L
CANOPY (DuPont)	METRIBUZIN+CHLORIMURON ETHYL	75% DG (64.3 + 10.7)
CLARITY (Sandoz)	DICAMBA	4 lb/gal L
CLASSIC (DuPont)	CHLORIMURON ETHYL	25% DF
COBRA (Valent)	LACTOFEN	2 lb/gal L
COMMAND (FMC)	CLOMAZONE	4 lb/gal EC
COMMENCE (FMC/DowElanco)	CLOMAZONE+TRIFLURALIN	5.25 lb/gal L (2.25 + 3)
CONCERT (DuPont)	CHLORIMURON ETHYL+THIFENSULFURON METHYL	25% DF (12.5 + 12.5)
CONCLUDE (BASF)	ACIFLUORFEN+BENTAZON+SETHOXYDIM	CO-PACK
* CONTOUR (American Cyanamid)	IMAZETHAPYR+ATRAZINE	3.38 L (0.38 + 3.0)
2,4-D Several (various)	2,4-D	various
DETAIL (American Cyanamid)	DIMETHENAMID+IMAZAQUIN	4.1 lb/gal EC (3.6 + 0.5)
DIQUAT (Zeneca)	DIQUAT	2 lb/gal L
DOUBLEPLAY (Zeneca)	EPTC+ACETOCHLOR (+SAFENER)	7L (5.6 + 1.4)
DUAL (Ciba)	METOLACHLOR	8 lb/gal L; 25% G
DUAL II (Ciba)	METOLACHLOR (+SAFENER)	7.8 lb/gal L
EPTAM (Zeneca)	EPTC	7 lb/gal L; 10% G
ERADICANE (Zeneca)	EPTC (+SAFENER)	6.7 lb/gal L
EVIK (Ciba)	AMETRYNE	80% WP
EXCEED (Ciba)	PROSULFURON+PRIMISULFURON	57% DG (28.5 + 28.5)
EXPRESS (DuPont)	TRIBENURON METHYL	75% DF
* EXTRAZINE II (DuPont)	ATRAZINE+CYANAZINE	4 lb/gal L (1 + 3) 90% DF (21.4 + 67.5)
FLEXSTAR (Zeneca)	FOMESAFEN	1lb/gal L
FLEXSTAR HL (Zeneca)	FOMESAFEN	1.88 lb/gal L
FRONTIER (Sandoz)	DIMETHENAMID	7.5 lb/gal L, 6 lb/gal L

(Continued on next page)

TABLE 13 – GLOSSARY OF CHEMICAL NAMES (continued)

TRADE NAME** AND (MANUFACTURER)	COMMON NAME	CONCENTRATION COMMERCIAL FORMULATION†
FUSILADE DX (Zeneca)	FLUAZIFOP-P-BUTYL	2 lb/gal L
FUSION (Zeneca)	FLUAZIFOP-P-BUTYL+FENOXAPROP	2.66 lb/gal L (2.0 + 0.66)
GALAXY (BASF)	BENTAZON+ACIFLUORFEN	3.68 lb/gal L (3 + 0.68)
* GRAMOXONE EXTRA (Zeneca)	PARAQUAT	2.5 lb/gal L
GUARDSMAN (Sandoz)	DIMETHENAMID+ATRAZINE	5 lb/gal L (2.33 + 2.67)
HARMONY EXTRA (DuPont)	THIFENSULFURON METHYL+TRIBENURON METHYL	75% DF
* HARNES (Monsanto)	ACETOCHLOR (+SAFENER)	7 lb/gal L; 20% G
* HARNES XTRA (Monsanto)	ACETOCHLOR (+SAFENER)+ATRAZINE	6 lb/gal L (4.3 + 1.7)
* HARNES XTRA 5.6L (Monsanto)	ACETOCHLOR (+SAFENER)+ATRAZINE	5.6L (3.1 + 2.5)
HERBICIDE 273 (Atochem)	ENDOTHALL	3 lb/gal L
HORNET (DowElanco)	FLUMETSULAM+CLOPYRALID	85.6% DG (23.1 + 62.5)
KERB (Rohm and Haas)	PRONAMIDE	50% WP (in soluble pouches)
* LASSO (Monsanto)	ALACHLOR	4 lb/gal L; 15% G
* LADDOK (BASF)	ATRAZINE+BENTAZON	3.3 lb/gal L (1.7 + 1.7)
* LARIAT (Monsanto)	ATRAZINE+ALACHLOR	4 lb/gal L (1.5 + 2.5)
LEXONE (DuPont)	METRIBUZIN	75% DF; 4 lb/gal L; 75% DF Sencor Solupak
LOROX (DuPont)	LINURON	50% WP; 4 lb/gal L; 50% DF
LINEX (Griffin)	LINURON	4 lb/gal L
LOROX PLUS (DuPont)	LINURON+CHLORIMURON ETHYL	60% DG (56.9 + 3.1)
* MARKSMAN (Sandoz)	ATRAZINE+DICAMBA	3.2 lb/gal L (2.1 + 1.1)
MCPA Several (various)	MCPA	Various L
* MICRO-TECH (Monsanto)	ALACHLOR	4 lb/gal L
NORTRON (AgrEvo)	ETHOFUMESATE	1½ lb/gal L; 4 lb/gal SC
* OPTION II (AgrEvo)	FENOXAPROP	0.79 lb/gal L
* PARTNER (Monsanto)	ALACHLOR	65% DG
PASSPORT (American Cyanamid)	IMAZETHAPYR+TRIFLURALIN	2.6 lb/gal L (0.2 + 2.4)
PERMIT (Monsanto)	HALOSULFURON	75% DS
PINNACLE (DuPont)	THIFENSULFURON METHYL	25% DF
POAST (BASF)	SETHOXYDIM	1.53 lb/gal L
POAST PLUS (BASF)	SETHOXYDIM+DASH	1.0 lb/gal L
PRINCEP (Ciba)	SIMAZINE	4 lb/gal L; 80% WP; 90% DG
PRISM (Valent)	CLETHODIM	0.94 lb/gal L
PROWL (American Cyanamid)	PENDIMETHALIN	3.3 EC
PURSUIT (American Cyanamid)	IMAZETHAPYR	2 lb/gal L; 70% DG, ECO-PAK
PURSUIT PLUS (American Cyanamid)	IMAZETHAPYR+PENDIMETHALIN	3 lb/gal L (0.2 + 2.8)
PYRAMIN (BASF)	PYRAZON	4 lb/gal L; 67% DF; 4.5 lb/gal SC
RAMROD (Monsanto)	PROPACHLOR	4 lb/gal L; 65% WP; 20% G
REFLEX (Zeneca)	FOMESAFEN	2 lb/gal L
RESOLVE (American Cyanamid)	IMAZETHAPYR+DICAMBA	75% SG (18.7 + 56.3)
RESOURCE (Valent)	FLUMICLORAC	0.86 lb/gal L
RO-NEET (Zeneca)	CYCLOATE	6 lb/gal L; 10% G
ROUNDUP ULTRA (Monsanto)	GLYPHOSATE	3 lb/gal L (ae)
SALUTE (Miles Inc.)	METRIBUZIN+TRIFLURALIN	4 lb/gal L (1.33 + 2.67)
SCEPTER (American Cyanamid)	IMAZAQUIN	1.5 lb/gal L; 70% DG, ECO-PAK
SCORPION III (DowElanco)	FLUMETSULAM+CLOPYRALID+2,4-D	84.3% DG (9.3 + 25 + 50)
SELECT (Valent, American Cyanamid)	CLETHODIM	2 lb/gal L
SENCOR (Miles Inc.)	METRIBUZIN	50% WP; 75% DF; 4 lb/gal L; Solupak
* SHOTGUN (United Agri Products)	ATRAZINE+2,4-D ESTER	3.25 lb/gal L (2.25 + 1)
SINBAR (DuPont)	TERBACIL	80% WP

(Continued on next page)

TABLE 13 – GLOSSARY OF CHEMICAL NAMES (continued)

TRADE NAME** AND (MANUFACTURER)	COMMON NAME	CONCENTRATION COMMERCIAL FORMULATION†
SONALAN (DowElanco)	ETHALFLURALIN	3 lb/gal L
STINGER (DowElanco)	CLOPYRALID	3 lb/gal L
SQUADRON (American Cyanamid)	PENDIMETHALIN+IMAZAQUIN	2.33 lb/gal L; (2.0 + 0.33)
STORM (BASF)	BENTAZON+ACIFLUORFEN	4 lb/gal L (2.7 + 1.3)
* SURPASS (Zeneca)	ACETOCHLOR (+SAFENER)	6.4 lb/gal L
* SURPASS 100 (Zeneca)	ACETOCHLOR (+SAFENER)+ATRAZINE	4.9 lb/gal L (2.9 + 2)
SUTAN PLUS (Zeneca)	BUTYLATE+R-25788	6.7 lb/gal L; 10% G
* SUTAZINE (Zeneca)	ATRAZINE+BUTYLATE+R-25788	6 lb/gal L (1.2 + 4.8)
SYNCHRONY STS (DuPont)	CHLORIMURON ETHYL+THIFENSULFURON METHYL	25% DF, Solupak (18.7 + 6.3)
* TOPNOTCH (Zeneca)	ACETOCHLOR (+SAFENER)	3.2 lb/gal L
TOUCHDOWN (Zeneca)	GLYPHOSATE	4.14 lb/gal L (ae)
TREFLAN (DowElanco)	TRIFLURALIN	4 lb/gal L; 10% G
TRI-4 (American Cyanamid)	TRIFLURALIN	4 lb/gal L
TRI-SCEPT (American Cyanamid)	TRIFLURALIN+IMAZAQUIN	3 lb/gal L (2.57 + 0.43)
TURBO (Miles Inc.)	METRIBUZIN+METOLACHLOR	8 lb/gal L (1.45 + 6.55)
VELPAR (DuPont)	HEXAZINONE	2 lb/gal L; 90% WP

*Restricted Use Pesticides

***"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.

†DC – dry concentrate, DF – dry flowable, DS – dry soluble granule, EC – emulsifiable concentrate, G – granular, L – liquid, DG – dispersible granule, WP – wettable powder, WSP – wettable soluble powder.

TABLE 14 – GLOSSARY OF EPA REGISTRATION NUMBERS

Accent SP	DuPont	352-560	Fusion	Zeneca	10182-343
Assure II	DuPont	352-541	Galaxy	BASF	7969-77
Atrazine 4L	Ciba	100-497	Gramoxone Extra	Zeneca	10182-280
Aatrex 90	Ciba	100-585	Guardsman	Sandoz	55947-150
Balan Dry Flowable	Dow Elanco	62719-129	Harmony Extra	DuPont	352-538
Balan E.C.	Dow Elanco	62719-94	Harness	Monsanto	524-473
Banvel	Sandoz	55947-1	Harness Xtra 5.6L	Monsanto	524-485
Banvel SGF	Sandoz	55947-28	Harnexx Xtra	Monsanto	524-480
Basagran	BASF	7969-45	Herbicide 273	Atochem	4581-223
Basis	DuPont	352-571	Hornet	Dow Elanco	62719-253
Basis Gold	DuPont	352-585	Kerb 50-W	Rohm & Haas	707-159
Beacon	Ciba	100-705	Laddok S-12	BASF	7969-100
Betamix	AgrEvo	45639-87	Lariat	Monsanto	524-329
Betamix Progress	AgrEvo	45639-159	Lasso	Monsanto	524-314
Betanex	AgrEvo	45639-86	Lasso II	Monsanto	524-296
Bicep	AgrEvo	100-645	Lexone DF	DuPont	352-390
Bicep II	AgrEvo	100-710	Lexone SP	DuPont	352-550
Bicep Lite	AgrEvo	100-731	Lorox DF	DuPont	352-394
Bladex 4L	DuPont	352-470	Lorox Plus	DuPont	352-451
Bladex 90 DF	DuPont	352-495	Marksman	Sandoz	55947-39
Blazer	BASF	7969-79	MCPA	Rhone Poulenc	264-55AA
Broadstrike + Dual	Dow Elanco/Ciba	62719-239	Micro-Tech	Monsanto	524-344
Broadstrike + Treflan	Dow Elanco	62719-222	Nortron SC	AgrEvo	45639-8
Bronco	Monsanto	524-341	Option II	AgrEvo	45639-185
Buctril	Rhone-Poulenc	264-437	Partner	Monsanto	524-403
Buctril Gel	Rhone-Poulenc	264-531	Passport	American Cyanamid	241-325
Buctril + Atrazine	Rhone-Poulenc	264-477	Permit	Monsanto	524-465
Bullet	Monsanto	524-418	Pinnacle	DuPont	352-525
Butyrac 175	Rhone-Poulenc	264-164	Poast	BASF	7969-58
Butyrac 200	Rhone-Poulenc	264-105	Poast Plus	BASF	7969-88
Canopy	DuPont	352-444	Princep 4L	Ciba	100-526
Clarity	Sandoz	55947-46	Princep Caliber 90	Ciba	100-603
Classic	DuPont	352-436	Prism	Valent	59639-78
Cobra	Valent	59639-34	Prowl 3.3 EC	American Cyanamid	241-337
Command	FMC	279-3053	Pursuit	American Cyanamid	241-310
Commence EL	FMC/Dow Elanco	279-3104	Pursuit DG	American Cyanamid	241-350
Concert	DuPont	352-563	Pursuit Plus EC	American Cyanamid	241-331
Concert SP	DuPont	352-561	Pyramin DF	BASF	7969-81
Conclude B	BASF	7969-76	Ramrod Flowable	Monsanto	524-331
Conclude G	BASF	7969-58	Ramrod and Atrazine	Monsanto	524-328
2,4-D	many	many	Ramrod 20 Granular	Monsanto	524-152
Detail	American Cyanamid	241-361	Reflex	Zeneca	10182-83
Diquat	Zeneca	10182-353	Resource	Valent	59639-
Dual	Ciba	100-673	Ro-Neet 6-E	Zeneca	10182-178
Dual II	Ciba	100-711	Roundup D-Pak	Monsanto	524-333
Dual II G	Ciba	100-712	Roundup RT Shuttle 100	Monsanto	524-454
Eptam 7-E	Zeneca	10182-220	Roundup Ultra	Monsanto	524-475
Eptam 10-G	Zeneca	10182-160	Salute 4EC	Miles Inc.	3125-375
Eptam 20-G	Zeneca	10182-199	Scepter	American Cyanamid	241-289
Eradicane 6.7-E	Zeneca	10182-223	Scepter O.T.	American Cyanamid	241-321
Eradicane 25-G	Zeneca	10182-323	Scepter 70 DG	American Cyanamid	241-306
Evik 80W	Ciba	100-473	Scorpion III	Dow Elanco	62719-264
Exceed	Ciba	100-774	Select 2EC	Valent/AmericanCyanamid	59639-3
Express	DuPont	352-509	Sencor 4	Miles Inc.	3125-314
Extrazine II 4L	DuPont	352-500	Sencor DF	Miles Inc.	3125-325
Extrazine II DF	DuPont	352-577	Sencor Solupak	Miles Inc.	3125-402
Flexstar	Zeneca	10182-390	Shotgun	United Agri Products	34704-728
Flexstar HL	Zeneca	10182-390	Sinbar	DuPont	352-317
Frontier	Sandoz	55947-140	Sonalan 10G	Dow Elanco	62719-184
Frontier 6L	Sandoz	55947-159	Sonalan HFP	Dow Elanco	62719-188
Fusilade DX	Zeneca	10182-367	Stinger	Dow Elanco	62719-73

(Continued on next page)

TABLE 14 – GLOSSARY OF EPA REGISTRATION NUMBERS (cont.)

Squadron	American Cyanamid	241-327	Treflan TR-10	Dow Elanco	62719-131
Storm	BASF	7969-76	Tri-4 EC	American Cyanamid	241-334
Surpass EC	Zeneca	10182-325	Tri-4 HF	American Cyanamid	241-343
Surpass 100	Zeneca	10182-363	Tri-Scept	American Cyanamid	241-307
Sutan + 6.7-E	Zeneca	10182-222	Turbo 8EC	Miles Inc.	3125-366
Synchrony STS	DuPont	352-568	Ultima 160	BASF	7969-121
Touchdown	Zeneca	10182-324	Velpar	DuPont	352-378
Treflan 5	Dow Elanco	62719-118	Velpar L	DuPont	352-392
Treflan E.C.	Dow Elanco	62719-93	Velpar ULW	DuPont	352-450
Treflan M.T.F.	Dow Elanco	62719-116			

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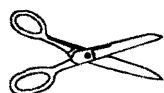
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For any type of an emergency involving a pesticide, immediately contact the following emergency information center for assistance.

Current as of January 1996



Human Pesticide Poisoning

MICHIGAN POISON CONTROL SYSTEM

From anywhere in Michigan, call

1 - 8 0 0 - P O I S O N - 1
1 - 8 0 0 - 7 6 4 - 7 6 6 - 1

Special Pesticide Emergencies

Animal Poisoning

Your veterinarian:

Phone No. _____

or

Animal Health Diagnostic Laboratory (Toxicology) Michigan State University:

(517) 355-0281

Pesticide Fire

Local fire department:

Phone No. _____

and

Fire Marshal Division, Michigan State Police: M-F: 8-12, 1-5

(517) 322-5847

*** Telephone Number Operated 24 Hours**

Traffic Accident

Local police department or sheriff's department:

Phone No. _____

and

Operations Division, Michigan State Police:

***(517) 336-6605**

Environmental Pollution

Pollution Emergency Alerting System (PEAS), Michigan Department of Environmental Quality:

Phone No. _____

and

For environmental emergencies:

***1-800-292-4706**

also

***1-800-405-0101**

Michigan Department of Agriculture Spill Response

Pesticide disposal information

Michigan Department of Environmental Quality, Waste Management Division.

Monday - Friday: 8 a.m.-5 p.m.

(517) 373-2730

National Pesticide Telecommunications Network

Provides advice on recognizing and managing pesticide poisoning, toxicologic, general pesticide information and emergency response assistance. Funded by EPA, based at Texas Tech University Health Services Center.

Monday - Friday:

8:00 a.m. - 6:00 p.m. Central Time Zone

1-800-858-7378

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